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	Attorney Docket No.	2655-0188
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	First Named Inventor	Hutton
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	Attorney Docket No.	2655-0188
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NON-PATENT REFERENCES

Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
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	Attorney Docket No.	2655-0188
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	Reexam number	90/010,416
	First Named Inventor	Hutton
	Patent Under Re-Exam	6108704
	Issue Date	2000/08/22
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0188
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(54) **Migration communication control device.**

(57) Disclosed is a migration communication control device constructed to control a continuous communication between a mobile node and a node unaffected the mobile node's migration. The migration communication control device comprises a first migration control unit, a second migration control unit on the mobile node, and a third migration control unit on the partner node. The first migration control unit comprises a packet transfer unit and an address post unit. The packet transfer unit receives a packet which was destined for an outdated address of the mobile node, generates a conversion packet which holds an updated address instead of the outdated address, and then transmits the conversion packet, while an address post unit transmits an address post message which indicates the updated address to the third migration control unit. The second migration control unit comprises a migration post unit and a packet resumption unit. The migration post unit transmits to the first migration control unit a migration post message which indicates the updated address when the mobile node migrates to another network while a packet resumption unit receives the conversion packet from both the first migration control unit and the third migration control unit and resumes an original packet from the conversion packet. The third migration control unit comprises a packet conversion unit which converts a destination address of a packet into the updated address, then transmits it to the mobile node.

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BACKGROUND OF THE INVENTION

(1) Field of the Invention

The present invention relates to a migration communication control device that controls a communication between a mobile node and a corresponding node to enable them to communicate continuously when the former migrates by managing addresses assigned to the former each time it migrates across networks.

(2) Description of the Related Art

Recent progress in the field of electronic technology makes it possible to assemble smaller and lighter portable computers. These portable computers referred to as mobile nodes are designed so that they can migrate across networks: they are unplugged from a network and plugged in another and communicate with a stationary node. Thus, each of them is assigned a specific address to prove its identity. The address, in general, includes location information as to which network the mobile nodes are currently plugged in, and for this reason, a new address is assigned each time they migrate.

For example, the address composed of a network address unit for specifying a network in which the mobile node is currently plugged in and a node address unit for proving the mobile node's identity in the network, or the address used in a conventional network architecture such as Internet Protocol(details of which are in Internet Protocol, RFC791, Jon Postel, Sep., 1981), they must be changed every time the mobile nodes migrate.

However, once the mobile node migrates to another network, a communication with the stationary node will be terminated. This is because a packet is transmitted to its old address only to be wasted.

Thus, to enable the mobile node and stationary node to communicate continuously when the former migrates, it is necessary to control the communication by managing the steadily changing address.

To date, two address managing methods have been proposed: one by Sony Computer Science Laboratory Inc. and one by the Department of Computer Science at Columbia University.

Sony Computer Science Laboratory Inc. proposed a method using VIP(Virtual Internet Protocol), details of which are on "VIP : Lower Layer Internet Protocol", Fumio Teraoka, Yasuhiko Yokote, Mario Tokoro, Proceed of Data Processing Convention : Multimedia Communication and Distributed Processing.

In this method, each mobile node is assigned a VIP(Virtual Internet Protocol) address and a PIP(Physical Internet Protocol) address. The former is an unchanged address used in a communication application for packet transmission and reception; and the latter is an address changed for every migration to specify an update physical location of the mobil node. Data related to both addresses are held in a cache of a gateway. Under these conditions, the stationary node transmits a packet to the mobile node to the VIP address thereof, and the packet is converted into another packet addressed to the PIP address when it passes the gateway, thence transmitted to the mobile node via the gateways placed in a route onwards. These gateways collect data related to a correlation between the VIP and PIP addresses from the header of the packet upon the receipt thereof, thus updates data in the cache, and hence are able to convert other packets addressed to the VIP addresses into the packets addressed to the PIP addresses based on the correlation entered in the cache.

In this method, in short, the use of the address constituting with the VIP and PIP addresses enables the mobile node and the stationary node to communicate continuously when the former migrates.

The Department of Computer Science at Columbia University proposed a method using an Internet Protocol address of which network address unit does not specify the network which the mobile node is currently plugged in but declares itself to be the mobile node, hence a certain value is given as the network address unit to all the mobile nodes. As well, the method uses an MSS(Mobile Support Station) installed at each network to manage the IP addresses and control a packet route to the mobile node. The MSS is designed so that it collects data related to the update physical location of the mobile nodes by referring other MSSs.

Given these conditions, when the stationary node transmits a packet to the mobile node when it migrates, it first transmits the packet to a first MSS installed in its network; thence the first MSS transfers the packet to a second MSS installed in a network which the mobile node is currently plugged in; and finally the second MSS transfers the packet to the mobile node.

In this method, in short, the use of the MSS enables the mobile node and the stationary node to continue the communication when the former migrates.

In the first method, however, all the nodes must be constructed so that they understand both the VIP and PIP addresses, causing them to extend a scale functionally, otherwise making it impossible to apply this method to apparatuses employed in existing networks. In addition, the communication via the gateways reduces communication efficiency compared with direct packet transmission, because the gateways check whether they have received the packet addressed to the VIP address or PIP address each time they receive it, as well as whether or not to collect the data therefrom to update those in the cache.

In the second method, each network must have the MSS, and the communication via the MSSs makes it impossible to transmit the packet directly, thereby reducing the communication efficiency.

SUMMARY OF THE INVENTION

The present invention therefore has an object to provide a migration communication control device that is available to any apparatus employed in existing networks. Also the present invention has another object to provide a migration communication control device that enables the mobile node and stationary node to communicate continuously when the former migrates by transmitting and receiving the packet directly besides transferring the packet as has been done when the mobile node migrates across the networks.

The above objects are fulfilled by a migration communication control device constructed to control a communication between a mobile node and a partner node, the mobile node migrating across networks and obtaining an address assigned on each network while the partner node being a communication partner of the mobile node, comprising a first migration control unit, a second migration control unit, a third migration control unit, the second migration control unit being placed on the mobile node and the third migration control unit being placed on the partner node, wherein the first migration control unit comprises a packet transfer unit for receiving a packet which was destined for an outdated address of the mobile node, the outdated address assigned when the mobile node migrated to a network to which the first migration control unit is attached, generating a conversion packet which holds an updated address instead of the outdated address, and transmitting the conversion packet; and an address post unit for transmitting an address post message which indicates the updated address of the mobile node to the third migration control unit, the third migration control unit transmitting the packet received by the packet transfer unit, and the second migration control unit comprises a migration post unit for transmitting to the first migration control unit a migration post message which indicates the updated address of the mobile node when the mobile node migrates to another network; and a packet resumption unit for receiving the conversion packet from both the first migration control unit and the third migration control unit and resuming an original packet from the conversion packet, and the third migration control unit comprises a packet conversion unit for converting a destination address of a packet, the packet to be transmitted to the mobile node, into the updated address indicated by the address post message, the address post message sent by the first migration control unit, and transmitting it to the mobile node.

The migration post unit in the second migration control unit may transmit an identification key included in the migration post message, the identification key being employed to identify the mobile node.

The identification key may be an address of the mobile node assigned at one network before the network to which the mobile node is currently attached.

The identification key may be an address of the mobile node assigned before its initial migration.

The second migration control unit may be constructed to transmit to the third migration control unit the packet which has the same format as the resumed packet.

The first migration control unit may further comprise an address hold unit for holding the outdated address and the updated address by corresponding them with each other; and an address comparison unit for comparing the destination address of the received packet with the outdated address, wherein the packet transfer unit generates the conversion packet and transmits it when the address comparison unit detects that the destination address of the received packet coincides with the outdated address.

The first migration control unit may further comprise an address hold unit for holding the outdated address and the updated address by corresponding them with each other; and an address comparison unit for comparing the destination address of the packet received by the packet transfer unit with the outdated address, wherein the address post unit transmits the address post message which indicates the updated address of the mobile node to the third migration control unit, the third migration control unit transmitting the packet received by the packet transfer unit, when the address comparison unit detects that the destination address of the packet coincides with the outdated address.

The second migration control unit may further comprise an address hold unit for holding the outdated address and the updated address by corresponding them with each other; and an address comparison unit for comparing the updated address with the destination address of the packet received from one of the first migration control unit and the third migration control unit, wherein the packet resumption unit resumes the original packet from the conversion packet when the address comparison unit detects that the updated address coincides with the destination address of the packet received from one of the first migration control unit and the third migration control unit.

The third migration control unit may further comprise an address hold unit for holding the outdated address and the updated address of the mobile node by corresponding them with each other; and an address comparison unit for comparing the outdated address in the address hold unit with the destination address of the packet to be transmitted to the mobile node, wherein the packet conversion unit converts the destination address of the packet to be transmitted to the mobile node into the updated address which corresponds to the outdated address in the address hold unit when the address comparison unit detects the outdated address in the address hold unit coincides with the destination address of the packet.

There may be a plurality of the first migration control units, and the second migration control unit transmits the migration post message to at least one of the first migration control units.

The migration post unit in the second migration control unit may transmit the migration post message to the first migration control unit which is attached to the network to which the mobile node was attached before its migration, each of the first migration control units has a migration post unit for transmitting to one of the other first migration control units a migration post message to post the same address as the updated address indicated by the migration post message received from the second migration control unit, and each of the first migration control units has a migration post unit for transmitting a migration post message from one of the other first migration control units to another first migration control unit to post the same address as the updated address indicated by the received migration post message.

Each of the first migration control units and the second migration control unit may further comprise a pointer hold unit for holding pointers related to the first migration control unit to which the migration post message is transmitted, and wherein the migration post unit in each of the first migration control units and the migration post unit in the second migration control unit transmit the migration post message to each of the addresses related to each of the pointers.

Each of the pointers may be a broadcast address of the network to which one of the first migration control units is attached.

Each of the pointers may be an address which is assigned to one of the first migration control units uniquely.

Each of the pointers may be the address of the mobile node which is assigned when the mobile node is attached to the same network as is the first migration control unit, and the migration post unit in the first migration control unit and the migration post unit in the second migration control unit obtain the broadcast address of the network to which each of the first migration control units is attached with referring to the address of the mobile node, and transmits the migration post message to the obtained broadcast address.

The pointer hold unit in the second migration control unit may hold a pointer related to a first migration control unit for the latest migration, which is the first migration control unit being attached to one network before the network to which the mobile node is currently attached, and the pointer hold unit in the first migration control unit holds a pointer related to another first migration control unit attached to the same network as was the mobile node attached before migrating to the network to which the first migration control unit is attached.

The second migration control unit may further transmit to the first migration control unit the pointer by sending thereto the migration post message, the pointer to be held by the first migration control unit.

The first migration control unit may store into the pointer hold unit the pointer when it receives from the second migration control unit the migration post message by corresponding the pointer with the updated address indicated by the received migration post message.

Each of the first migration control units may further comprise an address hold unit for holding the outdated address and the updated address by corresponding them with each other, wherein a migration post message unit stores into the address hold unit the outdated address and the updated address by corresponding them with each other when it receives from the second migration control unit the migration post message, while converts the updated address in the address hold unit into the updated address indicated by the migration post message when it receives from the first migration control unit the migration post message and the outdated address indicated by the migration post message coincides with one of the updated addresses in the address hold unit.

The first migration control unit may be placed on a gateway, which connects networks.

The first migration control unit may be placed on the network as an individual node.

The migration post unit in the second migration control unit may transmit the migration post message to a home migration control unit, the home migration control unit being the first migration control unit which is attached to a network where the mobile node left for its initial migration, and the home migration control unit may further comprise a home migration post unit for transmitting a migration post message to a first migration control unit for the latest migration, the first migration control unit for the latest migration being the first migration control unit which is attached to the network where the mobile node left for the latest migration, to post the same updated address as is indicated by the migration post message received from the second migration control unit.

The first migration control unit may further comprise a migration post unit for transmitting the migration post message indicating the updated address of the mobile node to one of the other first migration control units when the conversion.packet destined for the outdated address of the mobile node was sent therefrom to the first migration control unit.

The migration post unit in the second migration control unit may transmit to the home migration control unit the migration post message where a home address and the updated address are corresponded with each other, the home address assigned when the mobile node is attached to the same network as is the home migration control unit, and each of the packet transfer unit and the address post unit in the home migration control unit may transmit the conversion packet and the address post message respectively with referring to the above home address and the updated address.

The second migration control unit may further comprise an outdated address post unit for transmitting to the first migration control unit for the latest migration an outdated address post message where the outdated address and the home address are corresponded with each other, the outdated address being assigned to the mobile node before the latest migration, the home migration post unit in the home migration control unit may transmit to the said first migration control unit for the latest migration the migration post message where the above home address and the updated address are corresponded with each other, and the packet transfer unit and the address post unit in the first migration control unit for the latest migration may transmit the conversion packet and the address post message respectively in accordance with the outdated address and the updated address, the outdated address and the updated address being corresponded with each other via the home address.

The outdated address post unit in the second migration control unit may transmit the above outdated address post message at a migration of the mobile node preceding the latest migration, and each of the migration post units in the second migration control unit and the home migration post unit in the home migration control unit may transmit the above migration post message at the latest migration of the mobile node.

The second migration control unit may further comprise a home migration control unit pointer hold unit for holding a pointer related to the home migration control unit, the migration post unit in the second migration control unit transmits the migration post message to the address related to the pointer, the home migration control unit may further comprise a pointer hold unit for the latest migration for holding a pointer related to the first migration control unit for the latest migration, and the home migration post unit in the home migration control unit may transmit the migration post message to the address related to the pointer.

Each of the above pointers may be the broadcast address of the network to which each of the first migration control units is attached.

Each of the above pointers may be the address assigned to each of the first migration control units uniquely.

The second migration control unit may further comprise a pointer obtainment unit for requesting to the first migration control unit for the latest migration the pointer related to the first migration control unit for the latest migration, and the migration post unit in the second migration control unit may post the obtained pointer to the home migration control unit together with the updated address by sending thereto the migration post message.

The migration post unit in the second migration control unit may post to the home migration control unit the pointer at the migration of the mobile node preceding the latest migration, while the migration post unit may post the above updated address at the latest migration of the mobile node.

The first migration control unit may further comprise an address post suppressing unit for suppressing transmission of the address post message from the address post unit to the third migration control unit, and the address post suppressing unit may suppress transmission of the address post message when none of the first migration control units is attached to the same network as is the mobile node.

The second migration control unit may further comprise a detect unit for detecting whether or not the first migration control unit is attached to the network to which the mobile node migrates, the migration post unit in the second migration control unit may transmit to the home migration control unit the migration post message which includes the detecting result of the above detect unit together with the updated address, the home migration post unit in the home migration control unit may transmit to the first migration control unit for the latest migration the migration post message which includes the detecting result of the above detect unit together with the updated address, and the address post suppressing unit in each of the home migration control unit and the first migration control unit for the latest migration may suppress the transmission of the address post message in accordance with the detecting result of the above detect unit.

The first migration control unit may further comprise a packet transfer suppressing unit for suppressing transfer of the packet conducted by the packet transfer unit.

The first migration control unit may further comprise an address post suppressing unit for suppressing transmission of the address post message from the address post unit to the third migration control unit, and the address post suppressing unit in the first migration control unit being attached to a network to which the mobile node is not attached, may suppress the transmission of the address post message when the packet transfer suppressing unit in the first migration control unit for the latest migration suppresses transfer of the packet.

The second migration control unit may further comprise a detect unit for detecting whether or not the packet transfer suppressing unit in the first migration control unit suppresses the transfer of the packet, the first migration control unit being attached to the network to which the mobile node migrates, and the migration post unit in the second migration control unit transmits to the home migration control unit the migration post message which includes the detecting result of the above detect unit together with the updated address, the home migration post unit in the home migration control unit may transmit to the first migration control unit for the latest migration the migration post message which includes the detecting result of the detect unit together with the updated address, and the address post suppressing unit in each of the home migration control unit and the first migration control unit for the latest migration may suppress the transmission of the address post message in accordance with the detecting result of the above detect unit.

The packet transfer suppressing unit in the first migration control unit for the latest migration may suppress the transfer of the packet conducted by the packet transfer unit, when the packet transfer suppressing unit in the first migration control unit being attached to the network to which the mobile node migrates suppresses the transfer of the packet.

The above objects may also be fulfilled by a packet transfer migration control unit in a migration communication control device, the migration communication control device being constructed to control a communication between a mobile node and a partner node, the mobile node migrating across networks and obtaining an address assigned on each network while the partner node being a communication partner of the mobile node, comprising a packet transfer unit for receiving a packet which was transmitted by the partner node to an outdated address of the mobile node, the outdated address being assigned when the mobile node migrated to a network to which the packet transfer migration control unit is attached, generating a conversion packet which holds an updated address instead of the outdated address, and transmitting the conversion packet; and an address post unit for transmitting an address post message which indicates the updated address of the mobile node to the partner node, the partner node transmitting the packet received by the packet transfer unit.

The above objects may further be fulfilled by a mobile node migration control unit in a migration communication control device, the migration communication control device being constructed to control a communication between a mobile node which migrates across networks and obtains an address assigned on each network and a partner node which is a communication partner of the mobile node, being placed on the mobile node and comprising a migration post unit for transmitting to a packet transfer migration control unit a migration post message which indicates an updated address of the mobile node when the mobile node migrates to another network, the packet transfer migration control unit for receiving a packet which was transmitted by the partner node to an outdated address of the mobile node, the outdated address assigned when the mobile node migrated to a network to which the migration control unit for packet transfer is attached, generating a conversion packet which holds the updated address instead of the outdated address, and transmitting the conversion packet; and a packet resumption unit for receiving the conversion packet from both the packet transfer migration control unit and the mobile node, and resuming an original packet from the conversion packet.

The above objects are finally fulfilled by a partner node migration control unit in a migration communication control device, the migration communication control device being constructed to control a communication between a mobile node which migrates across networks and obtains an address assigned on each network and a partner node which is a communication partner of the mobile node, being placed on the mobile node and comprising an address post message receiving unit for receiving an address post message which indicates an updated address of the mobile node from a packet transfer migration control unit, the packet transfer migration control unit transmitting an address post message which indicates the updated address of the mobile node to the partner node; and a packet conversion unit for converting a destination address of a packet, the packet to be transmitted to the mobile node, into the updated address indicated by the address post message, and transmitting it to the mobile node.

According to the above construction, the migration communication control device of the present invention transfers and converts the packet using the address assigned to the mobile node each time it migrates across networks, obviating particular addresses or devices such as the VIP address used conventionally. For this reason, the migration communication control device of the present invention can be applied to the existing partner node and mobile node so that they can communicate continuously by transferring the packet. Moreover, it is advantageous that the migration communication control device of the present invention is not necessarily applied to all the nodes to enhance communication efficiency; the present invention can be applied only to where necessary on the existing networks. More precisely, when any existing partner node communicates with the mobile node when it migrates, the packet can be transmitted directly from the mobile nodes to the existing partner node; and it can be transferred via the first migration control unit from the existing partner node to the mobile node, thereby enhancing communication efficiency.

Furthermore, when the partner node employs the migration communication control device of the present invention, communication efficiency is further enhanced thanks to the direct packet transmission and reception made possible by posting the update address of the mobile node from the first migration control unit to the third migration control unit.

Also, the devices such as MSS or a gateway employing the VIP are not necessarily installed at every network to which the mobile node migrates. To be precise, according to the present invention, the continuous communication is implemented even when the mobile node migrates to a network at which no special devices including above ones are installed.

BRIEF DESCRIPTION OF THE DRAWINGS

These and the other objects, advantages and features of the invention will become apparent from the following description thereof taken in conjunction with the accompanying drawings which illustrate a specific embodiment of the invention. In the drawings:

FIG. 1 is a block diagram depicting a construction of a migration communication control device in a first embodiment of the present invention;

FIG. 2 is a block diagram depicting a detailed construction of the migration communication control device employed as a mobile node in the first embodiment of the present invention;

FIG. 3 is a block diagram depicting a detailed construction of the migration communication control device employed as a gateway in the first embodiment of the present invention;

FIG. 4 is a block diagram showing a detailed construction of the migration communication control device employed as a stationary node in the first embodiment of the present invention;

FIG. 5 is a block diagram showing a detailed construction of the migration communication control device employed as an individual node in the first embodiment of the present invention;

FIG. 6 is an illustration showing a first example of a network to which the migration communication control devices in FIG. 2, 3, 4 are attached;

FIG. 7 is an illustration showing a second example of the network to which the migration communication control devices in FIG. 2, 3, 4 are attached;

FIG. 8 is an illustration showing a third example of the network to which the migration communication control devices in FIG. 2, 3, 4 are attached;

FIG. 9 is an illustration showing a fourth example of the network to which the migration communication control devices in FIG. 2, 3, 4 are attached;

FIG. 10 is an illustration showing (a) data in a data hold unit 1 in the mobile node (b) data in a data hold unit 1 in the migration communication control devices each employed as the gateway, the stationary node, and the individual node.

FIG. 11 is an illustration showing a format of a packet in the first embodiment of the present invention;

FIG. 12 is an illustration showing a format of a packet in the first embodiment of the present invention;

FIG. 13 is an illustration showing a content of the data hold unit 1 in the migration communication control device employed as the gateway;

FIG. 14 is an illustration showing a content of the data hold unit 1 in the migration communication control device employed as the individual node;

FIG. 15 is an illustration showing an example of a network to which the migration communication control device is attached in a second embodiment of the present invention;

FIG. 16 is a detailed block diagram depicting a home migration communication control device in the second embodiment of the present invention;

FIG. 17 is an illustration showing a content of a home mobile host list hold unit in the second embodiment of the present invention;

FIG. 18 is a detailed block diagram depicting the visitor migration communication control device in the second embodiment of the present invention;

FIG. 19 is an illustration showing a content of a visitor mobile host list hold unit in the second embodiment of the present invention;

FIG. 20 is a detailed block diagram depicting a migration address unit in the second embodiment of the present invention;

FIG. 21 is an illustration showing a content of an address hold unit in the migration address unit in the second embodiment of the present invention;

FIG. 22 is a detailed block diagram depicting a migration address unit in the second embodiment of the present invention;

FIG. 23 is an illustration showing a content of the address hold unit in the migration address unit in the second embodiment of the present invention;

FIG. 24 is an illustration showing a format of a data packet in the second embodiment of the present invention;

FIG. 25 is an illustration showing a format of a packet transfer message in the second embodiment of the present invention;

FIG. 26 is an illustration showing a flow of a data packet transmitted between devices in the second embodiment of the present invention;

FIG. 27 is an illustration showing a communication sequence in FIG. 26;

FIG. 28 is an illustration showing a construction of each data packet in FIG. 26;

FIG. 29 is an illustration showing a change in the content of each hold unit in FIG. 26;

FIG. 30 is an illustration showing a flow of each data packet transmitted between devices at an operation example in the second embodiment of the present invention;

FIG. 31 is an illustration showing a communication sequence in FIG. 30;

FIG. 32 is an illustration showing a construction of each data packet in FIG. 30;

FIG. 33 is an illustration showing a change in the address hold unit in each device in FIG. 33;

FIG. 34 is an illustration showing a flow of a data packet transmitted between devices at an operation example in the second embodiment of the present invention;

FIG. 35 is an illustration showing the communication sequence in FIG. 34;

FIG. 36 is an illustration showing a construction of each data packet in FIG. 34;

FIG. 37 is an illustration showing a change in the address hold unit in each device in FIG. 34;

FIG. 38 is an illustration showing a flow of each data packet transmitted between devices at an operation example in the second embodiment of the present invention;

FIG. 39 is an illustration showing a communication sequence in FIG. 38;

FIG. 40 is an illustration showing a construction of each data packet in FIG. 38;

FIG. 41 is an illustration showing a change in the address hold unit in each device in FIG. 38;

FIG. 42 is an illustration showing a flow of each data packet transmitted between devices in the second embodiment of the present invention;

FIG. 43 is an illustration showing a flow of each data packet transmitted between devices in the second embodiment of the present invention;

FIG. 44 is an illustration showing a flow of each data packet transmitted between devices in the second embodiment of the present invention; and

FIG. 45 is an illustration showing a flow of each data packet transmitted between devices in the second embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[Embodiment 1]

A construction of a migration communication control device in a first embodiment of the present invention is described hereunder with referring to FIGs. Hereinafter, the mobile node and partner node in the related art as well as in the summary of the invention are referred to as a mobile host and a stationary host, respectively.

FIG. 1 is an illustration showing the construction of the migration communication control device comprising a data hold unit 1, an application unit 2, a migration address unit 3, and a communication control unit 4.

The data hold unit 1 holds a couple of addresses of a mobile host by corresponding them. Each of the addresses in the data hold unit 1 is assigned before and after a migration of the mobile host.

The application unit 2 checks a connection as well as monitors a timer. The unit 2 is relevant for a higher layer in OSI model, which includes an application layer. For example, the unit 2 operates as TCP at TCP/IP (Transmission Control Protocol/Internet Protocol) or a layer which is higher than TCP.

The migration address unit 3 processes a migration address with referring to data in the data hold unit 1. The concrete operation of the migration address unit 3 varies depending on a type of the migration communication control device comprising the unit 3, and this will be described in detail later.

The communication control unit 4 controls the communication. The unit 4 is relevant for a lower layer in the OSI model. For example, the unit 4 operates as a layer which is lower than IP at TCP.

The application unit 2 and the communication control unit 4 are the same units as ones implemented on a general host. Besides the unit 2 and 4, the migration communication device in the first embodiment of the present invention includes the data hold unit 1 and the migration address unit 3; thereby implements an operation unique to this case. That is, the data hold unit 1 and the migration address processing unit 3 are attached to the mobile host which migrates across networks, or a stationary host which is attached to a network fixedly (for example, a gateway or a server); otherwise, they operate alone. Each device comprising the unit 1 and 3 supports a continuous communication unaffected by migration of the mobile host besides providing its own function.

The data hold unit 1 and the mobile address unit 3, which are included in the devices attached to the network, are described in FIGs. 2, 3, 4, 5. FIG. 2 shows a migration communication control device where the unit 1 and the unit 3 are attached to the mobile host which migrates across networks; FIG. 3 shows a migration communication control device where the unit 1 and the unit 3 are attached to a gateway which connects the networks; FIG. 4 shows a migration communication control device where the unit 1 and the unit 3 are attached to the stationary host, which is the communication partner of the mobile host; and FIG. 5 shows a migration communication control device attached to the network itself.

The migration communication control device in FIG. 2 (hereinafter referred to as a mobile host) further includes the application unit 2, the communication control unit 4, and an address obtainment unit 25, besides the data hold unit 1 and the migration address unit 3.

Each of the application unit 2 and the communication control unit 4 operates as the above; while the unit 2 together with the unit 4 operate as a conventional stationary host.

The address obtainment unit 25 obtains an address of the mobile host assigned when it has migrated to another network. Although other options can be considered, such as employing a manual setting by an operator or communicating with a server computer which administrates addresses of the network, it is supposed here that the address is obtained in accordance with an instruction of a system administrator or the operator. The address obtainment unit 25 is also possessed by a general host and will not be described in detail.

The addresses held in the data hold unit 1 are obtained by the address obtainment unit 25.

The migration address unit 3 (enclosed with a broken line) consists of a response message transmission unit 20, a marked packet conversion unit 21, a migration address setting unit 26, a migration post transmission unit 27, a reception packet unit 28, and a marked packet resumption unit 29.

The response message transmission unit 20 transmits the packet which responds to the received packet if the response is needed.

The marked packet conversion unit 21 converts a packet received from the response message transmission unit 20 as well as the application unit 2 into a marked packet by converting the address of the received packet and marking the packet.

The migration address setting unit 26 stores the address obtained by the address obtainment unit 25 into the data hold unit 1. The address obtained by the unit 25 is the address of the mobile host assigned after the migration, and the unit 26 stores it into unit 1 by corresponding it to the address of the mobile host assigned before the migration.

The migration post transmission unit 27 posts via the communication control unit 4 that the address obtained by the unit 25 is held in the data hold unit 1 together with the correspondence between a couple addresses each of which assigned before and after the migration.

The reception packet unit 28 detects whether or not the received packet is marked, and sends the unmarked packet to the application unit 2 while sending the marked packet to the marketed packet resumption unit 29.

The marked packet resumption unit 29 resumes the marked packet.

The migration communication control device in FIG. 3 (hereinafter referred to as a gateway) further includes the application unit 2 and the communication control unit 4 besides the data hold unit 1 and the migration address unit 3 (enclosed with a broken line).

Each of the application unit 2 and the communication control unit 4 operates described the above, and the unit 2 together with the unit 4 operate as a conventional gateway.

The data hold unit 1 holds the correspondence between a couple of the addresses of the mobile host each of which assigned before and after migration.

The migration address unit 3 consists of a reception packet unit 35, a migration post information unit 36, an address comparison unit 37, an address conversion post transmission unit 38, and a marked packet conversion unit 39.

The reception packet unit 35 detects whether or not the received packet is the packet comprising a migration post message, which is transmitted by the mobile host. The unit 35 then sends the migration post message to the migration post information unit 36 while sending the other packets to the address comparison unit 37.

In accordance with the migration post message received from the reception packet unit 35, the migration post information unit 36 stores in the data hold unit 1 the correspondence between a couple of the addresses of the mobile host each of which assigned before and after the migration. The unit 36 also sends the migration post message to the address conversion post transmission unit 38.

The address comparison unit 37 detects whether or not the destination address of the packet received from the reception packet unit 35 coincides with the address of the mobile host assigned before migration, which is held in the data hold unit 1. When they coincide with each other, the unit 37 further sends to the marked packet conversion unit 39 the address assigned after the migration, which corresponds to the address which coincides with the destination address, as well as the packet received from the reception packet unit 35. On the other hand, when they do not coincided with each other, the unit 37 implements a function of a gateway by sending the packet to the application unit 2.

The address conversion post transmission unit 38 transmits to the destination address of the above packet received from the reception packet unit 35 an address conversion post message to inform that the address of the mobile host changes when the address comparison unit 37 detects a coincidence. Also the unit 38 transmits the address conversion post message to the network which satisfies the following two conditions: (1) the network where the address assigned before the migration, which is held in the data hold unit 1, is other than 0 (2) the migration communication control device employs as the gateway is not attached to the network. When the address conversion post message is transmitted to the network, which satisfies the above conditions, its destination address is a broadcast address of the network. The broadcast address consists of a network part and a host part, and every bit of the host part is 1.

The marked packet conversion unit 39 generates a marked packet when the address comparison unit 37 detects a coincidence. The unit 39 generates it by marking a general packet after converting the destination address of the packet. Then, the unit 39 transmits it.

The migration communication control device in FIG. 4 (hereinafter referred to as a stationary host) further includes the application unit 2 and the communication control unit 4 besides the data hold unit 1 and the migration address unit 3 (enclosed with a broken line).

Each of the application unit 2 and the communication control unit 4 operates as described the above, and the unit 2 together with the unit 4 operate as a conventional stationary host (not migrate).

The data hold unit 1 holds the correspondence between a couple of the addresses of the mobile host each of which assigned before and after the migration.

The migration address unit 3 consists of a reception packet unit 45, a marked packet resumption unit 46, an address conversion post information unit 47, an address comparison unit 48, and a marked packet conversion unit 49.

The reception packet unit 45 detects whether the received packet is the packet comprising the address conversion post message, the marked packet, or the other packets. The address conversion post message is transmitted by the gateway. Then the unit 45 sends the address conversion post message to the address conversion post information unit 47, the marked packet to the marked packet resumption unit 46, and the other packets to the application unit 2.

The marked packet resumption unit 46 resumes the unmarked packet from the marked packet, which is received from the reception packet unit 45.

The address conversion post information unit 47 obtains from the packet comprising the address conversions post message, which is received from the reception packet unit 45, the correspondence between the address of the mobile host assigned before the migration and the one assigned after the migration, and stores it into the data hold unit 1.

The address comparison unit 48 detects whether or not destination address of the packet received from the application unit 2 coincides with the address of the mobile host assigned before migration, which is held in the data hold unit 1. When they coincide with each other, the unit 48 further sends to the marked packet conversion unit 49 the address assigned after the migration, which corresponds to the address which coincides with the destination address, as well as the packet received from the application unit 2. On the other hand, when they do not coincided with each other, the unit 48 sends the packet to the communication control unit 4.

The marked packet conversion unit 49 generates a marked packet when the address comparison unit 37 detects a coincidence. The unit 49 generates it by marking a general packet after converting the destination address of the packet. Then, the unit 49 transmits it.

The migration communication control device in FIG. 5, which is attached to the network by itself, consists of the data hold unit 1, the migration address unit 3 (enclosed with a broken line), and the communication control unit 4.

The data hold unit 1 holds the correspondence between a couple of the addresses of the mobile host each of which assigned before and after the migration.

The migration address unit 3 consists of the reception packet unit 35, the migration post information unit 36, the address comparison unit 37, the address conversion post transmission unit 38, and the marked packet conversion unit 39. The units integrating the migration address unit 3 operate substantially same as equivalent units integrating the gateway in FIG. 3 except the following.

In FIG. 3 the address conversion post transmission unit 38 transmits the address conversion post message to the network satisfying both of the two conditions, which are described in the above; whereas, the address conversion post transmission unit 38 in FIG. 5 transmits the address conversion post message to the broadcast address of the network as long as the network satisfies the first condition, that is it transmits the address conversion post message to the network when the address assigned before the migration, which is held in the data hold unit 1, is other than 0.

FIG. 6 shows a first example of a network to which the migration communication control device as the mobile host in FIG. 2, the migration communication control device as the gateway in FIG. 3, and migration communication control device as the stationary host in FIG. 4 are attached. In the figure numeral 11 denotes a mobile host in FIG. 2, which migrates from a network A to a network B and obtains an address α assigned on the network A as well as an address β assigned on the network B.

Numeral 12 denotes a stationary host in FIG. 3, which is attached to the network B and obtains an address γ assigned thereon.

Numeral 12' denotes a stationary host in FIG. 3, which is attached to the network A and obtains an address γ' assigned thereon.

Numeral 13 denotes a gateway in FIG. 3, which has an address g. The gateway 13 is attached to both the network A and the network B.

The address on each network is assigned by a system administrator.

FIG. 7 shows a second example of a network to which the mobile host in FIG. 2, the gateway in FIG. 3, and the stationary host in FIG. 4 are attached. The stationary host is not illustrated in FIG. 7 since its location does not affect the communication with the mobile host.

In the figure the mobile host 11 migrates across network 1-4, and obtains an address m, m', m'', m''' assigned on each network respectively.

The network 5 as well as each of the network 1-4 (hereinafter referred to as the net 5, and the net 1-4 respectively) are connected with each other by a gateway 1-4, as shown in the figure.

A gateway 1-4 (hereinafter referred to as gw 1-gw 4) is the migration communication control device employed as the gateway in FIG. 3.

FIG. 8 shows a third example of the network to which the mobile host in FIG. 2, the gateway in FIG. 3, and the stationary host in FIG. 4 are attached. Construction of this network is substantially same as the second example of the network in FIG. 6 although operation thereof is different from the second example, which will be described later.

FIG. 9 shows a fourth example of the network to which the mobile host in FIG. 2, the migration communication control device in FIG. 5, the stationary host in FIG. 4 are attached. The migration communication control device as the stationary host will not be described here.

In the figure, numeral 11 denotes the mobile host which migrates across the network 1-4 and obtains the address m, m', m'', m''' assigned on each network respectively.

The network 5 as well as each of the network 1-4 (hereinafter referred to as the net 5, and the net 1-4 respectively) are connected with each other by a gw 1-4, as shown in the figure.

Each of the migration communication control unit 1-4 (hereinafter referred to as S1-S4) is relevant for the one in the FIG. 5.

An address used in the first embodiment of the present invention is described hereunder. Each address consists of a network part, which is assigned on each network and shared by every host attached to that network, as well as a host part, which is assigned to each host uniquely.

A broadcast address is a special kind of address, which can be divided into two types. The first one is the broadcast address used as the destination address in transmitting a packet from a network to another network, such as the broadcast address where every bit of the host part is 1. When the first type of the broadcast address is used as the destination address of the packet, the packet is transferred by the gateway to the network directed by the network part of the broadcast address. The other one is used in transmitting a packet within a network, such as the broadcast address where every bit of both the host part and the network part is 1. When the second type of the broadcast address is used as the destination address of the packet, the packet is transmitted to all the devices attached to the network, which includes the broadcast address. However, the gateway does not transfer the packet to any other network.

Operations of the migration communication control device in the first embodiment of the present invention are described hereunder with referring to drawings.

(operation example in FIG. 6)

In FIG. 6, when the mobile host migrates from the network A to the network B, the migration communication control device is operated as follows.

In a first operation, the mobile host and the gateway operate when the mobile host migrates across networks.

In a second operation, the stationary host transmits a packet to an address of the mobile host which was assigned before the migration.

In a third operation, the stationary host transmits the packet to an address of the mobile host which has been assigned after the migration.

In a fourth operation, the mobile host receives the packet which is transmitted by the stationary host.

In a fifth operation, the mobile host sends a response message to the stationary host.

(first operation in FIG. 6)

In FIG. 6 the mobile host 11 attached to the network A (enclosed with a broken line) migrates to the network B to complete ongoing communication with the stationary host 12, which is attached to the network B. When migrating to the network B, the address obtainment unit 25 in the mobile host 11 (FIG. 2) obtains the address β assigned on the network B.

Immediately after obtaining the address β, the address obtainment unit 25 gives the address β to the migration address setting unit 26 and the migration post transmission unit 27. The migration address setting unit 26 stores the address β into the data hold unit 1 by corresponding it to the address α, which is the address assigned before the migration. FIG. 10 (a) shows the content of the data hold unit 1. The migration post transmission unit 27 gives to the gateway 13 via the communication control unit 4 a packet comprising migration post message and the correspondence between the address α and the address β, so that the gateway 13 will know that the mobile host 11 has migrated to the network B. The mobile host 11 can transmit the packet both before and after the migration. In FIG. 6 a packet 51 is transmitted before the migration, and its format is shown in FIG. 11 (a). As shown in FIG. 11 (a), the packet 51 consists of a destination address 91, a source address 92, and data 93. The data 93 further comprise a message type 98, an address before migration 94, and an address after migration 95.

Receiving from the communication control unit 4 the packet 51, the gate way 13 sends it to the reception packet unit 35, the unit 4 and the unit 35 being in FIG. 3. From the message type 98 in FIG. 11 (a), the gateway 13 identifies the packet 51 with the migration post message, and gives the packet 51 to the migration post information unit 36. The migration post information unit 36 obtains from the data 93 in the data packet 51 the address before migration α and the address after the migration β; then stores them into the data hold unit 1 by corresponding them with each other. The content of the data in the data hold unit 1 is shown in FIG. 10 (b).

Additionally, the destination address 91 of the packet in FIG. 11 (a), can be the broadcast address of the network A, where the network part names the network A and every bit of the host part is 1. When the broadcast address is employed, every stationary host attached to the network A, including the gate way 13, receives the correspondence of the addresses each of which assigned before and after the migration. In this case communication control unit 4 in the stationary host 12' receives the data packet 51, and gives it to the reception packet unit 45, the unit 4 and the unit 45 in FIG. 4. From the message type 98 in FIG. 11 (a), the reception packet unit 45 identifies the packet 51 with the migration post message, and gives the packet 51 to the address conversion post information unit 47. The unit 47 obtains from the data 93 in the data packet 51 the address before migration α and the address after the migration β and stores them into the data hold unit 1 by corresponding them with each other. Once those addresses are stored in the data hold unit 1, the stationary host 12' can transmit a packet to the address assigned after the migration instead of transmitting it to the address before the migration, the same to other stationary hosts attached to the network A.

(second operation in FIG. 6)

In the second operation, the stationary host 12 transmits a packet to the address assigned before the migration after the mobile host 11 migrates to the network B and obtains the address β assigned on the network B. It is supposed that the mobile host 11 transmits the packet 51, which comprises the migration post message, to the gateway 13 rather than to the broadcast address of the network A.

The stationary host 12, which is not notified that the mobile host 11 has migrated to the network B, transmits the packet to the address α of the mobile host, which was assigned before the migration. A packet 52 in FIG. 6 is transmitted by the stationary host 12 to the address α of the mobile host 11, and its format is shown in FIG. 11 (f). The packet 52 is received by the gateway 13. Because the gateway 13 is located between the source address of the packet 52 and the address of the mobile host α assigned before the migration, and also it is attached to the network A, to which the mobile host 11 was attached before the migration.

The gateway 13 employs its devices in FIG. 3 to implement its functions including reception of the packet. That is, the communication control unit 4 in the gateway 13 receives the packet 52, and sends it to the reception packet unit 35 in the migration address unit 3. The reception packet unit 35 identifies the packet 52 with a general packet and gives it to the address comparison unit 37. The unit 37 compares the destination address α of the packet 52 with the address before the migration, which is held in the data hold unit 1; then detects whether or not they are coincide with each other. When the destination address of the received packet does not coincide with the address assigned before the migration, the address comparison unit 37 sends the packet to the application unit 2. On the other hand, when they coincide with each other, the address comparison unit 37 obtains from the data hold unit 1 the address β of the mobile host assigned after the migration, which corresponds to the address α; then sends it both to the address conversion post transmission unit 38 and the marked packet conversion unit 39.

As is described the above, the packet 52 is transmitted to the address α of the mobile host 11 by the stationary host 12. Therefore, the address conversion post transmission unit 38 notifies the stationary host 12 that the address of the mobile host 11 has changed by transmitting thereto the packet 53. FIG. 11 (b) shows the packet 53. Simultaneously, the marked packet conversion unit 39 converts the packet 52 into the packet 53 by rewriting the destination address of the packet 52 to the address β assigned after the migration, returning thereto the previous destination address of the packet 52 as additional information, and marking to show that its destination address has changed; then sends the packet to the communication control unit 4. Thereby, the packet 52, which is converted into the marked packet 52', is transferred from the address α of the mobile host 11 assigned before the migration to the address β assigned after the migration. FIG. 12 (e) shows the packet 52'.

Receiving the packet 53 from the communication control unit 4 in the stationary host 12, it sends its packet 53 to the reception packet unit 45, the unit 4 and the unit 45 being in FIG. 4. From the message type 98 in FIG. 11 (b), the reception packet unit 45 identifies the packet 53 with the address conversion post message, and gives the packet 53 to the address conversion post information unit 47. The address conversion post information unit 47 obtains from the data 93 in the data packet 53 the address before migration α and the address after the migration β; then stores them into the data hold unit 1 by corresponding them with each other. Thereby, the stationary host 12 obtains the address of the mobile host 11 assigned after the migration, so that a direct communication between the stationary host 12 and the mobile host 11 is implemented.

In the second operation the migration communication control device comprising the units in FIG. 4 is employed as the stationary host 12. However, a conventional stationary host, which is not constructed as the migration communication control device can also be communication partner of the mobile host if it is attached to a network. Therefore, hereunder a communication between the mobile host 11 and the convention stationary host is described.

When the conventional stationary host transmits a packet to the address of the mobile host 11 assigned before the migration after the mobile host 11 has migrated to another network, the gateway 13 transfers the packet to the address of the mobile host 11 assigned after the migration as well as sends to the stationary host the packet 53 comprising the address conversion post message in FIG. 11 (c). This operation is same as the above.

However, when receiving the packet 53, the stationary host disposes it since it does not support the address conversion post message and judges the packet 53 is not a required packet. Thus, the conventional stationary host cannot utilize the packet 53 to detect the address of the mobile host assigned after the migration nor hold the correspondence of the addresses each assigned before and after the migration.

Therefore, the stationary host gives the packet only to the address of the mobile host 11 assigned before the migration. Then, the gateway transfers the packet to the address of the mobile host 11 assigned after the migration, and the mobile host 11 receives the packet. The message from the mobile host 11, such as the response message, is transmitted to the stationary host directly, so that it is received by the stationary host without fail.

Thus, the conventional stationary host transmits a packet to the mobile host indirectly and receives a packet from the mobile host directly. Continuous communication unaffected by the mobile host's migration can be implemented, even when the conventional stationary host is employed.

(third operation in FIG. 6)

In the third operation, the stationary host 12 transmits the packet to the address β of the mobile host 11 assigned after the migration with referring to the correspondence of the addresses each assigned before and after the migration, which is held in the data hold unit 1. The third operation is described hereunder with referring to FIG. 4.

The stationary host 12 employs its devices in FIG. 4 to implement conversion of the destination address and the transmission of the packet, both of which integrate the third operation. That is, application unit 2 sends to the address comparison unit 48 the packet 54, whose destination address is the address α of the mobile host 11 assigned before the migration. FIG. 11 (f) shows a format of the packet 54. Then, the comparison unit 48 obtains the destination address of the packet 54 and detects whether or not it coincides with the address before the migration, which is held in the data hold unit 1.

The comparison unit 48 sends the packet 54 to the communication control unit 4 when the above addresses do not coincide with each other while it sends the packet 54 to the marked packet conversion unit 49 when the above addresses coincide with each other. In the third operation the coincidence is detected since the corresponded between the address α and the address β is stored in the data hold unit 1. Therefore, the packet 54 is sent to the marked packet conversion unit 49. Then the marked packet conversion unit 49 obtains from the data hold unit 1 the address β of the mobile host assigned after the migration, which corresponds to the address α as well as converts the packet 54 into the packet 54' by converting the destination address α into the address β, returning thereto the original destination address α as additional information, and marking the packet 54 to show that its destination address has changed; then sends the packet 54' to the communication control unit 4. FIG. 11 (c) shows a format of the packet 54'. Since the destination address of the packet 54' is an updated address of the mobile host 11, the packet 54' is given to the mobile host 11 without fail.

(fourth operation in FIG. 6)

In the fourth operation, the mobile host 11 receives the marked packet 54' and obtains the original unmarked packet 54 by resuming the packet 54'. This operation is described hereunder with referring to FIG. 2.

The mobile host 11 employs its devices in FIG. 2 to implement its operation. That is, the communication control unit 4 receives the packet 54' and sends it to the reception packet unit 28. The reception packet unit 28 detects that the received packet 54' is marked, and sends it to the marked packet resumption unit 29. The unit 29 obtains the original destination address α, which is held in the additional information 97, and replaces the current destination address β of the packet 54' with the address α. Then it sends the packet 54' to the application unit 2. Thus, the mobile host 11 can receive the packet destined for its outdated address.

(fifth operation in FIG. 6)

In the fifth operation, the mobile host 11 sends to the stationary host 12 a packet comprising a response message (hereinafter referred to as a response packet) or a packet excluding the response message (hereinafter referred to as a non-response packet). A type of the received packet determines whether or not it is responded with the response packet.

When the packet 54' is responded with a response packet, the mobile host 11 employs its devices in FIG. 2 to send the response packet. That is, the response message transmission unit 20 builds the response packet, and sends it to the marked packet conversion unit 21 together with the destination address α of the packet 54'.

The mobile host 12 also employs its devices to send the non-response packet 55. That is, the application unit 2 gives the address α assigned before the migration and the non-response packet to the marked packet conversion unit 21. The unit 21 sends the received packet to the stationary host 12 via the communication control unit 4 without marking it. FIG. 11 (e) shows the packet sent by the unit 21 to the stationary host 12.

The communication control unit 4 in the stationary host 4 receives the packet 55, and gives it to the reception packet unit 45. The unit 45 detects that the packet 55 is the non-response packet, so that it gives the packet 55 to the application unit 2. Thus, the stationary host and the mobile host implement a continuous communication unaffected by mobile host's migration. Although the migration communication control device is employed as the stationary host 12 in this embodiment, the conventional host can also be employed to transmit the non-response packet.

In the above, the unmarked response packet and the unmarked non-response packet are sent to the mobile stationary host 12. On the other hand, hereunder the operation of the mobile host 11 at conversion of the response packet and the non-response packet into the marked ones is described. This will be employed effectively in a communication between mobile hosts.

Receiving the unmarked packet from the application unit 2, the marked packet conversion unit 21 generates a packet 55' where the destination address and the source address are the address γ of the stationary host 12 and the address β assigned after the migration respectively. Also in generating the packet 55', the application unit 2 gives to the received packet the address α assigned before the migration as additional information as well as marks the received packet to indicate that the destination address has converted. FIG. 11 (d) shows a format of the packet 55'. Then the application unit 2 sends the packet 55' to the stationary host 12 via the communication control unit 4.

The communication control unit 4 in the stationary host 12 receives the packet 55', and sends it to the reception packet unit 45. Detecting the packet 55' is the marked packet, the reception packet unit 45 sends it to the marked packet resumption unit 46. The unit 46 resumes the packet 55' into the packet 55 by unmarking it and replacing the source address thereof with the address α assigned before the migration, which is held as the additional information. A format of the packet 55 is shown in FIG. 11 (e). Thus, the stationary host and the mobile host implement a continuous communication unaffected by mobile host's migration.

(operation example in FIG. 7)

In FIG. 7, when the mobile host migrates across the network 1, 2, 3, and 4, and obtains a temporary address assigned on each network, the newest address of the mobile host is transmitted to the stationary host, which operates as communication partner.

(migration from network 1 to network 2)

The address of the mobile host is m when it is attached to the network 1. When migrating from the network 1 to the network 2, the mobile host 11 replaces its address with m' assigned on the network 2. Then the mobile host 11 notifies the migration communication control device attached to the network 1 that it has migrated to the network 2 by sending thereto a packet comprising a migration post message. In FIG. 7 the migration communication control device gw 1, gw 2 attached to the network 1 receive the migration post packet 61, and store it into its own data hold unit 1. The operation in FIG. 7 is substantially same as the operation in FIG. 6 except that in FIG. 7 the packet 61 holds the address of the mobile host assigned before the last migration besides the correspondence of the addresses each assigned before and after the current migration. The address assigned before the last migration makes the gws prepare for further migration of the mobile host, which will be described later. A format of the packet 61 is shown in FIG. 12 (a). Since the migration from the network 1 to the network 2 is the first migration in FIG. 7, the packet 61 holds 0 at the address assigned before the last migration.

The gw 1 and the gw 2 store in the data hold unit 1 the correspondence of the addresses each assigned before and after the migration, as well as the address assigned before the last migration. As shown in FIG. 13 (a), m-m' and 0 are stored in the data hold unit 1 of each of the gw 1 and the gw 2.

Then, the gw 1 and the gw 2 detects from 0 at the address assigned before the last migration that no migration had been conducted before the current migration.

The broadcast address of the network 1 can be employed as the destination address of the migration post packet 61. If the packet is destined for the broadcast address, every host attached to the network 1, which includes the gw 1 and the gw 2, will hold the correspondence of the addresses each of which assigned before and after the migration as well as the address assigned before the last migration. Thereby, the hosts attached to the network 1 can communicated with the mobile host directly.

(migration from network 2 to network 3)

When migrating from the network 2 to the network 3, the mobile host 11 obtains m" at the address assigned after the migration. Then the mobile host 11 notifies the gw 2 and a gw 3, both of which are attached to the network 2, that the mobile host 11 has migrated to the network 3 by transmitting thereto a packet comprising the migration post message, referred to as a packet 62 in FIG. 7. FIG. 12 (b) shows a format of the packet 62, which is transmitted to the gw 2. The broadcast address of the network 2 can be employed as the destination address of the packet 62. When the packet 62 is transmitted to the broadcast address of the network 2, every host attached to the network 2, which includes the gw 2 and the gw 3, holds the correspondence of the addresses each assigned before and after the migration.

The gw 2 employs its devices in FIG. 3 to process the packet 62. That is, receiving the packet 62, the gw 2 sends it to the migration post information unit 36 via the communication control unit 4 and the reception packet unit 35, then refers to the data hold unit 1 where m→m' and 0 are still held at the address correspondence and at the address assigned before the last migration respectively. The migration post information post unit 36 obtains from the packet 62 m'-m" as the newly assigned correspondence between the addresses each of which assigned before and after the current migration, the migration from the network 2 to the network 3. Then, it detects whether or not the address m' coincides with the address held in the data hold unit 1 as the address assigned after the last migration. Since the unit 36 detects the coincidence, it replaces the address m' in the unit 1 with the address m" as well as replaces the correspondence m-m' with the correspondence m-m".

Also the migration post information unit 36 sends to the data hold unit 1 the address m assigned before the last migration together with the address correspondence m'-m" obtained from the current migration. Now the data hold unit 1 in the gw 2 holds the address m at the address assigned before the last migration and the address correspondence m'-m" at the correspondence of the addresses each of which assigned before and after the migration as well as the address 0 at the address assigned before the last migration as well as the address correspondence m-m' at the correspondence of the addresses each of which assigned before and after the migration. After updating as well as adding the addresses in the data hold unit 1, the migration post information unit 36 sends to the address conversions post transmission unit 38 m'-m" as the newly obtained correspondence of the addresses before and after the current migration.

The address conversion post transmission unit 38 detects the network satisfying the following conditions with referring to the data hold unit 1 and then transmits the address conversion post message to the broadcast address of the detected network. That is, the address conversion post message is transmitted to the network where the address assigned before the migration, which is held in the data hold unit 1, is other than 0 as well as the migration communication control device employed as the gateway is not attached. Although in the migration from the network 2 to the network 3, the data hold unit 1 holds m at the address assigned before the last migration, the gw 2 is attached to the network 1; therefore, the unit 38 does not transmit the address conversion post to the network 1.

The packet 62 is also received by gw 3. When receiving the packet 62, the gw 3 employs its own devices in FIG. 3 to process the packet 62, which is substantially same as does the gw 2 except the following. That is, the address conversion post transmission unit 38 of the gw 3 detects that the gw 3 is not attached to the network 1. Also it is detected that the mobile host 11, attached to the network 1, has the address m as the address assigned before the last migration. Therefore, the unit 38 of the gw 3 transmits to the broadcast address of the network 1 a packet comprising the address conversion post message, which is referred to as a packet 63. FIG. 12 (c) shows the packet 63.

The packet 63 is received by the gw 2, the gw 1, both of which are attached to the network 1. Although it is also received by the stationary host 11, this will not be described here. Obtaining the current address correspondence m'-m" from the packet 63, where m' coincides with the address which has been held in the hold unit 1 at the address obtained after the migration, the gw 1 changes the m-m' in the data hold unit 1 into the m-m" by replacing m' with m" as the address assigned after migration.

On the other hand, the data hold unit 1 of the gw 2 had gained from the packet 62 the above information before receiving the packet 63. Therefore the content of the unit 1 of the gw 2 does not change across reception of the packet 63. This is because the gws of the present invention locate on a gateway, which connects a couple of networks. Due to its location, each gw receives packets from two networks. However, actually the packet 62 is destined for the network 2 and the packet 63 is destined for the network 1. Therefore, even though the gw 2, which are attached to both the network 1 and the network 2, receives both the packet 62 and 63 by the gw 2, this will not cause any problem in the communication between the stationary host 12 and the mobile host 11.

FIG. 13 (b) shows the content of the data hold unit 1 in each of the gws.

(migration from network 3 to network 4)

When migrating from the network 3 to the network 4, the mobile host 11 obtains m''' as the address assigned after the migration. Then the mobile host 11 sends to the gw 3 and a gw 4, both of which are attached to the network 3, a packet comprising the migration post message. The packet received by the gw 3 is referred to as a packet 64. The broadcast address of the network 3 can be employed as the destination address of the packet 64. When the packet 64 is destined for the broadcast address of the network 3, every host attached to the network 2, which includes the gw 3 and the gw 4, obtains from the packet the correspondence of the addresses each of which assigned before and after the migration from the network 3 to the network 4.

The gw 3 employs its devices in FIG. 3 to process the packet 64. That is, receiving the packet 64, the gw 3 converts the content of the data hold unit 1 by replacing the address correspondence m-m'' with m-m''', newly holding m''-m''' obtained from the packet 64 as well as the address m' assigned before the last migration. Then, the address conversion post transmission unit 38 of the gw 3 transmits the address conversion post message to the network satisfying the following condition. That is, the address conversion post message is transmitted to the network where the address assigned before the migration, which is held in the data hold unit 1, is other than 0 as well as the gw 3 it self is not attached. The packet including the address conversion post message is referred to a packet 65, and the packet is transmitted to the broadcast address of the network 1. FIG. 7 (c) shows the packet 65.

The packet 64 is also received by gw 4. When receiving the packet 64, the gw 4 renews the content of the data hold unit 1 by replacing m'-m'' with m'-m''' as well as newly holding the address m' as the address assigned before the last migration. Further, the address conversion post transmission unit 38 of the gw 4 detects that the gw 4 is not attached to the network 2 which has the address other than 0 at the address assigned before the last migration; therefore, the unit 38 of the gw 4 transmits a packet comprising the address conversion post message, which is referred to as a packet 66, to the broadcast address of the network 2. FIG. 7 (c) shows the packet 66.

Receiving the packet 65, 65, the gw 2 and the gw 1 renew the content of its data hold unit 1, which is substantially the same as the above.

The gw 3 and the gw 2 receives the same information twice since the former receives the packet 64 and 65 while the latter receives the packet 65 and 66. This is because gws of the present invention locate on a gateway and receives packets from a couple of networks, which is described the above.

FIG. 13 (c) shows the content of the data hold unit 1 in each of the gws. Thus, according to the gws of the present invention, the packet transmitted to any of the addresses m, m', m'' is transferred by the gws to the updated address of the mobile host, the gws also notify the stationary host of the updated address.

For example, when the stationary host is not notified of the updated address of the mobile host and transmits a packet to the address m', the packet is received by the gw 2 and the gw 3, both of which are attached to the network 2. Then, the gw 2 and the gw 3 transfers the packet to the updated address of the mobile host as well as notifies the stationary host of the updated address. Thereby, the stationary host obtains the updated address of the mobile host, so that it will be able to communicate with the mobile host directly. The packet destined for the address m' is received by both the gw 2 and the gw 3, since they are attached to the network 2. Thus, the mobile host receives the same packet twice, once from the gw 2 and the other time from the gw 3, and the stationary host receives the same message twice; however, the repeated packet or the message can be simply ignored, so that this will not cause any problem in the communication between the stationary host and the mobile host. The repeated packet or the message is observed when the two gws are attached to each network in FIG. 7; whereas it is not observed when only one migration communication control device is attached to each network, which will be described later at the operation in FIG. 9.

(operation example in FIG. 8)

In FIG. 6, FIG. 7, the stationary host transmits the data packet to the outdated address after mobile host notifies the gws that it has migrated to another network. Then the gws transmit the address conversion post message to the stationary host. However, in FIG. 8 the gws convert the destination address of data the packet from the outdated address into the updated address assigned after the migration instead of transmitting the address conversion post message.

A packet 71, 72 in FIG. 8 are substantially same as the packet 51, 52 in FIG. 6. The operation conducted before the packet 72 is transmitted by the stationary host 12 and is received by the gateway 13 is substantially same as the first operation in FIG. 6. The operation which follows reception of the packet 72 is described hereunder with referring to FIG. 3.

The gate way 13 employs its units in FIG. 3 to process the packet 72. The communication control unit 4 receives the packet 72 and gives it to the reception packet unit 35 in the migration address unit 3. Detecting that the packet 72 is a general packet, the reception packet unit 35 sends it to the address comparison unit 37. The address comparison unit 37 detects whether or not the destination address of the packet 72 coincides with the address in the data hold unit 1 at the address assigned before the migration.

When no coincides is found, the address comparison unit 37 gives the packet 72 to the application unit 2. On the other hand, a coincidence is found, the address assigned after the migration, which corresponds with the address identical to the destination address of the packet 72, is obtained from the data hold unit 1, and is sent to the marked packet conversion unit 39 together with the packet 72. The marked packet conversion unit 39 generates a packet 72' where the destination address of the packet 72 is replaced with the address assigned after the migration, which is sent by the address comparison unit 37, the destination address of the packet 72 is added as additional address, and a mark is set to indicate that the destination address has converted. Then the packet 72' is sent to the communication control unit 4. FIG. 12 (e) shows a format of the packet 72', where identical numerals denotes the same units in FIG. 11. The packet 72' is sent to the mobile host 11 without fail since its destination address is the updated address thereof.

(operation example in FIG. 9)

In FIG. 9, the mobile host migrates across network 1, 2, 3, and 4. In FIG. 7 the gw 1-gw 4 are employed as the migration communication control devices; whereas in FIG. 9 the gw 1-gw 4 are employed simply as gateways to connect networks, and also another migration communication control device is attached to each network. The operation of the migration communication control device, which is connected to the network alone, at processing the migration post message or the address conversion post message is substantially same as one of the gw 1-gw 4 in FIG. 7. The flow of the migration post message and the address migration post message are mainly described hereunder.

(migration from network 1 to network 2)

When migrating from the network 1 to the network 2, the mobile host 11 sends a packet comprising the migration post message to the migration communication control device, which is attached to the network 1. In FIG. 9 (a) a migration post packet 81 is transmitted to a migration communication control device S1, which is attached to the network 1. The destination address of the packet 81 can be the broadcast address of the network 1.

The device S1 processes the packet 81 by employing its devices in FIG. 3. Receiving the packet 81, the device S1 stores into the data hold unit 1 the correspondence of the addresses each assigned before arid after the migration as well as the address assigned before the last migration. The migration post information unit 36 transmits the packet 81 to the address conversion post transmission unit 38; however, since the unit 38 detects that the address assigned before the last migration is 0, it does not transmit the address conversion post message to any network. The content of the data hold unit 1 in the S1-S4 are shown in FIG. 14 (a).

(migration from network 2 to network 3)

When migrating from the network 2 to the network 3, the mobile host 11 notifies the S2, which is attached to the network 2, that it has migrated to the network 3 by transmitting thereto the packet comprising the migration post message, which is referred to as a packet 82 in FIG. 9 (b).

The S2 employs its devices in FIG. 3 to process the packet 82. That is, it converts the content of the data hold unit 1 by renewing and adding new information, and finally holds in the unit 1 the address m'-m" at the correspondence of the addresses each of which assigned before and after the migration as well as the address m assigned before the last migration. Then, the migration post information unit 36 gives the newly obtained correspondence m'-m" to the address conversion post transmission unit 38.

The address conversion post transmission unit 38 detects whether or not the address assigned before the last migration, which is held in the data hold unit 1, is 0. If the address is not 0, the unit 38 transmits the address conversion post message to the broadcast address of the network which includes the detected address. In FIG. 9 (b) the address m is held at the address assigned before the last migration, so that the unit 38 transmits the packet 83 to the broadcast address of the network 1.

When receiving the packet 83, the migration communication control device S1, which is attached to the network 1, renews the content of the data hold unit 1 by newly holding the address correspondence m-m" as well as the address 0 at the address assigned before the last migration. Detecting 0 at the address assigned before the last migration, the address conversion post transmission unit 38 does not transmit the address conversion post to any network. The content of the data hold unit 1 in the S1-S4 are shown in FIG. 14 (b).

(migration from network 3 to network 4)

When migrating from the network 3 to the network 4, the mobile host 11 notifies the communication migration control device S3, which is attached to the network 3, that it has migrated to the network 4 by transmitting thereto a packet comprising the migration post message, referred to as a packet 84 in FIG. 9 (c).

The migration communication control device S3 employs its devices in FIG. 3 to process the packet 84. That is, it newly holds into the data hold unit 1 the address correspondence m"-m'" as well as the address m' assigned before the last migration. Then, the address conversion post transmission unit 38 in the S3 transmits a packet comprising the address conversion post message, referred to a packet 85 in FIG. 9 (c), to the broadcast address of the network 2 since the address m' is held at the address assigned before the last migration in the data host unit 1.

When receiving the packet 85, the migration communication control device S2 employs its devices in FIG. 3 to process it. That is, it newly holds into the data hold unit 1 the address correspondence m'-m" as well as the address m assigned before the last migration. Then, the address conversion post transmission unit 38 in the S2 transmits a packet comprising the address conversion post message, referred to a packet 86 in FIG. 9 (c), to the broadcast address of the network 2 since the address m is held at the address assigned before the last migration in the data hold unit 1.

When receiving the packet 86, the migration communication control device S1 employs its devices in FIG. 3 to process it. That is, it newly holds into the data hold unit 1 the address correspondence m-m'" as well as the address 0 at the address assigned before the last migration. The address conversion post transmission unit 38 in the S1 does transmit the address conversion post since 0 is detected at the address assigned before the last migration. The content of the data hold unit 1 in each of the S1-S4 are shown in FIG. 14 (c). Thus, according to the migration communication control device S1-S4 of the present invention, the S1-S4 are notified of the updated address of the mobile host at every migration, so that the packet transmitted to any of the addresses m, m', m" is transferred thereby to the updated address of the mobile host. The S1-S4 also notify the stationary host of the updated address of the mobile host.

The operation in FIG. 9 differs from the operation in FIG. 7 in that each network has just one communication migration control device (one of the S1-S4), so that the migration post and the address conversion transmitted to S1-S4 are not duplicated.

In the format shown in FIG. 11 and 12, the mark 96 or the message type 93 indicates kind of packet. That is, mark 96 indicates whether or not the packet is marked while the message type 93 indicates whether it is the packet comprising the migration post message, the packet comprising the address conversion post message, and the general packet. Further, a protocol type can also be employed to indicate which migration communication control device is employed. For example, when TCP/IP is employed, the protocol number at the IP header thereof distinguishes the packet employed in the embodiment from other packets. That is, when the protocol number in the packet is identical with the one, which has been assigned to the protocol number field, the packet is the one employed in the embodiment.

In the first embodiment of the present invention, a nonvolatile storage can be employed as the data hold unit 1 of the mobile host. If so, the communication can be resumed even after the host or the gateway is turned off as well as after the system is reset.

Also even when the stationary host employs the nonvolatile storage as the data hold unit 1, it can resume the communication, which has interrupted by the switch off or the system reset, rather fast since it obtains from another host the updated address of the mobile host instead of receiving from the gateway the address conversion post message which shows the updated address.

For example, it is supposed in FIG. 7 that the mobile host 11 migrates from the network 1 to the network 4. The data hold unit 1 of the migration communication device holds the address correspondence m-m'" since it has communicated with the mobile host, which is attached to the network 4, at least once. According to the migration communication control device in the embodiment described the above, the packet is transferred from the outdated address to the updated address of the mobile host and the stationary host is notified of the updated address; therefore, even when the address information in the data hold unit is lost by switch off thereof, the stationary host will obtain the updated address. Restart of the communication can also be implemented by employing a specific host such as a server. That is, the server may be constructed to obtain the updated address of the mobile host at every migration, and give it to the stationary host whenever requested. In this case a packet comprising the address inquiry should be generated beforehand.

Also in the fifth operation in FIG. 6, the mobile host 11 employs the application unit 2 and sends to the marked packet conversion unit 21 the address assigned before the migration when transmitting the non-response address to the stationary host after it has migrated to another network. Instead of sending the non-response address, the application unit 2 can transmit a connection identifier to the marked packet conversion unit 21. In this case the data hold unit of the migration communication control device, employed as the mobile host, holds a correspondence between the connection identifier and the address that had been assigned when the connection was established instead of holding the correspondence between the correspondence of the addresses each assigned before and after the migration. Then, the unit 21 obtains the source address of the packet by detecting the address which corresponds to the identifier, which is held in the data hold unit 1.

As is described the above, the mobile host can employ the broadcast address of the network when transmitting the migration post to the migration communication control devices. When the broadcast address is employed, every host attached to the network, to which the migration communication control device is also attached, obtains the updated address of the mobile host. This implements a direct communication between the mobile host and the stationary host, which improves efficiency of the communication.

The address assigned before the last migration, which is held in the hold unit 1, can be replaced with the broadcast address assigned to the network to which the mobile host is attached before the last migration. If the broadcast address is employed, the gateway employed as the migration communication control device (gws) or the migration communication control device (Ss) needs to include the broadcast address in the address conversion post message. In this case both devices can obtain the broadcast address from the data hold unit; therefore, the operation thereof at requesting the broadcast address will be eliminated.

When storage capacity of the data hold unit 1 is limited, the data hold unit 1 holds only the useful data by disposing the unuseful data, which is least recently retrieved therefrom by the address comparison unit.

[Embodiment 2]

In FIG. 15 network A, B, and C are connected in a line via gateways 143 and 143', the gateway 143 placing between the network A and B while the gateway 143' placing between the network B and C.

A home migration communication control device 101 including a migration address unit 144 is attached to the network A; a visitor migration communication control device 109 including a migration address unit 145 is attached to the network B; and a visitor migration communication control device 109' including a migration address unit 145' is attached to the network C. A mobile host 146 including a migration address unit 115 is attached to the network A as its home network, and a stationary host 151 including a migration address unit 125 is also attached to the network A.

The mobile host 146 migrates across the network A, B, and C. It has a home address α assigned when it is attached to the network A, as well as other addresses assigned depending on where it migrates, such as a temporary address β on the network B and a temporary address γ on the network C.

Also each of the home migration communication control device 101, the visitor migration communication control device 109, 109' which are identical in its construction and the stationary host 151 has an address Ha, Va, Va', and Sa respectively assigned on the network.

Detailed function of the above devices 101, 109, 109', 146, and 151 is described hereunder, in which like components are labeled with like reference numerals.

[home migration communication control device 101]

When the mobile host 146 migrates from the home network to another network, it is assigned the temporary address. However if the stationary host 151 is not notified of that migration, it transmits an original data packet (hereinafter referred to as a noncapsulated data packet) to the home address α of the mobile host 146. When the noncapsulated data packet is destined for the outdated address of the home mobile host 146, the home migration communication control device 101 transfers that noncapsulated data packet from there to the updated address, that is the temporary address β or γ of the mobile host. Then, the device 101 posts to the stationary host 151 the temporary address β or γ here, so that the stationary host 151 will be able to communicate directly with the mobile host. The device 101 also posts the same information to the visitor migration communication control device 109, 109', so that the devices 109, 109' will implement the same function with the home migration communication control device 101.

As shown in FIG. 16 the home migration communication control device 101 consists of the migration address unit 144 and a communication control unit 108. The migration address unit 144 further comprises a home mobile host (MH) list hold unit 102, a packet transfer unit 103, a mobile host (MH) transfer unit 104, an address inquiry unit 105, a packet monitoring unit 106, an address post unit 107.

Next the function of each component integrating the device 101 will be described. The communication control unit 108 mainly controls the communication of protocols located in lower layers including a physical layer, such as the protocol lower than IP.

The address post unit 107 receives from the mobile host 146 an data packet including an address post message. The address post message is generated when the mobile host 146 migrates to the network B or C, and posts the temporary address β or γ of the mobile host to the device 101. The unit 107 sends the address post message to the mobile host transfer unit 104 as well as sends a response message to the mobile host 146. FIG. 28 (3) is an example of the address post message, which includes the home address α as well as the temporary address β or γ of the mobile host 146, a value of an autonomous flag F, and a broadcast address Bba, Cba on the network B, C. The autonomous flag F will be described later. FIG. 28 (4) is an example of the response message.

A mobile host transfer unit 104 stores the address post message into the home mobile host list hold unit

102, notifies the visitor migration communication control device 109 or 109' of the migration of the mobile host 146 by sending thereto a mobile host transfer message, and receives the data packet including the response. Further, according to a direction given by the packet transfer unit 103, the unit 104 transmits the mobile host transfer message both to the stationary host 151 and the device 109 or 109'. The unit 103 gives the direction when the value of the autonomous flag F is 1.

FIG. 32 (3) and FIG. 36 (5) are examples of the mobile host transfer message including the home address α, the temporary address β or γ, and the autonomous flag F. Since the mobile host transfer message is sent to the stationary host 151 is sent only when the autonomous flag F is 1; therefore, it does not necessarily include the value of the flag F. However, the identical message is sent both to the stationary host 151 and the visitor migration communication control device 109, 109' in this embodiment to simplify the construction of the mobile host transfer unit 104. FIG 32 (4) is an example of the response message.

As shown in FIG. 17, the home mobile host list hold unit 102 holds the home address α, the temporary address β, γ, the value of the autonomous flag F, and the broadcast address Bba, Cba on the network B, C, all of which are obtained from the mobile host transfer unit 104.

The packet monitoring unit 106 receives the packet destined for the home address α of the mobile host 146, then sends it to the packet transfer unit 103 when the stationary host 151 transmits the packet to the home address α of the mobile host 146 after the mobile host 146 has migrated to another network.

The packet transfer unit 103 has a payload including the noncapsulated data packet and the packet transfer message informing the transfer of the noncapsulated data packet, generates another data packet, and sends it to the temporary address β, γ of the mobile host 146. FIG. 32 (2) is an example of the packet transfer message. As is described the above, the packet transfer unit 103 directs the mobile host transfer unit 104 to transmit the mobile host transfer message to the stationary host 151 only when the autonomous flag in the home mobile host list hold unit 102 shows the value of 1. The operation conducted when the flag F is 1 will be described later.

When the stationary host 151 has problems in communicating with the mobile host 146 such as receiving the unusual mobile host transfer message, the address inquiry unit 105 is employed to solve the problems. That is, receiving from the stationary host 151 an address inquiry message, the address inquiry unit 105 transmits to the stationary host 151 a data packet which responds to the address inquiry by showing the address to be used in the communication. The address inquiry message includes a type field 132, a flag field 133, a sequence field 134, and a home address field 138, each of which having value 5, 1, a certain number, and α respectively; while the response message includes a temporary address field 139 filled with the temporary address β, γ as well as the flag field with 2, besides the type field 132, the sequence field 134, and the home address field 138 filled with the same values in the address inquiry message.

[visitor migration communication control device 109]

The visitor migration communication control device 109 implements the same function with the home migration communication control device 101. That is, when the stationary host 151 transmits an encapsulated data packet to the temporary address β of the mobile host 146, which is the updated address thereof since the mobile host has migrated to the network C, the visitor migration communication control device 109 transfers that encapsulated data packet from the temporary address β to temporary address γ. Then, the device 109 posts to the stationary host 151 the temporary address γ, so that the stationary host 151 will be able to communicate directly with the mobile host 146. However, whether or not the device 109 provides the above packet transfer service will be determined in accordance with a processing load put on the device 109 or with a initial setting given by a system operator; thus, the packet transfer service of the device 109 is not necessarily an obligation.

As shown in FIG. 18, the visitor migration communication control device 109 consists of the migration address unit 145 and the communication control unit 108. The migration address unit 145 further comprises the packet monitoring unit 106, a visitor mobile host list hold unit 110, a packet transfer unit 111, a mobile host transfer unit 112, a mobile host visit unit 113, and an autonomous support unit 114. The unit 106 and the unit 108 function the same as those in the home migration communication control device 101.

Receiving an autonomous packet transfer support check message inquiring if the visitor migration communication control device 109 provides the packet transfer service, the autonomous support unit 114 responds to it with the response message where the autonomous flag F shows 1 when the device 109 provides that service or 0 when it does not provide that service. FIG. 28 (1) is an example of the autonomous packet transfer support check message, while FIG. 28 (2) is an example of the response message including the autonomous flag F and the broadcast address Bba.

Receiving from the mobile host 146 the mobile host visit message which informs that the mobile host 146 has migrated to the network B, the mobile host unit 113 responds it with the response message after storing the mobile host visit message into the visitor mobile host list hold unit 110. The mobile host visit message includes the home address α and the temporary address β of the mobile host 146. FIG. 28 (5) is the format of the mobile host visit message, while the FIG. 28 (6) is the format of the response message.

Receiving from the mobile host transfer unit 104 in the device 101 the mobile transfer message informing that the mobile host 146 has migrated to the network C, the mobile host transfer unit 112 stores in the visitor mobile host list hold unit 110 the updated temporary address γ of the mobile host 146 and the value of the autonomous flag F by corresponding them to the home address α. The unit 112 also transmits to the stationary host 151 the mobile host transfer message in accordance with the direction from the packet transfer unit 111, as does the mobile host transfer unit 104 in the device 101.

As shown in FIG. 19, the visitor mobile host list hold unit 110 holds the home address α and the temporary address β on the network B, which are obtained from the mobile host 146 via the mobile host visit unit 113, as well as the temporary address γ and value on the autonomous flag F, which are obtained from the home migration communication control device 101 via the mobile host transfer unit 112.

The packet transfer unit 111, as does the packet transfer unit 103 in the home migration communication control device 101, transmits to the temporary address γ the data packet including the transfer message as well as orders the mobile host transfer unit 112 to transmit the mobile host transfer message.

[mobile host 146]

As shown in FIG. 20, the mobile host 146 includes the migration address unit 115, an address obtainment unit 116, the communication control unit 108, and an application processing unit 124 which mainly controls the communication of protocols located in higher layers including an application layer, such as TCP or layers located higher than it.

The migration address unit 115 comprises the a packet transmission unit 117, a transfer packet reception unit 118, an address hold unit 119, a migration unit 120, an autonomous support unit 121, an address post unit 122, a mobile host visit unit 123.

The migration address unit 115 comprising the above units is employed in transfer of data to the temporary address β or γ when the mobile host 146 migrates to the network B or C. Also receiving the data packet destined for the temporary address β or γ including the packet transfer message and the noncapsulated data packet, the device 115 transmits the noncapsulated data to the application processing unit 124.

In accordance with the order given by the application processing unit 124 when the mobile host migrates to the network B, C, the migration unit 120 controls the address obtainment unit 116, the autonomous support unit 121, the address post unit 122, the mobile host visit unit 123, and the address hold unit 119.

Directed by the migration processing unit 120, the address obtainment unit 116 obtains the temporary address β, γ of the mobile host 146 assigned when it migrates to the network B, C respectively. BOOTP in "Bill Croft and John Gilmore, BOOTSTRAP PROTOCOL RFC951, Sep., 1985" is an example of obtaining the temporary address; besides employing the BOOTP, the operator may input the temporary address β, γ assigned by a system administrator of the network B, C.

Directed by the migration unit 120, the autonomous support unit 121 sends the autonomous packet transfer support check message to inquire if the visitor migration communication control device 109, 109' attached to the network B, C provides the packet transfer service and receives the response message to the inquiry. The autonomous packet transfer support check message is also sent to obtain the broadcast address Bba and Cba on the network B and C respectively.

Directed by the migration unit 120, the address post unit 122 sends the address post message to notify the home migration communication control device 101 of the temporary address β, γ. The address post message also informs whether or not the device 109, 109' provides the packet transfer service as well as the broadcast address Bba, Cba on the network B, C. If the response message from the visitor migration communication control device 109, 109' has the value 1 of the autonomous flag F, the mobile host visit unit 123 transmits to the visitor migration communication control device 109, 109' the mobile host visit message including the home address α as well as the temporary address β, γ respectively.

As shown in FIG. 21, the address hold unit 119 previously holds the home address α of the mobile host 146 and the broadcast address Aba on the network A. Now, the unit 119 newly holds the temporary address β or γ obtained from the address obtainment unit 116 via the migration unit 120 and the broadcast address Bba or Cba obtained from the autonomous support unit 121 via the migration unit 120.

When the mobile host 146 is attached to the network A and receiving a data packet destined for the home address α, the transfer packet reception unit 118 sends data etc. in the noncapsulated data packet to the application processing unit 124. On the other hand, when the mobile host 146 is attached to the network B and receiving a data packet destined for the temporary address β, the data packet including the packet transfer message and the noncapsulated data packet destined for α, the unit 118 sends to the application processing unit 124 data etc. in the noncapsulated data. Thus, the application processing unit 124 receives the data without being affected by the migration of the mobile across the networks.

Receiving the data to be transmitted and the instruction from the application processing unit 124, the packet transmission unit 117 generates a noncapsulated data packet whose destination address is the home address α and transmits it.

[stationary host 151]

As shown in FIG. 22, the stationary host 151 comprises the migration address unit 125 and the application processing unit 161 which mainly controls the communication of a protocol located in higher layers including application layer, such as TCP or layers located higher than the TCP and the communication control unit 108.

The migration address unit 125 comprises a transfer packet transmission unit 126, a packet reception unit 127, an address hold unit 128, an address inquiry unit 129, and the mobile host transfer unit 130.

The migration address unit 125 comprising the above units generates a noncapsulated data packet and sends it to the home address α when it is not notified that the mobile host 146 migrate to the network B or C and obtained the temporary address β or γ respectively. The unit 125 also generates an encapsulated data packet including as a payload the noncapsulated data packet and a data transfer message, which informs transfer of the noncapsulated data packet and sends it to the temporary address β, γ, when it is notified of the migration.

Receiving from the home migration communication control device 101 and the visitor migration communication control device 109, 109' the data packet including the mobile host transfer message which informs the migration of the mobile host 146, the mobile host transfer unit 130 stores into the address hold unit 128 the home address α and the temporary address β or γ of the mobile host 146 assigned on the network B or C respectively.

As shown in FIG. 23, the address hold unit 128 holds the home address α, the temporary address β or γ by corresponding them.

Directed by the application unit 161, the transfer packet transmission unit 126 generates a data packet destined for the home address α, and transmits it. However, if the address hold unit 128 holds the temporary address β or γ besides the home address α, the unit 126 generates an encapsulated data packet destined for the temporary address β or γ, which includes as a payload a noncapsulated data packet and a packet transfer message, which informs transfer of the noncapsulated data packet, and transmits it.

As is described the above, both the home migration communication control device 101 and the visitor migration communication control device 109, 109' generate the encapsulated data packet including the packet transfer message and the noncapsulated data and transmits it to the current temporary address of the mobile host 146. Owing to the device 101 or 109, 109', the stationary host 151 is able to transmit to the mobile host 146 both the noncapsulated data packet destined for the home address α and the encapsulated data packet destined for the temporary address β or γ without failure even when the address hold unit 128 fails to hold the current temporary address β or γ and the stationary host 151 transmits the data packet to the outdated address of the mobile host 146.

The packet reception unit 127 receives a data packet which is sent from the mobile host 146 and has Sa as its destination address, and sends the data etc. in it to the application unit 161.

When the address inquiry unit 129 has problems such as that it received an illegal mobile host transfer message or that it cannot communicate with the mobile host 146 successfully, it transmits a data packet including an address inquiry message in order to inquire of the host migration communication control device 101 the address which is currently used to communicate with the mobile host 146.

[construction of data packet]

As shown in FIG. 24 (a), (b), (c), there are three kinds of data packets, each data packet 210, 220, 230, includes each of header 211, 221, 231 and payload 212, 222, 232 respectively.

The header 211 of the data packet 210 includes a destination address 201, and a source address 202. Also the payload 212 consists of a transmission data 203.

The header 221 of the data packet 220 includes the destination address 201 and the source address 202. Also the payload 222 consists of a message 204.

The header 231 of the data packet 230 includes the destination address 201 and the source address 202. Also the payload 232 consists of the message 204, which is employed as the packet transfer message, and a noncapsulated data packet 210. Also each header 211, 221, 231 includes information showing presence or absence of the message 204 as a protocol number etc.

The message 204 includes some of the fields in FIG. 25 in accordance with its type.

The type of the message 204 is indicated in the message type field 132. Besides the above types, the message 204 is also employed as an echo message for examining whether or not a host employs an appropriate operation in accordance with the message.

A flag field 133 indicates whether or not the message 204 is a response. When the message 204 is not the response, the field 133 further indicates whether or not the message 204 requests a response.

A sequence field 134 gives a single number both to the request message and its response message, thereby the request message and the response message are corresponded.

An autonomous flag field 135 contains a value of the autonomous flag F indicating whether or not the visitor migration communication control device 109,109' provide the packet transfer service.

A counter field 136 contains a counter indicating the number of the visitor migration communication control devices employed to transfer the encapsulated data packet consisting of the packet transfer message and the noncapsulated data packet. The visitor migration communication control device increments the counter in the received message packet by 1, and gives it to the message to be transmitted. When the incremented number is greater than the predetermined number, the received message packet is disposed.

A status field 137 of the response message indicates presence or absence of an error in a transmission/reception of the data packet. For example, it indicates an error in authentication information, which will be described later, or the address inquiry message which cannot or should not be responded.

A home address field 138, a temporary address field 139, and a broadcast address field 140 indicates the home address as well as the temporary address of the mobile host 146 or the broadcast address on its home network or on the network it migrates. However, what the broadcast address field 140 indicates depends on type of the message 204. Whether the message 204 is the request or the response also devices the content of the broadcast address field 140.

The authentication information field 141 indicates if a source address coincides with the sender's address.

[outline of communication operation]

The home migration communication control device 101 and the visitor migration communication control device 109,109' is basically employed to transfer the data packet transmitted by the stationary host 151 as well as post to the stationary host 151 the updated temporary address of the mobile host 146. Understanding of such operations will be helped by the following two points.

1. Transfer of the data packet and posting of the updated temporary address are conducted only when the mobile host 146 migrates from its home network to another network. The home network refers to the one to which the home migration communication control device is attached.

2. Posting of the updated temporary address is conducted only when the autonomous flag F is 1, which indicates the visitor migration communication control device 109, attached to the same network as is the mobile host 146, provides the packet transfer service. Otherwise, the data packet transmitted by the stationary host 151 to the posted temporary address will not be received by the mobile host 146 when the mobile host 146 migrates to another network.

[communication operation 1]

An example of the communication operation is described hereunder. In the communication operation 1 the visitor migration communication control device 109,109' provides the packet transfer service when the mobile host 146 migrates from the network A to the network B, further from the network B to the network C.

[migration from network A to network B]

The operation at the migration of the mobile host 146 from the network A to the network B is described with referring to FIGs. 26-29. FIG. 26 shows a flow of the data packet transmitted between the devices; FIG. 27 shows a communication sequence of the data packet; FIG. 28 shows construction of each data packet; and FIG. 29 shows the content of the address hold unit 119 etc.

When the mobile host 146 is attached to the network A, the home mobile host list hold unit 102 in the home migration communication control device 101 holds the home address α both as the home address and the temporary address of the mobile host 146. Thereby the home migration communication control device 101 detects that the mobile host 146 is attached to the network A.

The address hold unit 119 in the mobile host 146 holds the home address α and the broadcast address Aba on the network A.

When the mobile host 146 migrates to the network B, the application unit 124 orders the operation of the migration unit 120 in accordance with the instruction given by the operator. The temporary address β is assigned to the mobile host 146 on the network B, and the address obtainment unit 116 obtains it. The migration unit 120 stores into the address hold unit 119 the temporary address β together with the home address α and the broadcast address Aba.

(1) The autonomous support unit 121 transmits to the visitor migration communication control device 109, which is attached to the network B, the data packet including the autonomous packet transfer support check message 147 which holds the home address α and the temporary address β. The destination address of the data packet is the broadcast address shared by every network, such as an address where every bit is 1. The message 147 does not necessarily hold the home address α and the temporary address β although

they can be used in checking the security of the network if it does. Also the message 147 holding the home address α and the temporary address γ can take the place of a mobile host visit message 146, which will be described later.

(2) The autonomous support unit 114 in the visitor migration communication control device 109 responds to the autonomous support unit 121 with the response message 147R where broadcast address Bba is set and the autonomous flag F in the autonomous flag field 135 indicates 1 to inform that the device 109 provides the packet transfer service.

The mobile host 146 transmits the data packet to the visitor migration communication control device 109. The broadcast address Bba is employed as the destination address of the data packet and it is set in the response message 147R; however, this is not an obligation.

That is, when the response message 147R does not hold the broadcast address Bba, the following means can be employed. First, the broadcast address shared by every network can be employed, which is described in the above. Second, the source address, which is set in the header of the data packet comprising the response message 147R, can be employed. Third, a so called name service can be employed, where a server device on the network system informs the broadcast address Bba. Finally, when the address assigned to each of the devices, which are attached to the network, consists of the network address being unique for the network and a device address being unique for the devices, and the broadcast address on each network consists of such network address and the device address where the value of every bit is 1, the network address Bba can be generated by employing the network address included in the temporary address β of the mobile host 146.

(3) The address post unit 122 transmits to the home migration communication control device 101 the address post message 148. The message 148 includes the value 1 of the autonomous flag F, which is obtained from the response message, home address α, the temporary address β on the network B, and the broadcast address Bba, and the broadcast address Aba is the destination address of the address post message 148.

When the address post unit 107 in the home migration communication control device 101 receives the address post message 148, the mobile host transfer unit 104 stores in the home mobile host list hold unit 102 the temporary address β, the value 1 of the autonomous flag 1, and the broadcast address Bba by corresponding them to the home address α. Since the home address α had been stored as the temporary address before the temporary address β was stored, the mobile host transfer unit 104 knows that the mobile host 146 has migrated from the network A to the network B; therefore, it does not transmit the mobile host transfer message to the visitor migration communication control device 109,109'. That is, the data packet transmitted by the stationary host 151 to the home address α of the mobile host 146 is received by the home migration communication control device 101 and transferred thereby to the temporary address β; therefore, the visitor migration communication control device 109,109' is not employed here.

(4) The address post unit 107 notifies the address post unit 122 that it has received the address post message 148 by sending the response message 148R.

(5) Since the visitor migration communication control device 109 provides the packet transfer service, the mobile host visit unit 123 transmits to the visitor migration communication control device 109 the mobile host visit message 149 including the home address α and the temporary address β, so that the device 109 is notified that the mobile host 146 has migrated to the network B. The mobile host visit message 149 is destined for the broadcast address Bba.

The mobile host visit unit 113 in the visitor migration communication control device 109 receives the mobile host visit message 149 and stores into the visitor mobile host list hold unit 110 the home address α as well as the temporary address β. The temporary address β is stored also as the updated temporary address of the mobile host 146, which will be assigned when the mobile host 146 migrates from the network B to another network; thereby, the visitor migration communication control device 109 detects that the mobile host is currently attached to the network B.

(6) The mobile host visit unit 113 notifies the mobile host visit unit 123 by sending the response message 149R that it has received the mobile host visit message 149.

[communication between the stationary host 151 and the mobile host 146 on the network B]

The operation at the communication between the stationary host 151 and the mobile host 146 when the mobile host is attached to the network B is described hereunder with referring to FIGs. 30-33, which are relevant for FIGs.26-29.

(1) The application unit 161 in the stationary host 151 directs the transmission of the noncapsulated data packet, whose destination is the home address α, despite the migration of the mobile host 146. Immediately after the mobile host 146

migrates to the network B, that is, when the address hold unit 128 does not hold the home address α and the temporary address β, the transfer packet transmission unit 126 is not notified of the migration; therefore, it generates the noncapsulated data packet 152 and transmits it to the home address α in accordance with the direction from the application unit 151.

The noncapsulated data packet 152 is not received by the mobile host 146, which is not attached to the network A, but by the packet monitoring unit 106 in the home migration communication control device 101 since the home mobile host list hold unit 102 in the device 101 holds the home address α as well as the temporary address β, which coincides with the destination address of the noncapsulated data packet 152.

(2) The packet transfer unit 103 in the home migration communication control device 101 generates an encapsulated data packet including the noncapsulated data packet 152, which is received by the packet monitoring unit 106, and the packet transfer message 153, which informs the transfer of the noncapsulated data packet 152; and transmits it to the temporary address β. The packet transfer message 153 includes the value 0 in the field 133, which indicates that no response is requested, as well as the value 0 on the counter in the field 136, which indicates that the packet transfer message is the first message added to the noncapsulated data packet 152. As is described, no response is requested by the packet transfer message 153. That is, the application unit 161 of the stationary host 151 and the application unit of the mobile host 146, rather than the home migration communication control device 101 and the migration address unit 115, confirm that the mobile host 146 receives the noncapsulated data packet 152.

The transfer packet reception unit 118 in the mobile host 146 receives the encapsulated data packet including the packet transfer message 153 and the noncapsulated data packet 152, since it is destined for the temporary address β, which is held in the address hold unit 119. The unit 118 then detects that the destination address of the noncapsulated data packet 152 is the home address α, and sends the data etc. in the noncapsulated data packet 152 to the application unit 124.

Thus, the communication between the application unit 124 and the application unit 161 is not affected by the migration of the mobile host 146.

(3) The packet transfer unit 103 transmits the encapsulated data packet including the data packet transfer message. It also directs, after detecting that the autonomous flag F indicates 1, the mobile host transfer unit 104 to transmit to the stationary host 151 the data packet including the mobile host transfer message 154 where the home address α and the temporary address β are set. Finally, the unit 104 transmits the data packet to the stationary host 151.

The mobile host transfer unit 130 in the stationary host 151 receives the mobile host transfer message and stores into the address hold unit 128 the home address α and the temporary address β.

(4) The mobile host transfer unit 130 responds to the mobile host transfer unit 104 with the response message 154R.

(5) When the application unit 161 directs the transmission of the noncapsulated data packet to the home address α after the address hold unit 128 holds the home address α and the temporary address β, the transfer packet transmission unit 126 first generates a noncapsulated data packet destined for the home address α, then generates an encapsulated data packet including it and a packet transfer message 155. The encapsulated data packet is then transmitted to the temporary address β. Thus, once the home migration communication control device 101 notifies the stationary host 151 of the home address α and the temporary address β, the stationary host 151 is able to transmit the data packet to the temporary address β of the mobile host 146, and the home migration communication control device 101 is not employed.

On the other hand, when data is transmitted from the mobile host 146 to the stationary host 151, the Sa is employed as the destination address α and the home address is employed as the source address; and the noncapsulated data packet is transmitted from the address α to the address Sa.

Thus, even when all the noncapsulated data transmitted by the stationary host 151 is destined for the home address α, the home migration communication device 101 transfers the data to the updated temporary address of the mobile host; thereby, the communication between the mobile host 146 and the stationary host 151 is implemented, and the conventional device can be employed as the stationary host 151, which broadens a practicability of the network system.

Whereas, when the network system checks the original source address of the data packet or a transfer path of the data packet, the transmission unit may be built in the mobile host 146 like the transfer packet transmission unit 126 in the stationary host 151, and also the reception unit may be built in the stationary host 151 like the transfer packet reception unit 118 in the mobile host 146; and the encapsulated data packet including the packet transfer message and the noncapsulated data packet may be transmitted therebetween.

[migration from network B to network C]

The operation at the migration of the mobile host 146 from the network B to the network C is described hereunder with referring to FIGs. 34-37, relevant for FIGs. 26-29.

(1)-(4) The operation related to transmission of an autonomous packet transfer support check message 147', a response message 147R', an address post message 148', and a response message 148' between the mobile host 146 and the visitor migration communication control device 109' is substantially same as the operation related to transmission of messages between the mobile host 146 and the visitor migration communication control device 109, which is conducted when the mobile host 146 migrates to the network B. However, the operation at the migration from the network A to the network B and the operation at the migration from the network B and the network C are different from each other in part of the operation of the home migration communication control device 101 conducted after it responds to the received address post message 148' with the response message 148R.

(5) When the address post unit 107 receives the address post message 148', the mobile host transfer unit 104 in the home migration communication control device 101 detects that the mobile host been attached to the network B before migrating to the network C since the temporary address β has been stored as the temporary address. Then, the mobile host transfer unit 104 sends to the visitor migration communication control device 109 the data packet including both the home address α and the temporary address γ, so that the device 109 transfers the data packet transmitted by the stationary host 151 from the temporary address β to the temporary address γ. The data packet received by the visitor migration communication control device is destined for the broadcast address Bba.

In accordance with the address post message 148', the mobile host transfer unit 104 stores into the home move host list hold unit 102 the temporary address γ, the value 1 of the autonomous flag F, and the broadcast address Cba by corresponding them to the home address α.

Receiving the data packet including the mobile host transfer message 150, the mobile host transfer unit 112 in the visitor migration communication control device 109 stores into the visitor mobile host list hold unit 110 the temporary address γ newly assigned to the mobile host 146 and the value 1 of the autonomous flag F by corresponding them to the home address α.

(6) The mobile host transfer unit 112 notifies the mobile host transfer unit 104 that it has received the mobile host transfer message 150 by sending thereto the response message 150R.

(7), (8) The transmission of a mobile host visit message 149' and a response message 149R' between the mobile host 146 and the visitor migration communication control device 109', which is conducted when the device 109' provides the packet transfer service, is substantially same as the transmission of messages between the mobile host 146 and the visitor migration communication control device 109, which is conducted when the mobile host 146 migrates to the network B.

[communication between mobile host 146 attached to network C and stationary host 151]

Transmission of the data packet from the stationary host 151 to the mobile host 146 when the mobile host is attached to the network C is described with referring to FIG. 38-41, which are relevant for FIG. 26-29.

The transmission is substantially same as the transmission between the stationary host 151 and the mobile host 146 when the mobile host 146 is attached to the network B, except that the visitor migration communication control device 109 instead of the home migration communication control device 101 is employed.

(1) When the stationary host 151 is not notified that the mobile host 146 has migrated from the network B to the network C, the stationary host 151 generates the encapsulated data packet including the noncapsulated data packet, which is destined for the home address α, and the packet transfer message 156; then transmits it to the temporary address β. This is substantially the same as (5) in the communication between the stationary host 151 and the mobile host 146 attached the network B.

The data packet transmitted by the stationary host is not received by the mobile host 146 since the mobile host is not attached to the network B. The data packet is received by the packet monitoring unit 106 in the visitor migration communication control device 109 since the visitor mobile host list hold list unit thereof holds the temporary address β besides the temporary address γ.

(2) The visitor migration communication control device 109 transmits to the temporary address γ of the mobile host 146 the data packet including the packet transfer message 157, which is substantially same as (2) in the communication between the stationary host 151 and the mobile host 146 on the network B except a difference described hereunder.

The home mobile host migration communication control device 101 receives the noncapsulated data packet 152 and generates an encapsulated data packet comprising the received noncapsulated data packet 152 and the packet transfer message 153. On the other hand, the visitor migration communication control device 109 receives the encapsulated data packet comprising the packet transfer message 156 and the packet transfer unit 111 converts the data packet by changing the destination address from the temporary address β into the temporary address γ as well as converting the packet transfer message 156 into the packet transfer message 157, whose value on the counter is incremented by 1.

(3)-(5) The visitor migration communication control device 109, the stationary host 151, and the mobile host 146 on the network C operate substantially same as the home migration communication control device 101, the stationary host 151, and the mobile host 146 on the network B, which is described the above in (3)-(5); thereby the mobile host transfer message 158 and the response message 158R are transmitted, and the data packet including the packet transfer message 160 is transmitted by the stationary host 151 to the mobile host 146 attached to the network C.

If the stationary host 151 does not transmit any data packet to the mobile host 146, which is attached to the network B, the stationary host is not notified of either the temporary address β or the temporary address γ; therefore, the stationary host 151 transmits the data packet to the home address α even when the mobile host 146 has migrated from the network B to the network C. When this occurs, the home migration communication control device 101, as does the visitor migration communication device 109, transfers the data packet from the home address α to the temporary address γ; then notifies the stationary host 151 of the updated temporary address γ of the mobile host 146 so that the stationary host 151 will be able to directly transmit the data packet, which comprises the packet transfer message, to the mobile host 146 attached to the network C.

Further, when the mobile host 146 migrates to the network, to which the visitor migration communication control device is attached to provide the packet transfer service, the stationary host 151 may transmit the data packet destined for any of the addresses α, β, or γ. When the data packet is transmitted to the home address α or the temporary address γ, the home migration communication control device 101 or the visitor migration communication control device 109', which is notified of the updated temporary address of the mobile host 146, transfers the data packet to the updated temporary address; then it notifies the stationary host 151 of the updated temporary address of the mobile host.

When the data packet is transmitted to the temporary address β of the mobile host 146, the visitor migration communication control device 109 receives it. Since the device 109 is notified of only the temporary address γ, it transmits the data packet comprising the packet transfer message to the temporary address γ as well as transmits the mobile host transfer message to notify the stationary host 151 of the temporary address γ. The visitor migration communication control device 109' receives the data packet comprising the packet transfer message, which is destined for the temporary address γ, and transmits it to the updated temporary address of the mobile host 146; then transmits the mobile host transfer message to notify the stationary host 151 of the updated temporary address. Also the visitor migration communication control device 109' obtains the address of the visitor migration communication control device 109 from the source address of data packet transmitted thereby, and transmits the mobile host transfer message to the device 109. Thus, the visitor migration communication control device 109' obtains the updated temporary address of the mobile host 146, and transfers the data packet to the mobile host 146 as well as notifies stationary host 151 of the obtained updated temporary address.

[communication operation 2]

Another example of the communication operation is described hereunder. In the communication operation 2 the visitor migration communication control device 109 does not provide the packet transfer service when the mobile host 146 migrates from the network A to the network B, further from the network B to the network C.

As shown in FIG. 42, when the device 109 does not provide the packet transfer service, the autonomous packet transfer support check message 181, transmitted by the mobile host 146 which has migrated from the network A to the network B, is responded with the response message 181R where the autonomous flag F in the autonomous flag field 135 indicates 0. Thereby, the autonomous flag field 135 in the address post message 182, which is transmitted by the mobile host 146 to the home migration communication control device 101, obtains the value 0, and the value 0 is held in the home mobile host list hold unit 102 in the device 101. The mobile host 146 does not transmit the mobile host visit message to the visitor migration communication control device 109.

As shown in FIG. 43, receiving from the stationary host 151 the noncapsulated data packet 183, which is destined for the home address α, the home migration communication control device generates the encapsulated data packet comprising the received noncapsulated data packet 183 and the packet transfer message 184, and transmits it to the temporary address β, as is in the communication operation 1.

However, recognizing the value 0 on the autonomous flag F, which is held in the home mobile host list hold unit 102, the device 101 does not transmit to the stationary host 151 the mobile host transfer message including the temporary address β. Therefore, every data packet transmitted by the stationary host 151 is destined for the home address α, and it is transferred to the mobile host 146 by the home migration communication control device 101. Thus, the stationary host 151 is not notified of the temporary address β since the data packet transmitted to the address other than the home address α is not transferred by the device 109; therefore it is not received by the mobile host 146 when it departs the network B to migrate to the network C.

When the visitor migration communication control device 109', which is attached to the network, provides the packet transfer service, the home migration communication control device 101 notifies the stationary host 151 of the temporary address γ when it transmits the noncapsulated data to the home address α, so that the stationary host 151 is able to directly transmit the data packet comprising the noncapsulated data packet and the packet transfer message to the mobile host 146 on the network C.

When the visitor migration communication control device 109 does not provide the packet transfer service, the home migration communication control device 101 does not necessarily notify the device 109 of the temporary address γ of the mobile host 146 assigned when it has migrated from the network B to the network C. However, the construction of the device 101 will be simplified if it conducts the same operation either or not the packet transfer service is provided since the visitor migration communication control device 109 ignores the mobile host transfer message.

Also the device 109 may respond to the autonomous packet transfer support check message 181 only when it provides the data packet transfer service; therefore, the presence or absence of the response message 181R indicates to the mobile host 146 whether or not the data packet transfer service is provided. In the above operation the value 0 of the autonomous F also indicates that the packet transfer service is not provided, whereas absence of the response message to the message 181 can indicate the absence of the packet transfer service, which will simplify construction of mobile host 146.

[communication operation 3]

The final example of the communication operation is described hereunder. In the communication operation 3 the visitor migration communication control device 109' does not provide the packet transfer service while the visitor migration communication control device 109 does.

As shown in FIG. 44, when the packet transfer service is not provided by the visitor migration communication control device 109', the mobile host 146 transmits to the home migration communication control device 101 the address post message 182' where the value 0 is set at the autonomous flag F. Then, the home migration communication control device 101 transmits to the device 109 the mobile host transfer message 185 by setting the value 0 at the autonomous flag F.

When detecting the value 0 at the autonomous flag F, the visitor migration communication control device 109 ceases to provide the packet transfer service.

As shown in FIG. 45, even after cease of the data packet transfer service, the stationary host 151 may transmit to the temporary address the data packet comprising the noncapsulated data packet and the packet transfer message 186.

When this happens, the visitor migration communication control device 109 obtains the noncapsulated data packet 187 from the received encapsulated data packet and transmits it to its destination address, the home address α. The noncapsulated data packet 187 is then received by the home migration communication control device 101, which is attached to the network A. Finally, the home migration communication control device 101 transfers the noncapsulated data packet 187 together with the packet transfer message 188 to the temporary address γ of mobile host 146, which is attached to the network C.

The visitor migration communication control device 109 notifies the stationary host 151 that the mobile host 146 is attached to the network A instead of the network C by sending the mobile host transfer message 189 where the home address α is set in the temporary address field 139. Then, the stationary host 151 transmits the noncapsulated data packet 187 to the home address α, and it is transferred by the home migration communication control device 101, which is employed to take the place of the visitor migration communication control device 109. As another option, the device 109 may send the mobile host transfer message 189 where the invalid address is set, such as the address where every bit is 1. Then, the home migration communication control device 101 may notify the stationary host 151 of the home address α in accordance with the address inquiry obtained from the stationary host 151.

The operation described the above will be employed when the visitor migration communication control device 109 ceases to provide the packet transfer service operation regardless whether or not the device 109' provides the packet transfer service.

On the other hand, the visitor migration communication device 109 may restart the packet transfer service even when the device 109' ceases to provide the service.

In this case, the home migration communication control device 101 needs to provide the visitor migration communication control device 109 with the updated temporary address at every migration of the mobile host 146 unless the mobile host migrates to the network to which another visitor migration communication control device is attached and provides the packet transfer service. To realized it, for example, when the value of the autonomous flag F in the address post message is 0 to indicate that the device 109' does not provide the packet transfer service, the broadcast address Bba as the destination address of the mobile host transfer message, which is transmitted to the device 109, will not be renewed.

Additionally, the broadcast address as the destination address of the data packet, which is transmitted by the mobile host 146, can be replaced with the address Ha, Va, Va', each of which is unique to each device. The address unique to each device will be obtained by detecting the source address of the data packet received from each device, or by employing a so called name service.

Also in the second embodiment, the home migration communication control device 101 detects whether or not the mobile host 146 is attached to the same network from what is held as the temporary address in the address hold unit; to be precise, whether or not the home address α is held as the temporary address. However, this can also be detected by knowing in which table the temporary address is held. For example, when the device 101 and the mobile host 146 are attached to the same network, the first table holds the addresses, such as the home address α; whereas, the second table holds the addresses when the device 101 and the mobile host 146 are attached to the different network from each other. Value of the autonomous flag F, 0 or 1, can also be utilized in the same way.

Further, the home migration communication control device 101 and the visitor migration communication control device 109, 109' may be employed as a host such as the mobile host 146 or the stationary host 151.

Finally, the home migration communication control device 101, the visitor migration communication control device 109, the mobile host 146, and the stationary host 156 may be constructed identically and can be replaced with each other.

Although in the embodiment the application unit 124 starts its operation before being notified of updated temporary address β; therefore it always transmits the data packet to the home address α of the mobile host 146, it can transmit the data to the temporary address β if is starts its operation after obtaining the temporary address β.

Although the present invention has been fully described by way of examples with reference to the accompanying drawings, it is to be noted that various changes and modifications will be apparent to those skilled in the art. Therefore, unless otherwise such changes and modifications depart from the scope of the present invention, they should be constructed as being included therein.

Claims

1. A migration communication control device constructed to control a communication between a mobile node and a partner node, the mobile node migrating across networks and obtaining an address assigned on each network while the partner node being a communication partner of the mobile node, comprising a first migration control unit, a second migration control unit, a third migration control unit, the second migration control unit being placed on the mobile node and the third migration control unit being placed on the partner node,

   wherein the first migration control unit comprises:

   packet transfer means for receiving a packet which was destined for an outdated address of the mobile node, the outdated address assigned when the mobile node migrated to a network to which the first migration control unit is attached, generating a conversion packet which holds an updated address instead of the outdated address, and transmitting the conversion packet; and

   address post means for transmitting an address post message which indicates the updated address of the mobile node to the third migration control unit, the third migration control unit transmitting the packet received by the packet transfer means, and

   the second migration control unit comprises:

   migration post means for transmitting to the first migration control unit a migration post message which indicates the updated address of the mobile node when the mobile node migrates to another network; and

   packet resumption means for receiving the conversion packet from both the first migration control unit and the third migration control unit and resuming an original packet from the conversion packet, and

   the third migration control unit comprises:

   packet conversion means for converting a destination address of a packet, the packet to be transmitted to the mobile node, into the updated address indicated by the address post message, the address post message sent by the first migration control unit, and transmitting it to the mobile node.

2. The migration communication control device of Claim 1, wherein the migration post means in the second migration control unit transmits an identification key included in the migration post message, the identification key being employed to identify the mobile node.

3. The migration communication control device of Claim 2, wherein the identification key is an address of the mobile node assigned at one network before the network to which the mobile node is currently attached.

4. The migration communication control device of Claim 2, wherein the identification key is an address of the mobile node assigned before its initial migration.

5. The migration communication control device of Claim 1; wherein the second migration control unit is constructed to transmit to the third migration control unit the packet which has the same format as the resumed packet.

6. The migration communication control device of Claim 1, wherein the first migration control unit further comprises:

address hold means for holding the outdated address and the updated address by corresponding them with each other; and

address comparison means for comparing the destination address of the received packet with the outdated address, wherein

the packet transfer means generates the conversion packet and transmits it when the address comparison means detects that the destination address of the received packet coincides with the outdated address.

7. The migration communication control device of Claim 1, wherein the first migration control unit further comprises:

address hold means for holding the outdated address and the updated address by corresponding them with each other; and

address comparison means for comparing the destination address of the packet received by the packet transfer means with the outdated address, wherein

the address post means transmits the address post message which indicates the updated address of the mobile node to the third migration control unit, the third migration control unit transmitting the packet received by the packet transfer means, when the address comparison means detects that the destination address of the packet coincides with the outdated address.

8. The migration communication control device of Claim 1, wherein the second migration control unit further comprises:

address hold means for holding the outdated address and the updated address by corresponding them with each other; and

address comparison means for comparing the updated address with the destination address of the packet received from one of the first migration control unit and the third migration control unit, wherein

the packet resumption means resumes the original packet from the conversion packet when the address comparison means detects that the updated address coincides with the destination address of the packet received from one of the first migration control unit and the third migration control unit.

9. The migration communication control device of Claim 1, wherein the third migration control unit further comprises:

address hold means for holding the outdated address and the updated address of the mobile node by corresponding them with each other; and

address comparison means for comparing the outdated address in the address hold means with the destination address of the packet to be transmitted to the mobile node, wherein

the packet conversion means converts the destination address of the packet to be transmitted to the mobile node into the updated address which corresponds to the outdated address in the address hold means when the address comparison means detects the outdated address in the address hold means coincides with the destination address of the packet.

10. The migration communication control device of Claim 1, wherein there are a plurality of the first migration control units, and the second migration control unit transmits the migration post message to at least one of the first migration control units.

11. The migration communication control device of Claim 10, wherein the migration post means in the second migration control unit transmits the migration post message to the first migration control unit which is attached to the network to which the mobile node was attached before its migration,

each of the first migration control units has migration post means for transmitting to one of the other first migration control units a migration post message to post the same address as the updated address indicated by the migration post message received from the second migration control unit, and

each of the first migration control units has migration post means for transmitting a migration post message from one of the other first migration control units to another first migration control unit to post the same address as the updated address indicated by the received migration post message.

12. The migration communication control device of Claim 11, wherein each of the first migration control units and the second migration control unit further comprise pointer hold means for holding pointers related to the first migration control unit to which the migration post message is transmitted, and wherein

the migration post means in each of the first migration control units and the migration post means in the second migration control unit transmit the migration post message to each of the addresses related to each of the pointers.

13. The migration communication control device of Claim 12, wherein each of the pointers is a broadcast address of the network to which one of the first migration control units is attached.

14. The migration communication control device of Claim 12, wherein each of the pointers is an address which is assigned to one of the first migration control units uniquely.

15. The migration communication control device of claim 12, wherein each of the pointers is the address of the mobile node which is assigned when the mobile node is attached to the same network as is the first migration control unit, and

the migration post means in the first migration control unit and the migration post means in the second migration control unit obtain the broadcast address of the network to which each of the first migration control units is attached with referring to the address of the mobile node, and transmits the migration post message to the obtained broadcast address.

16. The migration communication control device of Claim 12, wherein the pointer hold means in the second migration control unit holds a pointer related to a first migration control unit for the latest migration, which is the first migration control unit being attached to one network before the network to which the mobile node is currently attached, and

the pointer hold means in the first migration control unit holds a pointer related to another first migration control unit attached to the same network as was the mobile node attached before migrating to the network to which the first migration control unit is attached.

17. The migration communication control device of Claim 12, wherein the second migration control unit further transmits to the first migration control unit the pointer by sending thereto the migration post message, the pointer to be held by the first migration control unit.

18. The migration communication control device of Claim 17, wherein the first migration control unit stores into the pointer hold means the pointer when it receives from the second migration control unit the migration post message by corresponding the pointer with the updated address indicated by the received migration post message.

19. The migration communication control device of Claim 11, wherein each of the first migration control units further comprises:

address hold means for holding the outdated address and the updated address by corresponding them with each other, wherein

migration post message means stores into the address hold means the outdated address and the updated address by corresponding them with each other when it receives from the second migration control unit the migration post message, while converts the updated address in the address hold means into the updated address indicated by the migration post message when it receives from the first migration control unit the migration post message and the outdated address indicated by the migration post message coincides with one of the updated addresses in the address hold means.

20. The migration communication control device of Claim 1, wherein the first migration control unit is placed on a gateway, which connects networks.

21. The migration communication control device of Claim 1, wherein the first migration control unit is placed on the network as an individual node.

22. The migration communication control device of Claim 10, wherein the migration post means in the second migration control unit transmits the migration post message to a home migration control unit, the home migration control unit being the first migration control unit which is attached to a network where the mobile node left for its initial migration, and

the home migration control unit further

comprises home migration post means for transmitting a migration post message to a first migration control unit for the latest migration, the first migration control unit for the latest migration being the first migration control unit which is attached to the network where the mobile node left for the latest migration, to post the same updated address as is indicated by the migration post message received from the second migration control unit.

23. The migration communication control device of Claim 22, wherein the first migration control unit further comprises migration post means for transmitting the migration post message indicating the updated address of the mobile node to one of the other first migration control units when the conversion packet destined for the outdated address of the mobile node was sent therefrom to the first migration control unit.

24. The migration communication control device of Claim 22, wherein the migration post means in the second migration control unit transmits to the home migration control unit the migration post message where a home address and the updated address are corresponded with each other, the home address assigned when the mobile node is attached to the same network as is the home migration control unit,

and each of the packet transfer means and the address post means in the home migration control unit transmits the conversion packet and the address post message respectively with referring to the above home address and the updated address.

25. The migration communication control device of Claim 24, wherein the second migration control unit further comprises an outdated address post means for transmitting to the first migration control unit for the latest migration an outdated address post message where the outdated address and the home address are corresponded with each other, the outdated address being assigned to the mobile node before the latest migration,

the home migration post means in the home migration control unit transmits to the said first migration control unit for the latest migration the migration post message where the above home address and the updated address are corresponded with each other, and

the packet transfer means and the address post means in the first migration control unit for the latest migration transmit the conversion packet and the address post message respectively in accordance with the outdated address and the updated address, the outdated address and the updated address being corresponded with each other via the home address.

26. The migration communication control device of the Claim 25, wherein the outdated address post means in the second migration control unit transmits the above outdated address post message at a migration of the mobile node preceding the latest migration, and

each of the migration post means in the second migration control unit and the home migration post means in the home migration control unit transmits the above migration post message at the latest migration of the mobile node.

27. The migration communication control device of Claim 22, wherein the second migration control unit further comprises home migration control unit pointer hold means for holding a pointer related to the home migration control unit,

the migration post means in the second migration control unit transmits the migration post message to the address related to the pointer,

the home migration control unit further comprises pointer hold means for the latest migration for holding a pointer related to the first migration control unit for the latest migration, and

the home migration post means in the home migration control unit transmits the migration post message to the address related to the pointer.

28. The migration communication control device of Claim 27, wherein each of the above pointers is the broadcast address of the network to which each of the first migration control units is attached.

29. The migration communication control device of Claim 27, wherein each of the above pointers is the address assigned to each of the first migration control units uniquely.

30. The migration communication control device of Claim 27, wherein the second migration control unit further comprises pointer obtainment means for requesting to the first migration control unit for the latest migration the pointer related to the first migration control unit for the latest migration, and

the migration post means in the second migration control unit posts the obtained pointer to the home migration control unit together with the updated address by sending thereto the migration post message.

31. The migration communication control device of Claim 30, wherein the migration post means in the second migration control unit posts to the

home migration control unit the pointer at the migration of the mobile node preceding the latest migration, while the migration post means posts the above updated address at the latest migration of the mobile node.

32. The migration communication control device of Claim 22, wherein the first migration control unit further comprises address post suppressing means for suppressing transmission of the address post message from the address post means to the third migration control unit, and

the address post suppressing means suppresses transmission of the address post message when none of the first migration control units is attached to the same network as is the mobile node.

33. The migration communication control device of Claim 32, wherein the second migration control unit further comprises detect means for detecting whether or not the first migration control unit is attached to the network to which the mobile node migrates,

the migration post means in the second migration control unit transmits to the home migration control unit the migration post message which includes the detecting result of the above detect means together with the updated address,

the home migration post means in the home migration control unit transmits to the first migration control unit for the latest migration the migration post message which includes the detecting result of the above detect means together with the updated address, and

the address post suppressing means in each of the home migration control unit and the first migration control unit for the latest migration suppress the transmission of the address post message in accordance with the detecting result of the above detect means.

34. The migration communication control device of Claim 22, wherein the first migration control unit further comprises packet transfer suppressing means for suppressing transfer of the packet conducted by the packet transfer means.

35. The migration communication control device of Claim 34, wherein the first migration control unit further comprises address post suppressing means for suppressing transmission of the address post message from the address post means to the third migration control unit, and the address post suppressing means in the first migration control unit being attached to a network to which the mobile node is not attached, suppresses the transmission of the address post message when the packet transfer suppressing means in the first migration control unit for the latest migration suppresses transfer of the packet.

36. The migration communication control device of Claim 35, wherein the second migration control unit further comprises detect means for detecting whether or not the packet transfer suppressing means in the first migration control means suppresses the transfer of the packet, the first migration control means being attached to the network to which the mobile node migrates, and

the migration post means in the second migration control unit transmits to the home migration control unit the migration post message which includes the detecting result of the above detect means together with the updated address,

the home migration post means in the home migration control unit transmits to the first migration control unit for the latest migration the migration post message which includes the detecting result of the detect means together with the updated address, and

the address post suppressing means in each of the home migration control unit and the first migration control unit for the latest migration suppresses the transmission of the address post message in accordance with the detecting result of the above detect means.

37. The communication control device of Claim 36, wherein the packet transfer suppressing means in the first migration control unit for the latest migration suppresses the transfer of the packet conducted by the packet transfer means, when the packet transfer suppressing means in the first migration control unit being attached to the network to which the mobile node migrates suppresses the transfer of the packet.

38. A packet transfer migration control unit in a migration communication control device, the migration communication control device being constructed to control a communication between a mobile node and a partner node, the mobile node migrating across networks and obtaining an address assigned on each network while the partner node being a communication partner of the mobile node, comprising:

packet transfer means for receiving a packet which was transmitted by the partner node to an outdated address of the mobile node, the outdated address being assigned when the mobile node migrated to a network to which the packet transfer migration control unit is attached, generating a conversion packet which holds an updated address instead of the outdated address, and transmitting the conversion packet;

and

address post means for transmitting an address post message which indicates the updated address of the mobile node to the partner node, the partner node transmitting the packet received by the packet transfer means.

39. A mobile node migration control unit in a migration communication control device, the migration communication control device being constructed to control a communication between a mobile node which migrates across networks and obtains an address assigned on each network and a partner node which is a communication partner of the mobile node, being placed on the mobile node and comprising:

migration post means for transmitting to a packet transfer migration control unit a migration post message which indicates an updated address of the mobile node when the mobile node migrates to another network, the packet transfer migration control unit for receiving a packet which was transmitted by the partner node to an outdated address of the mobile node, the outdated address assigned when the mobile node migrated to a network to which the migration control unit for packet transfer is attached, generating a conversion packet which holds the updated address instead of the outdated address, and transmitting the conversion packet; and

packet resumption means for receiving the conversion packet from both the packet transfer migration control unit and the mobile node, and resuming an original packet from the conversion packet.

40. A partner node migration control unit in a migration communication control device, the migration communication control device being constructed to control a communication between a mobile node which migrates across networks and obtains an address assigned on each network and a partner node which is a communication partner of the mobile node, being placed on the mobile node and comprising:

address post message receiving means for receiving an address post message which indicates an updated address of the mobile node from a packet transfer migration control unit, the packet transfer migration control unit transmitting an address post message which indicates the updated address of the mobile node to the partner node; and

packet conversion means for converting a destination address of a packet, the packet to be transmitted to the mobile node, into the updated address indicated by the address post message, and transmitting it to the mobile node.

FIG. 1

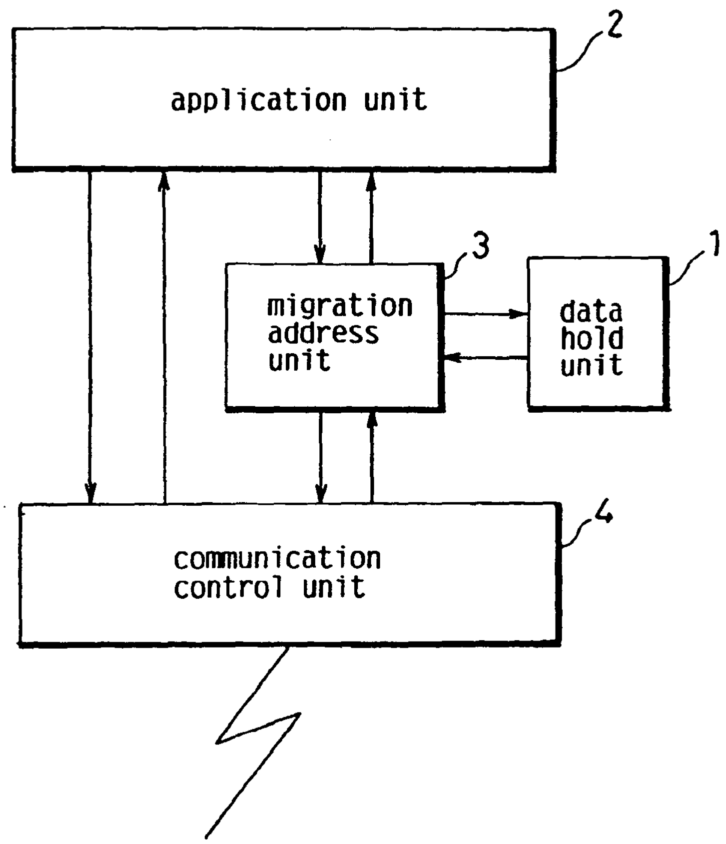

2
application unit
3
migration address unit
1
data hold unit
4
communication control unit

FIG. 2

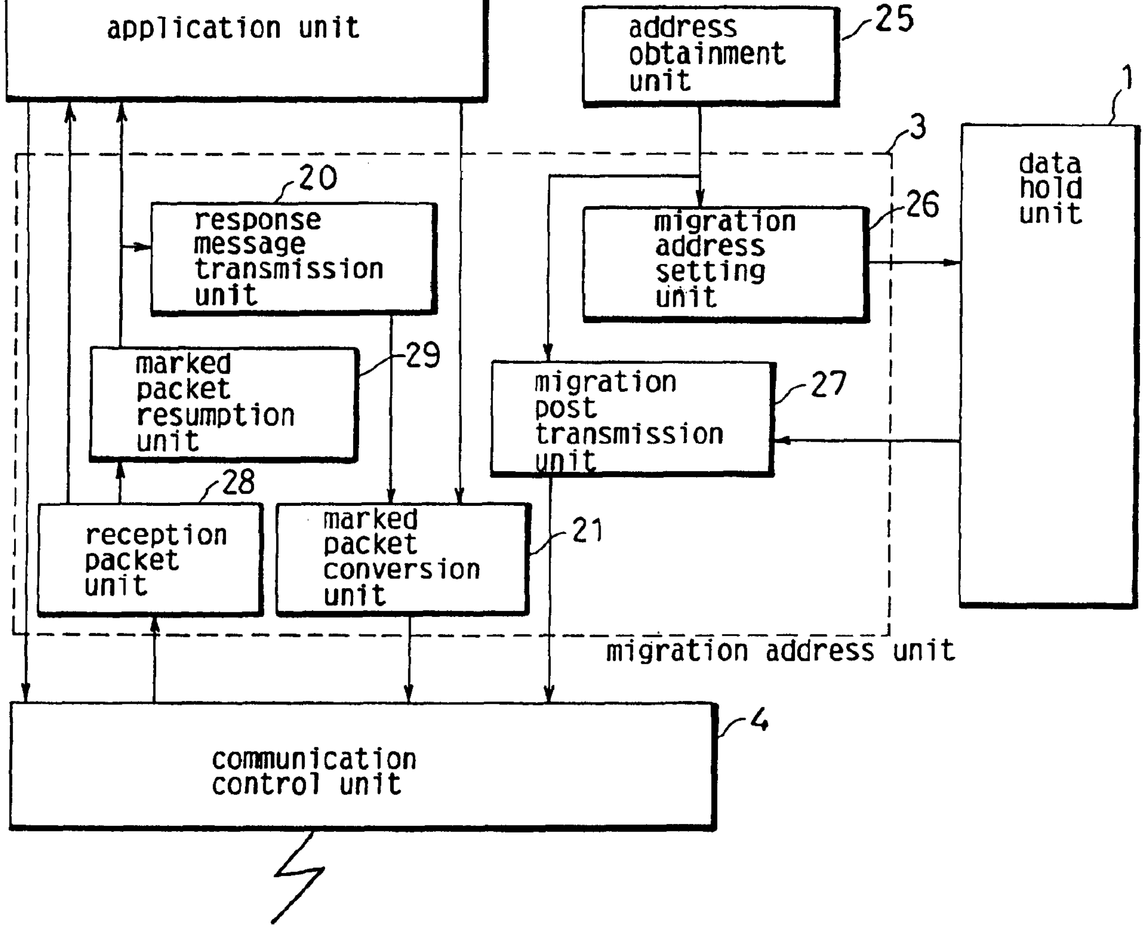

application unit
2
address obtainment unit
25
1
3
data hold unit
20
response message transmission unit
migration address setting unit
26
marked packet resumption unit
29
migration post transmission unit
27
28
reception packet unit
marked packet conversion unit
21
migration address unit
communication control unit
4

FIG. 3

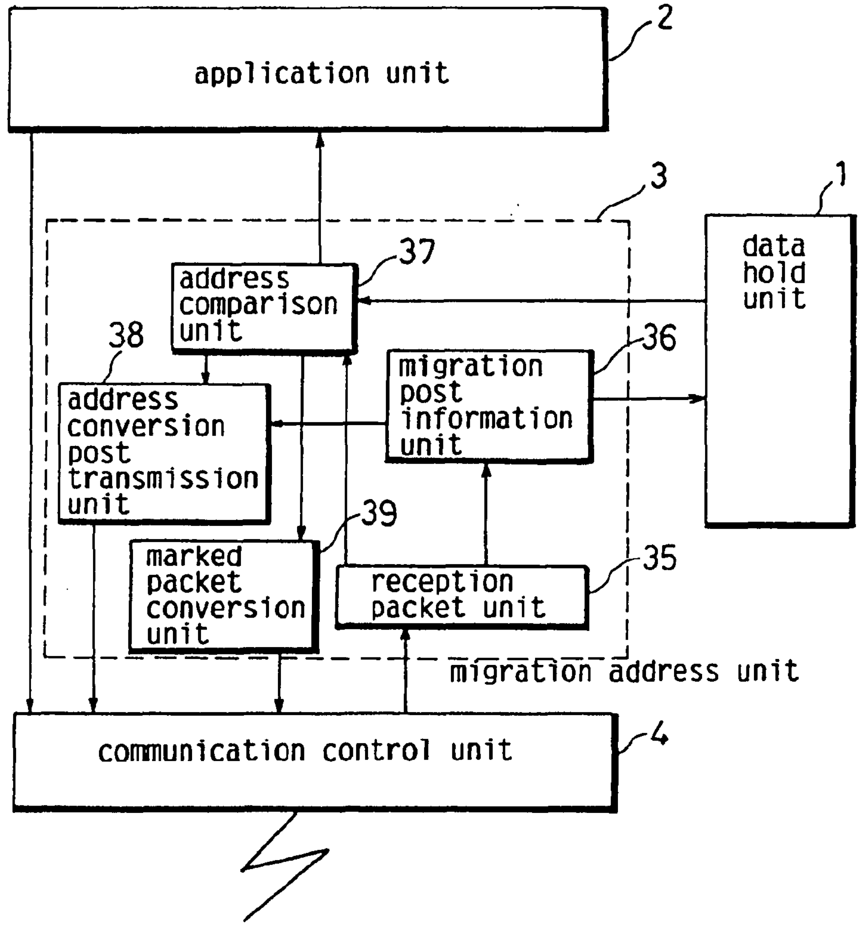

application unit
2
3
1
data hold unit
37
address comparison unit
38
36
migration post information unit
address conversion post transmission unit
39
marked packet conversion unit
35
reception packet unit
migration address unit
communication control unit
4

FIG. 4

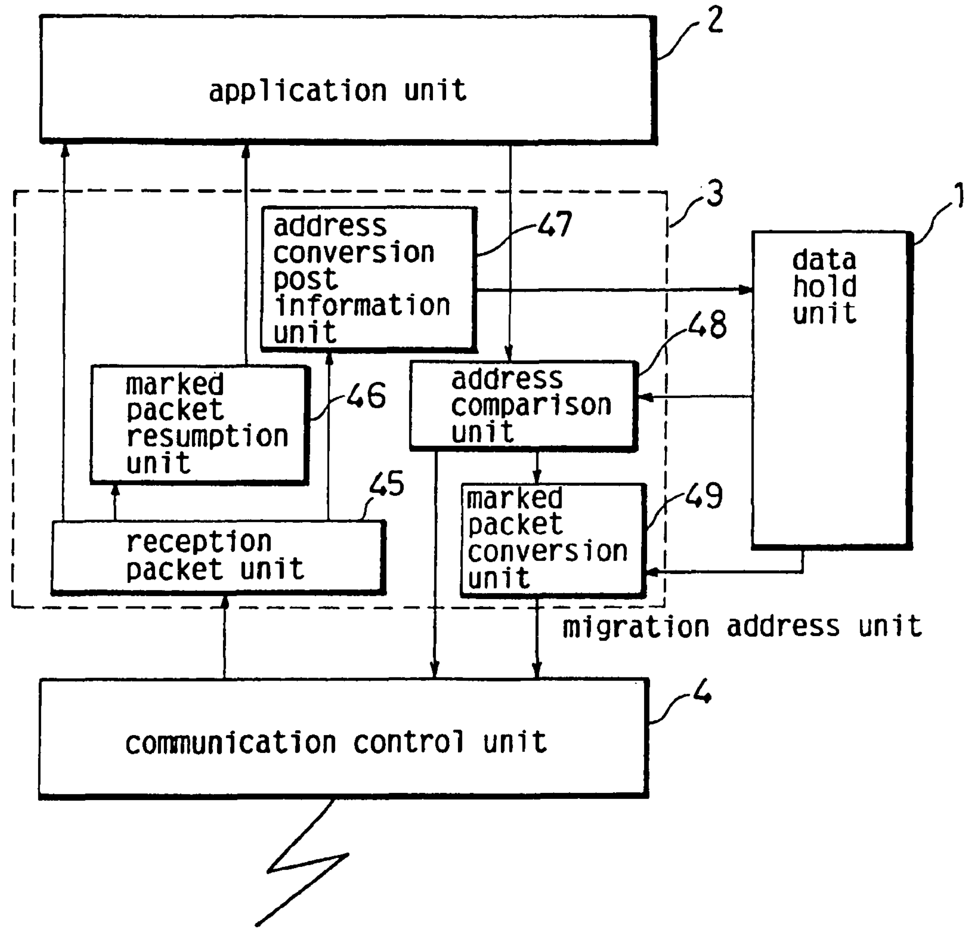

application unit
2
3
address conversion post information unit
47
1
data hold unit
48
address comparison unit
marked packet resumption unit
46
45
marked packet conversion unit
49
reception packet unit
migration address unit
4
communication control unit

FIG. 5

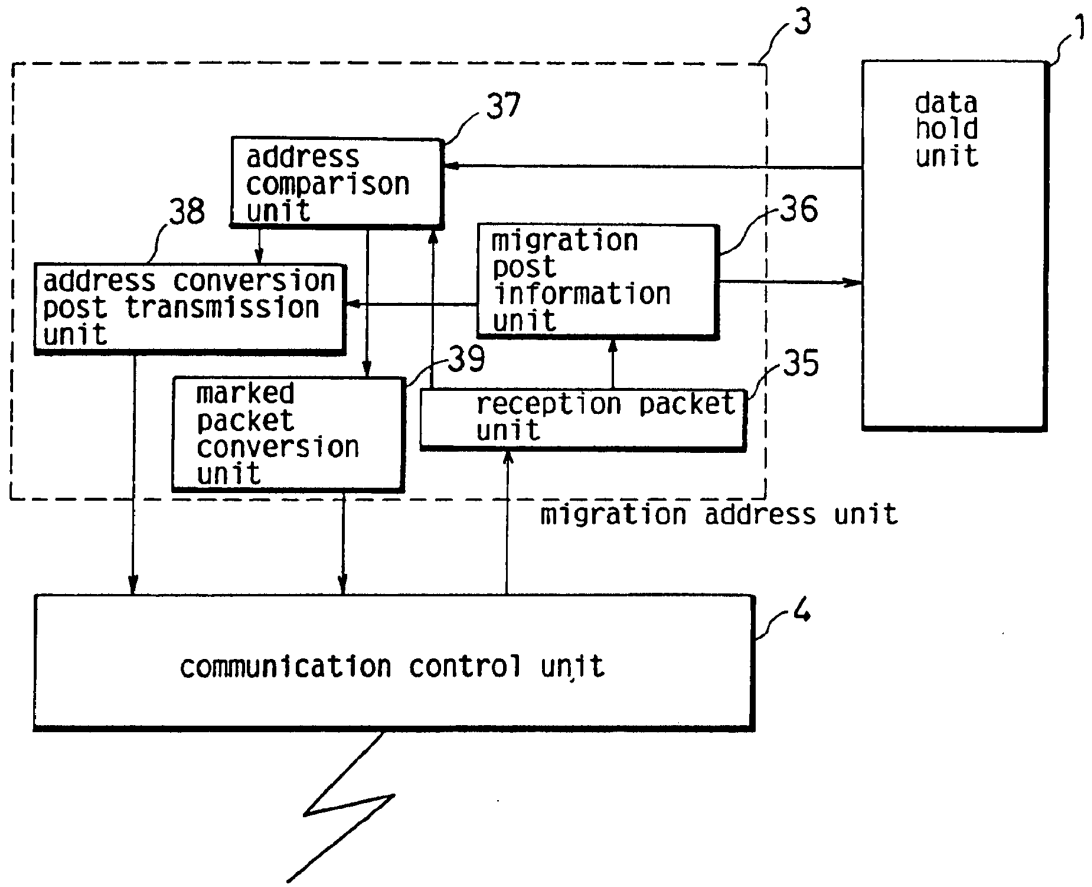

3
1
data
hold
unit
37
address
comparison
unit
38
address conversion
post transmission
unit
36
migration
post
information
unit
39
marked
packet
conversion
unit
35
reception packet
unit
migration address unit
4
communication control unit

FIG. 6

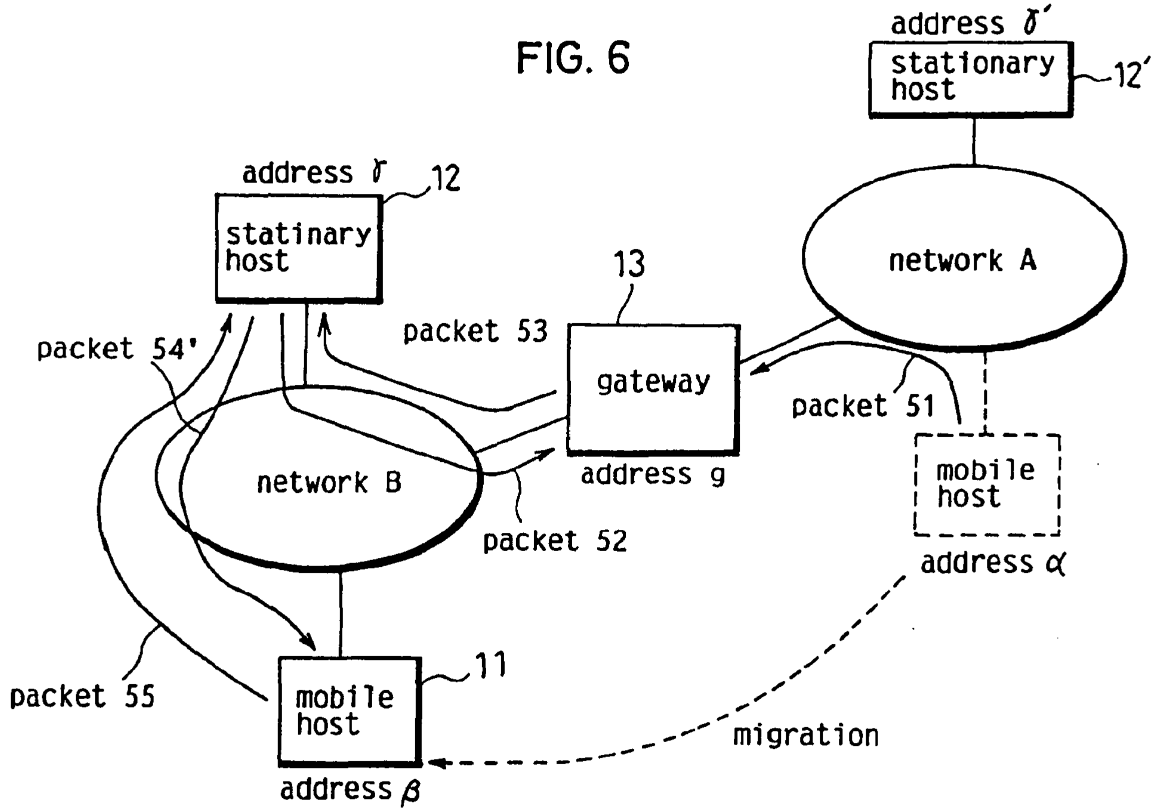
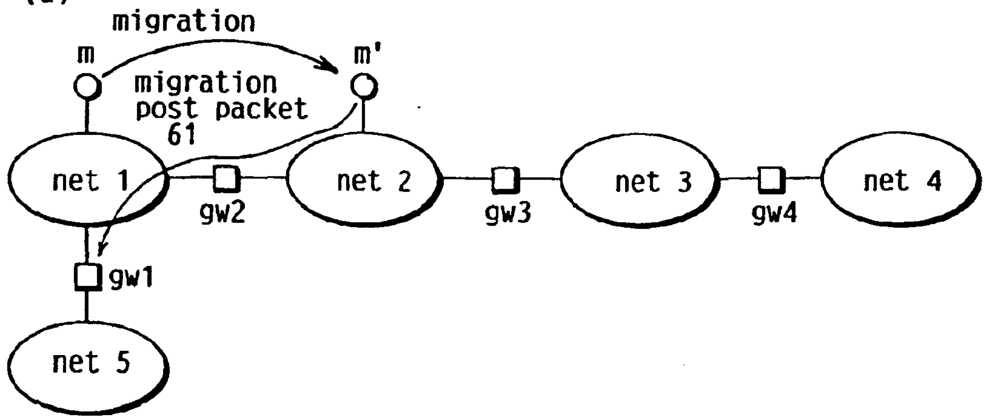
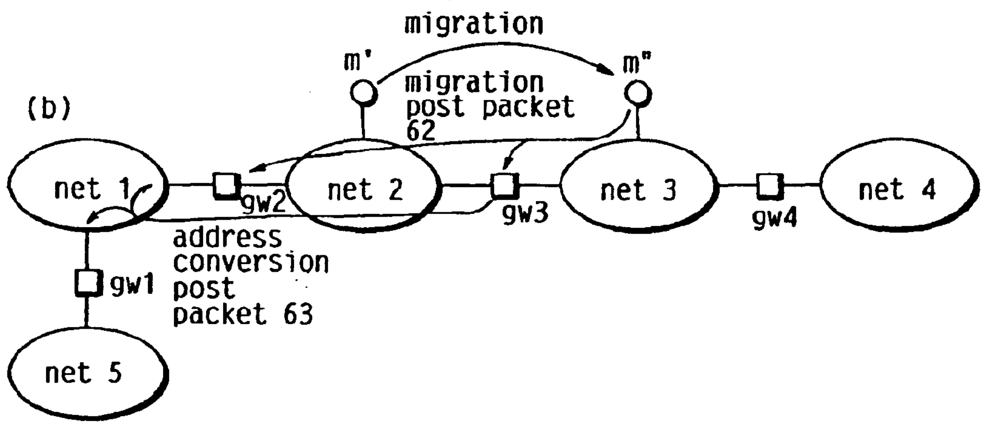

address γ'
stationary host
12'
network A
address γ
12
statinary host
13
gateway
address g
packet 53
packet 54'
packet 51
mobile host
address α
network B
packet 52
packet 55
mobile host
11
address β
migration

FIG. 7

(a)


migration
m
m'
migration
post packet
61
net 1
net 2
net 3
net 4
gw2
gw3
gw4
gw1
net 5

(b)


migration
m'
m"
migration
post packet
62
net 1
gw2
net 2
gw3
net 3
gw4
net 4
address
conversion
post
packet 63
gw1
net 5

(c)

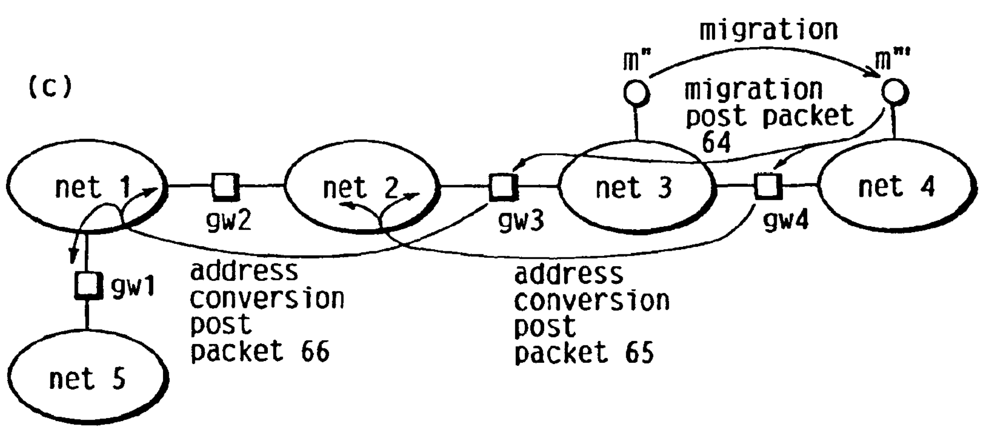

migration
m"
m"'
migration
post packet
64
net 1
gw2
net 2
gw3
net 3
gw4
net 4
gw1
address
conversion
post
packet 66
address
conversion
post
packet 65
net 5

FIG. 8

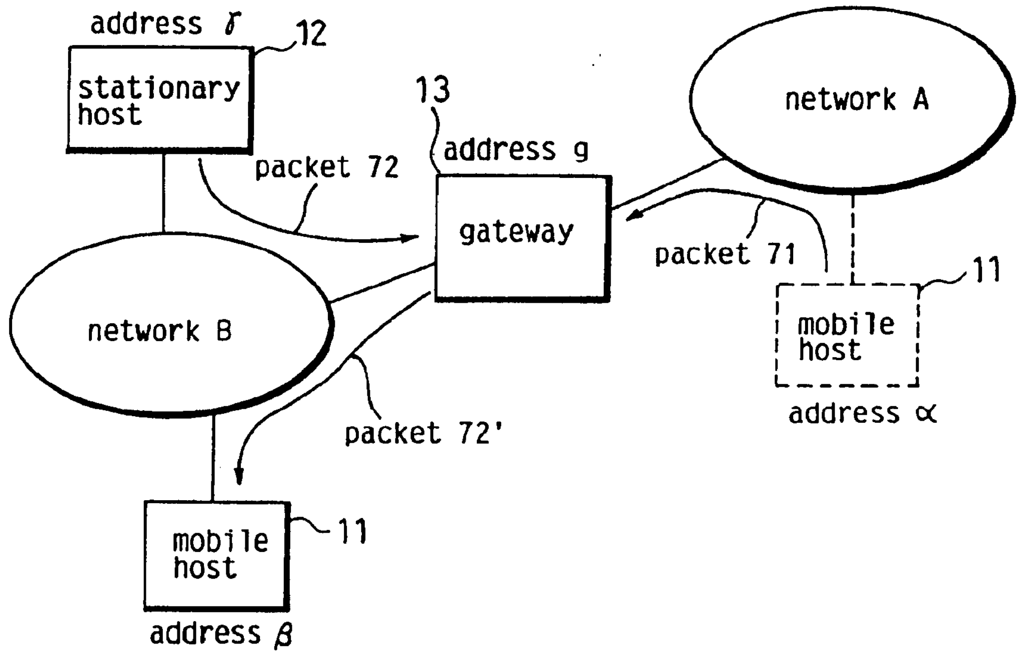

address γ
12
stationary host
13
address g
packet 72
gateway
network A
packet 71
11
mobile host
address α
network B
packet 72'
mobile host
11
address β

FIG. 9

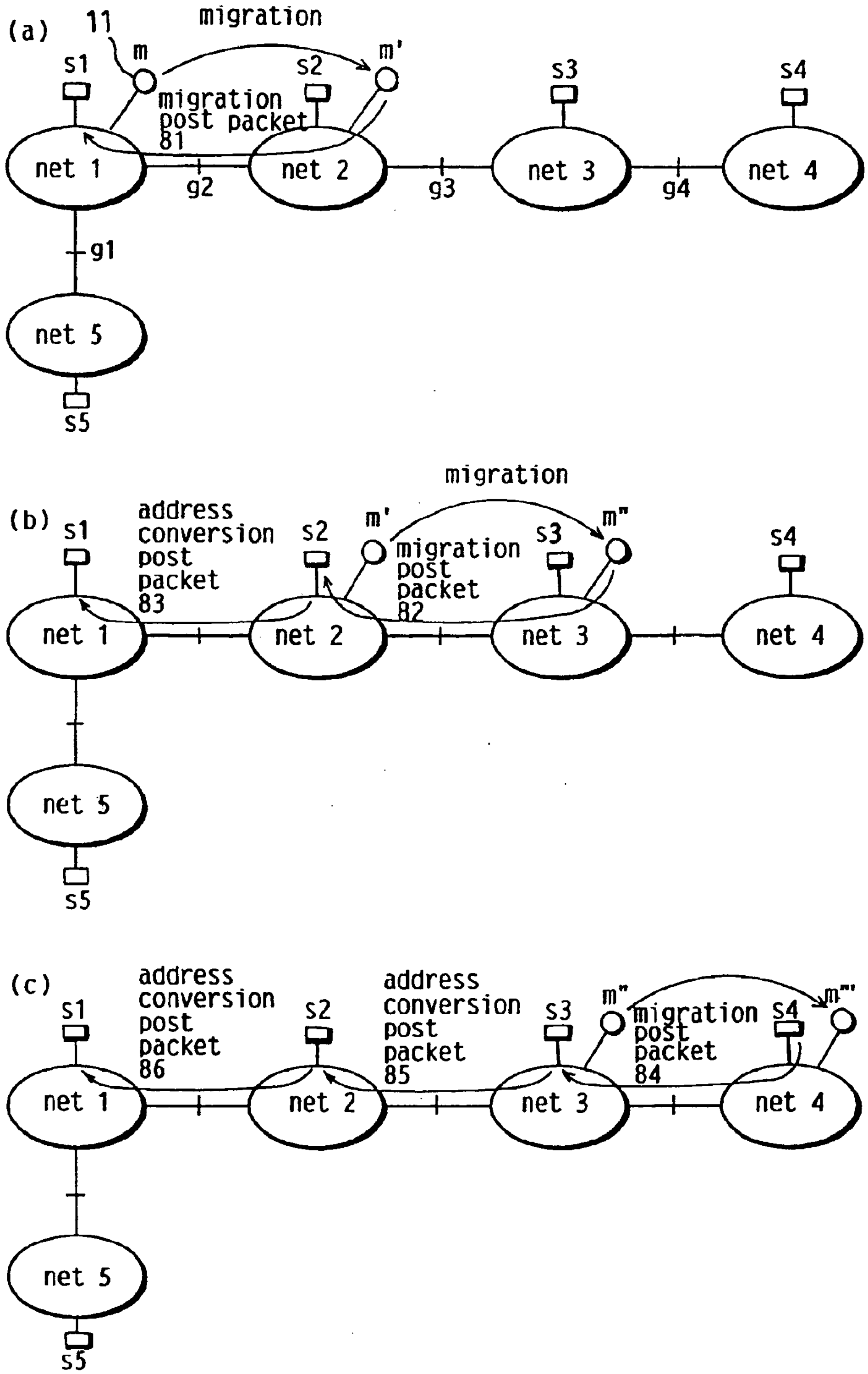

(a)
11
migration
m
m'
s1
s2
s3
s4
migration post packet 81
net 1
net 2
net 3
net 4
g2
g3
g4
g1
net 5
s5
(b)
migration
address conversion post packet 83
m'
m"
migration post packet 82
(c)
address conversion post packet 86
address conversion post packet 85
migration post packet 84
m"'

FIG. 10

(a)

address before migration	address after migration
address α	address β

(b)

address before migration	address after migration
address α	address β
address X	address Y

FIG. 11

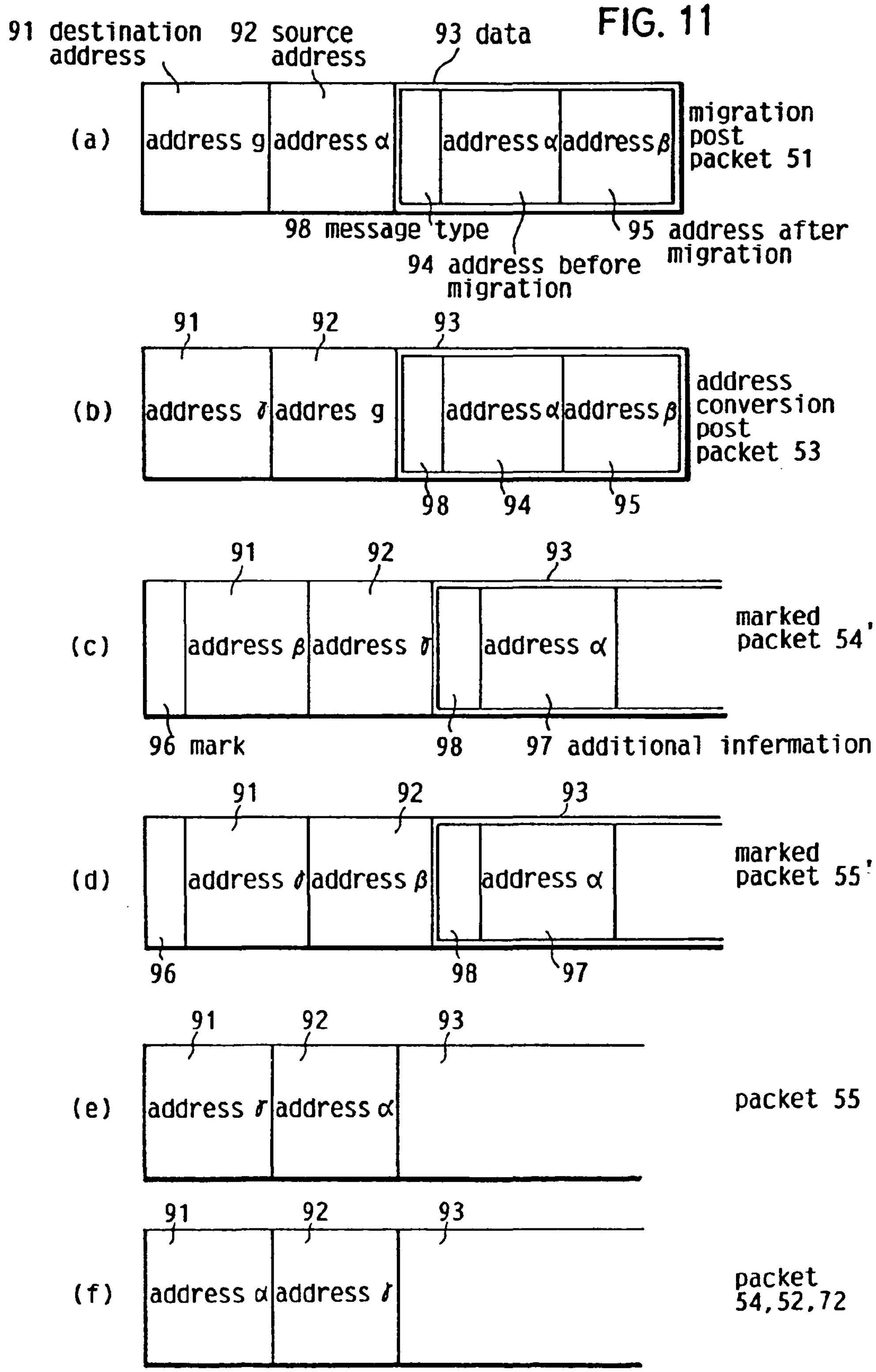

91 destination address
92 source address
93 data
(a)
address g
address α
address α
address β
migration post packet 51
98 message type
94 address before migration
95 address after migration
91
92
93
(b)
address γ
addres g
address α
address β
address conversion post packet 53
98
94
95
91
92
93
(c)
address β
address γ
address α
marked packet 54'
96 mark
98
97 additional information
91
92
93
(d)
address γ
address β
address α
marked packet 55'
96
98
97
91
92
93
(e)
address γ
address α
packet 55
91
92
93
(f)
address α
address γ
packet 54,52,72

FIG. 12

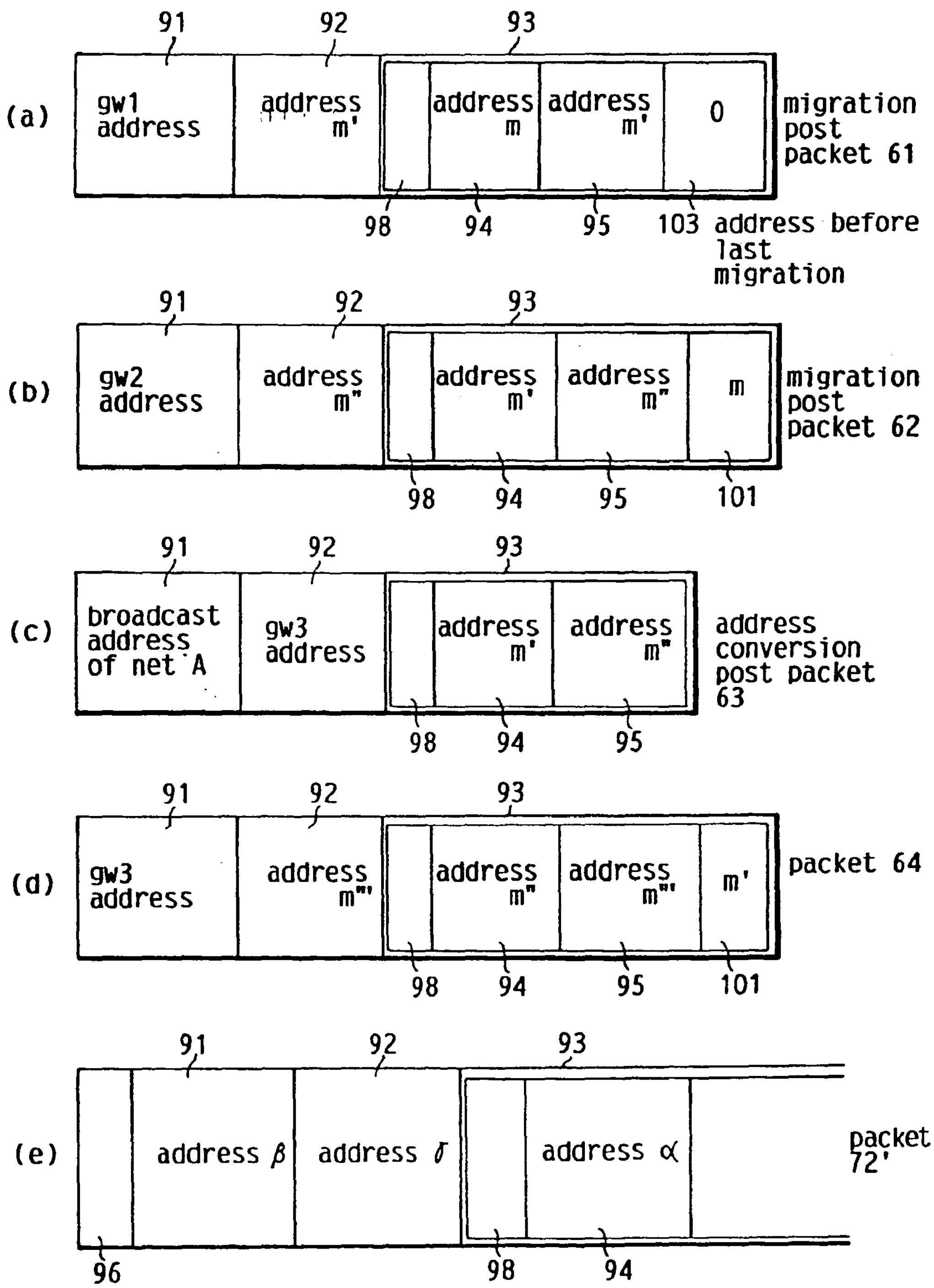

(a)
91
92
93
gw1 address
address m'
address m
address m'
0
migration post packet 61
98
94
95
103 address before last migration
(b)
91
92
93
gw2 address
address m"
address m'
address m"
m
migration post packet 62
98
94
95
101
(c)
91
92
93
broadcast address of net A
gw3 address
address m'
address m"
address conversion post packet 63
98
94
95
(d)
91
92
93
gw3 address
address m"'
address m"
address m"'
m'
packet 64
98
94
95
101
(e)
91
92
93
address β
address γ
address α
packet 72'
96
98
94

FIG. 13

(a) migration from network A to network B

gateway	address correspon-dence	address before last migration
gw1	m → m'	0
gw2	m → m'	0
gw3	——	——
gw4	——	——

(b) migration from network B to network C

gateway	address correspon-dence	address before last migration
gw1	m → m"	0
gw2	m → m" m' → m"	0 m
gw3	m' → m"	m
gw4	——	——

(c) migration from network C to network D

gateway	address correspon-dence	address before last migration
gw1	m → m'''	0
gw2	m → m''' m' → m'''	0 m
gw3	m' → m''' m" → m'''	m m'
gw4	m" → m'''	m'

FIG. 14

(a) migration from network A to network B

migration communication control device	content of hold unit	
	address correspondence	address before last migration
S1	m → m'	0
S2	—	—
S3	—	—
S4	—	—

(b) migration from network B to network C

migration communication control device	content of hold unit	
	address correspondence	address before last migration
S1	m → m"	0
S2	m' → m"	m
S3	—	—
S4	—	—

(c) migration from network C to network D

migration communication control device	content of hold unit	
	address correspondence	address before last migration
S1	m → m"'	0
S2	m' → m"'	m
S3	m" → m"'	m'
S4	—	—

FIG. 15

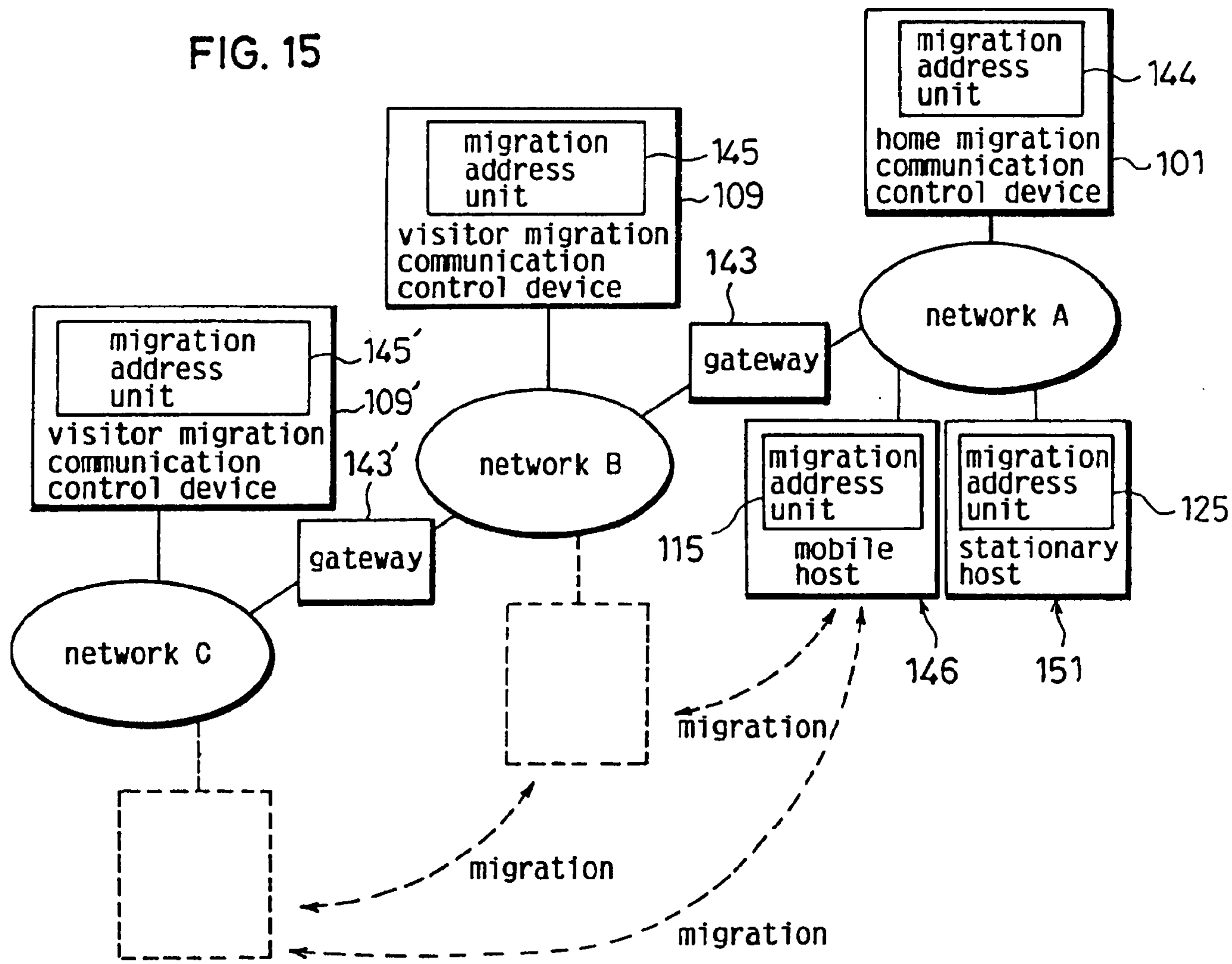

migration address unit
144
home migration communication control device
101
migration address unit
145
109
visitor migration communication control device
143
network A
gateway
migration address unit
145'
109'
visitor migration communication control device
143'
network B
migration address unit
115
mobile host
migration address unit
125
stationary host
gateway
network C
146
151
migration
migration
migration

FIG. 16

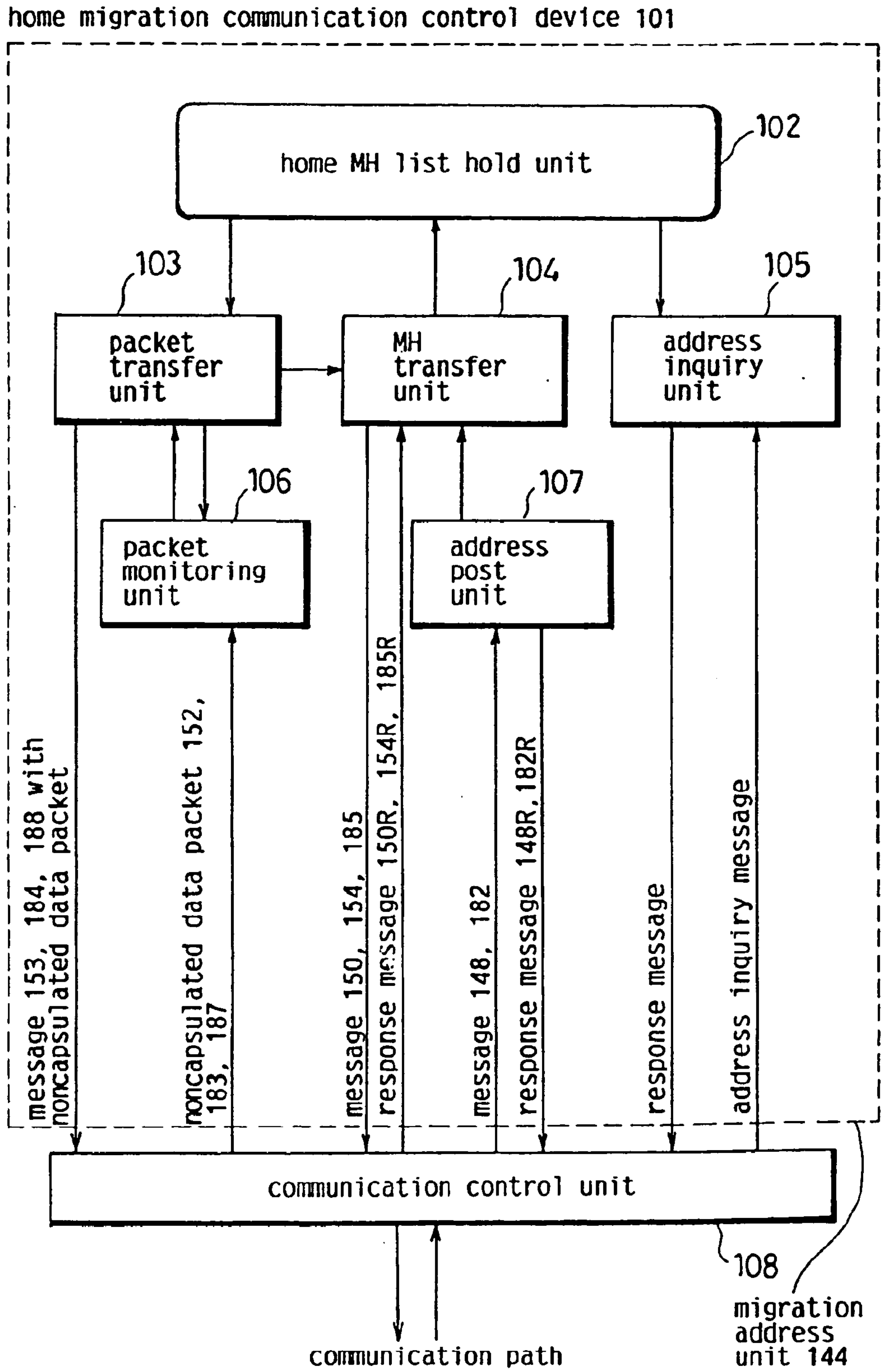

home migration communication control device 101
home MH list hold unit
102
103
packet transfer unit
104
MH transfer unit
105
address inquiry unit
106
packet monitoring unit
107
address post unit
message 153, 184, 188 with noncapsulated data packet
noncapsulated data packet 152, 183, 187
message 150, 154, 185
response message 150R, 154R, 185R
message 148, 182
response message 148R, 182R
response message
address inquiry message
communication control unit
108
migration address unit 144
communication path

FIG. 17

MH's home address	MH's current temporary address	autonomous flag F	current broadcast address
α	β or γ	1	Bba or Cba

FIG. 18

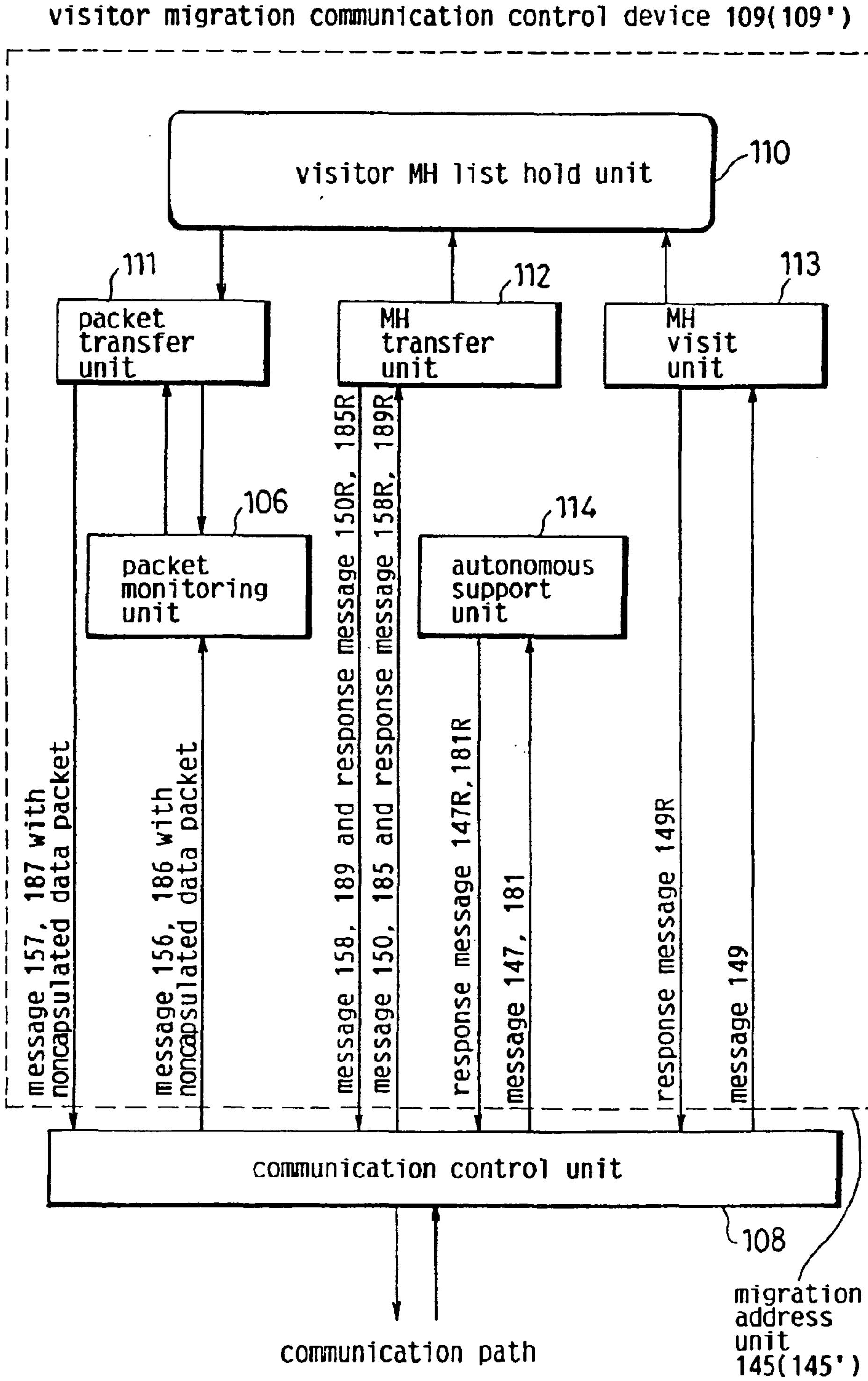

visitor migration communication control device 109(109')
visitor MH list hold unit
110
111
packet transfer unit
112
MH transfer unit
113
MH visit unit
106
packet monitoring unit
114
autonomous support unit
message 157, 187 with noncapsulated data packet
message 156, 186 with noncapsulated data packet
message 158, 189 and response message 150R, 185R
message 150, 185 and response message 158R, 189R
response message 147R,181R
message 147, 181
response message 149R
message 149
communication control unit
108
communication path
migration address unit 145(145')

FIG. 19

MH's home address	temporary address	temporary address after migration	autonomous flag F
α	β	γ	1

FIG. 20

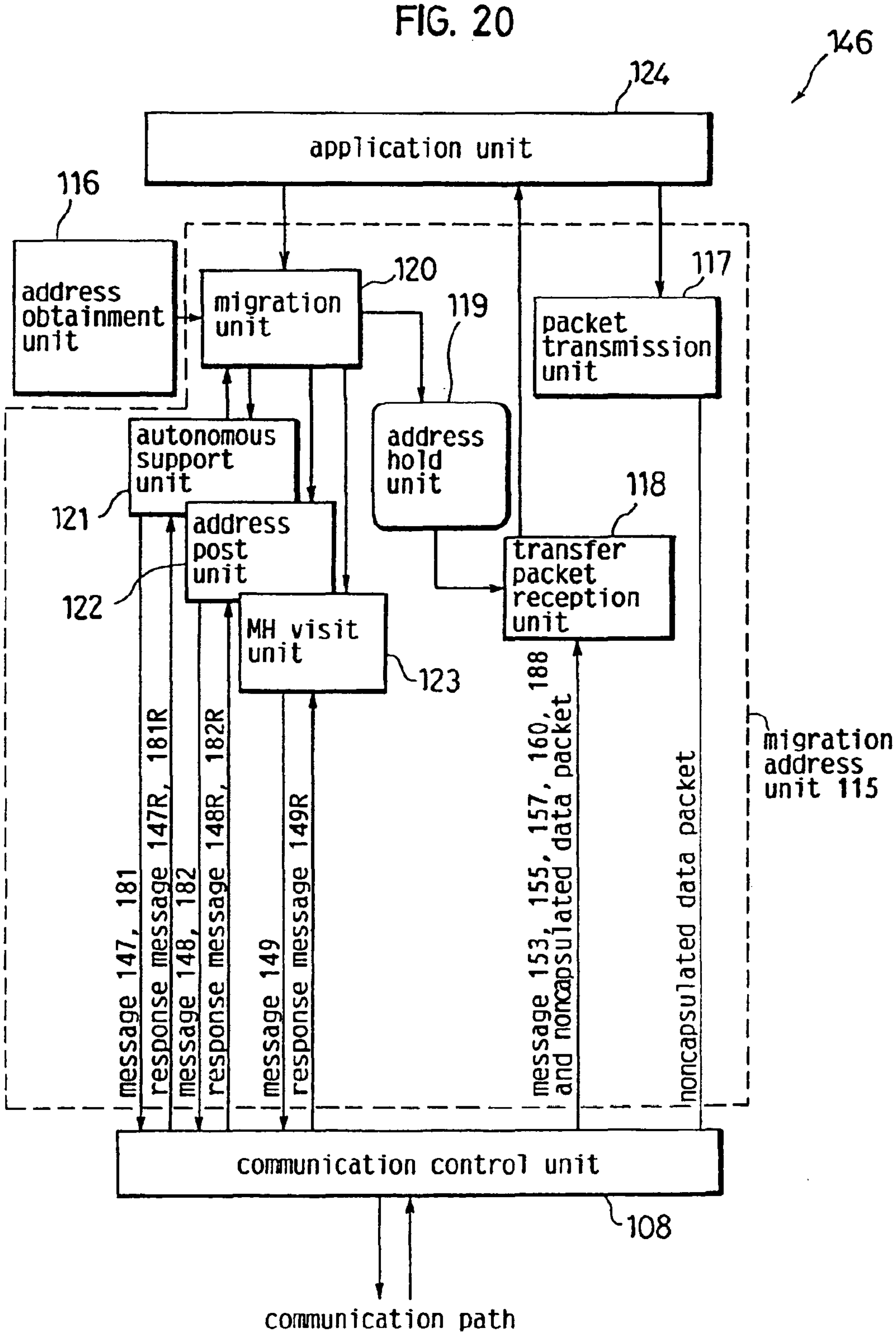

146
124
application unit
116
address obtainment unit
migration unit
120
119
117
packet transmission unit
autonomous support unit
address hold unit
118
121
address post unit
transfer packet reception unit
122
MH visit unit
123
migration address unit 115
message 147, 181
response message 147R, 181R
message 148, 182
response message 148R, 182R
message 149
response message 149R
message 153, 155, 157, 160, 188 and noncapsulated data packet
noncapsulated data packet
communication control unit
108
communication path

FIG. 21

home addres	broadcast address of home network	current temporary address	broadcast address
α	Aba	β or γ	Bba or Cba

FIG. 22

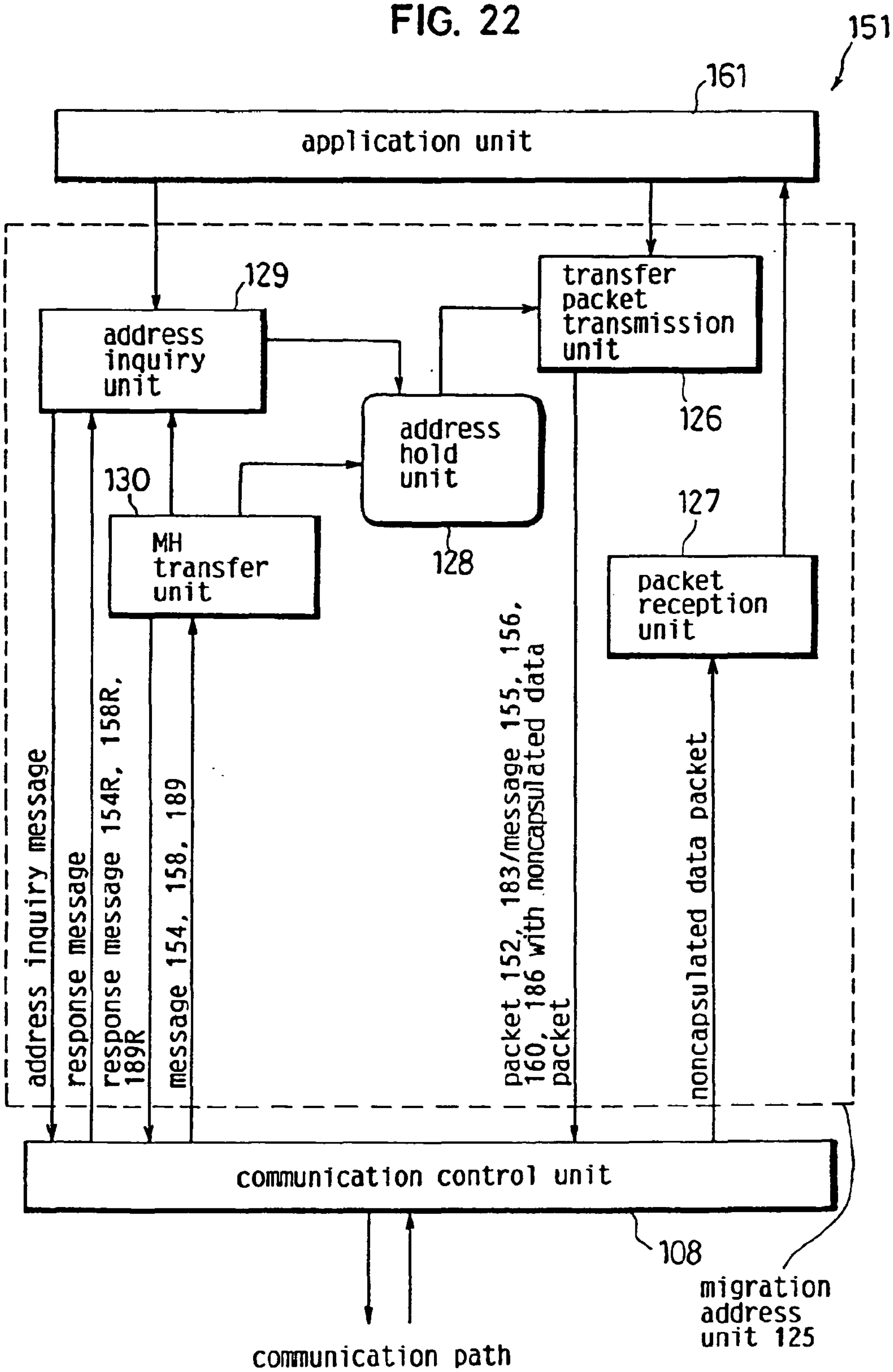

151
161
application unit
129
address inquiry unit
transfer packet transmission unit
address hold unit
126
130
MH transfer unit
128
127
packet reception unit
address inquiry message
response message
response message 154R, 158R, 189R
message 154, 158, 189
packet 152, 183/message 155, 156, 160, 186 with noncapsulated data packet
noncapsulated data packet
communication control unit
108
migration address unit 125
communication path

FIG. 23

MH's home address	MH's temporary address
α	β or γ

FIG. 24

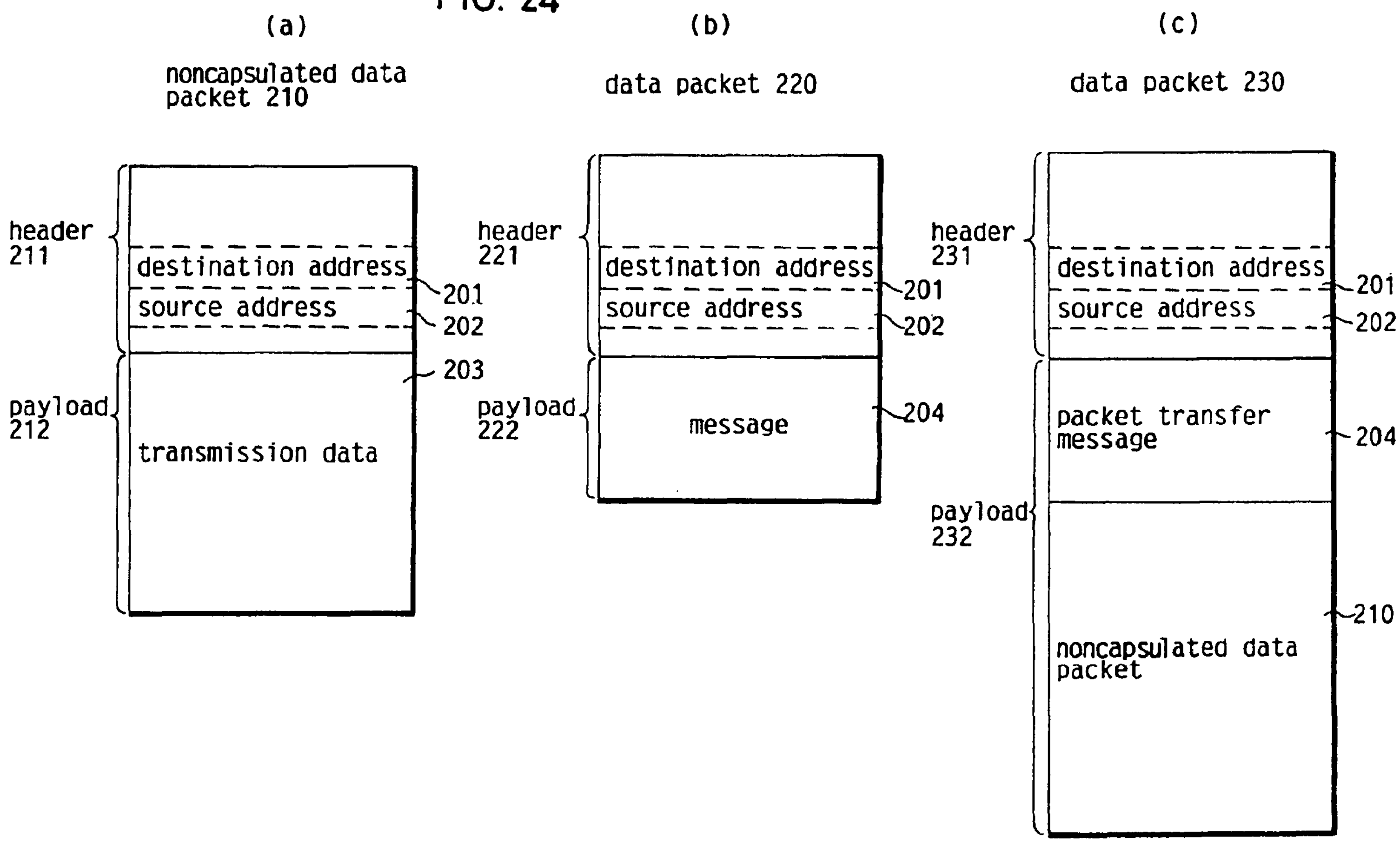

(a)
noncapsulated data packet 210
header 211
destination address
source address
201
202
203
payload 212
transmission data
(b)
data packet 220
header 221
destination address
source address
201
202
payload 222
message
204
(c)
data packet 230
header 231
destination address
source address
201
202
packet transfer message
204
payload 232
noncapsulated data packet
210

FIG. 25

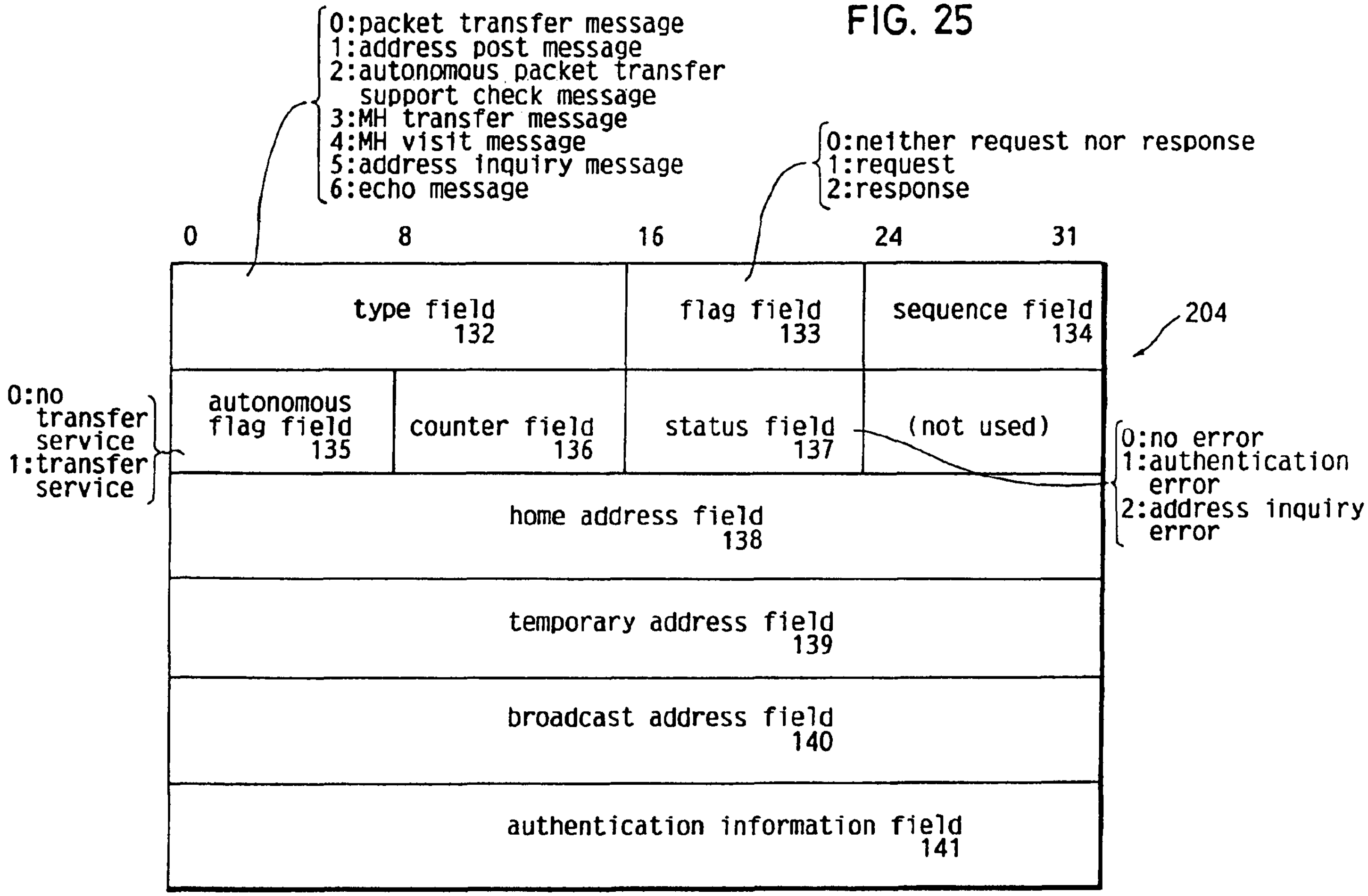

0:packet transfer message
1:address post message
2:autonomous packet transfer support check message
3:MH transfer message
4:MH visit message
5:address inquiry message
6:echo message
0:neither request nor response
1:request
2:response
0
8
16
24
31
type field 132
flag field 133
sequence field 134
204
0:no transfer service
1:transfer service
autonomous flag field 135
counter field 136
status field 137
(not used)
0:no error
1:authentication error
2:address inquiry error
home address field 138
temporary address field 139
broadcast address field 140
authentication information field 141

FIG. 26

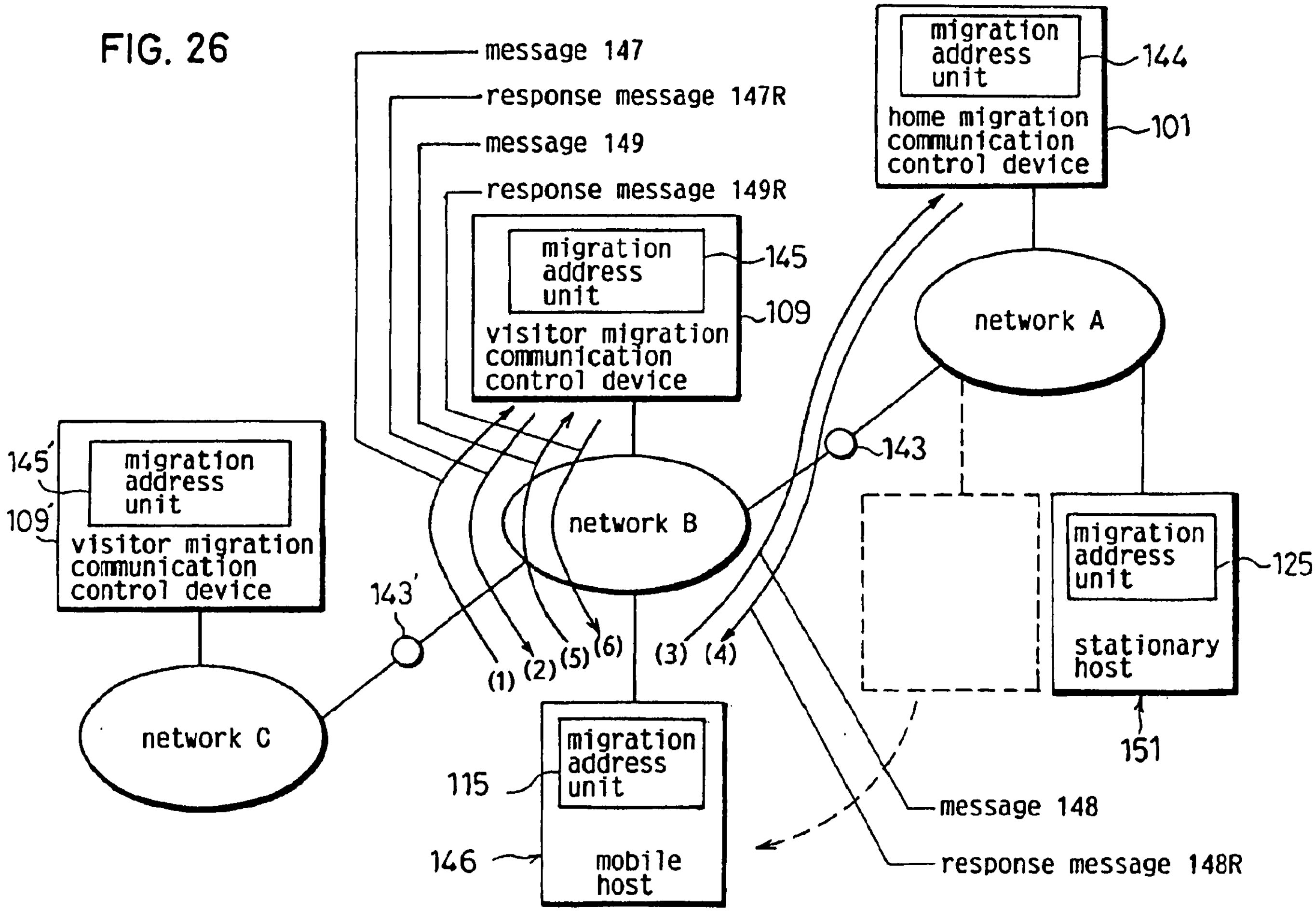

message 147
response message 147R
message 149
response message 149R
migration address unit
home migration communication control device
144
101
migration address unit
visitor migration communication control device
145
109
network A
143
network B
145'
109'
migration address unit
visitor migration communication control device
143'
(1) (2) (5) (6)
(3) (4)
migration address unit
stationary host
125
151
network C
migration address unit
mobile host
115
146
message 148
response message 148R

FIG. 27 migration from network A to network B

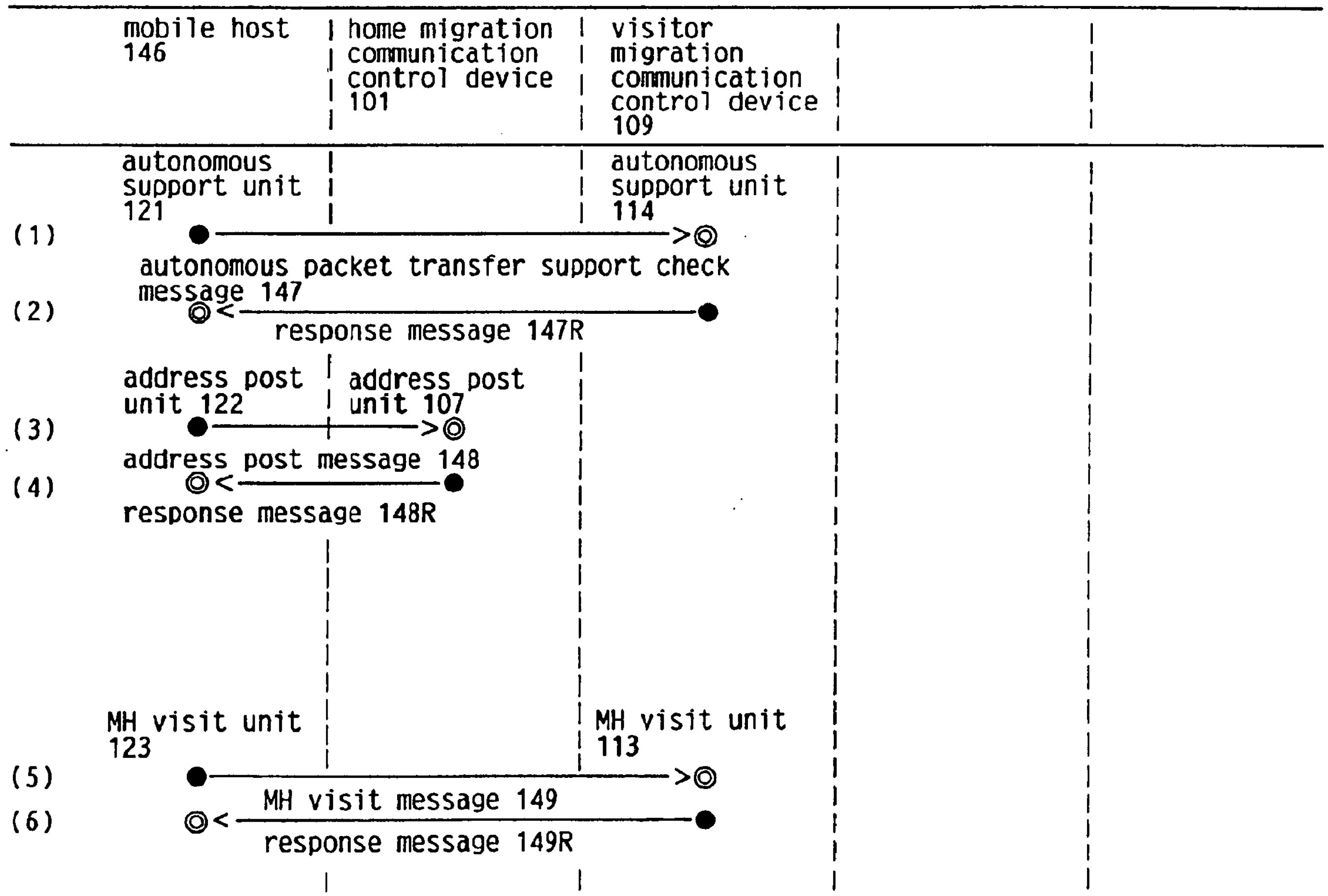


FIG.28

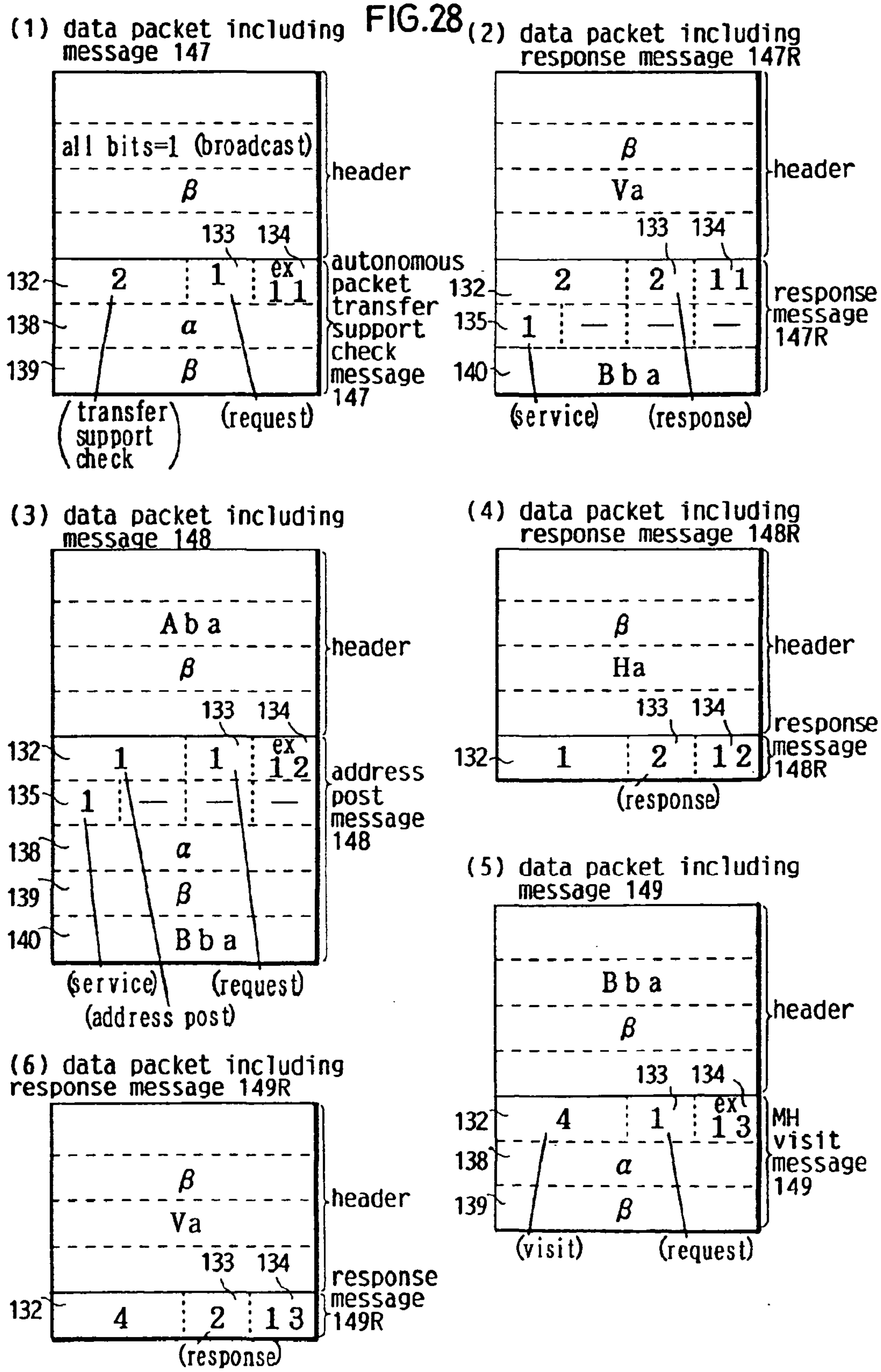

(1) data packet including message 147
all bits=1 (broadcast)
β
133
134
header
132
2
1
ex
1 1
autonomous packet transfer support check message 147
138
α
139
β
(transfer support check)
(request)
(2) data packet including response message 147R
β
Va
header
133
134
132
2
2
1 1
135
1
—
—
—
response message 147R
140
B b a
(service)
(response)
(3) data packet including message 148
A b a
β
header
133
134
132
1
1
ex
1 2
135
1
—
—
—
address post message 148
138
α
139
β
140
B b a
(service)
(request)
(address post)
(4) data packet including response message 148R
β
Ha
header
133
134
132
1
2
1 2
response message 148R
(response)
(5) data packet including message 149
B b a
β
header
133
134
132
4
1
ex
1 3
MH visit message 149
138
α
139
β
(visit)
(request)
(6) data packet including response message 149R
β
Va
header
133
134
132
4
2
1 3
response message 149R
(response)

FIG. 29

		address after obtainment of β	(1)	(2)	(3)	(4)	(5)	(6)
address hold unit 119(146)	home address	α		α				
	broadcast address of home network	Aba		Aba				
	current temporary address	β		β				
	current broadcast address	-		Bba				
home MH host list hold unit 102(101)	MH's home address	α			α			
	MH's current temporary address	α			β			
	autonomous flag F	-			1			
	current broadcast address	-			Bba			
visitor MH list hold unit 110(109)	MH's home address	-					α	
	temporary address	-					β	
	temporary address after migration	-					β	
	autonomous flag F	-					-	
visitor MH list hold unit 110'(109')	MH's home address	-						
	temporary address	-						
	temporary address after migration	-						
	autonomous flag F	-						
address hold unit 128(151)	MH's home address	-						
	MH's temporary address	-						

FIG. 30

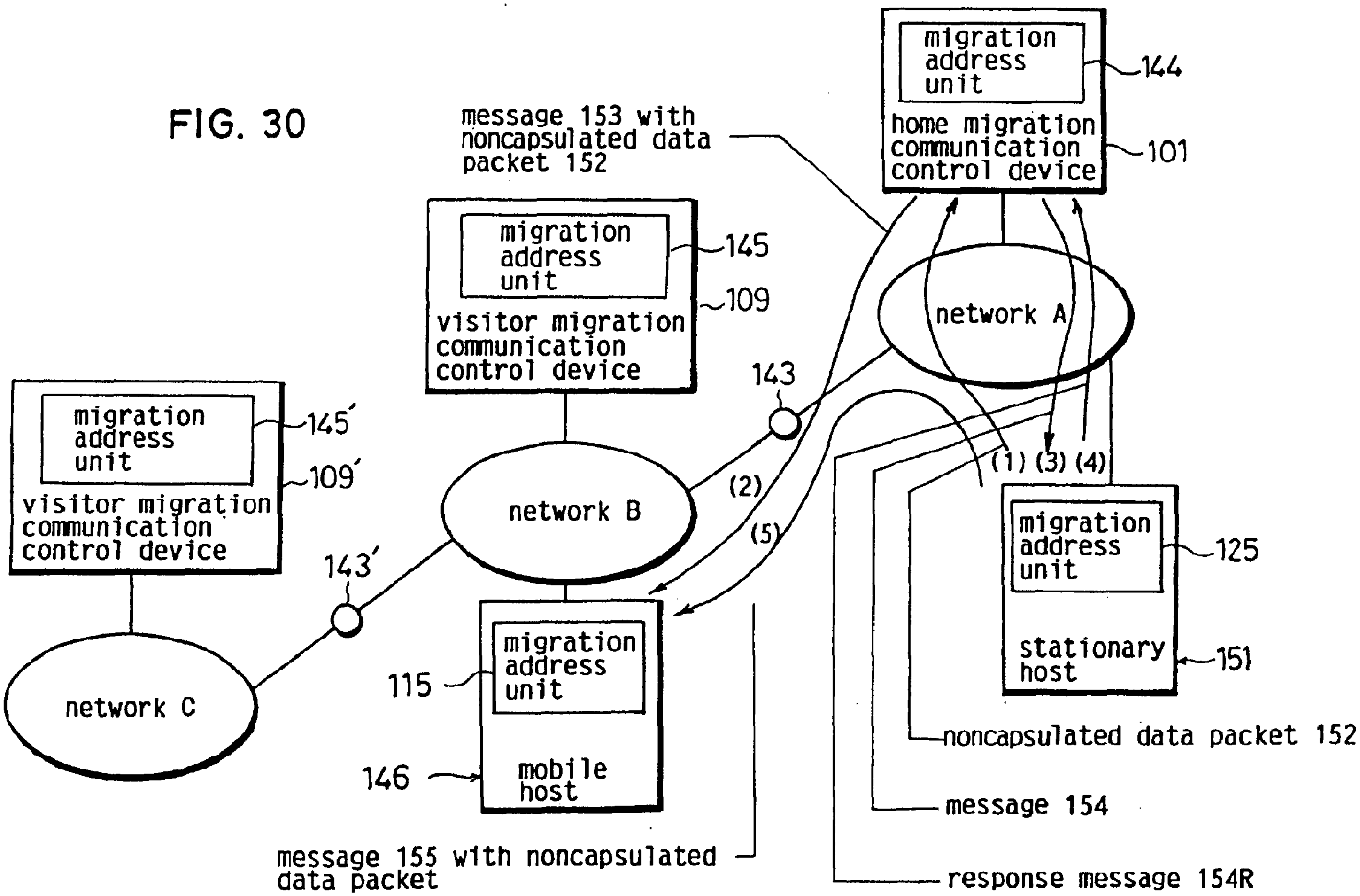

message 153 with noncapsulated data packet 152
migration address unit
144
home migration communication control device
101
migration address unit
145
109
visitor migration communication control device
network A
143
migration address unit
145'
109'
visitor migration communication control device
network B
(2)
(5)
(1) (3) (4)
migration address unit
125
stationary host
151
143'
network C
migration address unit
115
146
mobile host
noncapsulated data packet 152
message 154
response message 154R
message 155 with noncapsulated data packet

FIG. 31

data packet from SH 151 to MH 146 on network B

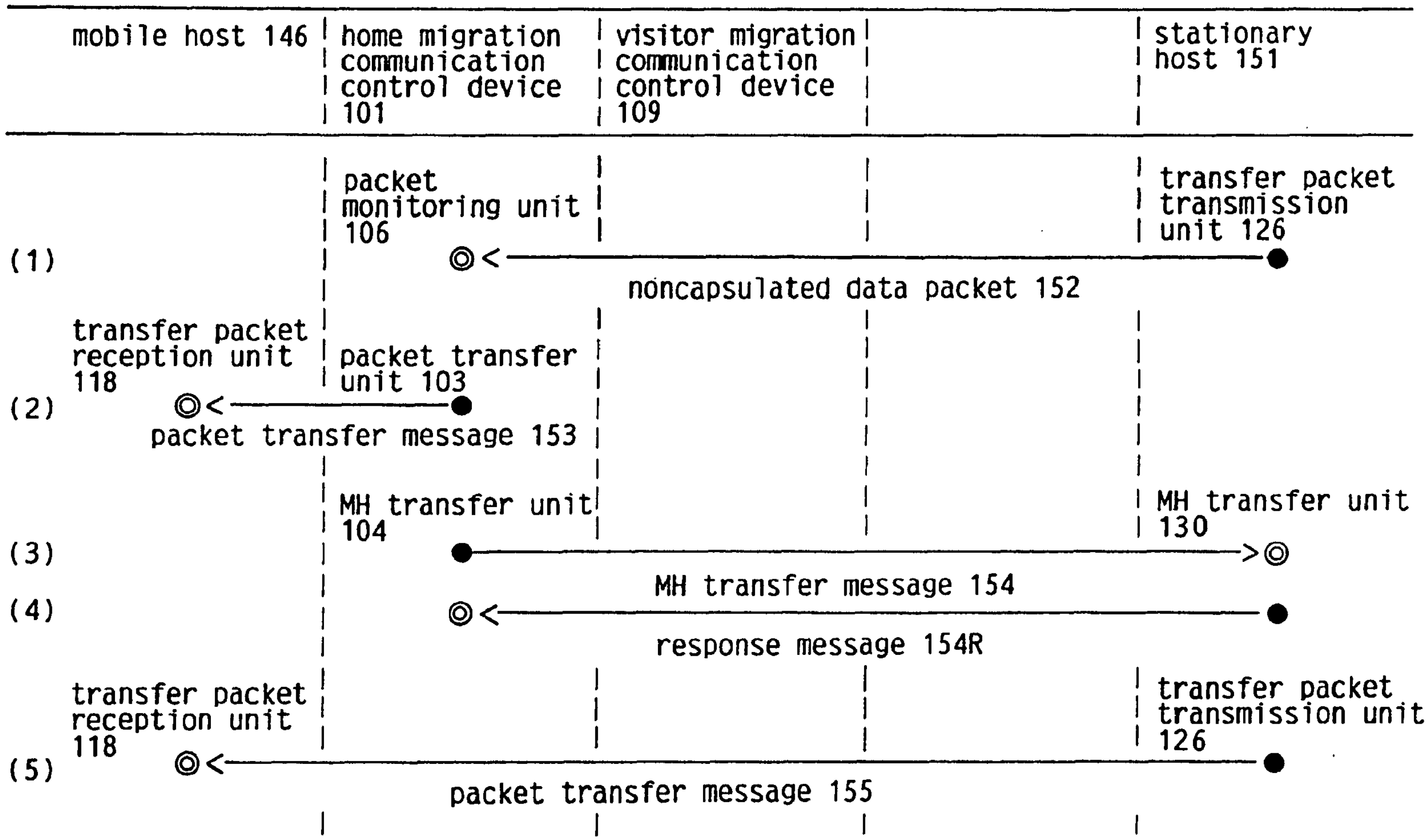


FIG. 32

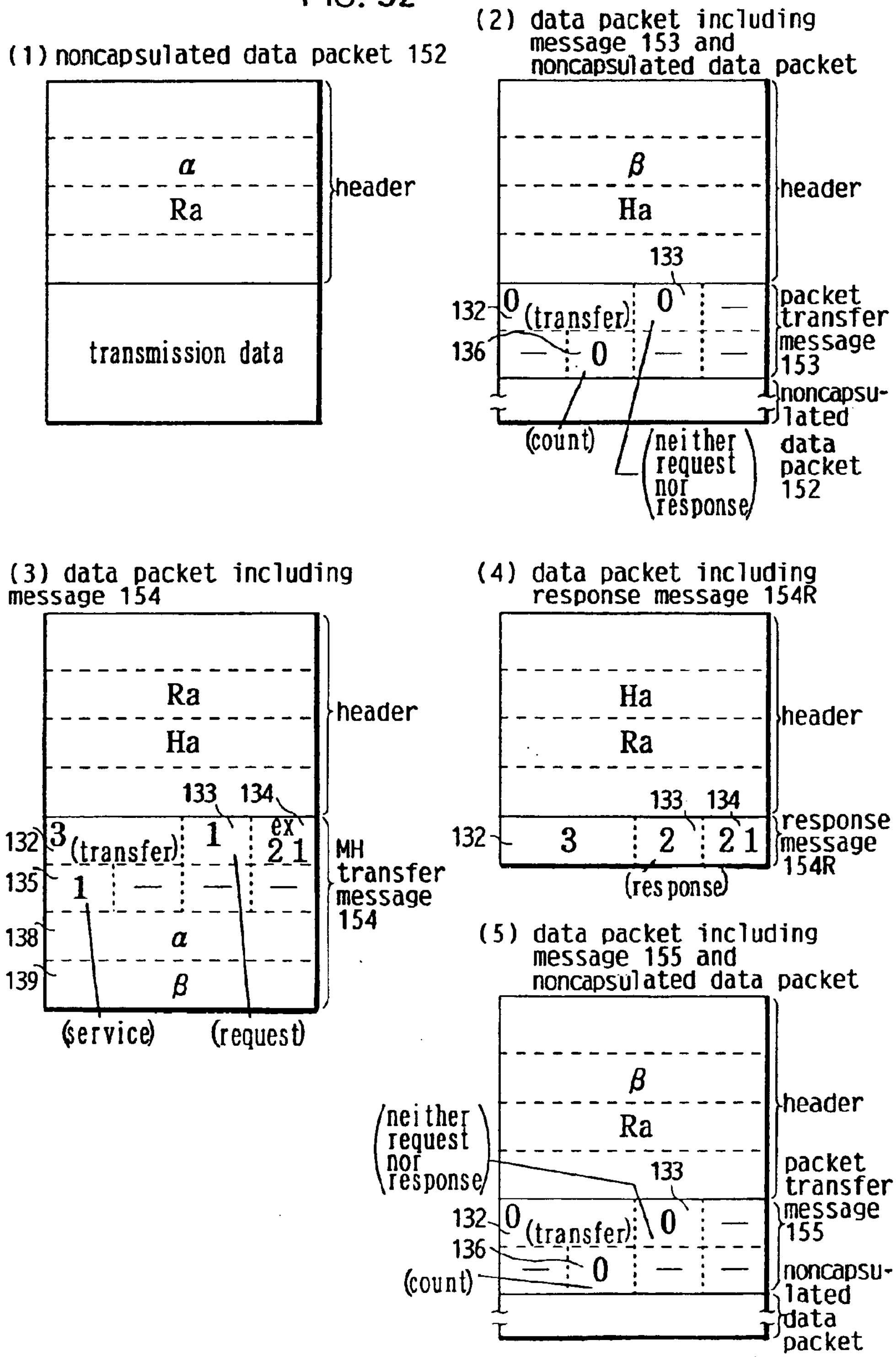


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FIG. 33

	address hold unit 119(146)				home MH list hold unit 102(101)				visitor MH list hold unit 110(109)				visitor MH list hold unit 110'(109')				address hold unit 128(151)	
	home address	broadcast address of home network	current temporary address	current broadcast address	MH's home address	current temporary address	autonomous flag F	broadcast address	MH's home address	temporary address	temporary address after migration	autonomous flag F	MH's home address	temporary address	temporary address after migration	autonomous flag F	MH's home address	MH's temporary address
address before communica-tion	α	Aba	β	Bba	α	β	1	Bba	α	β	β	—	—	—	—	—	—	—
(1)																		
(2)																		
(3)																	α	β
(4)																		
(5)																		

FIG. 34

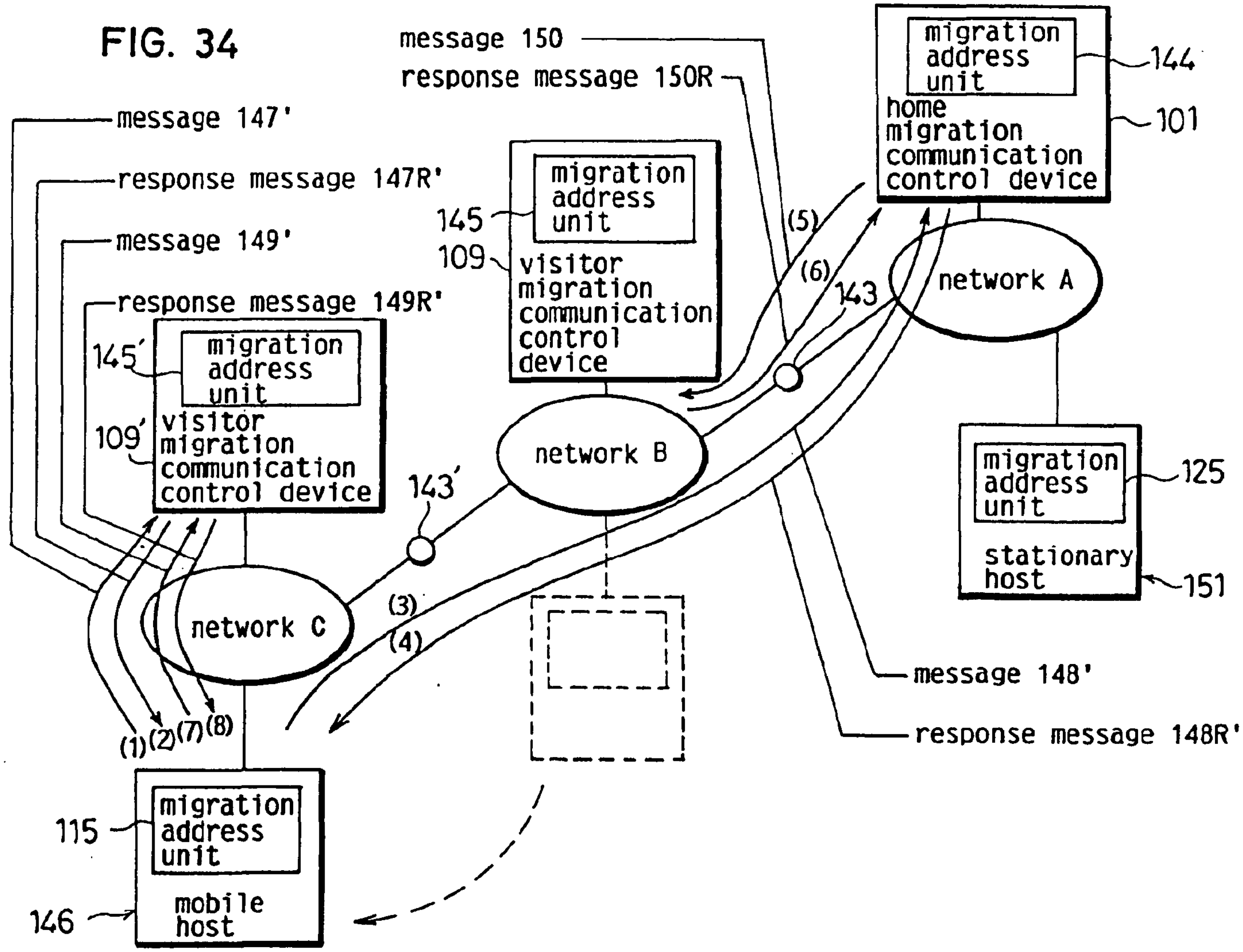

message 150
response message 150R
migration address unit
144
home migration communication control device
101
message 147'
response message 147R'
message 149'
response message 149R'
migration address unit
145
109
visitor migration communication control device
(5)
(6)
143
network A
145'
migration address unit
109'
visitor migration communication control device
143'
network B
migration address unit
125
stationary host
151
network C
(3)
(4)
message 148'
response message 148R'
(1)
(2)
(7)
(8)
115
migration address unit
146
mobile host

FIG. 35 migration from network B to network C

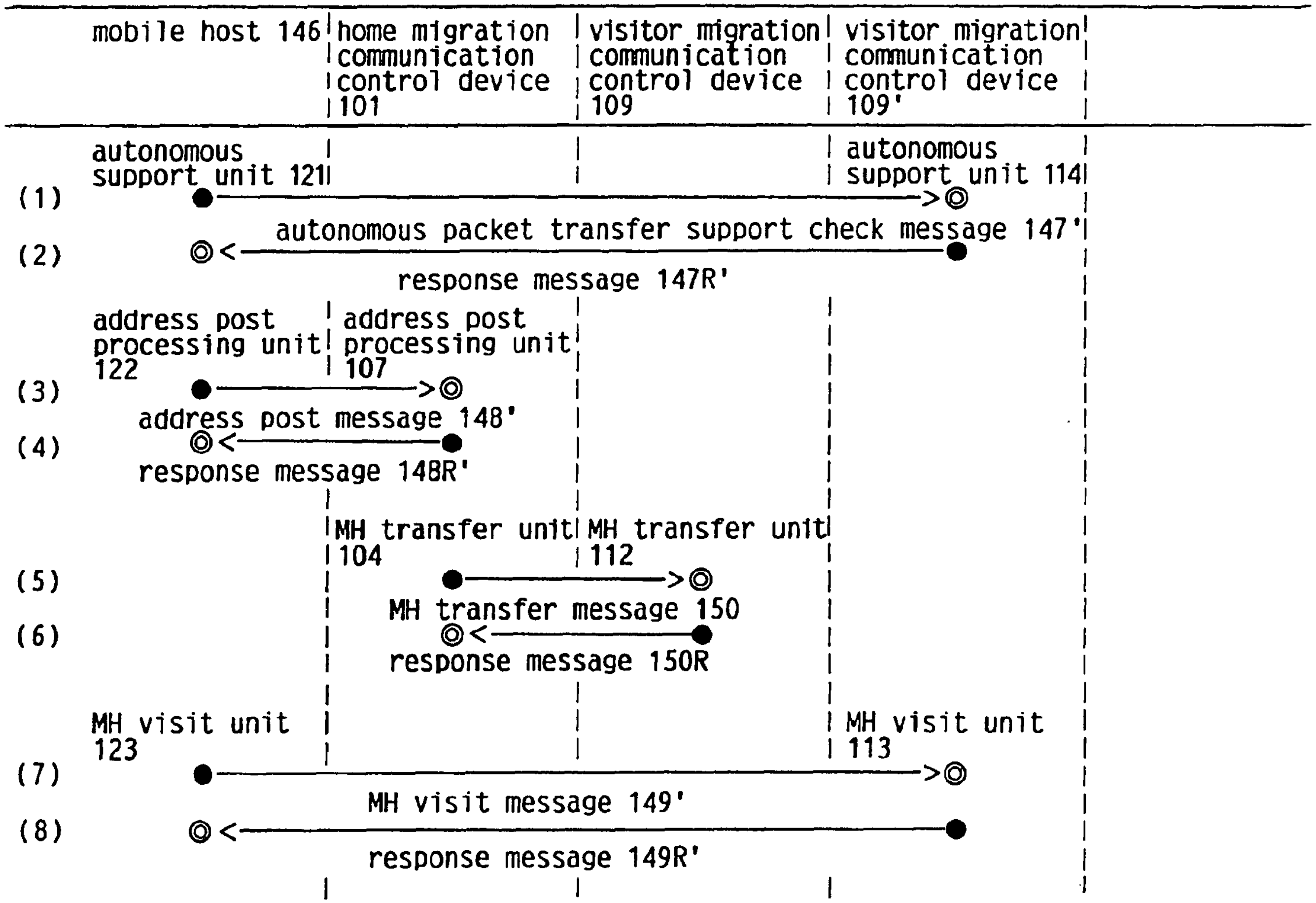
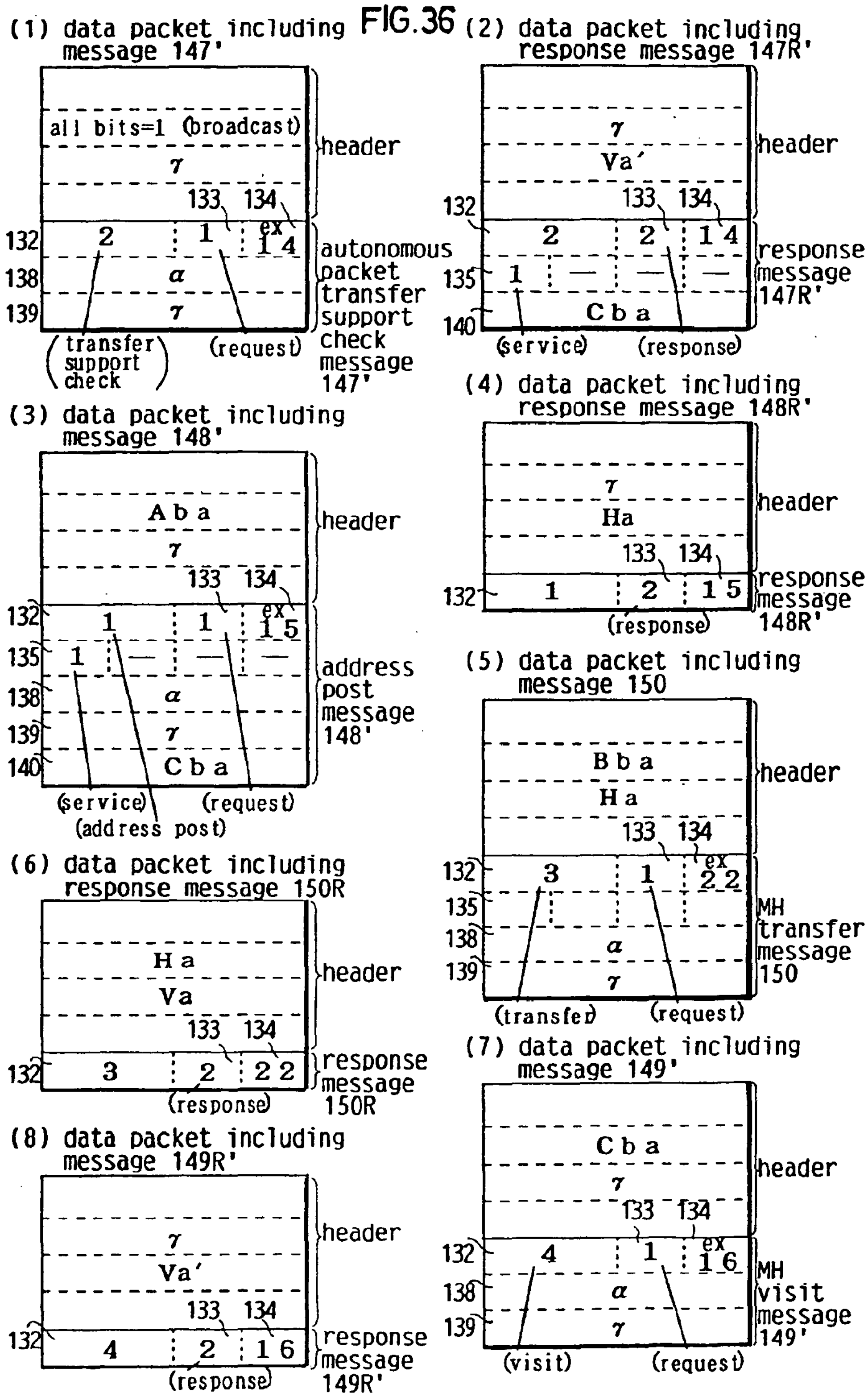


FIG.36



(1) data packet including message 147'
all bits=1 (broadcast)
γ
133
134
ex
2
1
1 4
α
γ
132
138
139
header
autonomous packet transfer support check message 147'
(transfer support check)
(request)
(2) data packet including response message 147R'
γ
Va'
133
134
2
2
1 4
1
—
—
—
C b a
132
135
140
header
response message 147R'
(service)
(response)
(3) data packet including message 148'
A b a
γ
133
134
1
1
ex
1 5
1
—
—
—
α
γ
C b a
132
135
138
139
140
header
address post message 148'
(service)
(address post)
(request)
(4) data packet including response message 148R'
γ
Ha
133
134
1
2
1 5
132
header
response message 148R'
(response)
(5) data packet including message 150
B b a
H a
133
134
3
1
ex
2 2
α
γ
132
135
138
139
header
MH transfer message 150
(transfer)
(request)
(6) data packet including response message 150R
H a
Va
133
134
3
2
2 2
132
header
response message 150R
(response)
(7) data packet including message 149'
C b a
γ
133
134
4
1
ex
1 6
α
γ
132
138
139
header
MH visit message 149'
(visit)
(request)
(8) data packet including message 149R'
γ
Va'
133
134
4
2
1 6
132
header
response message 149R'
(response)

FIG. 37

		address after obtainment of γ	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
address hold unit 119(146)	home address	α		α						
	broadcast address of home network	Aba		Aba						
	current temporary address	γ		γ						
	current broadcast address	Bba		Cba						
home MH list hold unit 102(101)	MH's home address	α			α					
	MH's current temporary address	β			γ					
	autonomous flag F	1			1					
	current broadcast address	Bba			Cba					
visitor MH list hold unit 110(109)	MH's home address	α					α			
	temporary address	β					β			
	temporary address after migration	β					γ			
	autonomous flag F	—					1			
visitor MH list hold unit 110'(109')	MH's home address	—							α	
	temporary address	—							γ	
	temporary address after migration	—							γ	
	autonomous flag F	—							—	
address hold unit 128(151)	MH's home address	α								
	MH's temporary address	β								

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FIG. 38

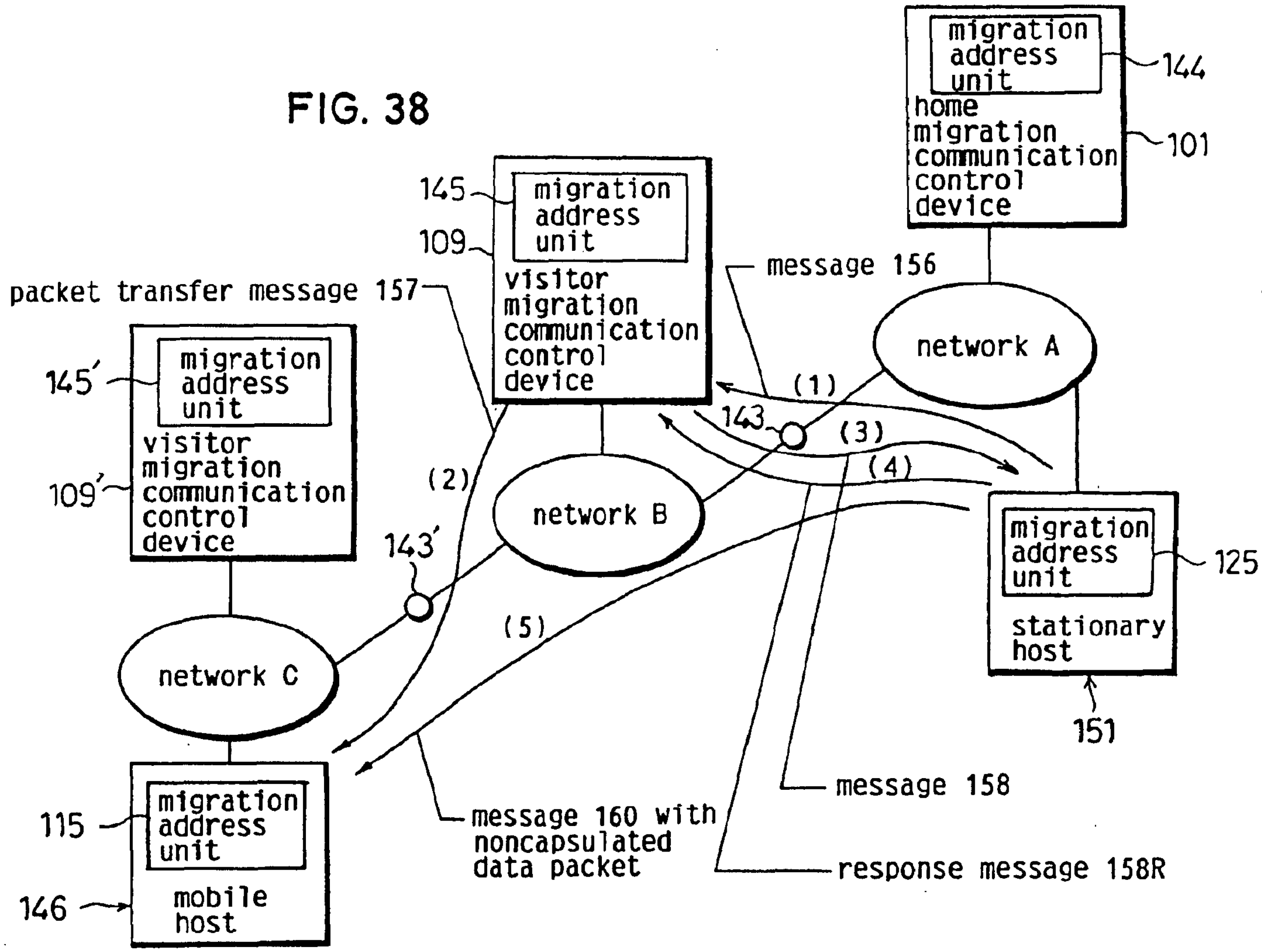

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FIG. 39

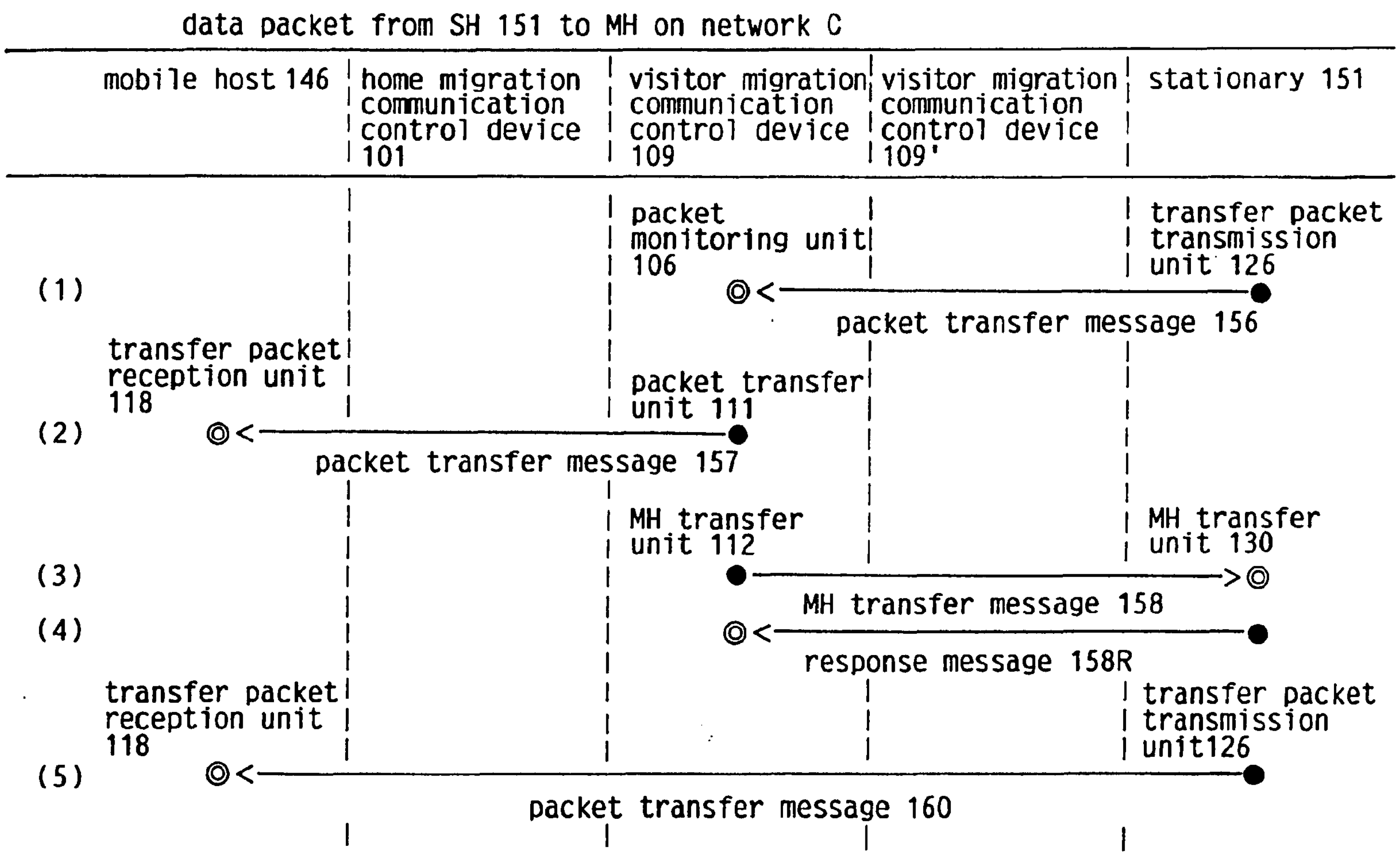
data packet from SH 151 to MH on network C
mobile host 146
home migration communication control device 101
visitor migration communication control device 109
visitor migration communication control device 109'
stationary 151
packet monitoring unit 106
transfer packet transmission unit 126
(1)
packet transfer message 156
transfer packet reception unit 118
packet transfer unit 111
(2)
packet transfer message 157
MH transfer unit 112
MH transfer unit 130
(3)
MH transfer message 158
(4)
response message 158R
transfer packet reception unit 118
transfer packet transmission unit126
(5)
packet transfer message 160

FIG. 40

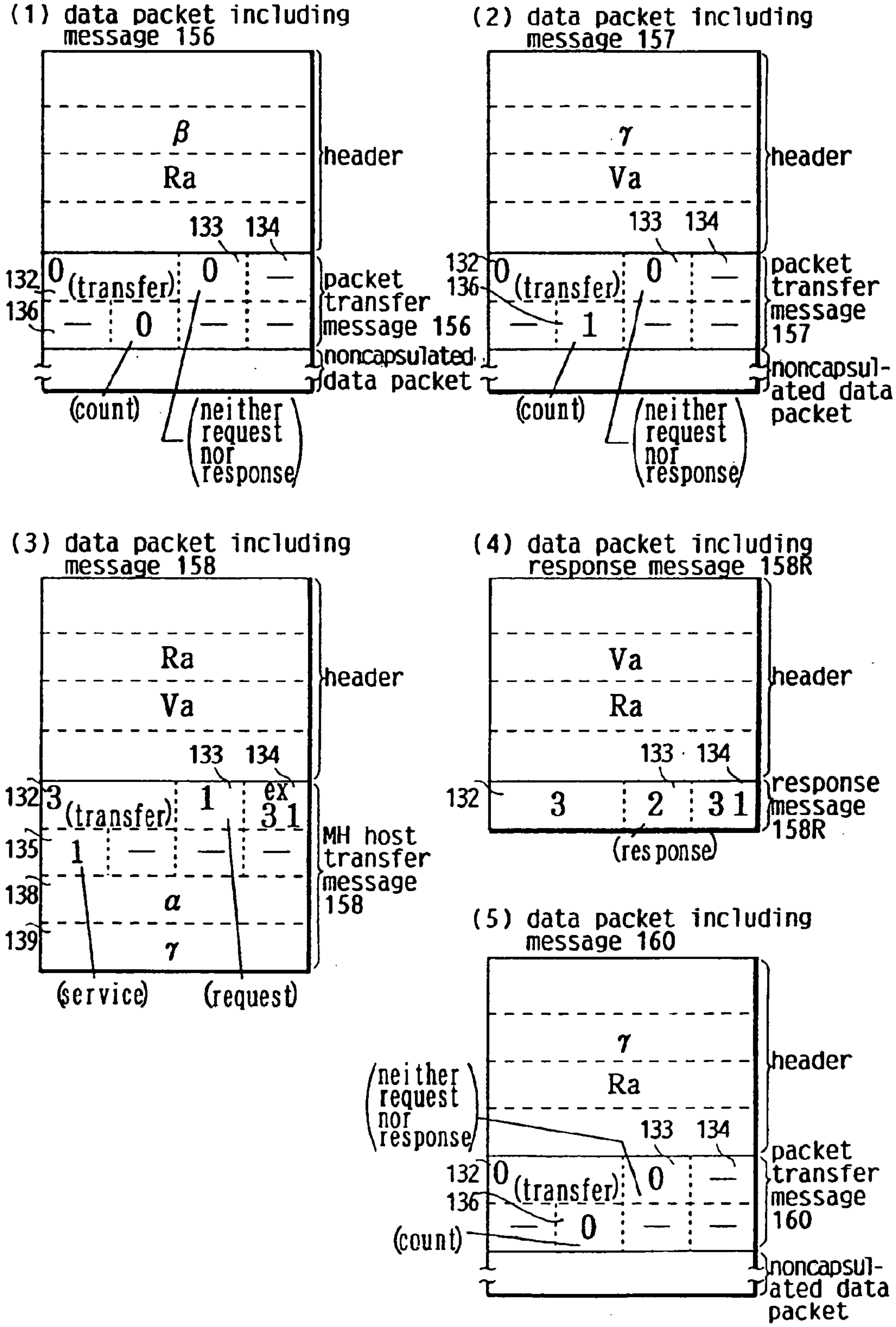

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FIG. 41

	address hold unit 119				home MH list hold unit 102				visitor MH list hold unit 110				visitor MH list hold unit 109'				address hold unit 128	
	home address	broadcast address of home network	current temporary address	current broadcast address	MH's home address	MH's current temporary address	autonomous flag F	broadcast address	MH's home address	temporary address	temporary address after migration	autonomous flag F	MH's home address	temporary address	temporary address after migration	autonomous flag F	MH's home address	MH's temporary address
address before communica-tion	α	Aba	γ	Cba	α	γ	1	Cba	α	β	γ	1	α	γ	γ	-	α	β
(1)																		
(2)																		
(3)																	α	γ
(4)																		
(5)																		

FIG. 42

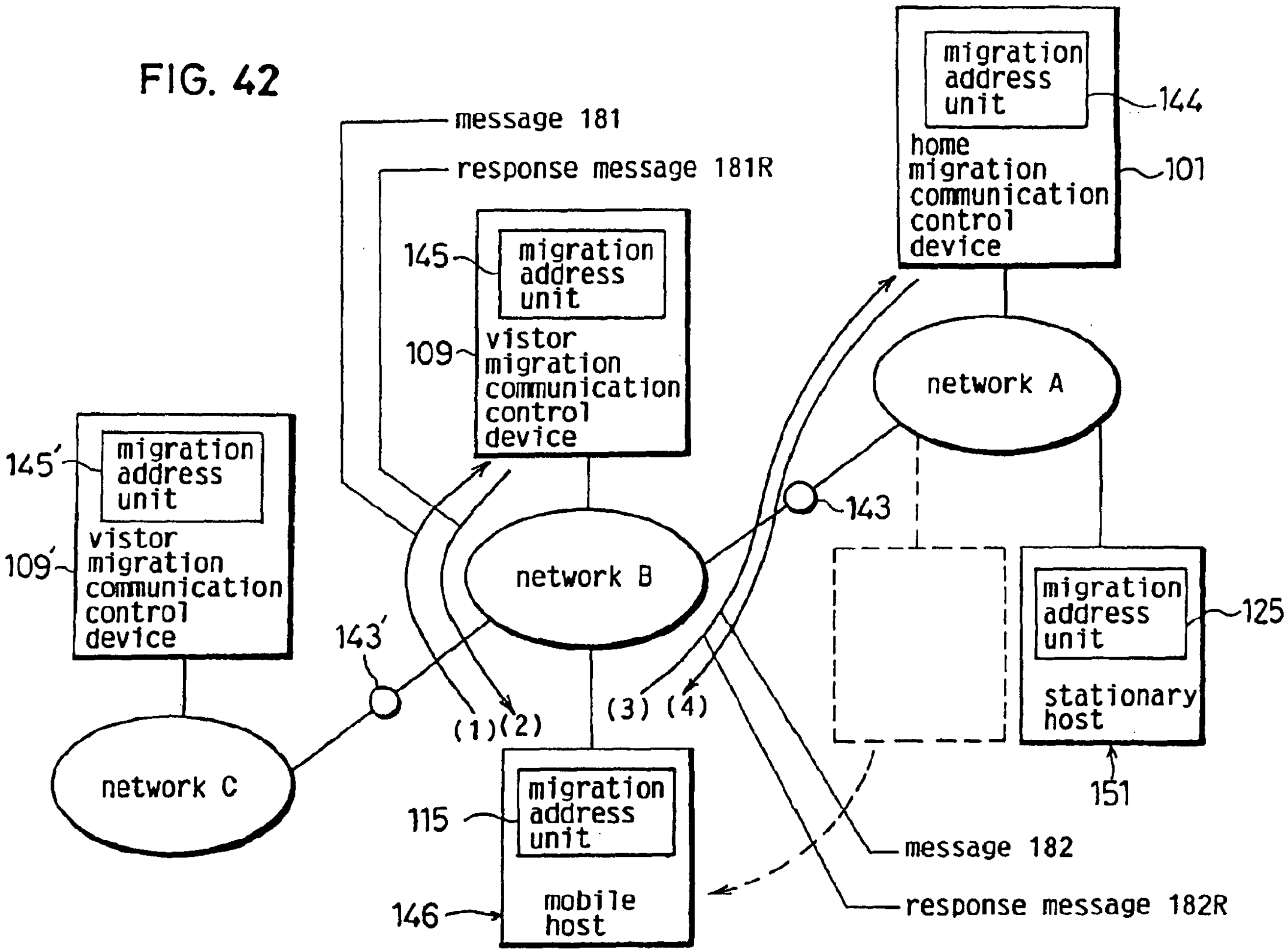

message 181
response message 181R
migration address unit
home migration communication control device
144
101
145
109
migration address unit
vistor migration communication control device
145'
109'
migration address unit
vistor migration communication control device
network A
network B
network C
143
143'
(1)
(2)
(3)
(4)
migration address unit
stationary host
125
151
115
migration address unit
mobile host
146
message 182
response message 182R

FIG. 43

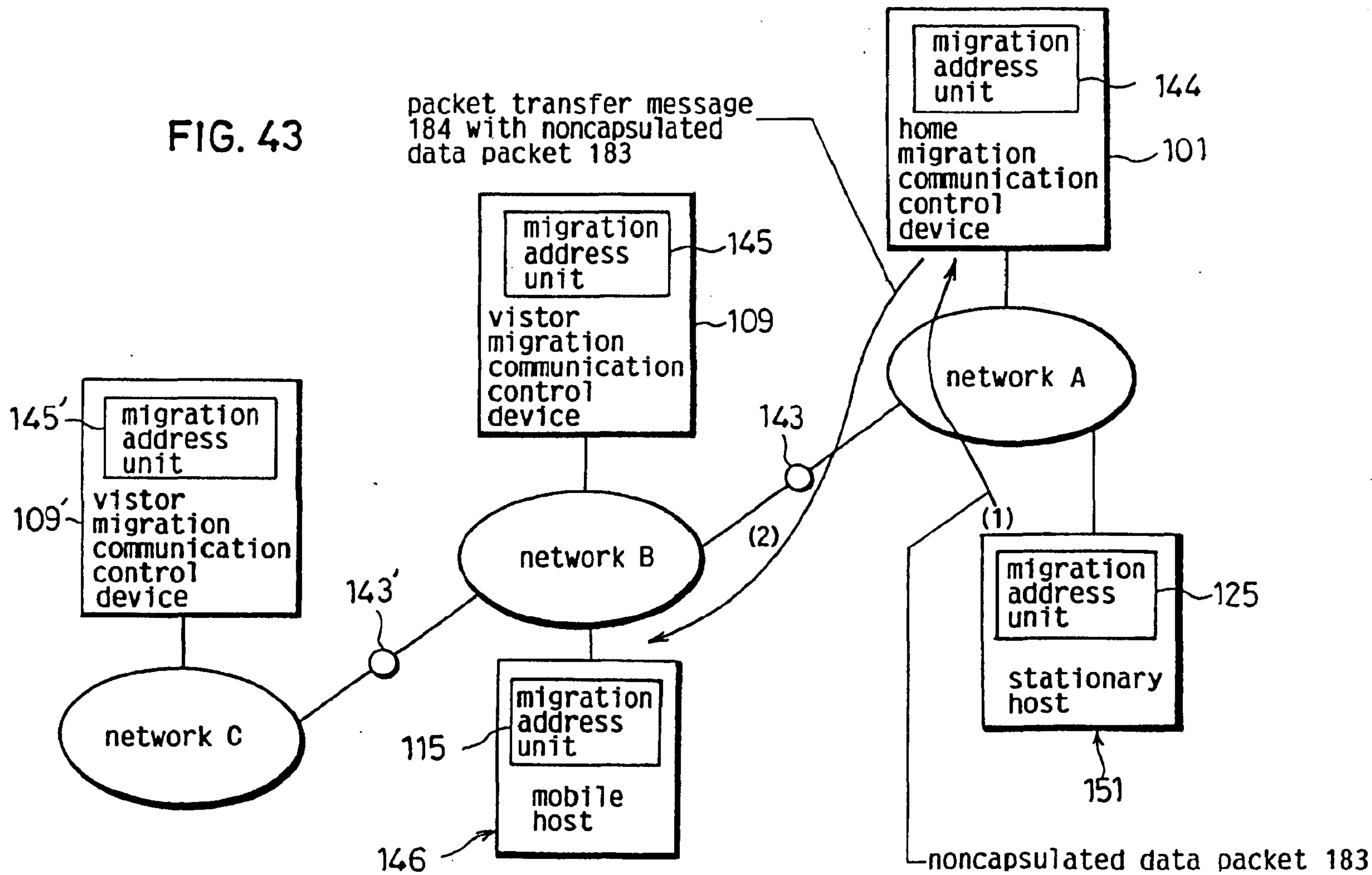

packet transfer message 184 with noncapsulated data packet 183
migration address unit
144
home migration communication control device
101
migration address unit
145
vistor migration communication control device
109
145'
migration address unit
109'
vistor migration communication control device
network A
network B
network C
143
143'
(1)
(2)
migration address unit
125
stationary host
151
migration address unit
115
mobile host
146
noncapsulated data packet 183

FIG. 44

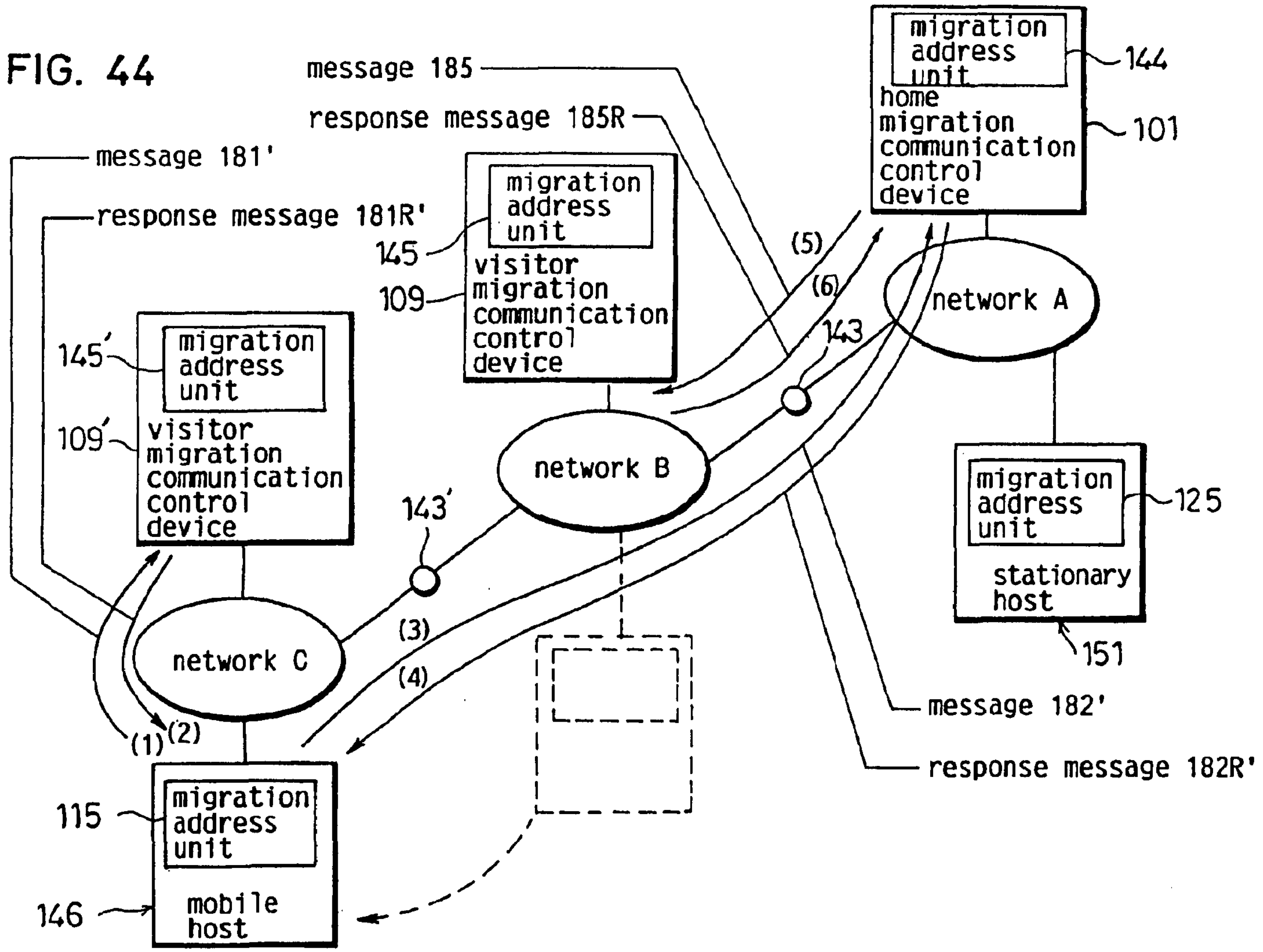
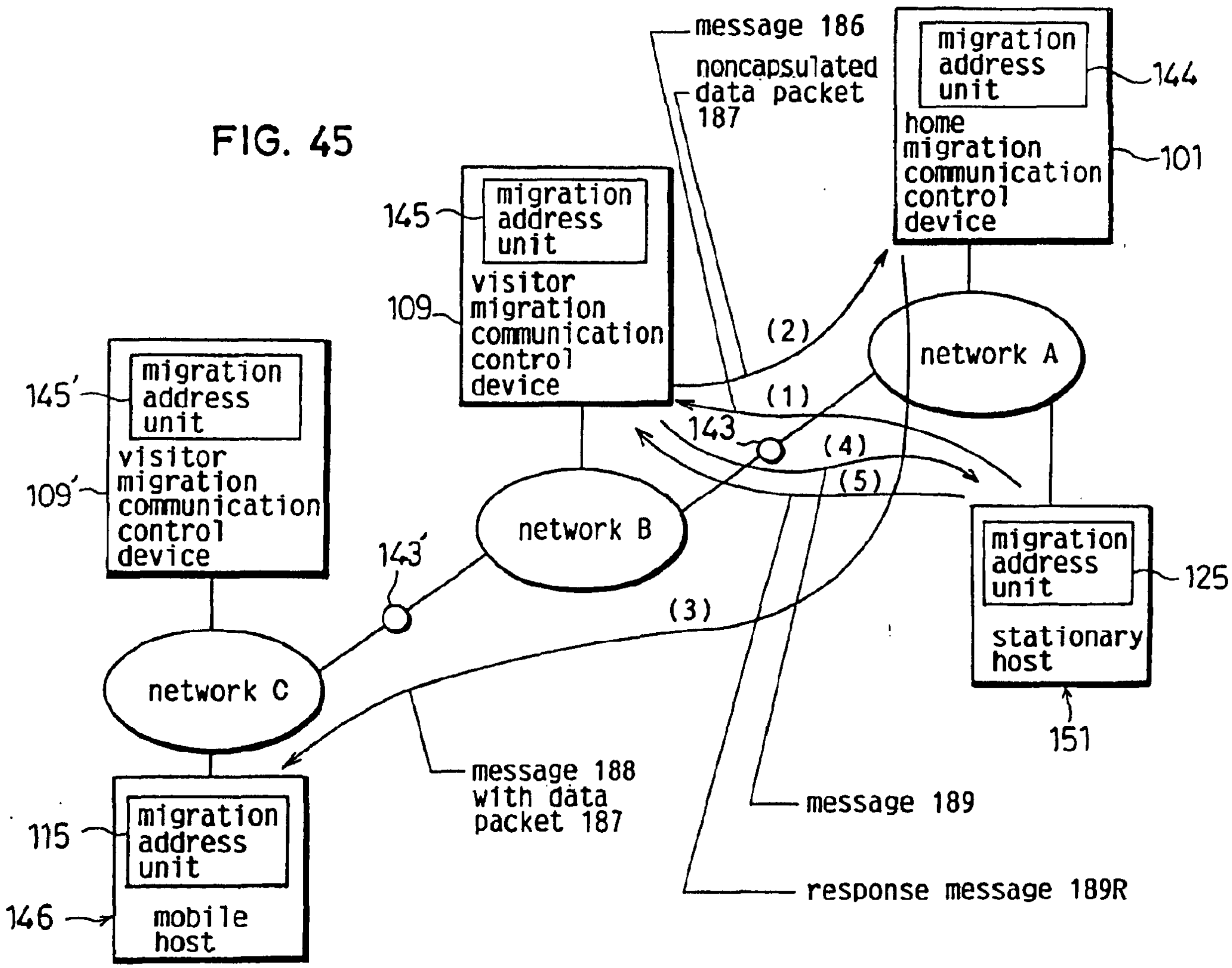

message 185
response message 185R
message 181'
response message 181R'
migration address unit
144
home migration communication control device
101
migration address unit
145
visitor migration communication control device
109
migration address unit
145'
visitor migration communication control device
109'
(5)
(6)
143
network A
network B
143'
network C
(3)
(4)
(1)
(2)
migration address unit
125
stationary host
151
message 182'
response message 182R'
migration address unit
115
mobile host
146

FIG. 45



message 186
noncapsulated data packet 187
migration address unit
144
home migration communication control device
101
145
migration address unit
109
visitor migration communication control device
(2)
network A
(1)
143
(4)
(5)
145'
migration address unit
109'
visitor migration communication control device
143'
network B
migration address unit
125
stationary host
151
(3)
network C
message 188 with data packet 187
message 189
response message 189R
115
migration address unit
146
mobile host

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(54) Automatic discovery of network elements.

(57) Disclosed is a computer network node discovery system that provides a general way of discovering network elements, or nodes, connected to a computer network, and a specific algorithm for discovering nodes connected to a TCP/IP network, using the SNMP protocol available within the TCP/IP network software. Some nodes on a network, called discovery agents, can convey knowledge of the existence of other nodes on the network. The network discovery system queries these agents and obtains the information they have about other nodes on the network. It then queries each of the nodes obtained to determine if that node is also a discovery agent. In this manner, most of the nodes on a network can be discovered. The process of querying discovery agents to obtain a list of nodes known to the discovery agents is repeated at timed intervals to obtain information about nodes that are not always active. In a TCP/IP network, discovery agents are nodes that respond to queries for an address translation table which translates internet protocol (IP) addresses to physical addresses. The data from each node's address translation table is used to obtain both the IP and the physical address of other nodes on the network. These nodes are then queried to obtain additional information. After all the nodes on a network are discovered, the list of nodes is written to a database where it can be displayed by the network manager or other users of the network.

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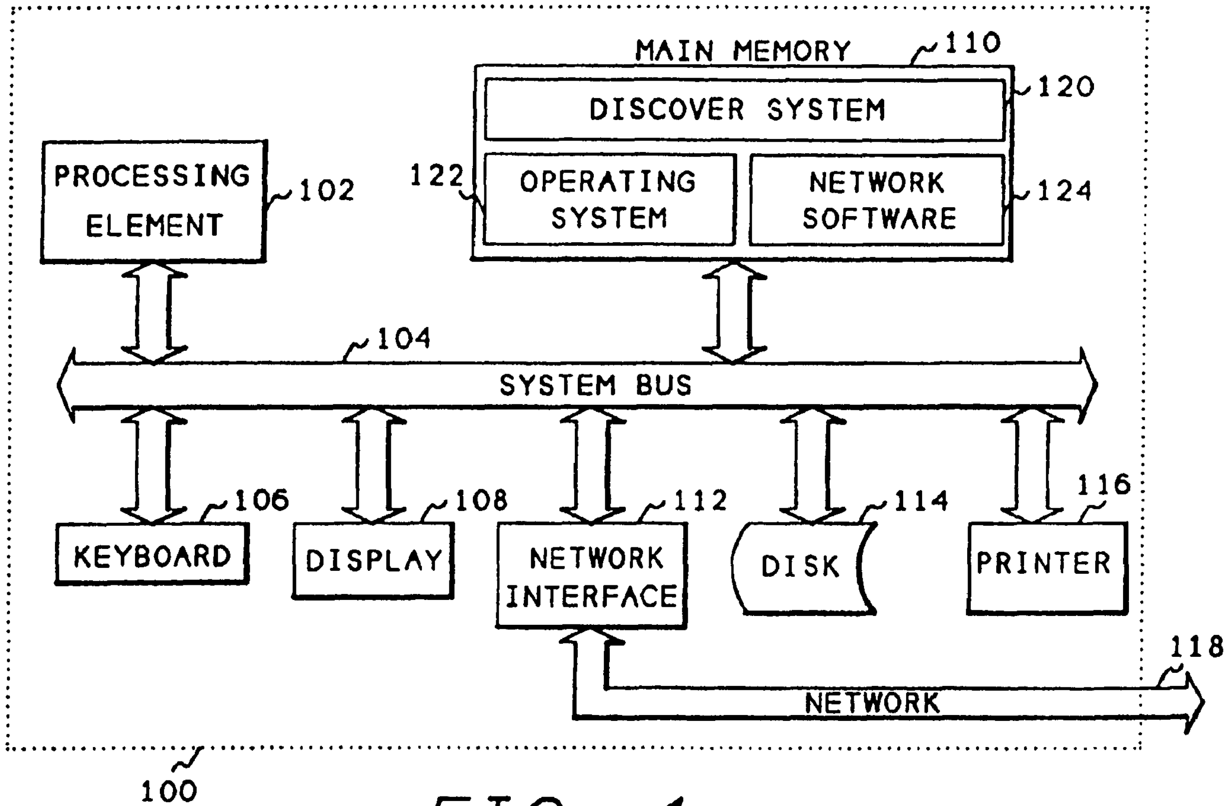
MAIN MEMORY
110
DISCOVER SYSTEM
120
PROCESSING ELEMENT
102
122
OPERATING SYSTEM
NETWORK SOFTWARE
124
104
SYSTEM BUS
106
108
112
114
116
KEYBOARD
DISPLAY
NETWORK INTERFACE
DISK
PRINTER
118
NETWORK
100

FIG. 1

FIELD OF THE INVENTION

This invention relates to computer systems and more particularly to computer networks that interconnect computers. Even more particularly, the invention relates to determining the nodes connected to a network.

BACKGROUND OF THE INVENTION

Computer networks are collections of hardware and software that connect computers and allow them to send information from one computer to another electronically. A computer network is comprised of the physical hardware connections between the various computers, for example telephone lines or a coax cable, and the software used to send and receive data and to route the data to the selected computer on the network.

A local area network (LAN) is a network connection between computers in close proximity, typically less than one mile, and usually connected by a single cable such as coax cable. A wide area network (WAN) is a network of computers located at longer distances, often connected by telephone lines or satellite links. Network software may sometimes be used with both types of networks. For example, a popular network is the Department of Defense Internetworking protocol suite, known as Transmission Control Protocol/Internet Protocol (TCP/IP). This system was originally developed by the Defense Advanced Research Projects Agency (DARPA) and has now been widely distributed to Universities and industry.

When a network is fast growing, that is, network elements or nodes are being added frequently, a network administrator may not know all of the nodes connected to the network. Also, a network administrator new to his or her job may not be familiar with the nodes on the network. Determining the nodes manually is a difficult problem. The administrator may contact all the users of the network known to the administrator, however, infrequent users may be forgotten and not contacted. Also, if a node is connected to the network, but not active because the computer is not powered up or is inoperative, that node may not be included in the list. In a very short local area network, a network administrator may physically trace the cable of the network to determine which nodes are located on the network. However, since longer local area networks can extend as far as a mile, through many floors and offices within a building, physical tracing may be impossible. In a wide area network, physical tracing is almost always impossible.

For some commonly used networks, special equipment can be purchased that will determine the nodes located on the network and the distance between them. This equipment, called a probe, is often limited by the other components of the network, however. For example, in a local area network, a repeater unit may be used to extend the effective distance of the local area network to a distance greater than is capable with a single cable. A repeater unit amplifies signals, and therefore will not allow a probe to determine the location of nodes beyond the repeater.

Other units connected to the network may obscure nodes. For example a bridge unit connects two similar networks but only passes messages that are being sent from a node on one side of the bridge to a node on the other side of the bridge. It will not pass messages between nodes on the same side, in order to reduce the traffic on the other side of the bridge. A bridge will prevent a probe from determining the nodes on the other side of the bridge. A gateway is a unit that connects dissimilar networks to pass messages. Because a gateway may have to reformat a message to accommodate a different network protocol, it will prevent a probe from finding nodes beyond the gateway.

There is need in the art then for a method of determining the nodes on a local area network. There is further need in the art for determining such nodes without the use of special equipment. A still further need is for a method that will determine which nodes are located beyond the repeater units, bridges, and gateways on a network.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a method of determining the elements or nodes connected to a network.

It is another object of the invention to provide a method of discovering network nodes on a TCP/IP network.

Another object of the invention is to determine which discovered nodes are discovery agents and can convey knowledge of the existence of other nodes on the network.

Another object is to query all discovery agents and ask for other nodes on the network

A further object is to query all TCP/IP nodes to retrieve the address translation table from the TCP/IP node.

The above and other objects of the invention are accomplished in a system which provides a general way of discovering network elements, or nodes, and a specific algorithm for discovering nodes within a TCP/IP network, using a standard Simple Network Management Protocol (SNMP), which is available within the TCP/IP network.

Some nodes on a network can convey knowledge of the existence of other nodes on a network, and are called discovery agents. When a network contains discovery agents, these agents can be queried to obtain the information they have about other nodes on the network. By obtaining a list of nodes from a single discovery agent, and querying each of the nodes obtained to determine if it is also a discovery agent, most of the nodes on a network can be discovered.

The process of querying discovery agents to obtain a list of nodes known to be discovery agents, must be repeated at timed intervals. At any given time on a network, one or more nodes may not be responding to the network, either because it is inoperative, or because it is not powered up. Therefore, if the discovery process is attempted during this time, these unavailable nodes will not be discovered. By repeating the discovery process over time at regular intervals, additional nodes on a network can be discovered.

In a TCP/IP network, discovery agents are nodes that respond to queries for an address translation table. Within TCP/IP network, every node will have an internet protocol (IP) address. This address is a 32 bit number and is unique to all nodes within the TCP/IP network. Although the IP address is probably unique to all nodes everywhere that use the TCP/IP protocol, the physical address of a node on a particular network will be different from the IP address. For example, some types of LANs use an 8 bit address, and can therefore use the low order 8 bits of the IP address, however, some other types of LANs use a 48 bit address and cannot use the internet address. Therefore, every node within a TCP/IP network must have an address translation table which translates the IP address to the physical address. The data from each node's address translation table can be used to obtain both the IP and the physical address of other nodes on the network. Again, as described in the above general algorithm, the queries should be repeated at timed intervals to insure that recently activated nodes are discovered. Another reason for repeating the discovery process over timed intervals in a TCP/IP network is that some of the information within a node's address translation table may be purged if the node does not use the information after a period of time. This purge is used to reduce the table size requirements within a node. By repeating the queries at timed intervals, the greatest amount of translation table information may be obtained.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features, and advantages of the invention will be better understood by reading the following more particular description of the invention, presented in conjunction with the following drawings, wherein:

Fig. 1 shows a block diagram of the hardware of the node that runs the process of the present invention;

Fig. 2 shows a diagram of a typical computer interconnection network;

Figs. 3 through 5 show a hierarchy diagram of the modules of the discovery system of the present invention;

Fig. 6 shows a flowchart of the main module of the invention;

Fig. 7 shows a flowchart of the self-seed module of the invention;

Fig. 8 shows a flowchart of the process-node module of the invention;

Fig. 9 shows a flowchart of the process-ping module of the invention;

Fig. 10 shows a flowchart of the process-IFIP module of the invention;

Fig. 11 shows a flowchart of the store-IP module of the invention;

Fig. 12 shows a flowchart of the store-IF module of the invention;

Fig. 13 shows a flowchart of the invalidnode module of the invention;

Fig. 14 shows a flowchart of the findnode module of the invention;

Fig. 15 shows a flowchart of the addnode module of the invention;

Fig. 16 shows a flowchart of the process-AT module of the invention; and

Fig. 17 shows a flowchart of the store-AT module of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The following description is of the best presently contemplated mode of carrying out the present invention. This description is not to be taken in a limiting sense but is made merely for the purpose of describing the general principles of the invention. The scope of the invention should be determined by referencing the appended claims.

Fig. 1 shows a block diagram of the computer hardware that contains the discovery system of the present invention. Referring now to Fig. 1, a computer system 100 contains a processing element 102. The processing element 102 communicates to other elements within the computer system 100 over a system bus 104. A keyboard 106 is used to input information from a user of the system, and a display 108 is used to output information to the user. A network interface 112 is used to interface the system 100 to a network 118 to allow the computer system 100 to act as a node on a network. A disk 114 is used to store the software of the discovery system of the present invention, as well as to store the data base collected by the discovery system. A printer 116 can be used to provide a hard copy output of the nodes of the network discovered by the discovery system. A main memory 110 within the system 100 contains the discovery system 120 of the present invention. The discovery system 120 communicates with in operating system 122 and network software 124 to discover the nodes on the network 118.

Fig. 2 shows a diagram of a network. Referring now to Fig. 2, a network 202 contains a node 206. Node 206 contains the processor 100 (Fig. 1) which contains the discovery system software of the present invention. Node 206 is attached to a first network segment 118. The network segment 118 is connected to a repeater 212 which is connected to a second network sequent 214. This second network system 214 has nodes 216 and 218 attached to it. A repeater, such as repeater 212, allows network sequents to be connected to allow a network to be extended over a longer distance. An important characteristic of a repeater is that there is no translation of data passing through it. That is, every message that is transmitted on one network segment, will pass unchanged through a repeater to the other network segment. Therefore, any messages broadcast, for example, by node 206 will be received by node 216 and node 218 after these messages pass through repeater 212.

Network segment 118 is also attached to a bridge 208 which connects it to a third network sequent 210. A bridge will only pass messages that are being transmitted from a node on one side of the bridge to a node on the other side of the bridge. It will block messages that are transmitted from a node on one side of the bridge to a node on that same side of the bridge. This characteristic reduces network traffic on various sequents of a network.

Segment 118 is also attached to a router/gateway 220 which connects is to a fourth network segment 222. Routers are devices that connect network segments which have similar characteristics. Gateways are devices which connect networks having different types of characteristics. For example, a gateway might connect a local area network to a wide area network.

Because bridges, routers, and gateways, must process the messages sent over the network, they also must contain information about which nodes are on the network. Therefore, bridges, routers, and gateways are authoritative sources of information for determining the nodes on the network. A protocol defines the format of messages that are sent across a network. One popular protocol is the Department of Defense Internetworking Protocol Suite, popularly known as TCP/IP. Because it was developed by the Department of Defense, this protocol is widely available and used extensively, particularly in a university environment. Also, this suite of protocols is very popular on the UNIX operating system and has seen wide distribution there. The internet protocol (IP) uses a single thirty-two bit address for all nodes that can be connected to the internet at any location. Physical addresses within a particular type of network, are normally different from an IP address. If a network address is very small, perhaps eight bits, it may be the same as the low order eight bits of the IP address. If a network address is large, for example, some LANs use forty-eight bit addresses, it is impossible for these addresses to correspond directly to IP addresses. Therefore, both an IP address and a physical address exist for each node on a network. Devices such as routers, gateways, and bridges, which can send messages from one network to another must be able to translate between IP addresses and physical addresses. Therefore, these devices have translation tables which allow them to translate between these two types of addresses. By accessing these translation tables, one of the nodes on a network can obtain information about the other nodes on the network. The existence of these translation tables allow the method of the present invention to perform its function.

A network probe 224 is also attached to the network 118. A network probe 224 is a device that assists in locating defective nodes and assists in repairing those nodes. Since it is a testing device, it may or may not be attached to a network at any given time. When a probe is attached to a network, the discovery system of the present invention can query the probe and use information obtained from the probe to assist in discovering other nodes on the network.

Figs. 3 through 5 show a hierarchy diagram of the modules of the software of the present invention. Referring now to Figs. 3 through 5, discovery module 302 is the main module of the system. Discovery calls self-seed block 304 to start the process of building a database about the network, and it calls process-node block 306 to process information about each node that it obtained from self-seed. Process-node block 306 calls process-ping block 308 to query a node on the network to determine if that node is active. Process-node block 306 also calls process-IFIP block 310 for each IP address that it obtains. Process-IFIP block 310 calls store-IP block 402 for each IP address, and store-IP block 402 calls invalidnode block 406, findnode block 408, and addnode block 410, for each IP address. For each IF entry (physical address) received, process-IFIP block 310 calls store-IF block 404. For each address translation table entry, process-node block 306 calls process-AT block 312 which in turn calls store-AT block 502. Store-AT block 502 calls invalidnode at block 504, findnode block 506, and addnode block 508.

Fig. 6 shows a flowchart of the discovery module block 302 (Fig. 3). Referring now to Fig. 6, after entry block 602 gets any options that the user wishes to enter. Block 604 then initializes the database used to permanently store the nodes, and loads node list from existing entries in the database. If a database for the network does not exist, the discovery system has the ability to create that database. If a database of the network already exists, the discovery system will use the node information which is already available in that database to query other nodes within the system.

Block 606 then initializes domains. A domain defines the limit beyond which the user of the discovery system does not wish to find nodes. That is, the domain limits the range of the discovery process. This limitation is necessary on large networks, to keep the amount of processing to reasonable level. Furthermore, a user usually is only interested in the nodes on a particular network segment, or the network segment connected by repeaters and possibly bridges.

Block 608 then calls Fig. 7 to self-seed the system. If no entries were available in the database, the discovery system can self-seed by sending a broadcast message and determine who responds to that message. After returning from self-seed, block 610 points to the first node list entry. As discussed earlier, the node list will contain a list of the nodes already known to the system. This list can be input from the database, or the list can be started from self-seed module. After pointing to the first entry, block 612 determines if there are more entries to process. If there are no more entries to process, block 612 transfers to block 614 which will wait a predetermined period of time before reprocessing the entire node list. Typically, block 614 will wait for approximately thirty seconds. By reprocessing the node list periodically, additional nodes can be discovered. This is because a node may be inactive on the system at any given time and might not be discovered by a single pass through the network. By waiting and reprocessing the node list, nodes that were inactive may now be active and additional information can be obtained.

If more entries in the node list exist, block 612 transfers to block 616 to process one of the nodes. After processing that node, block 616 transfers to block 618 which points to the next node list entry and returns to block 612 to process the next node.

Fig. 7 shows a flowchart for the self-seed block 304 (Fig. 3) which obtains initial information about nodes on the network. Referring now to Fig. 7, after entry, block 702 sends an SP broadcast request to all nodes on the network. SNMP stands for Simple Network Management Protocol, and is a part of the TCP/IP network software. After sending the broadcast request, block 702 transfers to block 704 which receives SNMP messages from the nodes. If more SNMP messages are available, block 704 transfers to block 706 which adds a node to the node list for each message received. In this manner, all nodes that are currently active on the network can be queried to obtain initial information about the node. After all SNMP messages have been received, block 704 returns to the caller.

Another way of self-seeding is to query the address translation table for the node that is executing the discovery system. This table will contain the addresses of other nodes on the network, and these addresses are then used to start the discovery process.

Fig. 8 is a flowchart of the process-node block 306 (Fig. 3). The process-node module of Fig. 8 is called from the discovery module of Fig. 6 once for each entry in the node list. Therefore, whin Fig. 8 is called, the address of a single node is passed to it. Referring now to Fig. 8, after entry, block 802 determines whether the node is within a domain. As discussed earlier, the domain defines the limits beyond which the discovery program does not wish to discover new nodes. If the node is within the domain, block 802 transfers to block 804 which calls the process-ping module of Fig. 9 to determine whether the node is active. After returning from Fig. 9, block 804 transfers to block 806 to determine whether the state of the node has changed since the last information was obtained. That is, when the process-ping module queries the node, it determines the state of the node at the present time. This state is compared, in block 806, with the state of the node as it was known previously in the database. If that state has changed, block 806 transfers to block 808 to store the new state in the database. Control then returns to block 810 which calls process-IFIP to retrieve the IF and IP tables from the node. After returning from Fig. 10, block 810 transfers to block 812 which determines whether the node responded to an SNMP request. If the node did respond to the SNMP request, block 812 transfers to block 814 which determines whether the node is currently in the database. If the node is not in the database, block 814 transfers to block 816 to add the node to the database. Control then continues at block 818 which calls Fig. 16 to retrieve the address translation table from the node. Control then returns to the caller.

Fig. 9 shows a flowchart of the process-ping module block 308 (Fig. 3). This module is called to determine whether a node is active on the network. Referring now to Fig. 9, after entry block 902 determines whether the ping interval has elapsed. The ping interval is used to prevent a node from being queried too often. If the ping interval has not elapsed, block 902 returns to the caller. If the ping interval has elapsed, block 902 transfers to block 904 which sends an ICMP-echo message to the node. The ICMP-echo protocol is defined as a part of TCP/IP and is used to cause the node to return an acknowledgement to a message. Block 904 then transfers to block 906 which determines whether a response has been received from the other node. If a response has not been received within a predetermined amount of time, typically block 906 transfers to block 910 which sets a flag to indicates that the node failed to respond. If the node does respond, block 906 transfers to block 908 which sets a flag to indicate that the node did respond and then block 912 sets a new ping interval which will prevent the node from being pinged for the period of the interval. The ping interval is typically five minutes. Block 912 then returns to the caller.

Fig. 10 shows a flowchart of the process-IFIP module block 310 (Fig. 3). The IF and IP tables are available in a node to define the translation of physical addresses to IP addresses. The information is available as two different tables, with an index contained in the IF table to cross-reference to the IP table within the node. By obtaining these two tables, the discovery system can determine what the other interfaces to which a node is connected, and therefore determine other networks to which the node is connected. Referring now to Fig. 10, after entry, block 1002 determines whether the IFIP interval has elapsed. The IFIP interval is similar to the ping interval described with respect to Fig. 9, and is used to keep a node from being queried too often. If the IFIP interval has not elapsed, block 1002 returns to the caller. If the IFIP has elapsed, block 1002 transfers to block 1004 which sends an SNMP message to request the node to send its next IP table entry to the discovery node. When an entry is received, block 1006 calls store-IP module of Fig. 11 to store the node within the node list. Block 1007 then transfers back to block 1004 if more IP entries are available. After all the entries are all stored in the node list, block 1007 transfers to block 1008 which sets a new IFIP interval of typically greater than 10 hours. Block 1010 then sends an SNMP message to request that the node send its next IF table entry to the discovery node. When an IF table entry is received, block 1012 calls the store-IF module of Fig. 12. Block 1014 then transfers back to block 101 if more entries are available. After receiving and storing all the IF table entries, block 1014 returns to the caller. Each IF table entry contains an index into the IP table. By using this index, physical addresses in the IF table can be matched with the IP address.

Fig. 11 shows a flowchart of the store-IP process block 402 (Fig. 4). Referring now to Fig. 11, after entry block 1102 calls Fig. 14 to find the node in the node list. The node will be found if the discovery system has already encountered this node in its process. Block 1304 then determines whether the node exists, and if the node does not exist, block 1104 transfers to block 1106 which calls Fig. 13 to determine whether the node is valid. Block 1108 then determines if the node is valid and if it is valid, block 1108 transfers to block 1110 to add the node to the node list. After adding the node, or if the node already existed, control goes to block 1112 which updates the state information about the node. After updating the node state information or if the node was not valid, Fig. 11 returns to the caller.

Fig. 12 is a flowchart of the store-IF process of block 404 (Fig. 4). This module is called for each table entry in the IF table received from a node. Referring now Fig. 12, after entry, block 1202 finds the IP index within the IF record. As described earlier, each IF table entry will have a corresponding IP table entry, and the IP entry is referenced by an index value contained in the IF entry. Block 1204 then determines whether a matching IP record exists. If a matching IP record does exist, block 1204 transfers to block 1206 which moves the physical address from the IP record to the node record in the node list. Block 1208 then updates any state information in the node record. After updating the state information, or if there were no matching IP record, Fig. 12 returns to its caller.

Fig. 13 shows a flowchart of the invalidnode module block 406 (Fig. 4). Referring now Fig. 13, after entry, block 1302 determines whether the address of the node is simply the loopback address of another node. Each node has a loopback address associated with it for use in testing the node. Because the loopback address refers to the same node, no additional information can be obtained from that node and the loopback address is never stored as a node address. If the IP address is not equal to the loopback address, block 1302 transfers to block 1304 to determine whether the node is within the domain. As described earlier, the domain is used to determine the limits beyond which the discovery system will not attempt to discover new nodes. If the node is within the domain, block 1304 transfers to block 1306 which returns an indication that the node is valid. If the node is not within the domain or if the IP address equals the loopback address, control transfers to block 1308 which returns an error indication indicating that node is not valid. Control then returns to the caller.

Fig. 14 is a flowchart of the findnode module block 408 (Fig. 4). The module is used to find a node within the node list. Referring now Fig. 14, after entry, block 1402 gets the node list entry. Block 1404 then determines whether the IP address matches the entry in the list. If a match does occur, block 1404 transfers to block 1408 which returns an indication that the node is in the node list. If the IP address does not match, block 1404 transfers to block 1406 which gets the next node list entry and block 1410 then determines whether the end of table has been reached. If the end of the list has not been reached, block 1410 transfers back to block 1404 to check the entry just found. If the end of the list has occurred, block 1410 transfers to block 1412 which returns an error indication indicating that the node is not in the node list.

Fig. 15 shows a flowchart of the process of adding a node to the node list. Referring now to Fig. 15, after entry, block 1502 performs a hash operation on the IP address to create a pointer into the node list. Block 1504 then allocates memory for a node record, and block 1506 stores the data available for the node into the node record at the location pointed to by the hashed IP address. Block 1506 then returns to the caller.

Fig. 16 shows a flowchart of the process-AT module of block 312 (Fig. 3). This module is called by the process-node module for each entry in the node list. Referring now to Fig. 16, after entry, block 1602 determines whether the AT interval has expired. The AT interval is used to prevent a node from being polled too frequently. If the AT interval has not expired, block

1602 simply returns to the caller. If the AT interval has expired, block 1602 transfers to block 1604 which sends an SNMP message to request that the node send its next address translation table entry to the discovery node. When an entry is received, block 1606 is called to store the table entry. Block 1607 then transfers back to block 1604 if more table entries are available. After storing all the table entries, block 1607 transfers to block 1608 which updates the node's state information in the node list. Block 1610 then sets a new AT interval, typically fifteen seconds, and returns to the caller.

Fig. 17 shows a flowchart of the store-AT module of block 502 (Fig. 5). Referring now to Fig. 17, after entry, block 1702 calls the findnode module Fig. 14 to determine whether the node is already in the node list. If the node is in the node list, block 1704 transfers to block 1712. If the node is not in the node list, block 1704 transfers to block 1706 which calls Fig. 13 to determine whether the node is a valid node. If the node is not valid, block 1708 returns to the caller. If the node is valid, block 1708 transfers to block 1710 which calls Fig. 15 to add the node to the node list. After adding the node to the node list, or if the node already existed, control to transfers block 1712 which updates the state information about the node in the node list before returning to the caller.

In addition to querying nodes on the network, the discovery system can also query any network probes that may be attached to the network. Information about other nodes on the network can be obtained from these probes, and the discovery system can use this information to assist in discovering other nodes on the network.

Having thus described a presently preferred embodiment of the present invention, it will now be appreciated that the objects of the invention have been fully achieved, and it will be understood by those skilled in the art that many changes in construction and circuitry and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope of the present invention. The disclosures and the description herein are intended to be illustrative and are not in any sense limiting of the invention, more preferably defined in scope by the following claims.

Claims

1. A computer network node discovery process (120) for determining nodes (206, 216, 218) connected to a computer network (118), said process (120) comprising the steps of:

   (a) obtaining (306), from one node of a set of known nodes on said computer network (118), a list of addresses of one or more other nodes with which said one node communicates;

   (b) repeating step (a) for each of said other nodes obtained; and

   (c) storing said list of node addresses in a file (808); whereby said list of node addresses may be displayed to a user of said computer network.

2. The process of claim 1 further comprising the step of:

   (d) repeating steps (a) through (c) at regular time intervals.

3. The process of claim 2 further comprising the step of:

   (a1) obtaining from each bridge unit (208) connected to said network (118) a list of addresses of all nodes accessible by said bridge unit (208).

4. The process of claim 3 further comprising the step of:

   (a2) obtaining from each router unit (220) connected to said network (118) a list of addresses of all nodes accessible by said router unit (220).

5. The process of claim 4 further comprising the step of:

   (a3) obtaining from each gateway unit (220) connected to said network (118) a list of addresses of all nodes accessible by said gateway unit (220).

6. The process of claim 5 further comprising the step of:

   (a4) obtaining from any network probe device (224) connected to said network (118) a list of addresses of all nodes known to said network probe device (224).

7. A computer network node discovery process (120) for determining nodes connected to a TCP/IP computer network (118), said process comprising the steps of:

   (a) obtaining (306), from one node of a set of known nodes on said computer network, an address translation table containing a list of addresses of other nodes with which said one node communicates;

   (b) repeating step (a) for each of said other nodes in said address translation table;

   (c) storing said list of nodes in a file (808); and

   (d) repeating steps (a) through (c) at regular time intervals.

8. The process of claim 7 further comprising the steps of:

   (a1) obtaining from each bridge unit (208) connected to said network (118) an address translation table containing a list of addresses of nodes accessible from said bridge unit (208);

(a2) obtaining from each router unit (220) connected to said network (118) an address translation table containing a list of addresses of nodes accessible from said router unit (220);

(a3) obtaining from each gateway unit (220) connected to said network (118) an address translation table containing a list of addresses of nodes accessible from said gateway unit (220);

(a4) obtaining from any network probe devices (224) attached to said network (118) a list of addresses of all nodes known to said network probe (224); and

(a5) obtaining from each node in said network (118) an interface table and an internet protocol table which defines other networks and nodes to which said node is connected.

9. A computer network node discovery process (120) for determining nodes connected to a computer network (118), said process comprising the steps of:

(a) sending a general response message (307) to all nodes on said network;

(b) creating a node list (410) containing the address of each node responding to said general response message;

(c) obtaining (306), from each node in said node list, a second list of addresses of other nodes with which said node communicates;

(d) adding each node (410) in said second list to said node list;

(e) repeating steps (c) through (d) for each of said nodes in said second list;

(f) storing said node list in a file (808); and

(g) repeating steps (a) through (f) at regular time intervals.

10. The process of claim 9 further comprising the steps of:

(c1) obtaining from each bridge unit (208) connected to said network (118) a list of addresses of all nodes accessible by said bridge unit (208);

(c2) obtaining from each router unit (220) connected to said network (118) a list of addresses of all nodes accessible by said router unit (220);

(c3) obtaining from each gateway unit (220) connected to said network (118) a list of addresses of all nodes accessible by said gateway unit (220); and .

(c4) obtaining from any network probe devices (224) attached to said network (118) a list of addresses of all nodes known to the network probe (224).

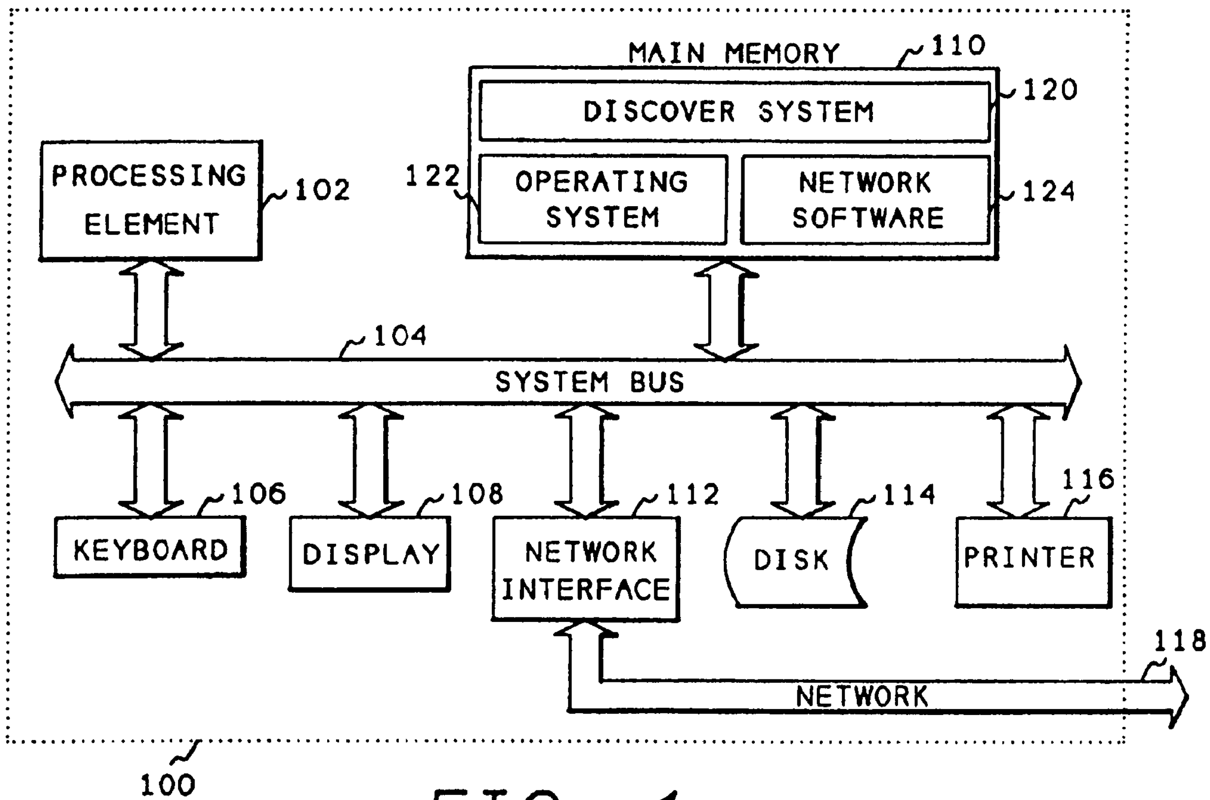

FIG. 1

10

EP 0 455 402 A2

SKYPE-N2P00288140

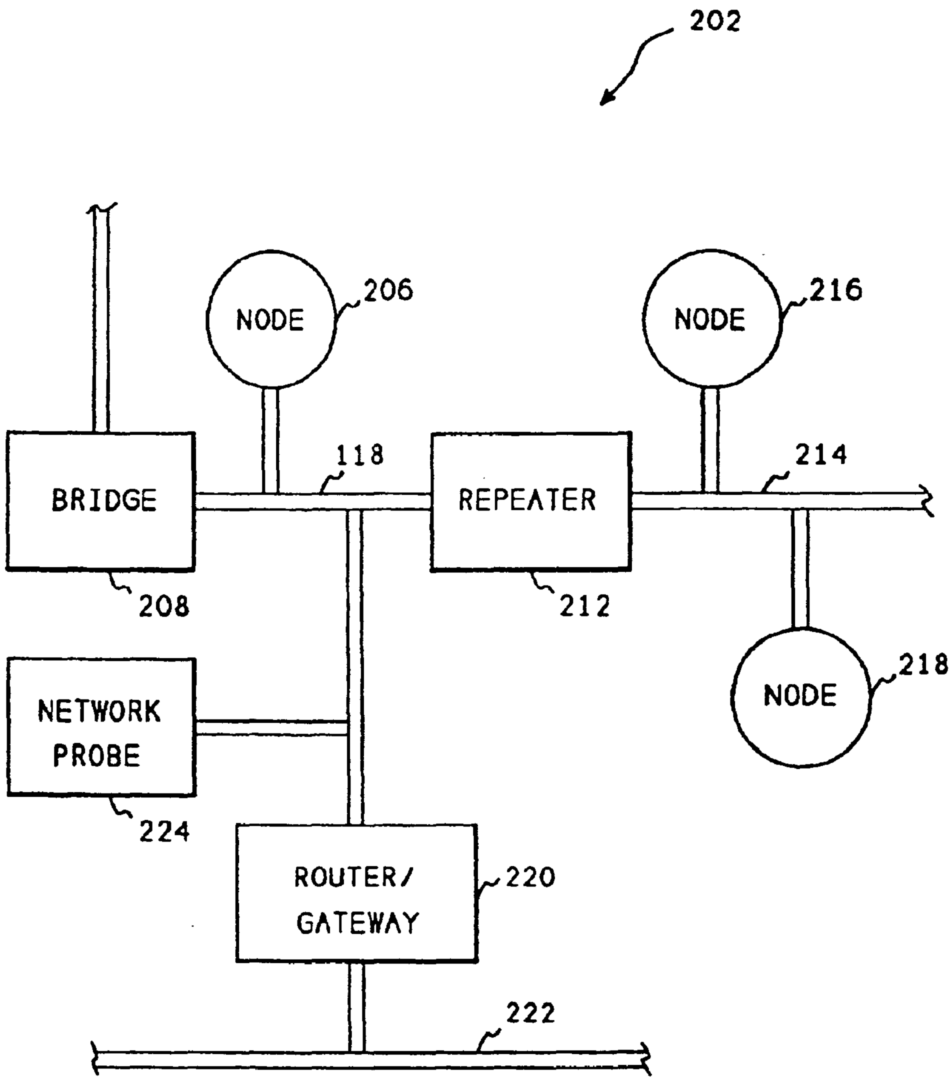
202
NODE
206
NODE
216
BRIDGE
118
REPEATER
214
208
212
NODE
218
NETWORK
PROBE
224
ROUTER/
GATEWAY
220
222

FIG. 2

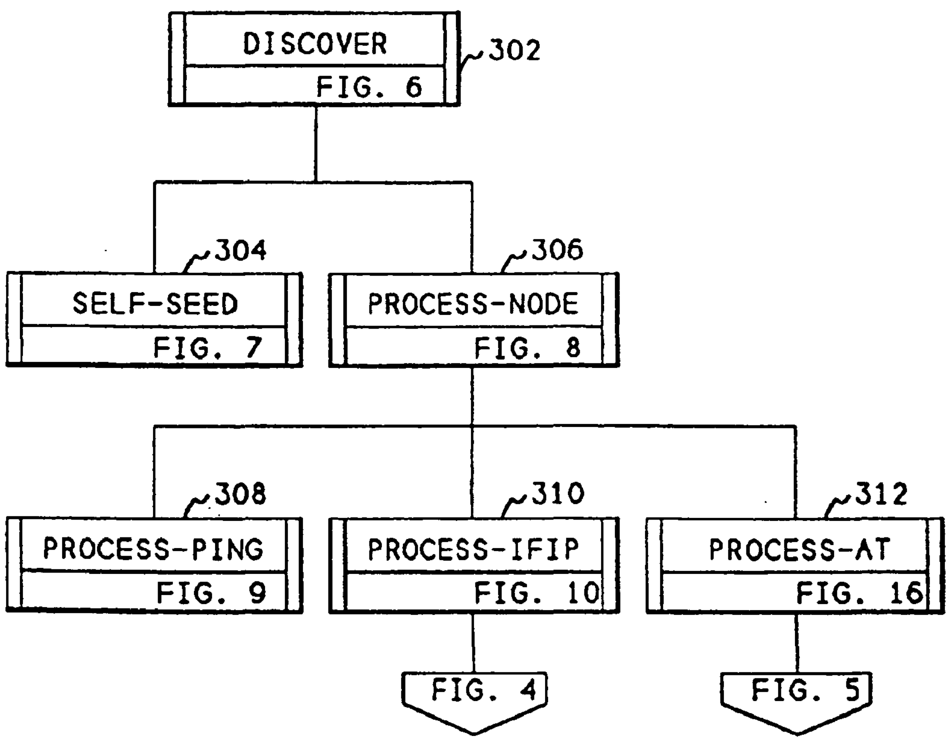
DISCOVER
FIG. 6
302
SELF-SEED
FIG. 7
304
PROCESS-NODE
FIG. 8
306
PROCESS-PING
FIG. 9
308
PROCESS-IFIP
FIG. 10
310
PROCESS-AT
FIG. 16
312
FIG. 4
FIG. 5

FIG. 3

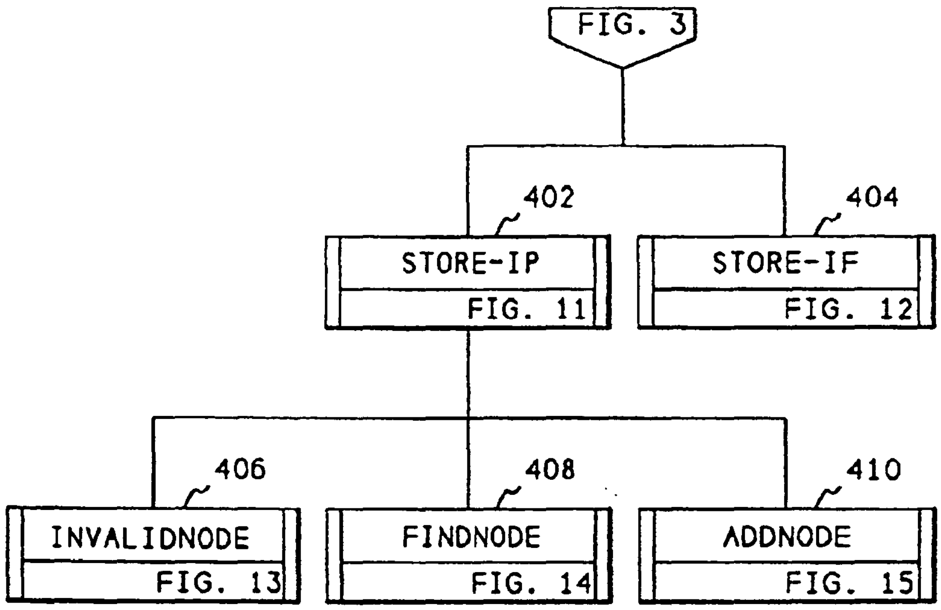
FIG. 3
402
STORE-IP
FIG. 11
404
STORE-IF
FIG. 12
406
INVALIDNODE
FIG. 13
408
FINDNODE
FIG. 14
410
ADDNODE
FIG. 15

FIG. 4

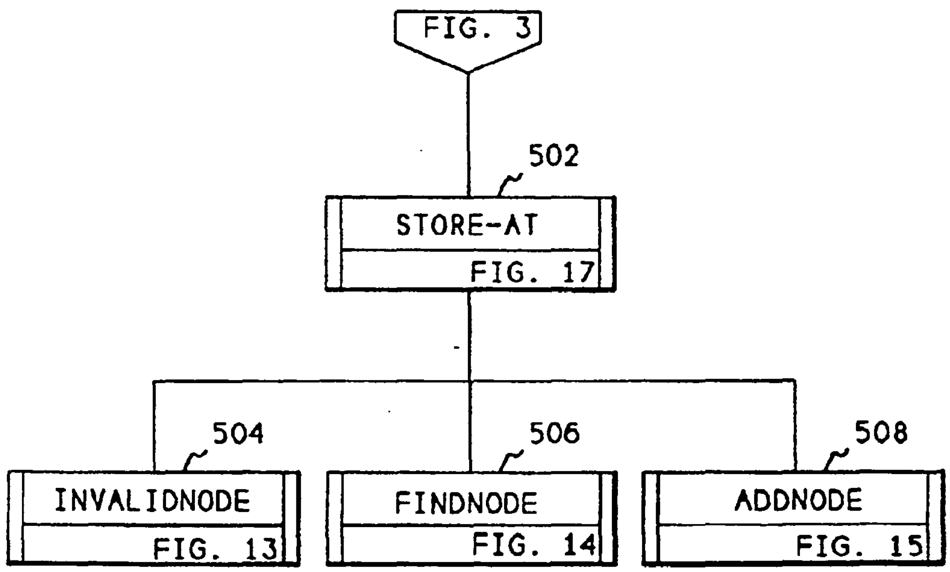
FIG. 3
502
STORE-AT
FIG. 17
504
INVALIDNODE
FIG. 13
506
FINDNODE
FIG. 14
508
ADDNODE
FIG. 15

FIG. 5

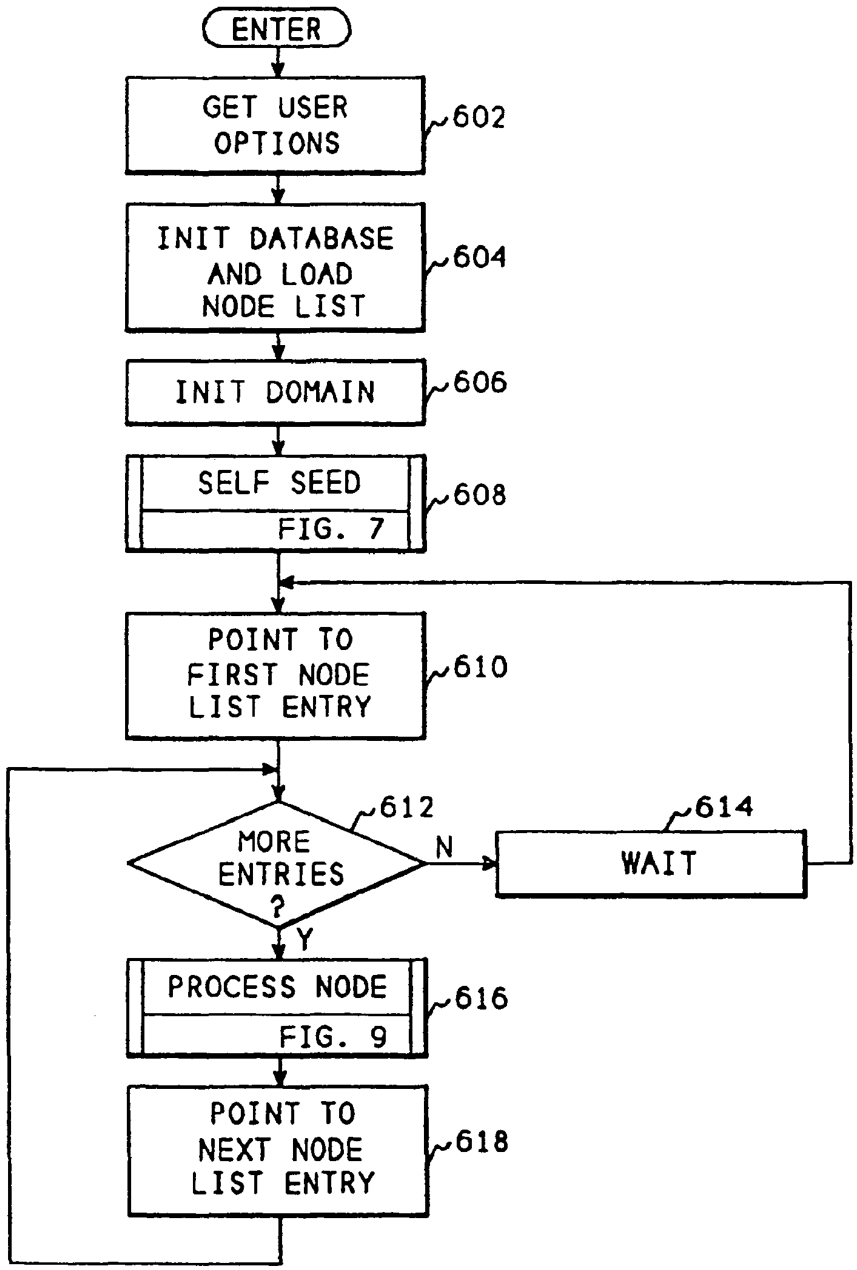
ENTER
GET USER OPTIONS
602
INIT DATABASE AND LOAD NODE LIST
604
INIT DOMAIN
606
SELF SEED
FIG. 7
608
POINT TO FIRST NODE LIST ENTRY
610
MORE ENTRIES ?
612
N
WAIT
614
Y
PROCESS NODE
FIG. 9
616
POINT TO NEXT NODE LIST ENTRY
618

FIG. 6

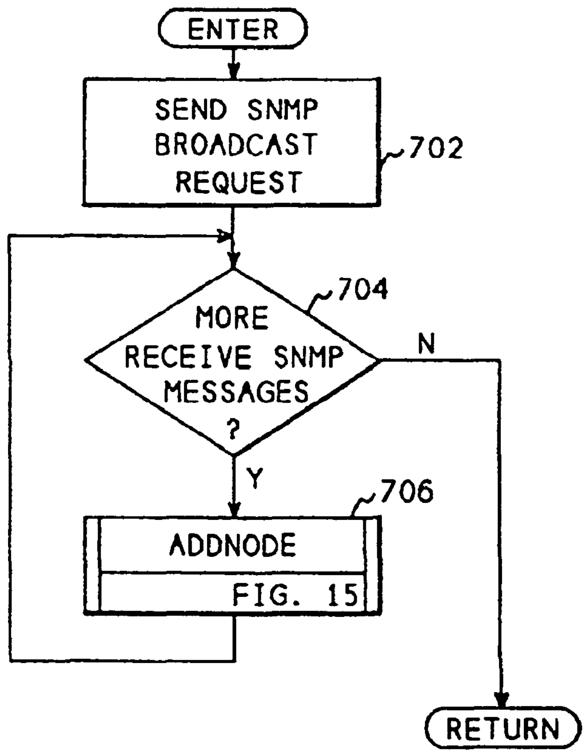
ENTER
SEND SNMP BROADCAST REQUEST
702
704
MORE RECEIVE SNMP MESSAGES ?
N
Y
706
ADDNODE
FIG. 15
RETURN

FIG. 7

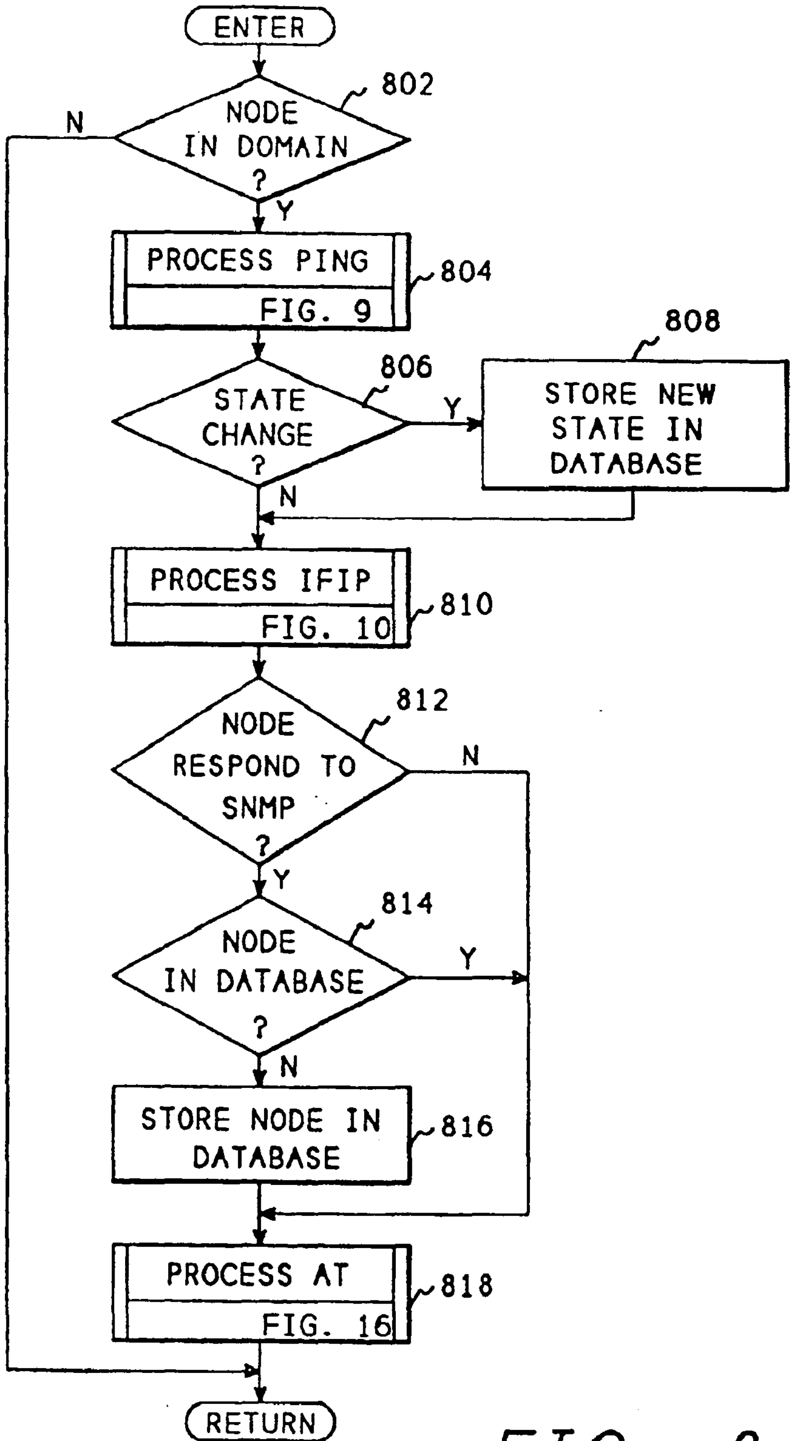
ENTER
NODE IN DOMAIN ?
802
N
Y
PROCESS PING
FIG. 9
804
STATE CHANGE ?
806
Y
STORE NEW STATE IN DATABASE
808
N
PROCESS IFIP
FIG. 10
810
NODE RESPOND TO SNMP ?
812
N
Y
NODE IN DATABASE ?
814
Y
N
STORE NODE IN DATABASE
816
PROCESS AT
FIG. 16
818
RETURN

FIG. 8

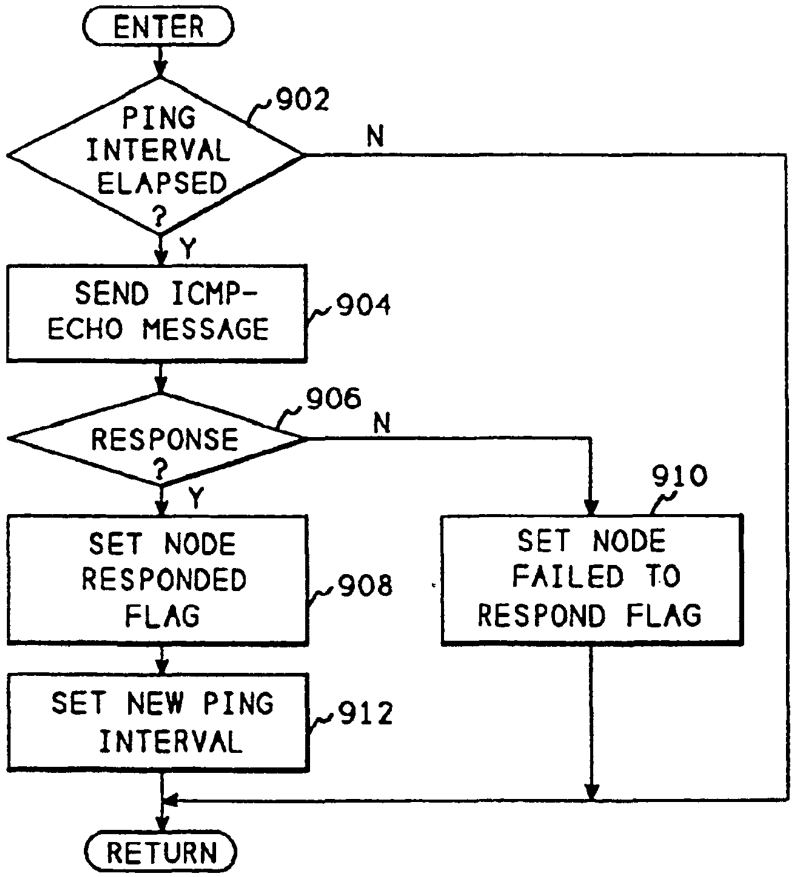
ENTER
PING INTERVAL ELAPSED ?
902
N
Y
SEND ICMP-ECHO MESSAGE
904
RESPONSE ?
906
N
Y
SET NODE RESPONDED FLAG
908
SET NODE FAILED TO RESPOND FLAG
910
SET NEW PING INTERVAL
912
RETURN

FIG. 9

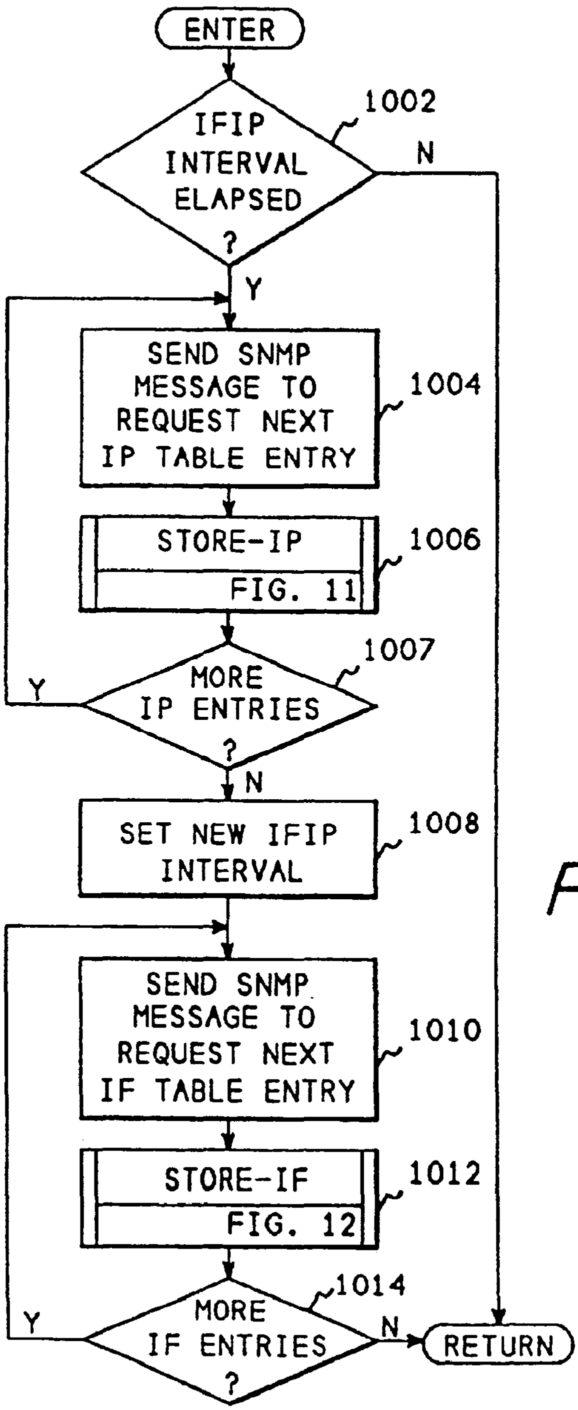
ENTER
IFIP INTERVAL ELAPSED ?
1002
N
Y
SEND SNMP MESSAGE TO REQUEST NEXT IP TABLE ENTRY
1004
STORE-IP
FIG. 11
1006
MORE IP ENTRIES ?
1007
Y
N
SET NEW IFIP INTERVAL
1008
SEND SNMP MESSAGE TO REQUEST NEXT IF TABLE ENTRY
1010
STORE-IF
FIG. 12
1012
MORE IF ENTRIES ?
1014
Y
N
RETURN

FIG. 10

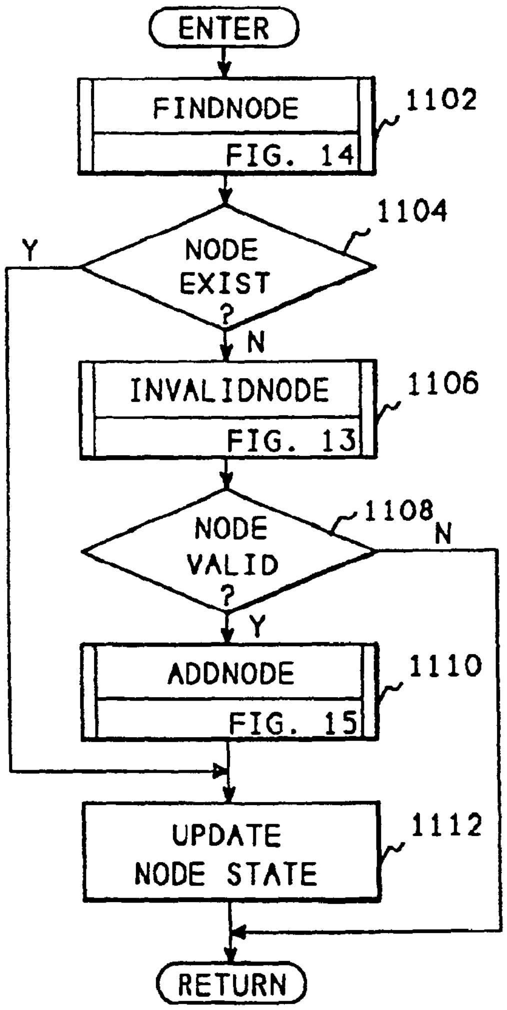
ENTER
FINDNODE
FIG. 14
1102
NODE
EXIST
?
1104
Y
N
INVALIDNODE
FIG. 13
1106
NODE
VALID
?
1108
N
Y
ADDNODE
FIG. 15
1110
UPDATE
NODE STATE
1112
RETURN

FIG. 11

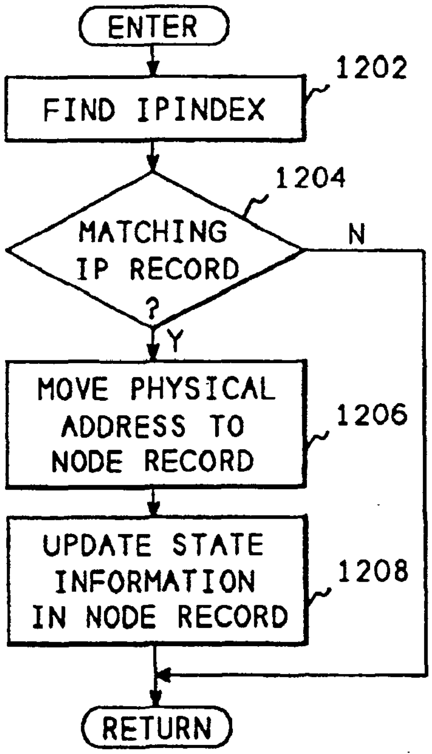
ENTER
FIND IPINDEX
1202
MATCHING IP RECORD ?
1204
N
Y
MOVE PHYSICAL ADDRESS TO NODE RECORD
1206
UPDATE STATE INFORMATION IN NODE RECORD
1208
RETURN

FIG. 12

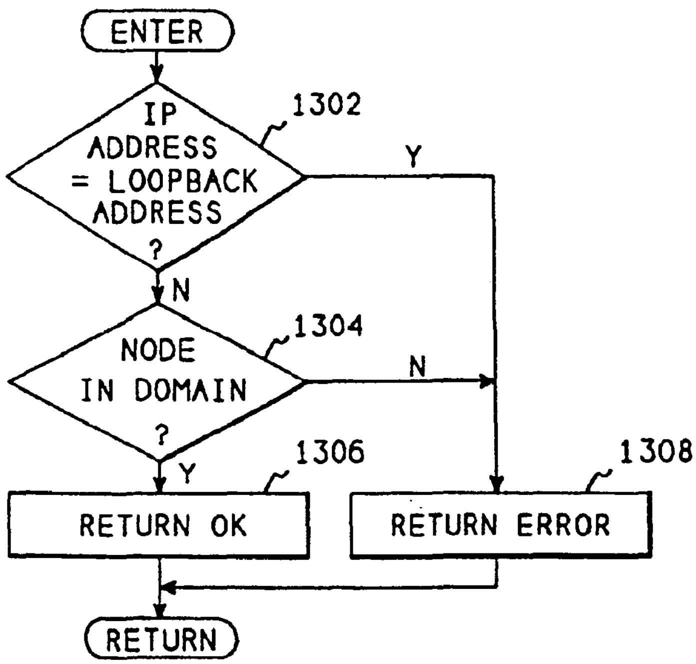
ENTER
IP ADDRESS = LOOPBACK ADDRESS ?
1302
Y
N
NODE IN DOMAIN ?
1304
N
Y
1306
1308
RETURN OK
RETURN ERROR
RETURN

FIG. 13

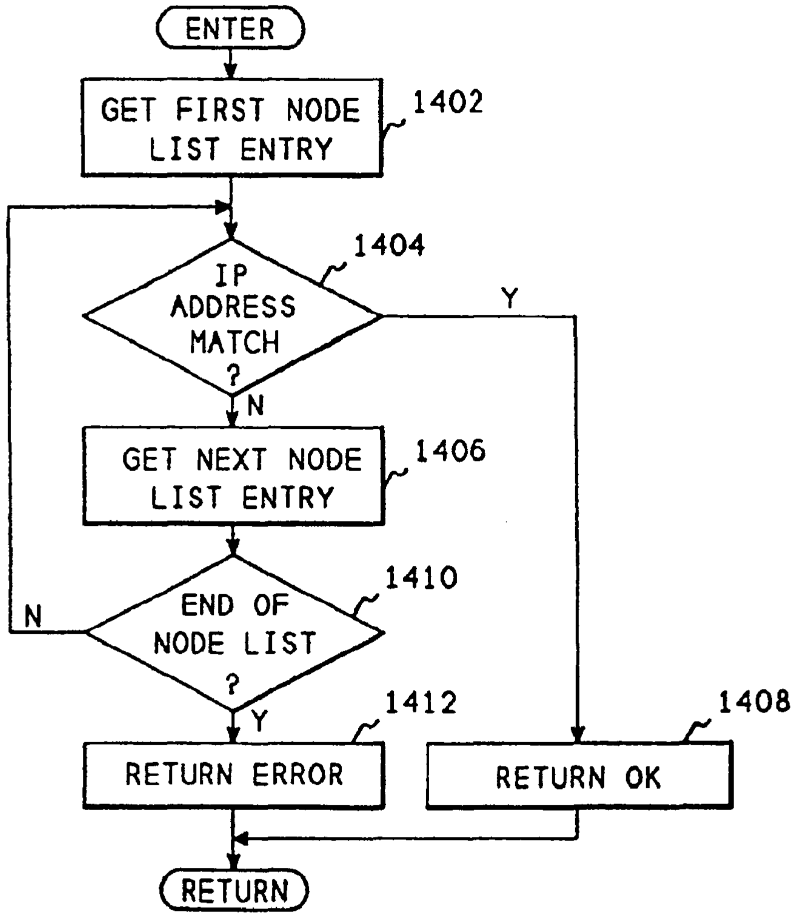
ENTER
GET FIRST NODE LIST ENTRY
1402
IP ADDRESS MATCH ?
1404
Y
N
GET NEXT NODE LIST ENTRY
1406
END OF NODE LIST ?
1410
N
Y
1412
RETURN ERROR
1408
RETURN OK
RETURN

FIG. 14

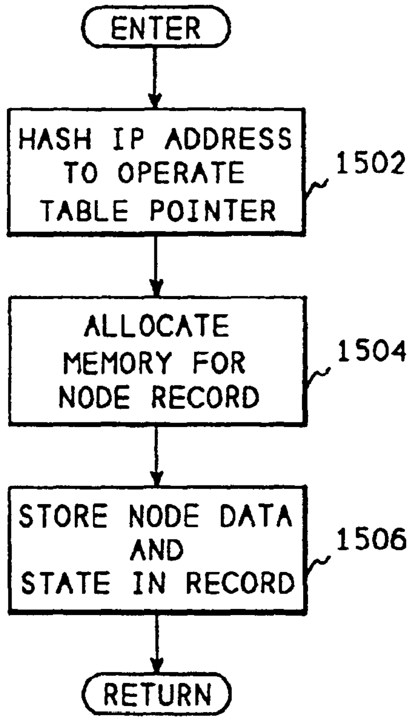
ENTER
HASH IP ADDRESS TO OPERATE TABLE POINTER
1502
ALLOCATE MEMORY FOR NODE RECORD
1504
STORE NODE DATA AND STATE IN RECORD
1506
RETURN

FIG. 15

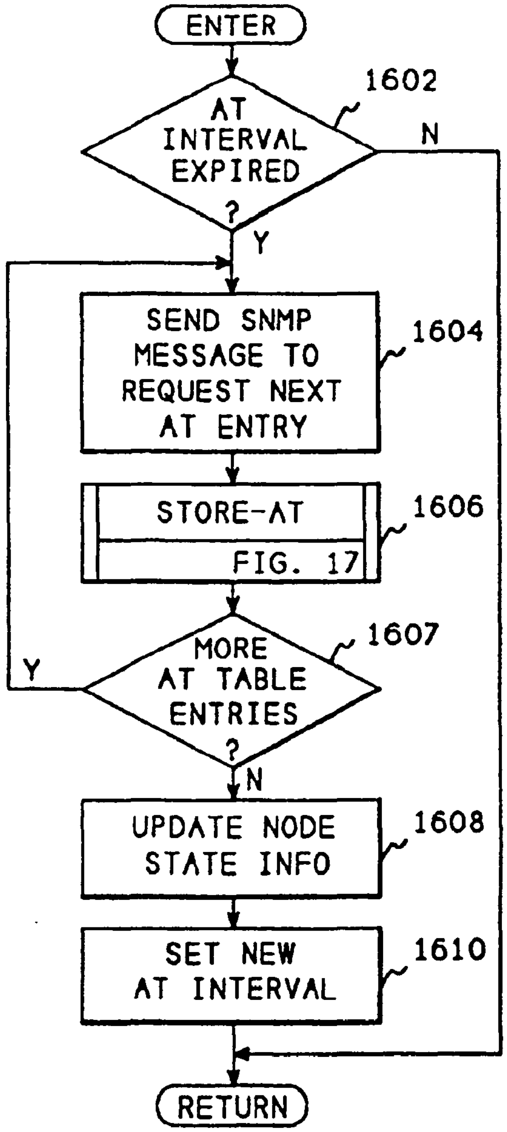
ENTER
AT INTERVAL EXPIRED ?
1602
N
Y
SEND SNMP MESSAGE TO REQUEST NEXT AT ENTRY
1604
STORE-AT
FIG. 17
1606
MORE AT TABLE ENTRIES ?
1607
Y
N
UPDATE NODE STATE INFO
1608
SET NEW AT INTERVAL
1610
RETURN

FIG. 16

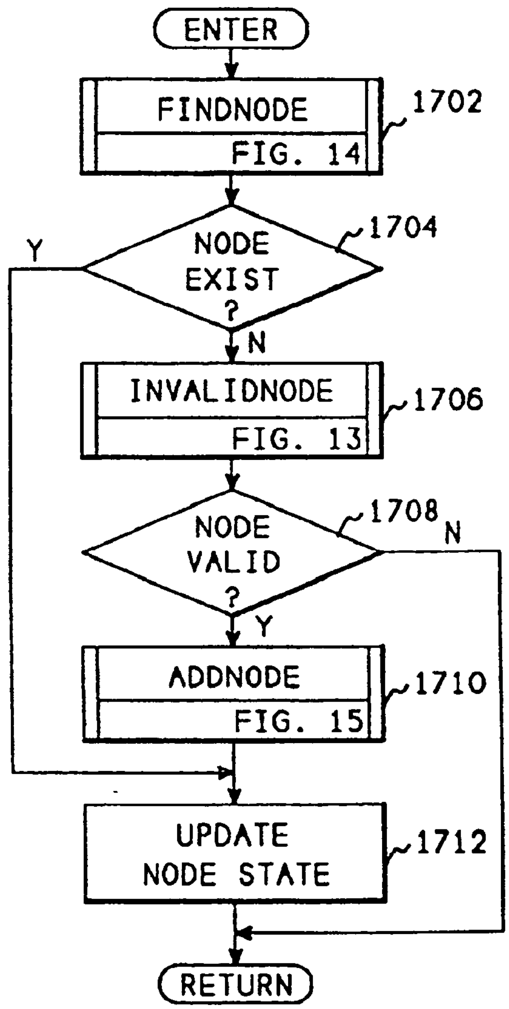
ENTER
FINDNODE
FIG. 14
1702
NODE EXIST ?
1704
Y
N
INVALIDNODE
FIG. 13
1706
NODE VALID ?
1708
N
Y
ADDNODE
FIG. 15
1710
UPDATE NODE STATE
1712
RETURN

FIG. 17

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 1 of 5		
	Reexam number	90/010,416
	First Named Inventor	Hutton
	Patent Under Re-Exam	6108704
	Issue Date	2000/08/22
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0188
	Confirmation No.	1061

NON-PATENT REFERENCES

Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
	1-1	Civ Action No. 06-2469 Appendix A (List of Prior Art References) to Defendants' Fourth Amended Responses to Plaintiff's Interrogatory Nos. 17-19 (N2PIDS_01618 -1657)	
	1-2	Civ Action No. 06-2469 Appendix B (Invalidty Claim Chart) to Defendants' Fourth Amended Responses to Plaintiff's Interrogatory Nos. 17-19 (N2PIDS_01658-1693)	
	1-3	Civ Action No. 06-2469 Appendix C (Obviousness Combinations Chart) to Defendants' Fourth Amended Responses to Plaintiff's Interrogatory Nos. 17-19 (N2PIDS_01694-01716)	
	1-4	Civ Action No. 06-2469 Declaration of Alan J. Heinrich in Support of Opening Claim Construction Brief of Skype Tech, Skype Inc. and Ebay (part 1 of 5) (N2PIDS_00457-506)	
	1-5	Civ Action No. 06-2469 Declaration of Alan J. Heinrich in Support of Opening Claim Construction Brief of Skype Tech, Skype Inc. and Ebay (part 2 of 5) (N2PIDS_00507-556)	
	1-6	Civ Action No. 06-2469 Declaration of Alan J. Heinrich in Support of Opening Claim Construction Brief of Skype Tech, Skype Inc. and Ebay (part 3 of 5) (N2PIDS_00557-606)	
	1-7	Civ Action No. 06-2469 Declaration of Alan J. Heinrich in Support of Opening Claim Construction Brief of Skype Tech, Skype Inc. and Ebay (part 4 of 5) (N2PIDS_00607-656)	

Examiner Signature		Date Considered	

*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 2 of 5	Reexam number	90/010,416
	First Named Inventor	Hutton
	Patent Under Re-Exam	6108704
	Issue Date	2000/08/22
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0188
	Confirmation No.	1061

NON-PATENT REFERENCES

Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
	2-1	Civ Action No. 06-2469 Declaration of Alan J. Heinrich in Support of Opening Claim Construction Brief of Skype Tech, Skype Inc. and Ebay (part 5 of 5) (N2PIDS_00657-733)	
	2-2	Civ Action No. 06-2469 Declaration of Alan J. Heinrich in Support of Reply Claim Construction Brief of Skype Tech, Skype Inc. and Ebay (part 1 of 3) (N2PIDS_00734-768)	
	2-3	Civ Action No. 06-2469 Declaration of Alan J. Heinrich in Support of Reply Claim Construction Brief of Skype Tech, Skype Inc. and Ebay (part 2 of 3) (N2PIDS_00769-802)	
	2-4	Civ Action No. 06-2469 Declaration of Alan J. Heinrich in Support of Reply Claim Construction Brief of Skype Tech, Skype Inc. and Ebay (part 3 of 3) (N2PIDS_00803-844)	
	2-5	Civ Action No. 06-2469 Declaration of Alan J. Heinrich in Support of Responsive Claim Construction Brief of Skype Tech, Skype Inc. and Ebay (N2PIDS_00412-456)	
	2-6	Civ Action No. 06-2469 Declaration of David B. Johnson in Support of Skype's Responsive Claim Construction Brief (N2PIDS_00845-913)	
	2-7	Civ Action No. 06-2469 Defendants' Fourth Amended Responses to Plaintiff's Interrogatory Nos. 17-19 Directed to Defendents Ebay Skype Tech and Skype Inc (N2PIDS_00387-411)	

Examiner Signature		Date Considered	

*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 3 of 5	Reexam number	90/010,416
	First Named Inventor	Hutton
	Patent Under Re-Exam	6108704
	Issue Date	2000/08/22
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0188
	Confirmation No.	1061

NON-PATENT REFERENCES

Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
	3-1	Civ Action No. 06-2469 Joint Final Pretrial Order (part 1 of 8) (N2PIDS_00914-963)	
	3-2	Civ Action No. 06-2469 Joint Final Pretrial Order (part 2 of 8) (N2PIDS_00964-1013)	
	3-3	Civ Action No. 06-2469 Joint Final Pretrial Order (part 3 of 8) (N2PIDS_01014-1063)	
	3-4	Civ Action No. 06-2469 Joint Final Pretrial Order (part 4 of 8) (N2PIDS_01064-1113)	
	3-5	Civ Action No. 06-2469 Joint Final Pretrial Order (part 5 of 8) (N2PIDS_01114-1163)	
	3-6	Civ Action No. 06-2469 Joint Final Pretrial Order (part 6 of 8) (N2PIDS_01164-1213)	
	3-7	Civ Action No. 06-2469 Joint Final Pretrial Order (part 7 of 8) (N2PIDS_01214-1263)	

Examiner Signature		Date Considered	

*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 4 of 5		
	Reexam number	90/010,416
	First Named Inventor	Hutton
	Patent Under Re-Exam	6108704
	Issue Date	2000/08/22
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0188
	Confirmation No.	1061

NON-PATENT REFERENCES

Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
	4-1	Civ Action No. 06-2469 Joint Final Pretrial Order (part 8 of 8) (N2PIDS_01264-1310)	
	4-2	Civ Action No. 06-2469 Opening Claim Construction Brief of Skype Tech Skype Inc. and Ebay (N2PIDS_01741-1790)	
	4-3	Civ Action No. 06-2469 Plaintiff Net2Phone's Reply Brief on Claim Construction (part 1 of 3) (N2PIDS_01311-1393)	
	4-4	Civ Action No. 06-2469 Plaintiff Net2Phone's Reply Brief on Claim Construction (part 2 of 3) (N2PIDS_01394-1451)	
	4-5	Civ Action No. 06-2469 Plaintiff Net2Phone's Reply Brief on Claim Construction (part 3 of 3) (N2PIDS_01452-1490)	
	4-6	Civ Action No. 06-2469 Plaintiff Net2Phone's Response Brief on Claim Construction (part 1 of 2) (N2PIDS_01491-1546)	
	4-7	Civ Action No. 06-2469 Plaintiff Net2Phone's Response Brief on Claim Construction (part 2 of 2) (N2PIDS_01547-1617)	

Examiner Signature		Date Considered	

*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 5 of 5	Reexam number	90/010,416
	First Named Inventor	Hutton
	Patent Under Re-Exam	6108704
	Issue Date	2000/08/22
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0188
	Confirmation No.	1061

NON-PATENT REFERENCES

Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
	5-1	Civ Action No. 06-2469 Reply Claim Construction Brief of Skype Tech, Skype Inc. and Ebay (N2PIDS_01717-1740)	
	5-2	Civ Action No. 06-2469 Responsive Claim Construction Brief of Skype Tech Skype Inc. and Ebay (N2PIDS_01791-1825)	
	5-3	U.S. Control No. 90/010,423 - 2009-08-05 PTO Office Action	
	5-4		
	5-5		
	5-6		
	5-7		

Examiner Signature		Date Considered	

*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

Electronic Acknowledgement Receipt

EFS ID:	5870450
Application Number:	90010416
International Application Number:	
Confirmation Number:	1061
Title of Invention:	Point-to-Point Internet Protocol
First Named Inventor/Applicant Name:	6108704
Customer Number:	42624
Filer:	Michael Raymond Casey
Filer Authorized By:	
Attorney Docket Number:	2655-0188
Receipt Date:	11-AUG-2009
Filing Date:	17-FEB-2009
Time Stamp:	19:58:38
Application Type:	Reexam (Third Party)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	26550188Xmittal.pdf	268365 ac46e633e14c8aca04098d83c913d8d623d3bb88	no	2

Warnings:

Information:

2	Information Disclosure Statement (IDS) Filed (SB/08)	26550188_1449.pdf	794095 2b89e3d3ec63e9ecc4b98073ec81b4a36bb50ac6	no	5
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Reexam Certificate of Service	20090811COS.pdf	58475 3e0d0b295f06538e5b37ee165c7654d83165ba4a	no	1
Warnings:					
Information:					
4	NPL Documents	N2PIDS_00387.pdf	1248303 103f829551fe55b548a541d669beda6cad272089	no	25
Warnings:					
Information:					
5	NPL Documents	N2PIDS_00412.pdf	3962848 1af848ed034593c08abb73fe5d189f1e6f7f5298	no	45
Warnings:					
Information:					
6	NPL Documents	N2PIDS_00457.pdf	2698601 ce8f9d9f9808e5c59d3b34fab8c77ca89aeb825f	no	50
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7	NPL Documents	N2PIDS_00507.pdf	1838285 37c19558ce807b15bbead7b7636c9d0f18f07a6f	no	50
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Information:					
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Warnings:					
Information:					
9	NPL Documents	N2PIDS_00607.pdf	3476450 b193aab143feb3aa818b3e418060396134387793	no	50
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Information:					
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Warnings:					
Information:					
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Warnings:					
Information:					
13	NPL Documents	N2PIDS_00803.pdf	4152068 7b3a2e2ddcdeffd164f8a1cfc96d610e8b846617	no	42
Warnings:					
Information:					
14	NPL Documents	N2PIDS_00845.pdf	4330148 c432255361158b4e81c3b1bb0d51e0574242a578	no	69
Warnings:					
Information:					
15	NPL Documents	N2PIDS_00914.pdf	2944261 080bb981dd8437b6157018b86fc3befc6ea75db8	no	50
Warnings:					
Information:					
16	NPL Documents	N2PIDS_00964.pdf	4490177 7d1ee36dc21fea4ded879265154bb7945a02315d	no	50
Warnings:					
Information:					
17	NPL Documents	N2PIDS_01014.pdf	4260549 3cdd0ff0c98cae3e3cae281b22424495215e177f	no	50
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Information:					
18	NPL Documents	N2PIDS_01064.pdf	3030407 4ac0890d3df0b3d2e76bc806eea54f876a6dad9c	no	50
Warnings:					
Information:					
19	NPL Documents	N2PIDS_01114.pdf	2797371 1aa57c3ffc28f68e2b72007b078334fd902a037f	no	50

Warnings:					
Information:					
20	NPL Documents	N2PIDS_01164.pdf	2757821 7b7842735401ba137dd0536afd9e0833119a0e19	no	50
Warnings:					
Information:					
21	NPL Documents	N2PIDS_01214.pdf	2751710 ef893e52560ecd5e62dcd743fb915147bde65a5b	no	50
Warnings:					
Information:					
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Warnings:					
Information:					
23	NPL Documents	N2PIDS_01311.pdf	4119057 b220edcf06eed135dc679c8358b50fad44b347d2	no	83
Warnings:					
Information:					
24	NPL Documents	N2PIDS_01394.pdf	3968881 4af783e9b0d04ff379bba2fc7dfcfa52b9b1d311	no	58
Warnings:					
Information:					
25	NPL Documents	N2PIDS_01452.pdf	1920359 3b013b03ee0d9b44a7aad1c6e1d3b56344860c7d	no	39
Warnings:					
Information:					
26	NPL Documents	N2PIDS_01491.pdf	3401591 364aed57efd1a9a5a36c818e1e65dc90a11abd54	no	56
Warnings:					
Information:					
27	NPL Documents	N2PIDS_01547.pdf	4441250 15d16abc2d22fc670e1b3af1890142dbe41d6c87	no	71
Warnings:					
Information:					
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Warnings:					
Information:					
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Warnings:					
Information:					
30	NPL Documents	N2PIDS_01694.pdf	1540394 6ec7be7e68a603a25c0fafd57a479064eac8d23f	no	23
Warnings:					
Information:					
31	NPL Documents	N2PIDS_01717.pdf	1150239 05ae46089b0835e058ab04f346c73aa6ea6ca128	no	24
Warnings:					
Information:					
32	NPL Documents	N2PIDS_01741.pdf	2620699 8878a7f238582ef777bb48052fa32342df91bc16	no	50
Warnings:					
Information:					
33	NPL Documents	N2PIDS_01791.pdf	1800489 59e0d76f3e3f44657ef083de4d41a22e7ff852f2	no	35
Warnings:					
Information:					
			Total Files Size (in bytes):	90853732	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

<u>New Applications Under 35 U.S.C. 111</u>
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT APPLICATION OF:	Attorney Docket: 2655-0188
Net2Phone, Inc.	Group Art Unit: 3992
Control No.: 90/010,416	Examiner: KOSOWSKI, Alexander J.
Issue Date: August 22, 2000	Date: August 11, 2009
Title: **POINT-TO-POINT INTERNET PROTOCOL**	Confirmation No.: 1061

INFORMATION DISCLOSURE STATEMENT

Hon. Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Pursuant to 37 C.F.R. § 1.56, the attention of the Patent and Trademark Office is hereby directed to the reference(s) listed on the attached PTO-1449. One copy of each non-U.S. Patent reference is attached. It is respectfully requested that the information be expressly considered during the prosecution of this application, and that the reference(s) be made of record therein and appear among the "References Cited" on any patent to issue therefrom.

The submission of any document herewith, which is not a statutory bar, is not intended that any such document constitutes prior art against any of the claims of the present application or is considered to be material to patentability as defined in 37 C.F.R. § 1.56(b). Applicants do not waive any rights to take any action which would be appropriate to antedate or otherwise remove as a competent reference against the claims of the present application.

☒ The Examiner's attention is directed to co-pending U.S. Patent Control Nos. 90/010,424, 90/010,421, 90/010,422 and 90/010,423 which are involved in the same litigation as the patent corresponding to the present re-examination. The identification of this U.S. Patent Application is not to be construed as a waiver of secrecy as to that application now or upon issuance of the present application as a patent. The Examiner is respectfully requested to consider the cited application and the art cited therein during examination.

☐ Copies of the references were cited by or submitted to the Office in parent Application No. _____, filed _____, which is relied upon for an earlier filing date under 35 U.S.C. 120. Thus, Form PTO 1449 is attached without copies of these references. 37 C.F.R. § 1.98(d).

CHARGE STATEMENT: Deposit Account No. 501860, order no. **2655-0188**.

The Commissioner is hereby authorized to charge any fee specifically authorized hereafter, or any missing or insufficient fee(s) filed, or asserted to be filed, or which should have been filed herewith or concerning any paper filed hereafter, and which may be required under Rules 16-18 (missing or insufficiencies only) now or hereafter relative to this application and the resulting Official Document under Rule 20, or credit any overpayment, to our Accounting/Order Nos. shown above, for which purpose a duplicate copy of this sheet is attached

This CHARGE STATEMENT does not authorize charge of the issue fee until/unless an issue fee transmittal sheet is filed.

CUSTOMER NUMBER
42624

Davidson Berquist Jackson & Gowdey LLP
4300 Wilson Blvd., 7th Floor,
Arlington Virginia 22203
Main: (703) 894-6400 • FAX: (703) 894-6430

Respectfully submitted,

By: /Michael R. Casey /

Michael R. Casey, Ph.D. (Reg. No.: 40,294)

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 1 of 1	Reexam number	90/010,416
	First Named Inventor	Hutton
	Patent Under Re-Exam	6108704
	Issue Date	2000/08/22
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0188
	Confirmation No.	1061

NON-PATENT REFERENCES

Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
	1-1	Civ Action No. 06-2469 Plaintiff Net2Phone, Inc.'s Opening Claim Construction Brief (part 1 of 3) (N2PIDS_02100-2166)	
	1-2	Civ Action No. 06-2469 Plaintiff Net2Phone, Inc.'s Opening Claim Construction Brief (part 2 of 3) (N2PIDS_02166-2232)	
	1-3	Civ Action No. 06-2469 Plaintiff Net2Phone, Inc.'s Opening Claim Construction Brief (part 3 of 3) (N2PIDS_02233-2292)	
	1-4		
	1-5		
	1-6		
	1-7		

Examiner Signature		Date Considered	

*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

CERTIFICATE OF SERVICE

The undersigned hereby certifies that, on August 12, 2009, the Information Disclosure Statements (with references in electronic format, as agreed by requestor) filed in Reexam Control Numbers:

1) 90/010,422;

2) 90/010,424;

3) 90/010,421;

4) 90/010,416; and

5) 90/010,423

were served by First Class Mail, on Requestor:

Blakely, Sokoloff, Taylor & Zafman LLP
1279 Oakmead Parkway
Sunnyvale, CA 94085-4040

Michael R. Casey, Ph.D.

Electronic Acknowledgement Receipt

EFS ID:	5874408
Application Number:	90010416
International Application Number:	
Confirmation Number:	1061
Title of Invention:	Point-to-Point Internet Protocol
First Named Inventor/Applicant Name:	6108704
Customer Number:	42624
Filer:	Michael Raymond Casey
Filer Authorized By:	
Attorney Docket Number:	2655-0188
Receipt Date:	12-AUG-2009
Filing Date:	17-FEB-2009
Time Stamp:	14:28:47
Application Type:	Reexam (Third Party)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	N2PIDS_02072.pdf	252336 69c2ba3d6a84b45b625fef0888a6ac4c9233a46a	no	2

Warnings:

Information:

2	Information Disclosure Statement (IDS) Filed (SB/08)	N2PIDS_02074.pdf	134023 c188e2b31d80239bce01a98ff8ceefa047fcc338	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	NPL Documents	N2PIDS_02100.pdf	7508718 5746764fc5941ad1219fab6873a3f311ed436bf0	no	66
Warnings:					
Information:					
4	NPL Documents	N2PIDS_02166.pdf	6806160 e5f84cd3022bf393d6052237c341fc4a78616503	no	67
Warnings:					
Information:					
5	NPL Documents	N2PIDS_02233.pdf	6987289 25ba8ceecec040367e21e1fdfb5f5a6fcd50c600	no	60
Warnings:					
Information:					
6	Reexam Certificate of Service	N2PIDS_02078_COS.pdf	21706 1a8b052cea43fd90e6f3de54729dca4e47d2bd7a	no	1
Warnings:					
Information:					
			Total Files Size (in bytes):	21710232	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

<u>New Applications Under 35 U.S.C. 111</u>
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<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

<u>New International Application Filed with the USPTO as a Receiving Office</u>
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT APPLICATION OF:	Attorney Docket: 2655-0188
Net2Phone, Inc.	Group Art Unit: 3992
Control No.: 90/010,416	Examiner: KOSOWSKI, Alexander J.
Issue Date: August 22, 2000	Date: August 12, 2009
Title: **POINT-TO-POINT INTERNET PROTOCOL**	Confirmation No.: 1061

INFORMATION DISCLOSURE STATEMENT

Hon. Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Pursuant to 37 C.F.R. § 1.56, the attention of the Patent and Trademark Office is hereby directed to the reference(s) listed on the attached PTO-1449. One copy of each non-U.S. Patent reference is attached. It is respectfully requested that the information be expressly considered during the prosecution of this application, and that the reference(s) be made of record therein and appear among the "References Cited" on any patent to issue therefrom.

The submission of any document herewith, which is not a statutory bar, is not intended that any such document constitutes prior art against any of the claims of the present application or is considered to be material to patentability as defined in 37 C.F.R. § 1.56(b). Applicants do not waive any rights to take any action which would be appropriate to antedate or otherwise remove as a competent reference against the claims of the present application.

☐ The Examiner's attention is directed to co-pending U.S. Patent Control Nos. 90/010,424, 90/010,421, 90/010,422 and 90/010,423 which are involved in the same litigation as the patent corresponding to the present re-examination. The identification of this U.S. Patent Application is not to be construed as a waiver of secrecy as to that application now or upon issuance of the present application as a patent. The Examiner is respectfully requested to consider the cited application and the art cited therein during examination.

CHARGE STATEMENT: Deposit Account No. 501860, order no. **2655-0188**.

The Commissioner is hereby authorized to charge any fee specifically authorized hereafter, or any missing or insufficient fee(s) filed, or asserted to be filed, or which should have been filed herewith or concerning any paper filed hereafter, and which may be required under Rules 16-18 (missing or insufficiencies only) now or hereafter relative to this application and the resulting Official Document under Rule 20, or credit any overpayment, to our Accounting/Order Nos. shown above, for which purpose a duplicate copy of this sheet is attached

This CHARGE STATEMENT does not authorize charge of the issue fee until/unless an issue fee transmittal sheet is filed.

CUSTOMER NUMBER
42624

Respectfully submitted,

By: /Michael R. Casey /

Michael R. Casey, Ph.D. (Reg. No.: 40,294)

Davidson Berquist Jackson & Gowdey LLP
4300 Wilson Blvd., 7th Floor,
Arlington Virginia 22203
Main: (703) 894-6400 • FAX: (703) 894-6430

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 1 of 1	Reexam number	90/010,416
	First Named Inventor	Hutton
	Patent Under Re-Exam	6108704
	Issue Date	2000/08/22
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0188
	Confirmation No.	1061

NON-PATENT REFERENCES

Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
	1-1	Civ Action No. 06-2469 Plaintiff Net2Phone, Inc.'s Opening Claim Construction Brief (part 1 of 3) (N2PIDS_02100-2166)	
	1-2	Civ Action No. 06-2469 Plaintiff Net2Phone, Inc.'s Opening Claim Construction Brief (part 2 of 3) (N2PIDS_02166-2232)	
	1-3	Civ Action No. 06-2469 Plaintiff Net2Phone, Inc.'s Opening Claim Construction Brief (part 3 of 3) (N2PIDS_02233-2292)	
	1-4		
	1-5		
	1-6		
	1-7		

Examiner Signature	/Alexander Kosowski/	Date Considered	08/19/2009

*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 1 of 5	Reexam number	90/010,416
	First Named Inventor	Hutton
	Patent Under Re-Exam	6108704
	Issue Date	2000/08/22
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0188
	Confirmation No.	1061

NON-PATENT REFERENCES

Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
	1-1	Civ Action No. 06-2469 Appendix A (List of Prior Art References) to Defendants' Fourth Amended Responses to Plaintiff's Interrogatory Nos. 17-19 (N2PIDS_01618 -1657)	
	1-2	Civ Action No. 06-2469 Appendix B (Invalidty Claim Chart) to Defendants' Fourth Amended Responses to Plaintiff's Interrogatory Nos. 17-19 (N2PIDS_01658-1693)	
	1-3	Civ Action No. 06-2469 Appendix C (Obviousness Combinations Chart) to Defendants' Fourth Amended Responses to Plaintiff's Interrogatory Nos. 17-19 (N2PIDS_01694-01716)	
	1-4	Civ Action No. 06-2469 Declaration of Alan J. Heinrich in Support of Opening Claim Construction Brief of Skype Tech, Skype Inc. and Ebay (part 1 of 5) (N2PIDS_00457-506)	
	1-5	Civ Action No. 06-2469 Declaration of Alan J. Heinrich in Support of Opening Claim Construction Brief of Skype Tech, Skype Inc. and Ebay (part 2 of 5) (N2PIDS_00507-556)	
	1-6	Civ Action No. 06-2469 Declaration of Alan J. Heinrich in Support of Opening Claim Construction Brief of Skype Tech, Skype Inc. and Ebay (part 3 of 5) (N2PIDS_00557-606)	
	1-7	Civ Action No. 06-2469 Declaration of Alan J. Heinrich in Support of Opening Claim Construction Brief of Skype Tech, Skype Inc. and Ebay (part 4 of 5) (N2PIDS_00607-656)	

Examiner Signature	/Alexander Kosowski/	Date Considered	08/19/2009

*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

N2PIDS_02023

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 2 of 5	Reexam number	90/010,416
	First Named Inventor	Hutton
	Patent Under Re-Exam	6108704
	Issue Date	2000/08/22
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0188
	Confirmation No.	1061

NON-PATENT REFERENCES

Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
	2-1	Civ Action No. 06-2469 Declaration of Alan J. Heinrich in Support of Opening Claim Construction Brief of Skype Tech, Skype Inc. and Ebay (part 5 of 5) (N2PIDS_00657-733)	
	2-2	Civ Action No. 06-2469 Declaration of Alan J. Heinrich in Support of Reply Claim Construction Brief of Skype Tech, Skype Inc. and Ebay (part 1 of 3) (N2PIDS_00734-768)	
	2-3	Civ Action No. 06-2469 Declaration of Alan J. Heinrich in Support of Reply Claim Construction Brief of Skype Tech, Skype Inc. and Ebay (part 2 of 3) (N2PIDS_00769-802)	
	2-4	Civ Action No. 06-2469 Declaration of Alan J. Heinrich in Support of Reply Claim Construction Brief of Skype Tech, Skype Inc. and Ebay (part 3 of 3) (N2PIDS_00803-844)	
	2-5	Civ Action No. 06-2469 Declaration of Alan J. Heinrich in Support of Responsive Claim Construction Brief of Skype Tech, Skype Inc. and Ebay (N2PIDS_00412-456)	
	2-6	Civ Action No. 06-2469 Declaration of David B. Johnson in Support of Skype's Responsive Claim Construction Brief (N2PIDS_00845-913)	
	2-7	Civ Action No. 06-2469 Defendants' Fourth Amended Responses to Plaintiff's Interrogatory Nos. 17-19 Directed to Defendents Ebay Skype Tech and Skype Inc (N2PIDS_00387-411)	

Examiner Signature		Date Considered	

*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 3 of 5	Reexam number	90/010,416
	First Named Inventor	Hutton
	Patent Under Re-Exam	6108704
	Issue Date	2000/08/22
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0188
	Confirmation No.	1061

NON-PATENT REFERENCES

Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
	3-1	Civ Action No. 06-2469 Joint Final Pretrial Order (part 1 of 8) (N2PIDS_00914-963)	
	3-2	Civ Action No. 06-2469 Joint Final Pretrial Order (part 2 of 8) (N2PIDS_00964-1013)	
	3-3	Civ Action No. 06-2469 Joint Final Pretrial Order (part 3 of 8) (N2PIDS_01014-1063)	
	3-4	Civ Action No. 06-2469 Joint Final Pretrial Order (part 4 of 8) (N2PIDS_01064-1113)	
	3-5	Civ Action No. 06-2469 Joint Final Pretrial Order (part 5 of 8) (N2PIDS_01114-1163)	
	3-6	Civ Action No. 06-2469 Joint Final Pretrial Order (part 6 of 8) (N2PIDS_01164-1213)	
	3-7	Civ Action No. 06-2469 Joint Final Pretrial Order (part 7 of 8) (N2PIDS_01214-1263)	

Examiner Signature		Date Considered	

*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

N2PIDS_02025

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 4 of 5		
	Reexam number	90/010,416
	First Named Inventor	Hutton
	Patent Under Re-Exam	6108704
	Issue Date	2000/08/22
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0188
	Confirmation No.	1061

NON-PATENT REFERENCES

Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
	4-1	Civ Action No. 06-2469 Joint Final Pretrial Order (part 8 of 8) (N2PIDS_01264-1310)	
	4-2	Civ Action No. 06-2469 Opening Claim Construction Brief of Skype Tech Skype Inc. and Ebay (N2PIDS_01741-1790)	
	4-3	Civ Action No. 06-2469 Plaintiff Net2Phone's Reply Brief on Claim Construction (part 1 of 3) (N2PIDS_01311-1393)	
	4-4	Civ Action No. 06-2469 Plaintiff Net2Phone's Reply Brief on Claim Construction (part 2 of 3) (N2PIDS_01394-1451)	
	4-5	Civ Action No. 06-2469 Plaintiff Net2Phone's Reply Brief on Claim Construction (part 3 of 3) (N2PIDS_01452-1490)	
	4-6	Civ Action No. 06-2469 Plaintiff Net2Phone's Response Brief on Claim Construction (part 1 of 2) (N2PIDS_01491-1546)	
	4-7	Civ Action No. 06-2469 Plaintiff Net2Phone's Response Brief on Claim Construction (part 2 of 2) (N2PIDS_01547-1617)	

Examiner Signature		Date Considered	

*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 5 of 5		
	Reexam number	90/010,416
	First Named Inventor	Hutton
	Patent Under Re-Exam	6108704
	Issue Date	2000/08/22
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0188
	Confirmation No.	1061

NON-PATENT REFERENCES

Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
	5-1	Civ Action No. 06-2469 Reply Claim Construction Brief of Skype Tech, Skype Inc. and Ebay (N2PIDS_01717-1740)	
	5-2	Civ Action No. 06-2469 Responsive Claim Construction Brief of Skype Tech Skype Inc. and Ebay (N2PIDS_01791-1825)	
	5-3	U.S. Control No. 90/010,423 - 2009-08-05 PTO Office Action	
	5-4		
	5-5		
	5-6		
	5-7		

Examiner Signature	/Alexander Kosowski/	Date Considered	08/19/2009

*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

N2PIDS_02027

Reexamination	Application/Control No. 90010416	Applicant(s)/Patent Under Reexamination 6108704
	Certificate Date	**Certificate Number**

Requester Correspondence Address: ☐ **Patent Owner** ☒ **Third Party**
Blakely Sokoloff Taylor & Zafman LLP 1279 Oakmead Parkway Sunnyvale, CA 94085-4040

LITIGATION REVIEW ☒	AJK (examiner initials)	08/25/2009 (date)
Case Name		Director Initials
OPEN: 2:06cv2469 Net2phone v. Ebay		Eric Keasel for GM

COPENDING OFFICE PROCEEDINGS	
TYPE OF PROCEEDING	**NUMBER**
1. no copending proceeding	

U.S. Patent and Trademark Office DOC. CODE RXFILJKT

Search Notes	Application/Control No. 90010416	Applicant(s)/Patent Under Reexamination 6108704
	Examiner ALEXANDER J KOSOWSKI	Art Unit 3992

SEARCHED

Class	Subclass	Date	Examiner

SEARCH NOTES

Search Notes	Date	Examiner
Reviewed proposed prior art and prosecution history	8/25/09	AJK

INTERFERENCE SEARCH

Class	Subclass	Date	Examiner

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
90/010,416	02/17/2009	6108704	2655-0188	1061

42624 7590 08/27/2009

DAVIDSON BERQUIST JACKSON & GOWDEY LLP
4300 WILSON BLVD., 7TH FLOOR
ARLINGTON, VA 22203

EXAMINER	
ART UNIT	PAPER NUMBER

DATE MAILED: 08/27/2009

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

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(THIRD PARTY REQUESTER'S CORRESPONDENCE ADDRESS)

Blakely Sokoloff Taylor & Zafman LLP

1279 Oakmead Parkway

Sunnyvale, CA 94085-4040

EX PARTE REEXAMINATION COMMUNICATION TRANSMITTAL FORM

REEXAMINATION CONTROL NO. 90/010,416.

PATENT NO. 6108704.

ART UNIT 3992.

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above identified *ex parte* reexamination proceeding (37 CFR 1.550(f)).

Where this copy is supplied after the reply by requester, 37 CFR 1.535, or the time for filing a reply has passed, no submission on behalf of the *ex parte* reexamination requester will be acknowledged or considered (37 CFR 1.550(g)).

PTOL-465 (Rev.07-04)

Office Action in Ex Parte Reexamination	**Control No.** 90/010,416	**Patent Under Reexamination** 6108704	
	Examiner ALEXANDER J. KOSOWSKI	**Art Unit** 3992	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

a☒ Responsive to the communication(s) filed on *2/17/09*. b☐ This action is made FINAL.
c☒ A statement under 37 CFR 1.530 has not been received from the patent owner.

A shortened statutory period for response to this action is set to expire 2 month(s) from the mailing date of this letter.
Failure to respond within the period for response will result in termination of the proceeding and issuance of an *ex parte* reexamination certificate in accordance with this action. 37 CFR 1.550(d). **EXTENSIONS OF TIME ARE GOVERNED BY 37 CFR 1.550(c).**
If the period for response specified above is less than thirty (30) days, a response within the statutory minimum of thirty (30) days will be considered timely.

Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:

1. ☐ Notice of References Cited by Examiner, PTO-892.
2. ☒ Information Disclosure Statement, PTO/SB/08.
3. ☐ Interview Summary, PTO-474.
4. ☐ ___.

Part II SUMMARY OF ACTION

1a. ☒ Claims *1-7 and 10-44* are subject to reexamination.

1b. ☐ Claims *8 and 9* are not subject to reexamination.

2. ☐ Claims ___ have been canceled in the present reexamination proceeding.

3. ☐ Claims ___ are patentable and/or confirmed.

4. ☒ Claims *1-7 and 10-44* are rejected.

5. ☐ Claims ___ are objected to.

6. ☐ The drawings, filed on ___ are acceptable.

7. ☐ The proposed drawing correction, filed on ___ has been (7a) ☐ approved (7b)☐ disapproved.

8. ☐ Acknowledgment is made of the priority claim under 35 U.S.C. § 119(a)-(d) or (f).

   a)☐ All b)☐ Some* c)☐ None of the certified copies have

   1☐ been received.

   2☐ not been received.

   3☐ been filed in Application No. ___.

   4☐ been filed in reexamination Control No. ___.

   5☐ been received by the International Bureau in PCT application No. ___.

   * See the attached detailed Office action for a list of the certified copies not received.

9. ☐ Since the proceeding appears to be in condition for issuance of an *ex parte* reexamination certificate except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte* Quayle, 1935 C.D. 11, 453 O.G. 213.

10. ☐ Other: ___

cc: Requester (if third party requester)

DETAILED ACTION

1) This Office action addresses claims 1-7 and 10-44 of United States Patent Number 6,108,704 (Hutton et al), for which it has been determined in the Order Granting Ex Parte Reexamination (hereafter the "Order") mailed 3/11/09 that a substantial new question of patentability was raised in the Request for *Ex Parte* reexamination filed on 2/17/09 (hereafter the "Request"). Claims 8-9 are not subject to reexamination.

IDS

2) With regard to the IDS's filed 8/11/09 and 8/12/09:

These IDS's have been given due consideration. However, that which are not either prior art patents or prior art printed publications have been crossed out so as not to appear reprinted on the front page of the patent.

Rejections

3) The following three rejections are utilized by the examiner below, referencing the proposed prior art listed on pages 5-6 of the Request:

Issue 1: Claims 1-7 and 10-44 in view of NetBIOS, RFC 1531, Pinard and VocalChat User's Guide.

Issue 2: Claims 1-7 and 10-44 in view of Etherphone, Vin, RFC 1531, NetBIOS, Pinard and VocalChat User's Guide.

Issue 3: Claims 1-7 and 10-44 in view of VocalChat, RFC 1531, NetBIOS and Pinard.

Claim Rejection Paragraphs

4) ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Issue 1

5) Claims 43-44 are rejected under 35 U.S.C. 102(b) as being unpatentable by NetBIOS (See claim mapping chart in Exhibit M, pages 36-40, incorporated by reference).

6) Claims 1-7 and 32-42 are rejected under 35 U.S.C. 103(a) as being unpatentable by NetBIOS, further in view of RFC 1531 (See claim mapping chart utilizing alternative 103 rejections in Exhibit M, pages 1-15 for claims 1-7 and pages 25-35 for claims 32-42, incorporated by reference).

<u>In addition, examiner adds that it would have been obvious to one skilled in the art at the time the invention was made to utilize the limitations taught by RFC 1531 in the invention taught</u>

by NetBIOS above since this would allow for automatic reuse of an address that is no longer needed by the host to which it was assigned (RFC 1531, Pg. 2), and since examiner notes the use of dynamic IP address assignment in a TCP/IP network are old and well known in the art, and are useful to eliminate the burdensome task of manually assigning IP addresses for all networked computers.

7) Claims 10-17, 19-28, 30-31 are rejected under 35 U.S.C. 103(a) as being unpatentable by NetBIOS, further in view of Pinard (See claim mapping chart in Exhibit M, pages 15-25, incorporated by reference).

In addition, examiner adds that it would have been obvious to one skilled in the art at the time the invention was made to utilize the user-interface elements and interactions taught by Pinard in the invention taught by NetBIOS since Pinard teaches that the invention can be used with any system in which a personal computer in conjunction with a server operates (Pinard, col. 2 lines 43-46), since NetBIOS teaches that it can be implemented using different operating systems (NetBIOS, pg. 359), and since examiner notes that both NetBIOS and Pinard relate to communications between at least two users implemented in a computerized environment.

8) Claims 18, 29, are rejected under 35 U.S.C. 103(a) as being unpatentable by NetBIOS, further in view of Pinard, further in view of VocalChat User's Guide (See claim mapping chart in Exhibit M, pages 19 and 24, incorporated by reference).

In addition, examiner adds that it would have been obvious to one skilled in the art at the time the invention was made to utilize the limitations taught by VocalChat User's Guide in the invention taught by NetBIOS and Pinard above since all three references relate to the field of communications over a computer network, since VocalChat and Pinard utilize a computer system for telephony features specifically, and since examiner notes that the use of a MUTE feature in telephone conversations is old and well known in the art.

Issue 2

9) Examiner notes the following will represent the Etherphone references utilized for the rejection below (All considered a single reference as published together):

"Zellweger": An Overview of the Etherphone System and its Applications

"Swinehart": Telephone Management in the Etherphone System

"Terry": Managing Stored Voice in the Etherphone System

"Swinehart 2": System Support Requirements for Multi-media Workstations

"Zellweger 2": Active Paths through Multimedia Documents

10) Claims 43-44 are rejected under 35 U.S.C. 102(b) as being unpatentable by Etherphone (See claim mapping chart in Exhibit N, pages 33-35, incorporated by reference).

11) Claims 1-2, 4-7, 32-42 are rejected under 35 U.S.C. 103(a) as being unpatentable by Etherphone, further in view of Vin, further in view of RFC 1531 (See claim mapping chart utilizing alternative 103 rejections in Exhibit N, pages 1-12 for claims 1-2 and 4-7, and pages 24-33 for claims 32-42, incorporated by reference).

In addition, examiner adds that it would have been obvious to one skilled in the art at the time the invention was made to utilize the computer program product taught by Etherphone above in an Internet based system utilizing dynamically assigned IP addresses from Internet access servers as taught by Vin and RFC 1531 since Etherphone was intended for use in multiple networks and communication protocols (Terry, page 3), since Vin and Etherphone both describe the same Etherphone system, since examiner notes that Internet and IP address-based networks are old and well known in the art and would be a natural extension from an ethernet-based system, since dynamic allocation of IP addresses allows for automatic reuse of an address that is no longer needed by the host to which it was assigned (RFC 1531, Pg. 2), and since examiner notes the use of dynamic IP address assignment in a TCP/IP network are old and well known in the art, and are useful to eliminate the burdensome task of manually assigning IP addresses for all networked computers.

12) Claims 10-17, 19-28, 30-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Etherphone, further in view of Pinard (See claim mapping in the Request pages 118-126, and also claim mapping chart utilizing alternative 103 rejections in Exhibit N, pages 12-17 for claims 10-17, pages 17-23 for claims 19-28, and page 24 for claims 30-31, incorporated by reference).

In addition, examiner adds that it would have been obvious to one skilled in the art at the time the invention was made to utilizing the user-interface elements and interactions taught by Pinard in the invention taught by Etherphone since Pinard teaches that the invention can be used with any system in which a personal computer in conjunction with a server operates (Pinard, col.

2 lines 43-46), and since examiner notes that both Etherphone and Pinard relate to communications between at least two users implemented in a computerized environment.

13) Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Etherphone, further in view of Vin, RFC 1531 and NetBIOS (See claim mapping in the Request, pages 112-113 and also claim chart in Exhibit N, page 8, incorporated by reference).

In addition, examiner adds that it would have been obvious to combine NetBIOS with Etherphone, Vin, and RFC 1531 as taught above since examiner notes that all references teach the use of computer networking, and since examiner notes that the use of timestamps would allow for determination of length of time a user has been online and would also allow for removal of stale entries in the database.

14) Claims 18 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Etherphone, further in view of Pinard and VocalChat User's Guide (see claim chart in Exhibit N, page 17 for claim 18, and page 23 for claim 29, incorporated by reference).

In addition, examiner adds that it would have been obvious to one skilled in the art at the time the invention was made to utilize the limitations taught by VocalChat User's Guide in the invention taught by Etherphone and Pinard above since all three references relate to the field of communications over a computer network, since VocalChat User's Guide and Pinard utilize a computer system for telephony features specifically, and since examiner notes that the use of a MUTE feature in telephone conversations is old and well known in the art.

Issue 3

14) Examiner notes the following will represent the VocalChat references utilized for the rejection below:

"User's Guide": VocalChat User's Guide, Version 2.0

"Readme": VocalChat Readme File, Version 2.02

"Networking Information": VocalChat 1.01 Networking Information

"Help File": VocalChat Information, Version 2.02

"Troubleshooting Help File": VocalChat Troubleshooting Help File, Version 2.02

15) Claims 1-2, 4-7, 32-42 are rejected under 35 U.S.C. 103(a) as being unpatentable by the combination of all five VocalChat references listed above (hereafter "VocalChat References"), further in view of RFC 1531 (See claim mapping chart utilizing alternative 103 rejections in Exhibit O, pages 1-15 for claims 1-2 and 4-7, and pages 26-36 for claims 32-42, incorporated by reference).

In addition, examiner adds that it would have been obvious to one skilled in the art at the time the invention was made to combine all five VocalChat References utilized above since they all describe a VocalChat system which shares numerous common features including a central server to store addresses and VocalChat client software and which all interoperate in the same basic manner. In addition it would have been obvious to utilize the limitations taught by RFC 1531 in the invention taught by VocalChat above since this allows for automatic reuse of an address that is no longer needed by the host to which it was assigned (RFC 1531, Pg. 2), and since examiner notes the use of dynamic IP address assignment in a TCP/IP network are old and well known in the art, and are useful to eliminate the burdensome task of manually assigning IP addresses for all networked computers.

16) Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable by the combination of VocalChat, further in view of RFC 1531, further in view of NetBIOS (See claim mapping chart in Exhibit O, pages 9-10, incorporated by reference).

In addition, examiner adds that it would have been obvious to combine NetBIOS with VocalChat and RFC 1531 as taught above since examiner notes that all references teach the use of computer networking, and since examiner notes that the use of timestamps would allow for determination of length of time a user has been online and would also allow for removal of stale entries in the database.

17) Claims 43-44 are rejected under 35 U.S.C. 103(a) as being unpatentable by VocalChat.

Referring to **(Claim 43)**, VocalChat teaches a computer program product for use with a computer system, the computer system executing a first process operatively coupled over a computer network to a second process and a server process (User's Guide, pg. 5, 7-8, Help File, pg. 2), the computer program product comprising a computer usable medium having computer readable program code embodied therein, the program code comprising:

a. program code configured to access a directory database, the database having a network protocol address for a selected plurality of processes having on-line status with respect to the computer network, the network protocol address of each respective process forwarded to the database following connection to the computer network (Help File, pg. 2, 26, Network

Information, pg. 10, whereby the network protocol address of clients are transmitted to and stored in a Connection List / USERS file located on the network); and

b. program code responsive to one of the network protocol addresses and configured to establish a point-to-point communication link from the first process to the second process over the computer network (Help File, pg. 17, User Guide, pg. 2, whereby user-to-user access is facilitated through a connection list file over a network).

In addition, examiner notes that it would have been obvious to one skilled in the art at the time the invention was made to combine all five VocalChat References utilized above since they all describe a VocalChat system which shares numerous common features including a central server to store addresses and VocalChat client software and which all interoperate in the same basic manner.

Referring to **(Claim 44)**, VocalChat teaches in a first computer process operatively coupled over a computer network to a second process and an address server (User's Guide, pg. 5, 7-8, Help File, pg. 2), a method of establishing a point-to-point communication between the first and second processes comprising the steps of:

A. following connection of the first process to the computer network forwarding to the address server a network protocol address at which the first process is connected to the computer network (Help File, pg. 2, 26, Network Information, pg. 10, whereby the network protocol address of clients are transmitted to and stored in a Connection List / USERS file located on the network);

B. querying the address server as to whether the second process is connected to the computer network (Help File, pg. 2, 26, Network Information, pg. 10, whereby clients query the network server and whereby the server stores addresses of logged in users);

C. receiving a network protocol address of the second process from the address server, when the second process is connected to the computer network (Help File, pg. 2, 22, whereby the server transmits network addresses from the directory database); and

D. in response to the network protocol address of the second process, establishing a point-to-point communication link with the second process over the computer network (Help File, pg. 17, User Guide, pg. 2, whereby user-to-user access is facilitated through a connection list file over a network).

In addition, examiner notes that it would have been obvious to one skilled in the art at the time the invention was made to combine all five VocalChat References utilized above since they all describe a VocalChat system which shares numerous common features including a central server to store addresses and VocalChat client software and which all interoperate in the same basic manner.

18) Claims 10-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over VocalChat, further in view of Pinard.

Referring to **(Claim 10)**, VocalChat teaches in a computer system, a method for establishing a point-to-point communication link from a caller process to a callee process over a computer network, the caller process having a user interface and being operatively connectable to the callee process and a server over the computer network (Help File, pg. 17, User Guide, pg.

2), the method comprising establishing a point-to-point communication link from the caller process to the first callee process (Help File, pg. 14, 20-21, whereby calls are established between two parties via network address).

In addition, VocalChat teaches the use of multiple user interface elements (User Guide, pg. 12, 14, Help File, pg. 11, 20-21). However, VocalChat does not explicitly teach providing a user interface element representing a first communication line, providing a user interface element representing a first callee process; and establishing communication in response to a user associating the element representing the first callee process with the element representing the first communication line.

Pinard teaches a human machine interface for telephone feature invocation which is utilized on a personal computer and allows a user to make telephone calls by moving graphics around a screen. Pinard teaches a user interface element representing a first communication line and callee process (Pinard, Figure 6 and col. 5 lines 23-30), and also teaches clicking and dragging an icon representing a callee from a directory into a call setup icon to establish a call link (Pinard, Figure 3, col. 4 lines 38-51, Figure 6, col. 5 lines 36-37).

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to utilize the user-interface elements and interactions taught by Pinard in the invention taught by VocalChat since Pinard teaches that the invention can be used with any system in which a personal computer in conjunction with a server operates (Pinard, col. 2 lines 43-46), and since examiner notes that both VocalChat and Pinard relate to communications between at least two users implemented in a computerized environment.

Referring to **(Claim 21)**, VocalChat teaches a computer program product for use with a computer system comprising a computer usable medium having program code embodied in the medium for establishing a point-to-point communication link from a caller process to a callee process over a computer network, the caller process having a user interface and being operatively connectable to the callee process and a server over the computer network (User's Guide, pg. 5, 7-8, readme, pg. 1, Help File, pg. 2), the medium further comprising program code for establishing a point-to-point communication link from the caller process to the first callee process (Help File, pg. 14, 20-21, whereby calls are established between two parties via network address).

In addition, VocalChat teaches the use of multiple user interface elements (User Guide, pg. 12, 14, Help File, pg. 11, 20-21). However, VocalChat does not explicitly teach program code for generating an element representing a first communication line and a first callee process and establishing communication responsive to a user associating the element representing the first callee process with the element representing the first communication line.

Pinard teaches a human machine interface for telephone feature invocation which is utilized on a personal computer and allows a user to make telephone calls by moving graphics around a screen. Pinard teaches a user interface element representing a first communication line and callee process (Pinard, Figure 6 and col. 5 lines 23-30), and also teaches clicking and dragging an icon representing a callee from a directory into a call setup icon to establish a call link (Pinard, Figure 3, col. 4 lines 38-51, Figure 6, col. 5 lines 36-37).

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to utilize the user-interface elements and interactions taught by Pinard in the invention taught by VocalChat since Pinard teaches that the invention can be used with any system in which a personal computer in conjunction with a server operates (Pinard, col. 2 lines 43-46), and since examiner notes that both VocalChat and Pinard relate to communications between at least two users implemented in a computerized environment.

Referring to **(Claims 11-20 and 22-31)**, See claim mapping chart in Exhibit O, pages 17-20 for claims 11-20 and pages 22-26 for claims 22-31, incorporated by reference.

In addition, examiner notes that it would have been obvious to one skilled in the art at the time the invention was made to combine all five VocalChat References utilized above since they all describe a VocalChat system which shares numerous common features including a central server to store addresses and VocalChat client software and which all interoperate in the same basic manner. In addition it would have been obvious to utilize the limitations taught by Pinard in the invention taught by VocalChat above since this allows for automatic reuse of an address that is no longer needed by the host to which it was assigned (RFC 1531, Pg. 2), and since examiner notes the use of dynamic IP address assignment in a TCP/IP network are old and well known in the art, and are useful to eliminate the burdensome task of manually assigning IP addresses for all networked computers.

Conclusion

All correspondence relating to this ex parte reexamination proceeding should be directed as follows:

By U.S. Postal Service Mail to:

Mail Stop Ex Parte Reexam
ATTN: Central Reexamination Unit
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

By FAX to:

(571) 273-9900
Central Reexamination Unit

By hand to:

Customer Service Window
Randolph Building
401 Dulany St.
Alexandria, VA 22314

By EFS-Web:

Registered users of EFS-Web may alternatively submit such correspondence via the electronic filing system EFS-Web, at

https://sportal.uspto.gov/authenticate/authenticateuserlocalepf.html

EFS-Web offers the benefit of quick submission to the particular area of the Office that needs to act on the correspondence. Also, EFS-Web submissions are "soft scanned" (i.e., electronically uploaded) directly into the official file for the reexamination proceeding, which offers parties the opportunity to review the content of their submissions after the "soft scanning" process is complete.

Any inquiry concerning this communication or earlier communications from the Reexamination Legal Advisor or Examiner, or as to the status of this proceeding, should be directed to the Central Reexamination Unit at telephone number (571) 272-7705.

/Alexander J Kosowski/

Primary Examiner, Art Unit 3992

Electronic Patent Application Fee Transmittal

Application Number:	90010416
Filing Date:	17-Feb-2009
Title of Invention:	Point-to-Point Internet Protocol
First Named Inventor/Applicant Name:	6108704
Filer:	Michael Raymond Casey
Attorney Docket Number:	2655-0188

Filed as Large Entity

ex parte reexam Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Petition fee- 37 CFR 1.17(g) (Group II)	1463	1	200	200

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
		Total in USD ($)		**200**

Electronic Acknowledgement Receipt

EFS ID:	6284307
Application Number:	90010416
International Application Number:	
Confirmation Number:	1061
Title of Invention:	Point-to-Point Internet Protocol
First Named Inventor/Applicant Name:	6108704
Customer Number:	42624
Filer:	Michael Raymond Casey
Filer Authorized By:	
Attorney Docket Number:	2655-0188
Receipt Date:	19-OCT-2009
Filing Date:	17-FEB-2009
Time Stamp:	13:50:02
Application Type:	Reexam (Third Party)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$200
RAM confirmation Number	52
Deposit Account	501860
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Reexam Request for Extension of Time	90010416_EOT_Request.pdf	382840 94dfe5a4493abf9c276d7038ee1d83a927ae9560	no	3
Warnings:					
Information:					
2	Reexam Certificate of Service	90010416_COS.pdf	52350 99c977a6b9c66dc7d5ddf3ae97637dd80adf8bc8	no	1
Warnings:					
Information:					
3	Fee Worksheet (PTO-875)	fee-info.pdf	29573 badfb57da1af9a8a395bdd55e7573f23a4721f2f	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	464763		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

<u>New Applications Under 35 U.S.C. 111</u>
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

MAILED
OCT 26 2009
CENTRAL REEXAMINATION UNIT

DAVIDSON BERQUIST JACKSON & GROWDEY LLP 4300 WILSON BLVD., 7TH FLOOR ARLINGTON VA 22203	:	(For Patent Owner)
BLAKELY SOKOLOFF TAYLOR & ZAFMAN LLP 1270 OAKMEAD PARKWAY SUNNYVALE, CA 94085-7070	:	(For Third-Party Requester)
In re HUTTON et al. Reexamination Proceeding Control No. 90/010,416 Request Deposited: February 17, 2009 For: U.S. Patent No. 6,108,704	:	DECISION GRANTING PETITION FOR EXTENSTION OF TIME [37 CFR 1.550(c)]

This is a decision on the October 8, 2009, "REQUEST FOR EXTENSION OF TIME PURSUANT TO 37 C.F.R §1.550(c)" requesting that the time to submit a Patent Owner response be extended one month.

The petition is before the Director of the Central Reexamination Unit for consideration.

The petition is **granted** and a one-month extension of time is granted for the reasons set forth below.

REVIEW OF RELEVANT FACTS

1. U.S. Patent 6,108,704 issued to Hutton *et alia* on August 22, 2000.

2. On February 17, 2009 a third party requester requested ex parte reexamination of US Patent No. 6,108,704 which is identified under control no. 90/010,416.

3. The Order was granted for reexamination on March 11, 2009.

4. A First Office action was issued on August 27, 2009 setting a two-month period for response.

5. A petition for extension of time under 37 CFR 1.550(c) was filed October 19, 2009 requesting a one month extension.

DECISION

The Patent Owner requests an extension of time in which to file a response to the outstanding Office action. The present petition for extension of time was timely filed on October 8, 2009 together with the petition fee required by 37 CFR 1.515(c).

37 CFR 1.550 (c) states:

> (c) The time for taking any action by a patent owner in an ex parte reexamination proceeding will be extended only for sufficient cause and for a reasonable time specified. Any request for such extension must be filed on or before the day on which action by the patent owner is due, but in no case will the mere filing of a request effect any extension. Any request for such extension must be accompanied by the petition fee set forth in § 1.17(g). See § 1.304(a) for extensions of time for filing a notice of appeal to the U.S. Court of Appeals for the Federal Circuit or for commencing a civil action.

Addressing the requirement of 37 CFR 1.550 (c) to make a showing of' "sufficient cause" to grant an extension of time request, MPEP 2265 states, in pertinent part:

> Evaluation of whether sufficient cause has been shown for an extension must be made in the context of providing the patent owner with a fair opportunity to present an argument against any attack on the patent, and the requirement of the statute (35 U.S.C. 305) that the proceedings be conducted with special dispatch ....
>
> Any request for an extension of time in a reexamination proceeding must fully state the reasons therefor ....
>
> The reasons stated in the request will be evaluated by the CRU Director, and the requests will be favorably considered where there is a factual accounting of reasonably diligent behavior by all those responsible for preparing a response within the statutory time period.

Patent Owner's Showing of Sufficient Cause to Grant an Extension of Time

The request notes what steps Owner has taken to date in preparation of a response to the Office action. Further, the request outlines why, in spite of the actions taken thus far, the requested additional time is believed necessary.

Analysis and Findings

On balance it is considered that the petition explains the "sufficient cause" for an extension of time. It is clear Patent Owner requires some additional time to prepare a response to the outstanding Office action. See pages 2-3 of the petition for details. An extension of time of one month is considered sufficient.

Patent Owner should expect that future requests for extensions will not be granted absent strong and compelling reasons that establish the existence of an extraordinary situation necessitating the additional time.

CONCLUSION

1. Petitioner's request is **granted**. The time for filing a response to the outstanding Office action is extended for one month and is due on or before November 27, 2009.

2. **All** correspondence relating to this *ex parte* reexamination proceeding should be directed:

By EFS: Registered users may submit via the electronic filing system EFS-Web, at **https://sportal.uspto.gov/authenticate/authenticateuserlocalepf.html**.

By Mail to: Mail Stop *Ex Parte* Reexam
Central Reexamination Unit
Commissioner for Patents
United States Patent & Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

By FAX to: (571) 273-9900
Central Reexamination Unit

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Randolph Building
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For EFS-Web transmissions, 37 CFR 1.8(a)(1)(i) (C) and (ii) states that correspondence (except for a request for reexamination and a corrected or replacement request for reexamination) will be considered timely filed if (a) it is transmitted via the Office's electronic filing system in accordance with 37 CFR 1.6(a)(4), and (b) includes a certificate of transmission for each piece of correspondence stating the date of transmission, which is prior to the expiration of the set period of time in the Office action.

3. Telephone inquiries related to this decision should be directed to Eric Keasel, at (571) 272-4929, Jessica Harrison at (571) 272-4449 or Mark Reinhart, at (571) 272-1611.

/J. Harrison/ for

Gregory Morse
Director, Central Reexamination Unit

Electronic Patent Application Fee Transmittal

Application Number:	90010416
Filing Date:	17-Feb-2009
Title of Invention:	Point-to-Point Internet Protocol
First Named Inventor/Applicant Name:	6108704
Filer:	Michael Raymond Casey
Attorney Docket Number:	2655-0188

Filed as Large Entity

ex parte reexam Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Petition fee- 37 CFR 1.17(g) (Group II)	1463	1	200	200

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
		Total in USD ($)		**200**

Electronic Acknowledgement Receipt

EFS ID:	6503705
Application Number:	90010416
International Application Number:	
Confirmation Number:	1061
Title of Invention:	Point-to-Point Internet Protocol
First Named Inventor/Applicant Name:	6108704
Customer Number:	42624
Filer:	Michael Raymond Casey
Filer Authorized By:	
Attorney Docket Number:	2655-0188
Receipt Date:	23-NOV-2009
Filing Date:	17-FEB-2009
Time Stamp:	12:04:32
Application Type:	Reexam (Third Party)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$200
RAM confirmation Number	8169
Deposit Account	501860
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Reexam Request for Extension of Time	20091123_EOT_request.pdf	652300 a738821d2dd1ec62f6cb703bc394ef6564b6666b	no	7
Warnings:					
Information:					
2	Reexam Certificate of Service	20091123_COS.pdf	53579 3d48b703ddeebe5e1ad7e0fb6475fc2d4b004358	no	1
Warnings:					
Information:					
3	Fee Worksheet (PTO-875)	fee-info.pdf	29576 84f06dd76e04ef0733c8cee86391a3b9f5caea51	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	735455		

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
90/010,416	02/17/2009	6108704	2655-0188	1061

42624 7590 11/25/2009

DAVIDSON BERQUIST JACKSON & GOWDEY LLP
4300 WILSON BLVD., 7TH FLOOR
ARLINGTON, VA 22203

EXAMINER	

ART UNIT	PAPER NUMBER

DATE MAILED: 11/25/2009

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

UNITED STATES PATENT AND TRADEMARK OFFICE

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THIRD PARTY REQUESTER'S CORRESPONDENCE ADDRESS
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1279 Oakmead Parkway
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Date:
MAILED
NOV 25 2009
CENTRAL REEXAMINATION UNIT

EX PARTE REEXAMINATION COMMUNICATION TRANSMITTAL FORM

REEXAMINATION CONTROL NO. : 90010416
PATENT NO. : 6108704
ART UNIT : 3992

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above identified ex parte reexamination proceeding (37 CFR 1.550(f)).

Where this copy is supplied after the reply by requester, 37 CFR 1.535, or the time for filing a reply has passed, no submission on behalf of the ex parte reexamination requester will be acknowledged or considered (37 CFR 1.550(g)).

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Michael R Casey
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(For Patent Owner

MAILED

NOV 25 2009

CENTRAL REEXAMINATION UNIT

BLAKELY SOKOLOFF TAYLOR
& ZAFMAN LLP
1279 OAKMEAD PARKWAY
SUNNYVALE, CA 94085-4040
(For Third Party Requester)

In re: Hutton *et alia*
Ex Parte Reexamination Proceeding
Control No. 90/010,416
Deposited: 17 February 2009
For: US Patent No. 6,108,704

DECISION
DISMISSING
PETITION FOR EXTENSION
OF TIME
37 CFR § 1.550(c) & 1.181

This is a decision on the 23 November 2009, "Supplemental Request for Extension of Time in a Re-Examination" filed under 37 CFR § 1.550(c) requesting that the time for responding to the non-final Office action dated 27 August 2009, be further extended by one (1) week. The petition was filed with the required certificate of service and petition fee. The petition was timely filed.

The petition is before the Director of the Central Reexamination Unit for consideration.

The petition is dismissed for the reasons set forth below.

DISCUSSION

The Patent Owner requests the period of time be further extended in which to file a response to non-final Office action dated 27 August 2009 which set a two (2) month period for response thereto. A first petition for extension of time was granted extending the response period by one month in the decision dated 26 October 2009. The subsequent petition was timely filed with the required certificate of service and petition fee pursuant to 37 CFR §§ 1.550(c) and 1.17(g). Second requests for extension of time will only be granted in exception circumstances.

The petition for extension of time dated 23 November 2009 is dismissed.

37 CFR § 1.550 (c) states:

(c) The time for taking any action by a patent owner in an *ex parte* reexamination proceeding will be extended only for sufficient cause and for a reasonable time specified. Any request for such extension must be filed on or before the day on which action by the patent owner is due, but in no case will the mere filing of a request effect any extension. Any request for such extension must be accompanied by the petition fee set forth in § 1.17(g). See § 1.304(a) for extensions of time for filing a notice of appeal to the U.S. Court of Appeals for the Federal Circuit or for commencing a civil action. (emphasis added)

MPEP § 2265 Extension of Time (in-part)

...

Ex parte prosecution will be conducted by initially setting either a 1-month or a 2-month shortened period for response, see MPEP § 2263. The patent owner also will be given a 2-month period after the order for reexamination to file a statement >(by statute (35 U.S.C. § 304), this period cannot be less than 2-months, even in a proceeding where the patent is being litigated). See 37 CFR § 1.530(b). First requests for extensions of these statutory time periods will be granted for sufficient cause, and for a reasonable time specified — usually 1 month. The reasons stated in the request will be evaluated by the CRU or TC Director, and the requests will be favorably considered where there is a factual accounting of reasonably diligent behavior by all those responsible for preparing a response within the statutory time period. Second or subsequent requests for extensions of time or requests for more than 1 month will be granted only in extraordinary situations.

...

ANALYSIS AND FINDINGS

The patent owner's representative petitions to extend the period for response by adding thirty (30) days to the period for response. The decision to extend the period for response is evaluated based upon a showing of "sufficient cause." There is always the consideration to balance the need for the patent owner to have a fair opportunity to respond to the Office action between the need for special dispatch.

The patent owner timely submitted a first petition for extension which was granted on 26 October 2009. This first extension of time granted one additional month for which the patent owner to respond to the outstanding Office action. Second or subsequent requests for extensions of time or requests for more than 1 month will be granted only in extraordinary situations. The factual accounting presented by the petitioner does not meet the level of extraordinary circumstances.

The petition request to extend the response time is hereby dismissed.

CONCLUSION

1. The patent owner's petition for extension of time is hereby **dismissed.**

2. The time to respond continues to run.

3. Response is due on **27 November 2009.**

4. Response and/or submissions to the Office should be addressed as follows:

By Mail to: Mail Stop *Ex Parte* Reexam
Central Reexamination Unit
Commissioner for Patents
United States Patent & Trademark Office
P. O. Box 1450
Alexandria, VA 22313-1450

By Fax to: (571) 273-9900
Central Reexamination Unit

By Hand: Customer Service Window
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401 Dulany Street
Alexandria, VA 22314

By EFS: Registered users of EFS-Web may alternatively submit such correspondence via the electronic filing system EFS-Web, at https://sportal.uspto.gov/authenticate/authenticateuserlocalepf.html. EFS-Web offers the benefit of quick submission to the particular area of the Office that needs to act on the correspondence. Also, EFS-Web submissions are "soft scanned" (i.e., electronically uploaded) directly into the official file for the reexamination proceeding, which offers parties the opportunity to review the content of their submissions after the "soft scanning" process is complete.

5. Telephone inquiries with regard to this decision should be directed to Mark Reinhart, at (571) 272-1611, in the event that Mark Reinhart is unavailable Eric Keasel at (571) 272-4929, or Jessica Harrison at (571) 272-4449; all are Supervisory Patent Examiners in the Central Reexamination Unit, Art Unit 3992 may also be contacted..

/Mark Reinhart/
for

Gregory Morse
Director,
Central Reexamination Unit 3999

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT APPLICATION OF:

Net2Phone, Inc. (Patent No. 6,108,704)

Control No.: 90/010,416

Issue Date: August 22, 2000

Title: **POINT-TO-POINT INTERNET PROTOCOL**

Attorney Docket: 2655-0188

Group Art Unit: 3992

Examiner: KOSOWSKI, Alexander

Date: November 27, 2009

Confirmation No.: 1061

RESPONSE TO NON-FINAL REJECTION IN A RE-EXAMINATION

Hon. Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Office Action dated August 27, 2009 (and having had the deadline for responding extended one month), the Assignee hereby submits:

Claim Amendments beginning on page 2 of this paper; and

Remarks/Arguments beginning on page 6 of this paper.

Re-Examination of Patent No. 6,108,704
Control No.: 90/010,416
Filed: February 24, 2009
Reply to Office Action of August 27, 2009

AMENDMENTS TO THE CLAIMS

Please amend the claims in re-examination as follows:

10. (Canceled)

11. (Amended) <u>In a computer system, a method for establishing a point-to-point communication link from a caller process to a callee process over a computer network, the caller process having a user interface and being operatively connectable to the callee process and a server over the computer network, the method comprising the steps of:</u>

<u>A. providing a user interface element representing a first communication line;</u>

<u>B. providing a user interface element representing a first callee process; and</u>

<u>C. establishing a point-to-point communication link from the caller process to the first callee process, in response to a user associating the element representing the first callee process with the element representing the first communication line,</u> [The method of claim 10] wherein step C further comprises the steps of:

c.1 querying the server as to the on-line status of the first callee [process] process; and

c.2 receiving a network protocol address of the first callee process over the computer network from the server.

12. (Amended) The method of claim [10] <u>11</u> further comprising the step of:

D. providing an element representing a second communication line.

14. (Amended) The method of claim [10] <u>11</u> further comprising the steps of:

D. providing a user interface element representing a second callee process; and

E. establishing a conference point-to-point communication link between the caller process and the first and second callee process, in response to the user associating the element representing the second callee process with the element representing the first communication line.

15. (Amended) The method of claim [10] 11 further comprising the step of:

F. removing the second callee process from the conference point-to-point communication link in response to the user disassociating the element representing the second callee process from the element representing the first communication line.

16. (Amended) The method of claim [10] 11 further comprising the steps of:

D. providing a user interface element representing a communication line having a temporarily disabled status; and

E. temporarily disabling a point-to-point communication link between the caller process and the first callee process, in response to the user associating the element representing the first callee process with the element representing the communication line having a temporarily disabled status.

19. (Amended) The method of claim [10] 11 wherein the caller process further comprises a visual display and the user interface comprises a graphic user interface.

21. (Canceled)

22. (Amended) A computer program product for use with a computer system comprising:

a computer usable medium having program code embodied in the medium for establishing a point-to-point communication link from a caller process to a callee process over a computer network, the caller process having a user interface and being operatively connectable to the callee process and a server over the computer network, the medium further comprising:

program code for generating an element representing a first communication line;

program code for generating an element representing a first callee process;

program code, responsive to a user associating the element representing the first callee process with the element representing the first communication line, for establishing a point-to-point communication link from the caller process to the first callee process, [The computer program product of claim 21] wherein the program code for establishing a point-to-point communication link further comprises:

program code for querying the server as to the on-line status of the first callee process; and

program code for receiving a network protocol address of the first callee process over the computer network from the server.

23. (Amended) A computer program product of claim [21] 22 further comprising: program code for generating an element representing a second communication line.

25. (Amended) The computer program product of claim [21] 22 further comprising:

program code for generating an element representing a second callee process; and

program code means, responsive to the user associating the element representing the second callee process with the element representing the first communication line, for establishing a conference communication link between the caller process and the first and second callee process.

27. (Amended) The computer program product of claim [21] 22 further comprising:

program code for generating an element representing a communication line having a temporarily disabled status; and

program code, responsive association of the element representing the first callee process with the element representing the communication line having a temporarily disabled status, for temporarily disabling the point-to-point communication link between the caller process and the first callee process.

30. (Amended) A computer program product of claim [21] 22 wherein the computer system further comprises a visual display and the user interface comprises a graphic user interface.

REMARKS/ARGUMENTS

Favorable reconsideration of the claims currently undergoing re-examination, in view of the present amendment and in light of the following discussion, is respectfully requested.

STATUS OF THE CLAIMS AND SUPPORT FOR THE CLAIM CHANGES

Claims 1-7, 11-20 and 22-44 are pending and the subject of this re-examination. Claims 11 and 22 have been rewritten in independent form without changing their scope, thus those amendments are self supporting. Their corresponding independent claims (i.e., claims 10 and 21) have been canceled. The dependencies of claims 12, 14, 15, 16, 19, 23, 25, 27 and 30 have been amended in light of the cancelation of claims 10 and 21 to depend from new independent claims 11 and 22. In light of the changes to the dependencies, these changes are self supporting. Thus, no new matter has been added. No other claims have been amended, added or canceled herewith.

RESPONSE TO REJECTIONS

In the outstanding Office Action, five main rejections were made as follows:

1. Claims 43 and 44 were alleged to be anticipated by NetBIOS;
2. Claims 1-7 and 10-42 were alleged to be rendered obvious by NetBIOS in combination with at least one other reference;
3. Claims 43 and 44 were alleged to be anticipated by the Etherphone papers;
4. Claims 1-7 and 10-42 were alleged to be rendered obvious by the Etherphone papers in combination with at least one other reference; and
5. Claims 1-7 and 10-44 were alleged to be rendered obvious by the VocalChat References, either alone or in combination with at least one other reference.

Each of those rejections is respectfully traversed for the reasons set forth below. Reference is made throughout this response to the Declaration Of Ketan Mayer-Patel Under 37 C.F.R. 1.132 (hereinafter the "Mayer-Patel Declaration") attached hereto as Exhibit 1.

The Rejection of Claims 43 and 44 over NetBIOS

Claim 43 recites "a. program code configured to access a directory database, the database having a network protocol address for a selected plurality of processes having on-line status with respect to the computer network, the network protocol address of each respective process forwarded to the database following connection to the computer network." This limitation is not taught by the NetBIOS reference as NetBIOS does not provide dynamic addressing or on-line status. See Exhibit 1, Mayer-Patel Declaration, paragraph 21.

In rejecting claim 43, the Office Action adopts the positions of the third-party requester and states "See claim mapping chart in Exhibit M, pages 36-40, incorporated by reference." With respect to this limitation (a), the claim mapping does not allege, much less prove, that NetBIOS teaches "the network protocol address of each respective process forwarded to the database ***following connection to the computer network***." In fact, the Office Action appears to have agreed (e.g., with respect to claim 1) that the NetBIOS reference does not teach that the processes receive network protocol addresses "following connection to the computer network." The Office Action did this by rejecting the requester's arguments under 35 U.S.C. § 102 and instead adopting "claim chart mapping utilizing alternative 103 rejections" -- rejections that rely on RFC 1531 to teach dynamic addressing. See Exhibit 1, Mayer-Patel Declaration, paragraph 22.

Even assuming that the Office Action intended the rejection to be a rejection under 35 U.S.C. § 103 by combining NetBIOS with RFC 1531, the rejection would still not be proper. When alleging that one of ordinary skill in the art would have combined NetBIOS with RFC 1531, the Office Action states "it would have been obvious ... to utilize the limitations taught by RFC 1531 in the invention taught by NetBIOS ... since this would allow for automatic reuse of an address ... and since examiner notes the use of dynamic IP address assignment in a TCP/IP network are old and well known ... and are useful to eliminate the burdensome task of manually assigning IP addresses for all networked computers." The assignee respectfully submits that the conclusion drawn by the Office Action on the combinability of NetBIOS and RFC 1531 is mistaken in its conclusion on motivation. The Office Action speculates, with hindsight, as to why a person of ordinary skill might want to combine the two references, but does not acknowledge the problems that would arise in doing so, and does not provide any prior art that would indicate how the problems that dynamic addressing would bring into a NetBIOS type system could be resolved by those of ordinary skill at the time the patent was filed. See Exhibit 1, Mayer-Patel Declaration, paragraph 23. In the context of point-to-point communication, widespread use of dynamically assigned addresses does not solve NetBIOS's problems, it creates further problems. The assignee agrees that dynamically assigned addresses were known, and the patent in re-examination specifically states in that regard, "Due to the dynamic nature of temporary IP addresses of some devices accessing the Internet, point-to-point communications in realtime of voice and video have been generally difficult to attain." Col. 1, lines 53-56. See Exhibit 1, Mayer-Patel Declaration, paragraph 24.

But it is not enough to prove that the cause of a problem existed, namely the problematic use of changing addresses. The Office Action must show by citation of prior art that the problem was recognized, and that the solution for NetBIOS was either known or trivially apparent from the known art. See *Innogenetics, N.V. v. Abbott Laboratories*, 512 F.3d 1363, 1373 (Fed Cir. 2008) ("The district court was nevertheless correct that knowledge of a problem and motivation to solve it are entirely different from motivation to combine particular references to reach the particular claimed method."). If the requester of this reexamination had such prior art it would undoubtedly have been provided as part of its exhaustive reexamination request. The fact that there is none is testimony to the lack of teaching in the prior art to make the suggested combination.

The NetBIOS reference cited in the request, moreover, indicates the opposite. For example, Section 15.1.7 of the NetBIOS reference (entitled "Consistency of the NBNS Data Base") recognizes that the association between a node, a registered name and an IP address is tenuous, even in an environment that uses static IP addresses. "Even in a properly running NetBIOS scope the NBNS and its community of end-nodes may occasionally lose synchronization with respect to the true state of name registrations." To minimize the impact of this problem, the reference states, "Various approaches have been incorporated into the NetBIOS-over-TCP protocols" which it then proceeds to describe. See Exhibit 1, Mayer-Patel Declaration, paragraph 26.

However, by incorporating DHCP and adopting dynamic address allocation as used by Internet access providers, the synchronization problem would become more disruptive, not less. Dynamic addressing would have introduced a new uncertainty to the relationships among the NBNS and its community of end-nodes and a new set of obstacles to NetBIOS synchronization that ***are not addressed by the NetBIOS reference***. Consider the case of a node that is turned-off and then subsequently turned back on, or a node that has simply lost its Internet connection for some technical reason or whose DHCP lease has expired and then re-established a connection. In a dynamic addressing environment, such a node would most likely obtain a new IP address when it was turned back on that was different than the one it had when it registered its name. This change could lead to any number of node-name-IP address synchronization problems for the disclosed NetBIOS protocols. See Exhibit 1, Mayer-Patel Declaration, paragraph 27.

For example, because the NBNS does not know the node's new address, the NBNS would be unable to send to the node a Name Release Request or a Name Conflict Demand or request that the node send it a Name Status Request. Because communication from the node would be originating at a new address that was not recognized by the NBNS, a node's response to a Name Query Request (assuming it somehow knew that its name had been challenged, perhaps from before it lost network connectivity) would not be recognized. A node would also be unable to confirm its association with registered names by sending Name Refresh Request packets to the NBNS. If a session between two NetBIOS applications were cut-off, re-establishing the communication would be especially difficult where the ability of a called entity to obtain both its associated name and its associated IP address were in doubt. As a result, the Office Action has not demonstrated that a solution to the problems created by exposure of NetBIOS to DHCP and dynamic addressing has been addressed by any of the applied references.[1] See Exhibit 1, Mayer-Patel Declaration, paragraph 28.

The Office Action also has not identified anything in the cited art that suggests how a person of ordinary skill is to go about the redesign of NetBIOS and the solving of obstacles to NetBIOS operation that are created by Internet access; ***problems that were recognized and left as warnings unresolved in the NetBIOS reference.***[2] See Exhibit 1, Mayer-Patel Declaration, paragraph 29.

Merely citing to dynamic addressing, i.e., the source of those problems, is insufficient as the Supreme Court and the Federal Circuit have repeatedly made clear. See *Depuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1326 (Fed. Cir. 2009) citing *inter alia KSR Int'l Co. v Teleflex Inc.*, 550 U.S. 398 (2007) and *U.S. v Adams*, 383 U.S. 39 (1966), for the proposition that obviousness requires not only "the expectation that prior art elements are capable of being physically combined, but also that the combination would have worked for its intended purpose," and quoting *In re ICON Health & Fitness, Inc.*, 496 F.3d 1374, 1382 (Fed.

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[1] Besides dynamic addressing, Internet access would pose other challenges to a NetBIOS system. For example, because NetBIOS was designed for use on local area networks with small numbers of computers, trust among the network participants is assumed. That assumption cannot be transferred to a global Internet made up of unknown, and sometimes malevolent, entities. An implementation of NetBIOS on the public Internet would necessitate non-trivial adaptations to ensure that its services perform correctly and return accurate information. There is no discussion of security issues in the cited references. See Exhibit 2, from http://www.w3schools.com/Site/site_security.asp which instructs Microsoft Windows users whose computers access the Internet to disable NetBIOS over TCP/IP in order to solve their security problems. See Exhibit 1, Mayer-Patel Declaration, paragraph 28.

[2] The cited references go out of their way *to avoid* describing how a NetBIOS protocol might work in inter-connected network environments that that are *less complex* than the Internet and that *predate* DHCP. See Section 4.6 ("The proposed standard recognizes the need for NetBIOS operation across a set of networks interconnected by network (IP) level relays (gateways.) However, the standard assumes that this form of operation will be less frequent than on the local MAC bridged-LAN.")

Cir. 2007) as saying "[A] reference teaches away from a combination when using it in that combination would produce an inoperative result."

In view of the foregoing, a rejection of claim 43, even over the combination of NetBIOS and RFC 1531, can be compared to the rejection of a patent that claims a vehicle that travels on water where one piece of prior art shows a land vehicle and another shows water. The fact that water creates a problem for the land vehicle does not disclose that the person of ordinary skill would know how to build a vehicle capable of crossing the water. Thus, claim 43 is patentable over NetBIOS alone or over NetBIOS in combination with RFC 1531. See Exhibit 1, Mayer-Patel Declaration, paragraph 30.

NetBIOS and RFC 1531 also do not teach "a. program code configured to access a directory database…having a network protocol address for a selected plurality of processes ***having on-line status with respect to the computer network***." While NetBIOS uses name entries with "active" statuses as part of its name management process, an analysis of how that "active" status is used shows that "an active name" is not synonymous with an "on-line status with respect to the computer network." An active name simply refers to a name that has been registered and that has not yet been de-registered, independent of whether the associated computer is or is not on-line. As shown on page 447 (and reproduced below), the Node_Name entries stored with respect to a NetBIOS Name Server contain a series of fields including the "ACT" field.

```
The NAME_FLAGS field:

                                          1   1   1   1   1   1
  0   1   2   3   4   5   6   7   8   9   0   1   2   3   4   5
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| G |  ONT  |DRG|CNF|ACT|PRM|          RESERVED                 |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

The NAME_FLAGS field is defined as:

Symbol      Bit(s)   Description:

RESERVED     7-15    Reserved for future use.  Must be zero (0).
PRM             6    Permanent Name Flag.  If one (1) then entry
                     is for the permanent node name.  Flag is zero
                     (0) for all other names.
ACT             5    Active Name Flag.  All entries have this flag
                     set to one (1).
CNF             4    Conflict Flag.  If one (1) then name on this
                     node is in conflict.
DRG             3    Deregister Flag.  If one (1) then this name
                     is in the process of being deleted.
ONT           1,2    Owner Node Type:
                        00 = B node
                        01 = P node
                        10 = M node
                        11 = Reserved for future use
G               0    Group Name Flag.
                     If one (1) then the name is a GROUP NetBIOS
                     name.
                     If zero (0) then it is a UNIQUE NetBIOS name.
```

See Exhibit 1, Mayer-Patel Declaration, paragraph 31.

The ACT field is a single bit field (in bit 5) that signifies an "Active Name Flag. ***All entries have this flag set to one (1).***" (Emphasis added.) If all name entries have this flag set to one (1), then the NetBIOS name server cannot be using the Active Name Flag as a means of separately tracking whether the entity that owns the name is "active," let alone what its "on-line status" might be. See Exhibit 1, Mayer-Patel Declaration, paragraph 32.

The NetBIOS reference also does not teach that the active status of a name in the NetBIOS server is an indication of the active status of the owner of that name. To the contrary, when information about whether the owner of a name is "active" may be relevant, for example when a new entity seeks to register a name that has already been registered in the NetBIOS name server, the NetBIOS reference describes an elaborate set of interactions used to test whether the existing owner of the registered name is active or inactive. It does not rely on the fact that the name is active in the NetBIOS name server (See Section 15.2.2.2 and 15.2.2.3 entitled "Existing Name and Owner is Inactive"). See Exhibit 1, Mayer-Patel Declaration, paragraph 33.

The NetBIOS reference also does not teach that an acquired IP address can be reasonably relied upon by a requesting end-node to confirm the "on-line status" of an end-node associated with a sought name. The NetBIOS reference describes at least two different scenarios where a second end-node sends a ***rejection response*** to the first end-node ***notwithstanding the fact that a second end-node is connected*** to the computer network and active with respect to the sought name. See Section 16.1.1 ("There exists a NetBIOS LISTEN compatible with the incoming call, but there are inadequate resources to permit establishment of a session...The called name does, in fact, exist on the called node, but there is no pending NetBIOS LISTEN compatible with the incoming call."). No distinction is made in the reference between the rejection response in these cases and the rejection response in cases where the called name does not exist on the called end-node. *Id.*, ("In all but the first case, a rejection response is sent back over the TCP connection to the caller."). See Exhibit 1, Mayer-Patel Declaration, paragraph 34.

Thus, the limitation "program code configured to access a directory database, the database having a network protocol address for a selected plurality of processes having on-line status with respect to the computer network, the network protocol address of each respective process forwarded to the database following connection to the computer network" of claim 43 is not taught by the NetBIOS reference alone or in combination with RFC 1531, and the rejection of claim 43 should be withdrawn. See Exhibit 1, Mayer-Patel Declaration, paragraph 35.

Claim 44 recites "***following connection of the first process to the computer network*** forwarding to the address server a network protocol address at which the first process is connected to the computer network." As was discussed above with respect to the recitation of "the network protocol address of each respective process forwarded to the database following connection to the computer network" in claim 43, NetBIOS does not teach the claimed dynamic address assignment. Moreover, it would not have been obvious to combine NetBIOS and RFC 1531 for the reasons set forth above with respect to claim 43. See Exhibit 1, Mayer-Patel Declaration, paragraph 36.

Claim 44 also recites "querying the address server as to ***whether the second process is connected to the computer network***." As was discussed above with respect to the recitation of "processes having on-line status with respect to the computer network" in claim 43, NetBIOS does not teach that an active name in NetBIOS is synonymous with "whether the second process is connected to the computer network." An active name simply refers to a name that has been registered and that has not yet been de-registered, independent of whether the associated computer is or is not connected to the computer network. Thus, claim 44 is patentable over both NetBIOS alone and the combination of NetBIOS and RFC 1531. See Exhibit 1, Mayer-Patel Declaration, paragraph 37.

<u>Claims 1-7 and 32-42</u>

Claim 1 recites "program code for transmitting to the server ***a network protocol address received by the first process following connection to the computer network***." Claim 1 further recites "program code for receiving a network protocol address of the second process from the server, ***when the second process is connected to the computer network***." As was discussed above with respect to the recitation of "the network protocol address of each respective process forwarded to the database following connection to the computer network" in claim 43, NetBIOS does not teach this dynamic address assignment. Further, it would not have been obvious to combine NetBIOS and RFC 1531 for the reasons set forth above with respect to claim 43. See Exhibit 1, Mayer-Patel Declaration, paragraph 38.

Claim 1 also recites "program code for transmitting, to the server, a query as to ***whether the second process is connected to the computer network***." As was discussed above with respect to the recitation of "processes having on-line status with respect to the computer network" in claim 43, NetBIOS does not teach that an active name in NetBIOS is synonymous with "whether the second process is connected to the computer network." An active name simply refers to a name that has been registered and that has not yet been de-registered, independent of whether the associated computer is or is not connected to the computer network. Thus, claim 1 patentable over the combination of NetBIOS and RFC 1531. See Exhibit 1, Mayer-Patel Declaration, paragraph 39.

Claim 2 recites "each network protocol address stored in the memory ***following connection of a respective process to the computer network***." As was discussed above with respect to the recitation of "the network protocol address of each respective process forwarded to the database following connection to the computer network" in claim 43, NetBIOS does not teach this dynamic address assignment. Further, it would not have been obvious to combine NetBIOS and RFC 1531 for the reasons set forth above with respect to claim 43. See Exhibit 1, Mayer-Patel Declaration, paragraph 40.

Claim 2 also recites "means... for determining the ***on-line status of the second process*** and for ***transmitting a network protocol address of the second process*** to the first process ***in response to a positive determination of the on-line status of the second process***." As was discussed above with respect to the recitation of "processes having on-line status with respect to the computer network" in claim 43, NetBIOS does not teach that an active name in NetBIOS is synonymous with "an on-line status of the second process." An active name simply refers to a name that has been registered and that has not yet been de-registered, independent of whether the associated computer is or is not connected to the computer network. Thus, claim 2 and its dependent claim 3 are patentable over the combination of NetBIOS and RFC 1531. See Exhibit 1, Mayer-Patel Declaration, paragraph 41.

Claim 4 recites "each of the network protocol addresses received following connection of the respective process to the computer network." As was discussed above with respect to the recitation of "the network protocol address of each respective process forwarded to the database following connection to the computer network" in claim 43, NetBIOS does not teach this dynamic address assignment. Further, it would not have been obvious to combine NetBIOS and

RFC 1531 for the reasons set forth above with respect to claim 43. See Exhibit 1, Mayer-Patel Declaration, paragraph 42.

Claim 4 also recites "receiving and storing into a computer memory a respective network protocol address for selected of a plurality of processes that have an ***on-line status*** with respect to the computer network." Claim 4 further recites "determining the ***on-line status*** of the second process." As was discussed above with respect to the recitation of "processes having on-line status with respect to the computer network" in claim 43, NetBIOS does not teach that an active name in NetBIOS is synonymous with "an on-line status" of a process. An active name simply refers to a name that has been registered and that has not yet been de-registered, independent of whether the associated computer is or is not connected to the computer network. Thus, claim 4 and its dependent claims 5-7 are patentable over the combination of NetBIOS and RFC 1531. See Exhibit 1, Mayer-Patel Declaration, paragraph 43.

Claim 32 recites "the Internet Protocol address ***added to the list following connection of the process to the computer network***." As was discussed above with respect to the recitation of "the network protocol address of each respective process forwarded to the database following connection to the computer network" in claim 43, NetBIOS does not teach this dynamic address assignment. Further, it would not have been obvious to combine NetBIOS and RFC 1531 for the reasons set forth above with respect to claim 43. See Exhibit 1, Mayer-Patel Declaration, paragraph 44.

Claim 32 also recites "an Internet accessible list having a plurality of selected entries, each entry comprising an identifier and a corresponding Internet protocol address of ***a process currently connected to the Internet***." As was discussed above with respect to the recitation of "processes having on-line status with respect to the computer network" in claim 43, NetBIOS does not teach that an active name in NetBIOS is synonymous with "a process currently [being] connected to the Internet." An active name simply refers to a name that has been registered and that has not yet been de-registered, independent of whether the associated computer is or is not connected to the Internet. Thus, claim 32 is patentable over the combination of NetBIOS and RFC 1531. See Exhibit 1, Mayer-Patel Declaration, paragraph 45.

Claim 33 recites "***the network protocol address*** of the corresponding process ***assigned to the process upon connection to the computer network***." As was discussed above with respect to the recitation of "the network protocol address of each respective process forwarded to the database following connection to the computer network" in claim 43, NetBIOS does not teach this dynamic address assignment. Further, it would not have been obvious to combine NetBIOS and RFC 1531 for the reasons set forth above with respect to claim 43. See Exhibit 1, Mayer-Patel Declaration, paragraph 46.

Claim 33 also recites "selected ... entries comprising **a network protocol address** and a corresponding identifier ***of a process connected to the computer network***." As was discussed above with respect to the recitation of "processes having on-line status with respect to the computer network" in claim 43, NetBIOS does not teach that an active name in NetBIOS is synonymous with "a process [being] connected to the computer network." An active name simply refers to a name that has been registered and that has not yet been de-registered, independent of whether the associated computer is or is not connected to the computer network. Thus, claim 33 and its dependent claims 34-37 are patentable over the combination of NetBIOS and RFC 1531. See Exhibit 1, Mayer-Patel Declaration, paragraph 47.

Claim 38 recites "***the network protocol address*** of the corresponding process ***assigned to the process upon connection to the computer network***." As was discussed above with respect to the recitation of "the network protocol address of each respective process forwarded to the database following connection to the computer network" in claim 43, NetBIOS does not teach this dynamic address assignment. Further, it would not have been obvious to combine NetBIOS and RFC 1531 for the reasons set forth above with respect to claim 43. See Exhibit 1, Mayer-Patel Declaration, paragraph 48.

Claim 38 also recites "selected ... entries comprising a network protocol address and a corresponding identifier of ***a process connected to the computer network***." As was discussed above with respect to the recitation of "processes having on-line status with respect to the computer network" in claim 43, NetBIOS does not teach that an active name in NetBIOS is synonymous with "a process [being] connected to the computer network." An active name simply refers to a name that has been registered and that has not yet been de-registered, independent of whether the associated computer is or is not connected to the computer network. Thus, claim 38 and its dependent claims 39-42 are patentable over the combination of NetBIOS and RFC 1531. See Exhibit 1, Mayer-Patel Declaration, paragraph 49.

Claims 10-31

Claims 10-31 are rejected under 35 U.S.C. § 103(a) as being obvious over NetBIOS in view of Pinard, either alone or in combination with VocalChat User's Guide. That ground for rejection is respectfully traversed.

Amended claim 11 recites "the caller process having a user interface and being operatively connectable to the callee process" and "establishing a point-to-point communication link ***from the caller process*** to the first callee process." When taken together, it is clear that the Office Action has not alleged, much less proven, that the caller process, having a user interface, establishes a point-to-point communication link with a first callee process. The Exhibit M of the Request for Re-examination (the "Request") states that "Pinard discloses that a point-to-point communication link is established in response to a user associating an element representing ***the first callee process*** with the element representing a first communication line." However, as shown in Figure 1, Pinard discloses that conventional telephones connected to a telephony server via telephony interface circuits make calls to other conventional telephones. Those telephones are not caller and callee processes. In fact, with respect to the limitation "providing a user interface element representing a first callee process," Exhibit M identifies, instead of a callee process, two people, Mary and John. Clearly neither is a callee ***process***. See Exhibit 1, Mayer-Patel Declaration, paragraph 51.

Exhibit M further states that "Applications which utilize NetBIOS application services ***inherently*** include 'user interfaces.'" This assertion is disputed. Page 356 of NetBIOS states "Protocols supporting NetBIOS services have been constructed on diverse protocol and ***hardware*** foundations." Thus, the NetBIOS applications could be running on a computer system (e.g., an embedded system) such that there are no user interfaces at all. In fact, the example provided in Exhibit M is disingenuous. Exhibit M states that "NetBIOS provides a vendor independent interface for the IBM Personal Computer (PC) and compatible systems." The "interface" discussed in that sentence is a software ***communications*** interface, between NetBIOS service elements and NetBIOS-compatible applications, not a ***user*** interface. Moreover, the reference to "IBM Personal Computer (PC) and compatible systems" is a reference to the hardware, not the software with user interfaces that is running on the hardware. Exhibit M itself admits the deficiency in the inherency argument when it states "it is ***expected*** that on computers operating under the PC-DOS and MS-DOS operating systems that the existing NetBIOS interface will be preserved." This says nothing about what processes with user interfaces can participate in the claimed point-to-point communications. See Exhibit 1, Mayer-Patel Declaration, paragraph 52.

With respect to the establishing step, Exhibit M does not even assert that one of the processes running on one of the DOS-style computers is the caller process. This is because neither the phone application not the device agent are part of the point-to-point communication -- the telephones are. Thus, this limitation is not met. See Exhibit 1, Mayer-Patel Declaration, paragraph 53.

In addition, the Office Action has not established that one of ordinary skill in the art would have made the proposed combination. The Office Action alleges that "it would have been obvious … to utilize the user-interface elements and interaction taught by Pinard in the invention taught by NetBIOS since Pinard teaches that the invention can be used with any system in which a personal computer in conjunction with a server operates … since NetBIOS teaches that it can be implemented using different operating systems … and since examiner notes that both

NetBIOS and Pinard relate to communications between at least two users implemented in a computerized environment." However, Pinard already discloses a personal computer 1 interacting with a server 5 without any indication that there is something missing from Pinard. Thus, without an indication that Pinard was somehow deficient, one of ordinary skill in the art would not have been motivated to include NetBIOS with Pinard. Accordingly, amended claim 11 and its dependent claims 12-20 are not rendered obvious by the combination of NetBIOS and Pinard. See Exhibit 1, Mayer-Patel Declaration, paragraph 54.

Amended claim 22, like amended claim 11, recites "***the caller process having a user interface*** and being operatively connectable to the callee process" and "establishing a ***point-to-point communication link from the caller process*** to the first callee process." As was set forth for the patentability of amended claim 11 above, that combination of elements is not taught by the applied combination of references. Thus, amended claim 22 and its dependent claims 23-31 are patentable over the applied combination of references. See Exhibit 1, Mayer-Patel Declaration, paragraph 55.

The rejection of claims 43 and 44 as anticipated by the Etherphone papers

Claims 43 and 44 have been rejected under 35 U.S.C. § 102(b) as anticipated by the Etherphone papers. Those grounds for rejection are respectfully traversed.

Claim 43 recites "a. program code configured to access a directory database, the database having a network protocol address for a selected plurality of processes having on-line status with respect to the computer network, the network protocol address of each respective process forwarded to the database following connection to the computer network." Exhibit N of the Request asserts that this limitation is taught by the system directory database of local Xerox employees and cites Zellweger, page 4. However, in the paragraph just prior to the section cited by Exhibit N, Zellweger states "Figure 3 shows an Etherphone control window, called Finch, and a personal telephone directory window." The caption for Figure 3 further explains that "the lower window [of Figure 3] shows a portion of a personal telephone directory, which is a set of speed-dialing buttons that can be created easily from an ordinary text file." See Exhibit 1, Mayer-Patel Declaration, paragraph 58.

Figure 3 does not show that the cited database includes the claimed "network protocol address for a selected plurality of processes having on-line status with respect to the computer network" -- rather it simply appears to include phone numbers for the various entries, including phone numbers outside of the Etherphone system. Thus, this limitation is not taught by the Etherphone references, and the rejection of claim 43 should be withdrawn. See Exhibit 1, Mayer-Patel Declaration, paragraph 59.

The Office Action also has not shown that the Etherphone papers disclose "the network protocol address of each respective process forwarded to the database following connection to the computer network" as the Office Action has not shown how such a dynamic addressing technique is taught by the Etherphone papers. Thus, this limitation is not anticipated by the Etherphone papers as well. See Exhibit 1, Mayer-Patel Declaration, paragraph 60.

As described above, claim 43 recites "a selected plurality of processes having on-line status with respect to the computer network." The Request and Exhibit N do not show how the Etherphone papers teach this recitation limitation. In fact, "on-line" status is not mentioned in any of the corresponding support sections for claim 43 in either the Request or Exhibit N. Further, the Etherphone papers do not teach an association between users' on-line status and the maintaining of a network address. To the contrary, the Etherphone system appears to always associate a user with a location, ***whether or not the user is currently at that location,*** and directs telephone calls for that user to that location ***without regard to the users' on-line status***. So, for example, while the Request points out that logging in to a workstation tells the Etherphone system—through unspecified mechanisms—where calls should be directed (citing Swinehart 1, page 2 as stating "Calls are to individuals, not locations...Logging in tells the telephone system where Karmen is."), the Request neglects to point out that ***logging out also tells the telephone system where calls should be directed.*** ("Since Karmen has signed off from her workstation, the call rings immediately at an attendant's workstation..." Swinehart page 3). See Exhibit 1, Mayer-Patel Declaration, paragraph 61.

Even assuming that the Office Action intended the rejection of claim 43 to be an obviousness rejection, claim 43 still is patentable over the Etherphone papers in view of Vin and RFC 1531. The Office Action alleges, with respect to claim 1, that it would have been obvious ... to utilize dynamically assigned IP address from Internet access servers as taught by Vin and RFC 1531 since Etherphone was intended for use in multiple networks and communication protocols (Terry, page 3), ... [and] since dynamic allocation of IP addresses allows for automatic reuse of an address that is no longer needed by the host to which it was assigned ... and since examiner notes the use of dynamic IP address assignment in a TCP/IP network are old and well known in the art, and are useful to eliminate the burdensome task of manually assigning IP addresses for all networked components." See Exhibit 1, Mayer-Patel Declaration, paragraph 62.

Terry, page 3, however, does not indicate under what circumstances the "multiple networks and communications protocols" would be used. The full paragraph that appears to be referenced by the Office Action states:

> The Etherphone system is intended for use in a locally distributed computing environment containing multiple workstations and programming environments, multiple networks and communication protocols, and perhaps even multiple telephone transmission and switching choices. The system is intended to be extensible in that introducing new applications, network services, workstations, networks, and other components is possible.

See Exhibit 1, Mayer-Patel Declaration, paragraph 63.

Thus, it is probable that the "multiple networks and communications protocols" refers to uses of the workstations and not the Etherphones. Similarly, Vin does not disclose how/where the IP address of Figure 5 is obtained. In addition, Figure 5 shows that the IP address is below a "datagram multicast" layer, so there is no evidence that one of ordinary skill in the art would have been motivated to use -- let alone know how to adapt -- the techniques of a multicast system when implementing a "point-to-point communication link between the first and second processing units through the Internet." See Exhibit 1, Mayer-Patel Declaration, paragraph 64.

Furthermore, the Office Action has not shown that one of ordinary skill in the art would have been motivated to combine the Etherphone papers with Vin and RFC 1531 without additional modifications to the combination -- modifications which are not specified in the Office Action. For example, the Office Action has not identified that one of ordinary skill in the art would have been motivated to combine the Etherphone papers with RFC 1531 in light of the use of "leases" on network addresses within the RFC 1531 framework. As described in section 3.6 "If the lease expires before the host can contact a DHCP server, the host must immediately discontinue use of the previous network address and may inform local users of the problem." Similarly, section 4.4.4 of RFC 1531 states "If the lease expires before the client receives a DHCPACK, the client moves to INIT state, MUST immediately stop any other network processing and requests network initialization parameters as if the client were uninitialized. ... If the client is given a new network address, it MUST NOT continue using the previous network address and SHOULD notify the local users of the problem." However, if the system of the Etherphone papers and Vin is using "datagram multicast," how is the system supposed to deal with the loss of the address? Other processes that were communicating with the process that lost its lease would now begin sending the packets to the wrong destination. Moreover, by having to rely on another server that can go down such that a lease cannot be renewed and the computer has to stop using its network address, the combination is less robust than a system using static address assignment. Thus, the Office Action has not shown that one of ordinary skill in the art would have been motivated to combine the Etherphone papers with Vin and RFC 1531. See Exhibit 1, Mayer-Patel Declaration, paragraph 65.

Thus, claim 43 is neither anticipated by the Etherphone papers nor rendered obvious by the Etherphone papers in combination with Vin and RFC 1531. See Exhibit 1, Mayer-Patel Declaration, paragraph 66.

Claim 44 recites "following connection of the first process to the computer network forwarding to the address server a network protocol address at which the first process is connected to the computer network." As discussed above with respect to claim 43, the Office Action has not shown how such a dynamic addressing technique is taught by the Etherphone papers or rendered obvious by the combination of the Etherphone papers and Vin and RFC 1531. See Exhibit 1, Mayer-Patel Declaration, paragraph 67.

Claim 44 also recites "querying the address server as to whether the second process is connected to the computer network." Exhibit N alleges that "conversations are established between two or more parties (Etherphones, servers, and so on) by performing remote procedure calls to the Voice Control Server." It then alleges that "when a first user at a first Etherphone (a first 'process') calls a second user at a second Etherphone (a second 'process'), the first Etherphone ***transmits a query*** in the form of a remote procedure call to determine the location of the second Etherphone." This allegation is made without citation to any portion of the Etherphone papers -- because the conclusion is not supported. See Exhibit 1, Mayer-Patel Declaration, paragraph 68.

As admitted in the Exhibit N, Swinehart states "The telephone control server manages voice switching by sending to each Etherphone or service the network addresses of the other participants. ... Thereafter, voice datagrams are transmitted directly among the participants, bypassing the control server." Neither the Exhibit N nor Swinehart discloses when this information is sent, thus there is no evidence that a query is sent to an address server (e.g., such that the network address information is returned as part of the result of the query). In fact, if the Voice Control Server were periodically sending out information to Etherphones or other services, there would be no need to "querying the address server as to whether the second process is connected to the computer network." Thus, this limitation is not inherently met by the Etherphone references, and the rejection of claim 44 should be withdrawn. See Exhibit 1, Mayer-Patel Declaration, paragraph 69.

As described above, claim 44 recites "querying the address server ***as to whether the second process is connected to the computer network***." As was discussed above with respect to claim 43, the Request and Exhibit N do not show how the Etherphone papers teach this tracking of on-line status. Thus, claim 44 is patentable over the Etherphone papers. See Exhibit 1, Mayer-Patel Declaration, paragraph 70.

<u>The rejection of claims 1-7 and 10-42 as obvious over the Etherphone papers in combination with at least one other reference</u>

Claims 1-7 and 10-42 have been rejected under 35 U.S.C. § 103(a) as obvious over the combination of the Etherphone papers in combination with (1) Vin and RFC 1531, (2) Pinard, (3) Vin, RFC 1531 and NetBIOS, and (4) Pinard and VocalChat User's Guide. Those rejections are respectfully traversed.

Claims 1, 2, 4-7 and 32-42 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the Etherphone papers in view of Vin and RFC 1531. As was discussed above with respect to claim 43, the Office Action has not shown that one of ordinary skill in the art would have been motivated to make the proposed combination of references in light of the problems associated with the use of dynamic addresses. See Exhibit 1, Mayer-Patel Declaration, paragraph 72.

Claim 1 also recites "program code for ***transmitting***, to the server, ***a query*** as to whether the second process is connected to the computer network." As was discussed above with respect to claim 44, the Office Action has not provided any evidence to support the allegation that such a query is taught by the Etherphone papers. Further, as was discussed with respect to claim 43, the Office Action has not shown that the Etherphone papers teach determining "whether the second process is connected to the computer network." Thus, claim 1 is not rendered obvious by the proposed combination of references. See Exhibit 1, Mayer-Patel Declaration, paragraph 73.

Claim 2 recites "a memory, operatively coupled to the processor, for storing a network protocol address for selected of a plurality of processes, ***each network protocol address stored in the memory following connection of a respective process to the computer network***." As was discussed above with respect to claim 43, the Office Action has not shown that one of ordinary skill in the art would have been motivated to make the proposed combination of references in light of the problems associated with the use of dynamic addresses. See Exhibit 1, Mayer-Patel Declaration, paragraph 74.

Claim 2 also recites "means, ***responsive to a query from the first process***, for determining the on-line status of the second process and for transmitting a network protocol address of the second process to the first process in response to a positive determination of the on-line status of the second process." As was discussed above with respect to claim 44, the Office Action has not provided any evidence to support the allegation that such a query is taught by the Etherphone papers. Further, as was discussed with respect to claim 43, the Office Action has not shown that the Etherphone papers teach "determining the on-line status of the second process." Thus, claim 2 and its dependent claim 3 are not rendered obvious by the proposed combination of references. See Exhibit 1, Mayer-Patel Declaration, paragraph 75.

Claim 4 recites "A. receiving and storing into a computer memory a respective network protocol address for selected of a plurality of processes that have an on-line status with respect to the computer network, ***each of the network protocol addresses received following connection of the respective process to the computer network***." As was discussed above with respect to claim 43, the Office Action has not shown that one of ordinary skill in the art would have been motivated to make the proposed combination of references in light of the problems associated with the use of dynamic addresses. See Exhibit 1, Mayer-Patel Declaration, paragraph 76.

Claim 4 also recites "B. ***receiving a query*** from the first process to determine the on-line status of the second process." As was discussed above with respect to claim 44, the Office Action has not provided any evidence to support the allegation that such a query is taught by the Etherphone papers. Further, as was discussed with respect to claim 43, the Office Action has not shown that the Etherphone papers teach "determin[ing] the on-line status of the second process." Thus, claim 4 and its dependent claim 5-7 are not rendered obvious by the proposed combination of references. See Exhibit 1, Mayer-Patel Declaration, paragraph 77.

Claim 32 recites "a. maintaining an Internet accessible list having a plurality of selected entries, each entry comprising an identifier and a corresponding Internet protocol address of a process currently connected to the Internet, ***the Internet Protocol address added to the list following connection of the process to the computer network***." As was discussed above with respect to claim 43, the Office Action has not shown that one of ordinary skill in the art would have been motivated to make the proposed combination of references in light of the problems associated with the use of dynamic addresses. Further, as was discussed with respect to claim 43, the Office Action has not shown that the Etherphone papers teach determining the on-line status of processes such that the Etherphone papers would disclose entries for processes that are "***currently connected*** to the Internet." Thus, claim 32 is patentable over the applied combination of references. See Exhibit 1, Mayer-Patel Declaration, paragraph 78.

Claim 33 recites "maintaining, in a computer memory, a network accessible compilation of entries, selected of the entries comprising a network protocol address and a corresponding identifier of a process connected to the computer network, the network protocol address of the corresponding process assigned to the process upon connection to the computer network." As was discussed above with respect to claim 43, the Office Action has not shown that one of ordinary skill in the art would have been motivated to make the proposed combination of references in light of the problems associated with the use of dynamic addresses. Further, as was discussed with respect to claim 43, the Office Action has not shown that the Etherphone papers teach determining the on-line status of processes such that the Etherphone papers would disclose entries for processes that are "***connected to*** the computer network." Thus, claim 33 and its dependent claims 34-37 are patentable over the applied combination of references. See Exhibit 1, Mayer-Patel Declaration, paragraph 79.

Claim 38 recites "program code configured to maintain, in the computer memory, a network accessible compilation of entries, selected of the entries comprising a network protocol address and a corresponding identifier of a process connected to the computer network, ***the network protocol address of the corresponding process assigned to the process upon***

connection to the computer network." As was discussed above with respect to claim 43, the Office Action has not shown that one of ordinary skill in the art would have been motivated to make the proposed combination of references in light of the problems associated with the use of dynamic addresses. Further, as was discussed with respect to claim 43, the Office Action has not shown that the Etherphone papers teach determining the on-line status of processes such that the Etherphone papers would disclose entries for processes that are "***connected to*** the computer network." Thus, claim 38 and its dependent claims 39-42 are patentable over the applied combination of references. See Exhibit 1, Mayer-Patel Declaration, paragraph 80.

Claims 10-30 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the Etherphone papers in view of Pinard, either alone or in combination with the VocalChat User's Guide. Amended claim 11 recites "the caller process having a user interface and being operatively connectable to the callee process" and "establishing a point-to-point communication link ***from the caller process*** to the first callee process." When taken together, it is clear that the Request (including Exhibit N) and Office Action have not alleged, much less proven, that the caller process, having a user interface, establishes a point-to-point communication link with a first callee process. The Request states on page 119 that "Etherphone describes establishing a point-to-point communication link between a caller process and a callee process. ... Pinard discloses that a point-to-point communication link is established in response to a user associating an element representing the first callee process with the element representing a first communication line." Neither of those assertions actually state that any of the user interface elements described in the Request establish a point-to-point communication with a callee process. In fact, Exhibit N admits that the user interface elements are on the workstation not on the Etherphones that conduct the voice communications. Page 12 of Exhibit N directly states that the "GUI features [are] presented on the workstation display." See Exhibit 1, Mayer-Patel Declaration, paragraph 81.

In addition, the Office Action has not established that one of ordinary skill in the art would have made the proposed combination. The Office Action alleges that "it would have been obvious … to utilize[e] the user-interface elements and interactions taught by Pinard in the invention taught by Etherphone since Pinard teaches that the invention can be used with any system in which a person computer in conjunction with a server operate." However, Pinard already discloses a personal computer 1 interacting with a server 5 without any indication that there is something missing from Pinard. Thus, without an indication that Pinard was somehow deficient, one of ordinary skill in the art would not have been motivated to include Etherphone with Pinard. Accordingly, amended claim 11 and its dependent claims 12-20 are not rendered obvious by the combination of NetBIOS and Pinard. See Exhibit 1, Mayer-Patel Declaration, paragraph 82.

Amended Claim 22, like amended claim 11, recites "***the caller process having a user interface*** and being operatively connectable to the callee process" and "establishing a ***point-to-point communication link from the caller process*** to the first callee process." As was set forth for the patentability of claim 11 above, that combination of elements is not taught by the applied combination of references. Thus, amended claim 22 and its dependent claims 23-31 are patentable over the applied combination of references. See Exhibit 1, Mayer-Patel Declaration, paragraph 83.

The rejection of claims 1-7 and 10-42 over the combination of the VocalChat References, either alone or in combination with at least one other reference

Claims 1-7 and 10-44 are rejected under 35 U.S.C. § 103(a) as obvious over VocalChat User's Guide in view of VocalChat Readme, VocalChat Networking, VocalChat Help File and VocalChat Troubleshooting Help file (collectively the "VocalChat References"), either alone or in combination with at least one other reference. Those rejections are respectfully traversed.

The VocalChat References Are Not Printed Publications

The Office Action appears to rely on, but does not expressly reference, Exhibit L of the Request for Re-examination (i.e., the Declaration of Alon Cohen), to establish that the

VocalChat References are, in fact, printed publications. However, the Office Action has not established that the VocalChat References constitute printed publications as required by statute. See 35 U.S.C. §§ 301 and 302.

As found by the Federal Circuit in *Carella v. Starlight Archery*, 804 F.2d 135, 139, 231 USPQ 644, 646-7 (Fed. Cir. 1986), "one who wishes to characterize the information, in whatever form it may be, as a 'printed publication' ... should produce sufficient proof of its dissemination or that it has otherwise been available and accessible to persons concerned with the art to which the document relates and thus most likely to avail themselves of its contents." (Citing *In re Wyer*, 655 F.2d 221, 227, 210 USPQ 790, 795 (CCPA 1981) as quoting *Phillips Electronics & Pharmaceutical Industries Corp. v. Thermal & Electronic Industries, Inc.*, 450 F.2d 1164, 1171, 171 USPQ 641, 646 (3rd. Cir. 1971).

Mr. Cohen states in paragraph 3 of his declaration that "the first version of the VocalChat product was commercially released to the public in 1993." However, this provides no indication of what information was distributed with that version (or even what the version number was of that version).

In paragraph 4 of his declaration, Mr. Cohen alleged that VocalChat 1.01 Networking Information "was publicly distributed in 1994 as part of the VocalChat version 1.01 software, which was commercially released and on sale to the general public in 1994." Mr. Cohen did not, however, allege the facts necessary to show that the files are actually printed publications For example, to whom was the software distributed, if anyone, outside of VocalTec? Second, how many copies were distributed and under what conditions? For example, were the copies distributed under a confidentiality agreement such that the associated files were not available to the general public? Were they distributed in such a way as to have been sufficiently available to one of ordinary skill in the art that she/he could have found them when trying to solve a similar problem? Without evidence on these factors, the mere allegation that VocalChat 1.01 Networking Information "was publicly distributed in 1994 as part of the VocalChat version 1.01

software, which was commercially released and on sale to the general public in 1994" is insufficient to show that this reference constitutes a printed publication.

Similarly, with respect to the VocalChat Help File and the VocalChat Troubleshooting Help file, Mr. Cohen alleges in paragraph 6 of his declaration that "Electronic copies of these documents were publicly distributed in 1994 as part of the VocalChat version 2.02 software, which was commercially released and on sale to the general public as a boxed product in 1994." However, this too fails to provide the same relevant facts required to make a prima facie case that the VocalChat Help file and VocalChat Troubleshooting Help file constitute printed publications.

As also described in *Carella*, "Although in some circumstances unsupported oral testimony can be sufficient to prove prior knowledge or use, it must be regarded with suspicion and subject to close scrutiny." 804 F.2d at 138, 231 USQP at 646. Although not disclosed in the declaration, the declarant, Mr. Cohen, is a paid consultant for the Defendants in the litigation relating to the patent in re-examination. See Exhibit 3 where the Court found Mr. Cohen to be a "consultant[] who the defendant has paid, see Deposition of Alon Cohen…" Mr. Cohen also co-founded a company named BitWine that partners with Defendant Skype. See Exhibit 4 (from http://techaddress.wordpress.com/2006/12/06/interview-with-alon-cohen-co-founder-and-co-ceo-of-bitwine.). Mr. Cohen also offers personal services to the public through the BitWine-Skype partnership. See Exhibit 5 (from http://www.bitwine.com/search?query=alon+cohen&=). Moreover, Mr. Cohen's company, VocalTec, produced Internet Phone, and the original patentee, NetSpeak, produced a competing product called WebPhone, thereby creating a potential for bias -- especially when at least one person compared the two products and stated "WebPhone may well become the killer app that puts to shame similar offerings from VocalTec (Internet Phone) and Quarterdeck (WebTalk). See Exhibit 6 (N2P-001-00005919).

TheVocalChat References Do Not Teach All of the Claim Limitations

Even assuming that the VocalChat References constitute printed publications (which has not been established), the combination of references still does not render obvious the claims under re-examination.

Claims 43 and 44

Claim 43 recites "program code configured to access a directory database, the database having a network protocol address for a selected plurality of processes having on-line status with respect to the computer network." The Office Action alleges that this limitation is met because "the network protocol address of clients are transmitted to and stored in a Connection List / USERS file located on the network." However, each VocalChat process actually reads the file and locally processes it, writing back the whole contents of the file when it has added its changes to it. Thus, in the context of multiple, independently-operating VocalChat clients each being able to read from and write to the "shared CONNLIST.VC" file, that file is not acting as a directory database, just a file whose contents could readily become inconsistent with the actual state of processes. For example, if a first process reads the file and then a second process reads the file, then the first process writes the file and then the second process writes the file, the changes written by the first process will be lost when the second process writes back its changes. Similarly, if the second process wrote back the file before the first, then the second process's changes would be lost when the first process wrote back its version of the file. Thus, the VocalChat References do not anticipate the claimed "program code configured to access a directory database, the database having a network protocol address for a selected plurality of processes having on-line status with respect to the computer network." See Exhibit 1, Mayer-Patel Declaration, paragraph 85.

In addition, claim 43 also recites "the network protocol address of each respective process forwarded to the database following connection to the computer network." This limitation is not taught by the VocalChat References, and the Office Action does not identify how this dynamic addressing is taught by the VocalChat References. Even assuming that the Office Action had intended to apply the combination of the VocalChat references and RFC 1531, the combination of references still would not have rendered obvious the subject matter of claim 43. See Exhibit 1, Mayer-Patel Declaration, paragraph 86.

With respect to claim 1, the Office Action asserts that "it would have been obvious to utilize the limitations taught by RFC 1531 in the invention taught by VocalChat ... since this allows for automatic reuse of an address that is no longer needed by the host to which it was assigned ... and since examiner notes the use of dynamic IP address assignment in a TCP/IP network are old and well known ... and are useful to eliminate the burdensome task of manually assigning IP addresses for all network computers." The assignee respectfully submits that the Office Action is mistaken in its conclusion on motivation. In the context of point-to-point communication, widespread use of dynamically assigned addresses is not the solution to a problem, it is the problem itself. See Exhibit 1, Mayer-Patel Declaration, paragraphs 87-88. The assignee agrees that dynamically assigned addresses were known, and the patent in re-examination specifically states in that regard, "Due to the dynamic nature of temporary IP addresses of some devices accessing the Internet, point-to-point communications in realtime of voice and video have been generally difficult to attain." Col. 1, lines 53-56.

But it is not enough to prove that the cause of a problem existed. The Office Action must show by citation of prior art that the problem was recognized, and that the solution was either known or trivially apparent from the known art. See *Innogenetics, N.V. v. Abbott Laboratories*, 512 F.3d 1363, 1373 (Fed Cir. 2008) ("The district court was nevertheless correct that knowledge of a problem and motivation to solve it are entirely different from motivation to combine particular references to reach the particular claimed method.").

The development history of the VocalChat products indicates the opposite. See Exhibit 1, Mayer-Patel Declaration, paragraph 89. The Request cites a Generic version of the VocalChat client which, according to Mr. Cohen, was used on local area networks. See Cohen Declaration, paragraph 3. Absent from the Request, however, is any reference to the subsequent versions of

VocalChat that were released by VocalTec to the public for use on the Internet. The first of those versions was released in 1994, at least in beta, and was called VocalChat Gateway To Interent (or "VocalChat GTI"). This Internet version is believed to have required users to manually input callee addresses into static local address files. (See paragraph 393 of the Pre-Trial Order (filed with the IDS dated August 11, 2009) and Exhibit 7, SKYPE-N2P00286659.) Likewise, it is believed that VocalChat GTI did not utilize a server at all. See Pre-Trial Order at paragraph 390.

The use of manually input static addresses and the absence of a server suggests that the VocalTec designers—presumably software developers of at least ordinary skill in the art—did not consider the alleged combination of their own VocalChat references with RFC 1531, or it suggests that they did consider it but were unable to overcome the non-trivial obstacles to doing so. See Exhibit 1, Mayer-Patel Declaration, paragraph 90.

The next version of VocalChat was released soon thereafter and was also meant for use on the Internet. This version, again, did not combine the Request's disclosed versions of VocalChat with RFC 1531. Instead, it used the Internet Relay Chat (IRC) to help VocalChat clients with dynamically assigned IP addresses find one another. See Pre-Trial Order at paragraph 392 and Exhibit 7, SKYPE-N2P00286660. The development history of VocalChat—from the Generic version disclosed by the Request for use on local area networks to the GTI and IRC versions for use on the Interent—is strong, objective evidence of nonobviousness. If the designers of the VocalChat Generic implementation did not see fit to combine dynamic addressing with the implementation disclosed in the VocalChat references, it is respectfully submitted that one of ordinary skill in the art would not have done so either. Thus, the subject matter of claim 43 is not anticipated by or rendered obvious by the VocalChat References. See Exhibit 1, Mayer-Patel Declaration, paragraph 91.

Claim 44 recites "querying the address server as to whether the second process is connected to the computer network." The Office Action cites the Help file, pages 2 and 26, and the Network Information file, page 10, as disclosing this element and states "clients query the network server and … the server stores addresses of logged in users." However, the Office Action has not identified how the cited portions of those references teach the claimed "querying." At best, the references teach that a local process reads a "USERS" file or a Connections file. As can be seen from page 4 of the VocalChat Network Information (reproduced below), when the VocalChat system uses the Generic mode, a USERS file is used. See Exhibit 1, Mayer-Patel Declaration, paragraph 92.

2.5. Network parameters in the VocalChat INI files

These are the network parameters in the VocalChat VOCLCHAT.INI and VCSETUP.INI files (under the NetWork section):

```
[NetWork]
NetWork=            / description of the selected network
NetWorkUsers=       / user services: NetWare / WinWorkgroups / Generic*
NetWorkProtocol=    / network protocol: IPX / NetBIOS
NetWorkType=        / name of the selected network, for future use
UsersFile=          / path name of users file (when Generic is set)
MyUserName=         / the name of the user (when Generic is set)**
```

* When Generic is set, a USERS file is used.
** This line appears only in the VOCALCHAT.INI file of each user.

The VOCLCHAT.INI files are in the windows directory of each user. The VCSETUP.INI file is in the VOCLCHAT directory, where VocalChat was installed, and is used only to supply default values for the different installations.

The USERS file configuration parameter includes a "UsersFile" entry that specifies the "path name of users file (when Generic is set)." However, it is also stated that "The VOCLCHAT.INI files are in the windows directory of each user." Thus, this "UsersFile" entry is a local configuration parameter such that the local VocalChat client reads and writes the USERS file on its own -- without performing the claimed query. See Exhibit 1, Mayer-Patel Declaration, paragraph 93.

Similarly, page 8 of the VocalChat Help file states "If your network type is not NetWare or Windows for Workgroups, the Setup program creates a Connection List file which is used to identify and access users." The Connection List file and the USERS file apparently have the same function. Thus, the identification and access enabled by the Connection List is performed by the local VocalChat client reading and writing the file itself -- without performing the claimed query. Accordingly, claim 44 is not rendered obvious by the applied combination of references. See Exhibit 1, Mayer-Patel Declaration, paragraph 94.

Claim 44 further recites "following connection of the first process to the computer network forwarding to the address server a network protocol address at which the first process is connected to the computer network." As discussed above with respect to the "querying" step, in the VocalChat Generic implementation, a local process reads a "USERS" file or a Connections file in its entirety and writes it back in its entirety rather than "forwarding to the address server a network protocol address at which the first process is connected to the computer network." This causes the VocalChat system to have to send an increasing amount of information as the number of users increases. Sending the whole file such that the new file replaces the old file also creates problems with consistency such that one user's changes could overwrite the changes of another user -- especially as networks got larger which would have increased the problem of inconsistent files being written. See Exhibit 1, Mayer-Patel Declaration, paragraph 95.

In addition, with respect to "following connection of the first process to the computer network forwarding ... a network protocol address at which the first process is connected to the computer network," the Office Action has not shown how this dynamic address-based limitation is taught by the VocalChat References. Thus, this limitation has not been shown to be taught by the applied references. See Exhibit 1, Mayer-Patel Declaration, paragraph 96.

Further, even if the Office Action had proposed a combination of the VocalChat References and RFC 1531, the combination would still not render obvious claim 44. As was discussed above with respect to claim 43, there is no motivation for combining VocalChat References and RFC 1531. Thus, claim 44 is not rendered obvious by the VocalChat

References, either alone or in combination with RFC 1531. See Exhibit 1, Mayer-Patel Declaration, paragraph 97.

Claims 1-7 and 31-42

Claim 1 recites "program code for transmitting, to the server, a query as to whether the second process is connected to the computer network." As was discussed above with respect to claim 44, the VocalChat References do not teach "querying." In addition, the Office Action has not shown how the VocalChat references teach such a server capable of receiving a query. Thus, this limitation is not taught by the proposed combination. See Exhibit 1, Mayer-Patel Declaration, paragraph 98.

Claim 1 also recites "program code for transmitting to the server a network protocol address received by the first process ***following connection to the computer network***." As was discussed above with respect to claim 43, it would not have been obvious to combine the VocalChat References and RFC 1531. Thus, claim 1 is nonobvious in view of the applied references. See Exhibit 1, Mayer-Patel Declaration, paragraph 99.

Claim 2 recites "means, ***responsive to a query from the first process***, for determining the on-line status of the second process and for transmitting a network protocol address of the second process to the first process in response to a positive determination of the on-line status of the second process." As was discussed above with respect to claim 44, the Office Action has not provided any evidence to support the allegation that such a query is taught by the VocalChat References. See Exhibit 1, Mayer-Patel Declaration, paragraph 100.

Claim 2 further recites "each network protocol address stored in the memory ***following connection of a respective process to the computer network***." As was discussed above with respect to claim 43, the VocalChat References do not teach this dynamic address assignment. Further, it would not have been obvious to combine the VocalChat References and RFC 1531 for the reasons set forth above with respect to claim 43. Thus, claim 2 and its dependent claim 3 are patentable over the combination of the VocalChat References and RFC 1531. See Exhibit 1, Mayer-Patel Declaration, paragraph 101.

Claim 4 recites "A. receiving and storing into a computer memory a respective network protocol address for selected of a plurality of processes that have an on-line status with respect to the computer network, ***each of the network protocol addresses received following connection of the respective process to the computer network***." As was discussed above with respect to claim 43, the Office Action has not shown that one of ordinary skill in the art would have been motivated to make the proposed combination of references. See Exhibit 1, Mayer-Patel Declaration, paragraph 102.

Claim 4 also recites "B. ***receiving a query*** from the first process to determine the on-line status of the second process." As was discussed above with respect to claim 44, the Office Action has not provided any evidence to support the allegation that such a query is taught by the VocalChat references. Thus, claim 4 and its dependent claim 5-7 are not rendered obvious by the proposed combination of references. See Exhibit 1, Mayer-Patel Declaration, paragraph 103.

Claim 32 recites "a. maintaining an ***Internet accessible*** list having a plurality of selected entries, each entry comprising an identifier and a corresponding Internet protocol address of a process currently connected to the Internet." Exhibit O of the Request admits that "While VocalChat does not explicitly describe a server with stored names and addresses is accessible over 'the Internet,' it describes the use of TCP/IP, which is the protocol used on the Internet." Exhibit O then states that "VocalChat inherently describes that the list of users and network addresses is accessible over the Internet"; however, this is not inherently true. There may be any range of local area networks running TCP/IP communications that are not connected to the Internet. Thus, just because the Internet is a type of TCP/IP network does not mean that all TCP/IP networks must be the Internet. See Exhibit 1, Mayer-Patel Declaration, paragraph 104.

In fact, the security and privacy concerns that arise in a secure, local area network are very different than the issues that arise on the Internet. The VocalChat References describe that "All users must use the same Post-Office, otherwise they won't be able to communicate or leave messages to each other. This means that all users must ... have write permission for the Post-Office directory." This would mean opening up one's network to outsiders across the Internet. The Office Action has not cited any evidence that one of ordinary skill in the art would have been motivated to do so in light of the inherent risks. Further, the VocalChat development history discussed above is illuminating about how one of ordinary skill in the art would have modified the VocalChat system. The VocalChat designers went from a Generic implementation with a shared directory with a shared file that can be remotely updated, to locally processed files that were manually updated in the VocalChat GTI version. Thus, the trend on how to modify the VocalChat system was the opposite of what is being proposed. See Exhibit 1, Mayer-Patel Declaration, paragraph 105.

Claim 32 also recites "***the Internet Protocol address added to the list following connection of the process to the computer network***." As was discussed above with respect to claim 43, the Office Action has not shown that one of ordinary skill in the art would have been motivated to make the proposed combination of references. Thus, claim 32 is patentable over the applied combination of references. See Exhibit 1, Mayer-Patel Declaration, paragraph 106.

Claim 33 recites "maintaining, in a computer memory, a network accessible compilation of entries, selected of the entries comprising a network protocol address and a corresponding identifier of a process connected to the computer network, the network protocol address of the corresponding process assigned to the process upon connection to the computer network." As was discussed above with respect to claim 43, the Office Action has not shown that one of ordinary skill in the art would have been motivated to make the proposed combination of references in light of the problems associated with the use of dynamic addresses. Thus, claim 33 and its dependent claims 34-37 are patentable over the applied combination of references. See Exhibit 1, Mayer-Patel Declaration, paragraph 107.

Claim 38 recites "program code configured to maintain, in the computer memory, a network accessible compilation of entries, selected of the entries comprising a network protocol address and a corresponding identifier of a process connected to the computer network, ***the***

network protocol address of the corresponding process assigned to the process upon connection to the computer network. As was discussed above with respect to claim 43, the Office Action has not shown that one of ordinary skill in the art would have been motivated to make the proposed combination of references in light of the problems associated with the use of dynamic addresses. Thus, claim 38 and its dependent claims 39-42 are patentable over the applied combination of references. See Exhibit 1, Mayer-Patel Declaration, paragraph 108.

Amended claim 11 recites "c.1 querying the server as to the on-line status of the first callee process; and c.2 receiving a network protocol address of the first callee process over the computer network from the server." As was discussed above with respect to claim 44, the VocalChat References do not disclose such a querying step. Thus, amended claim 11 and its dependent claims 12-20 are patentable over the applied combination of references. See Exhibit 1, Mayer-Patel Declaration, paragraph 109.

Amended claim 22 recites "program code for querying the server as to the on-line status of the first callee process; and program code for receiving a network protocol address of the first callee process over the computer network from the server." As was discussed above with respect to claim 44, the VocalChat References do not disclose such a querying step. Thus, amended claim 22 and its dependent claims 23-30 are patentable over the applied combination of references. See Exhibit 1, Mayer-Patel Declaration, paragraph 110.

Objective Evidence of Non-Obviousness

In addition to the reasons set forth above showing that all of the elements of the claims under re-examination are not taught by the applied references, it is respectfully submitted that objective evidence supports a finding that the claims are non-obviousness. Objective indicia of non-obviousness, which include commercial success, licenses showing industry respect, and the failure of others, "provide evidence of how the patented device is viewed by the interested public: not the inventor, but persons concerned with the product in the objective arena of the marketplace." *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966); *WMS Gaming Inc. v.*

International Game Tech., 184 F.3d 1339, 1359 (Fed. Cir. 1999); *Arkie Lures, Inc. v. Gene Larew Tackle, Inc.*, 119 F.3d 953, 957 (Fed. Cir. 1997). Evidence supporting the objective indicia of non-obviousness is set out below.

Commercial Success

NetSpeak's WebPhone, an exemplary embodiment of the '704 patent (see, e.g., col. 3, ll. 6-10), was a commercial success as evidenced by the recognition it received in the industry. WebPhone's commercial success is attributable to the novelty and non-obviousness of the invention. *Demaco Corp. v. F. Von Langsdorff Licensing, Ltd.*, 851 F.2d 1387, 1393 (Fed. Cir. 1988) ("A prima facie case of nexus is generally made out when the patentee shows both that there is commercial success, and that the thing (product or method) that is commercially successful is the invention disclosed and claimed in the patent.").

NetSpeak's WebPhone won Internet Telephony's 1998 Product of the Year in the category of Internet Telephony Clients. Exhibit 8, page 6 (N2P-200-00012627).

NetSpeak's WebPhone product also won significant praise when compared to other products in the same timeframe. "WebPhone may well become the killer app that puts to shame similar offerings from VocalTec (Internet Phone) and Quarterdeck (WebTalk). See Exhibit 6 (N2P-001-00005919).

The importance of the claimed invention can also be seen in its praise by other companies in the industry. In a joint press release of NetSpeak and Durand Communications Network ("Durand"), Durand's president and CEO stated "NetSpeak's WebPhone is hands-down the best PC-voice communications package available in the market today. ... We wanted to work with a company whose leading edge technology would add value to our existing MindWire NT CommunityServer by offering unique telephony services so integral to fostering growth within online communities." Exhibit 9, page 1.

NetSpeak's WebPhone was also praised in the Computer Telephony Magazine. The July 1996 Edition included an article on the WebPhone trial version and stated "You've gotta try this

Internet telephony package. NetSpeak … makes WebPhone. … Does it work? Yes." Exhibit 10 (N2P-200-00012630).

As set forth in the original Assignee's Amended S-1 Registration form (Exhibit 11), NetSpeak's technology was a commercial success as further evidenced by the investments made in the company. At least three different stock offerings were made which raised millions of dollars for the company. The Amended S-1 Registration form describes on numbered page 19:

> In January and February of 1996, the Company sold 1,204,000 shares of Common Stock at $2.50 per share in a private offering raising $2,992,028 ….
>
> In June 1996, the Company issued 207,679 shares of Common Stock to Creative at a price of $5.05 per share raising $943,698 ….
>
> In August 1996, the Company issued 769,853 shares of Common Stock and the Motorola Warrant to purchase up to an additional 452,855 shares of Common Stock at a price of $5.50 per share for a six year period expiring in August 2002 to Motorola raising $3,993,864….

Later, in 1998, Motorola took an even larger interest in NetSpeak by acquiring an additional 27% of the stock that it did not already own at a cost of $90 million. See Press Release, Exhibit 12 (N2P-200-00012891). See also March 30, 1998 article from Telephony online describing strategic alliance between Motorola and NetSpeak. See Exhibit 13 (N2P-102-00000048).

Also in 1998, the Company issued approximately 1.3 million shares of common stock to Bay Networks for $36.8 million. See Exhibit 14, NetSpeak Form 10-K for the Fiscal Year ending December 31, 1997.

See also, the 8-K related to the acquisition of NetSpeak by Net2Phone. Exhibit 15.

As more fully detailed in NetSpeak's 10-K for Fiscal Year 1997 (Exhibit 14), NetSpeak's communications technology was a commercial success as further evidenced by the strategic alliances it made with "with leaders in various segments of the telecommunications and networking industries," including Siemens (whereby Siemens agrees to market NetSpeak's "IP telephony server products"), Bay Networks (whereby the Company agrees "not to provide its source code to...competitors for a period of three years), Fujitsu and Rockwell International (whereby NetSpeak was "integrating its software into the[se] companies' proprietary hardware platforms"), MCI (see Exhibit 16 announcing that MCI signs contract with NetSpeak to incorporate WebPhone in networkMCI Click'NConnect Web-Based Service) and NTC (whereby NetSpeak would "supply IP telephony products and systems"), and others.

NetSpeak's WebPhone client software products were a commercial success as further evidenced by the number and extent of the channels through which they were sold, including "distribution agreements with over 900 ISPs worldwide." See Exhibit 14, 10-K cited above. Details of the operation of the WebPhone client can be found in Exhibits 17 and 18. For example, Exhibit 17 states "the CS [i.e., connection server] updates the user e-mail address, IP address, and online status fields, and uses them to perform IP address resolution and track account activation information. ... When a user calls ... using a WebPhone, the CS is used to resolve the target e-mail address to an IP address." Similarly, Exhibit 18 states "Connection and Information servers are the addresses here at NetSpeak that your WebPhone uses to find and call other parties. ...Connection Server: is used when you dial someone by e-mail address. If you try to dial someone by e-mail address, the WebPhone, calls the connection server, matches the desired e-mail address to an IP address, disconnects from the Connection server, and dials the IP address."

Licenses Showing Industry Respect

In connection with Motorola's 1998 investment described above, and as set forth more fully in the NetSpeak Form 10-K for the Fiscal Year 1997 (Exhibit 14), NetSpeak and Motorola entered into a joint development and licensing agreement pursuant to which the two companies would seek to join their technologies to enable Internet Protocol multimedia communications on wireless networks. Under that agreement, Motorola obtained a license to develop RF products using NetSpeak's technology, to include NetSpeak's technology in wireless devices such as cellular phones, pagers, satellite phones and two way radios to support real-time multimedia communications (voice, audio, video, data, etc.), and to manufacture and sell NetSpeak products. See description of NetSpeak's technology at page 6 of Exhibit 14 under the header "NETSPEAK'S CORE COMMUNICATIONS TECHNOLOGY" (reciting, *inter alia*, "allows users to connect to other users in a point-to-point fashion, rather than through an intermediate routing mechanism."). NetSpeak's licenses included a license to the WebPhone product and network address resolution technology, see Exhibit 14, which are commercial embodiments of the patented claims. NetSpeak's success in licensing is attributable to the novelty and non-obviousness of the invention. *Demaco Corp.*, 851 F.2d at 1393.

Failure of Others

The inventions claimed in the '704 Patent resolved the problem of locating a computer process connected to a network, where the computer process was assigned a temporary network address. See, e.g., specification at col. 5, lines 21-24. Each time a particular computer process connected to the network, it would have a different address. Such addresses were largely a by-product of the near-universal adoption of the Dynamic Host Configuration Protocol ("DHCP"), described in RFC 1531. As discussed above, others, including the developers of the VocalChat references cited by the Request and the writer of Exhibit 23, attempted to resolve the problem of locating a computer process with a dynamically assigned address and failed to suggest the claimed methods.

Recognition in the Patent Literature

The Federal Circuit has left itself open to acknowledging that the patent citations of later patent applicants and examiners can be objective evidence of an earlier patent's nonobviousness. See *In re: Mettke*, 570 F.3d 1356, 1361 (Fed. Cir. 2009). This position is supported by the academic literature. See, e.g., Trajtenberg, Manuel , "A Penny for Your Quotes: Patent Citations and the Value of Innovations," The RAND Journal of Economics, Vol. 21, No. 1 (Spring 1990), pp. 172-187 at 174. ("Thus, if citations keep coming, it must be that the innovation originating in the cited patent had indeed proven to be valuable.") (Exhibit 19.) As shown in Exhibit 20, according to the USPTO's own records, the '704 patent and its continuations and divisionals have been cited in 76 issued patents. This supports an inference that the '704 patent in re-examination advanced the art in a nonobvious way that was neither cumulative of the art that came before it nor predictable in its view.

This inference of nonobviousness is especially compelling over the NetBIOS references. Not one issued patent that cites the patent in re-examination (or one of its related patents) also cites a NetBIOS reference. See Exhibit 21 (including variations on the name for NetBIOS such that it includes RFC 1001 and RFC 1002). This phenomenon is especially significant given that NetBIOS is a well known piece of networking art that has been cited frequently in the patent literature -- 33 times according to the USPTO's records.[3] The assignee respectfully submits that there is a simple explanation for this otherwise highly improbably dichotomy: NetBIOS and the patent in re-examination do not overlap because the scope and content of what they disclose are distinct.

The assignee also notes in this regard that the cover page of U.S. Patent No. 6,389,127, assigned to ICQ Inc., an unrelated company, and entitled "Telephone Status Notification System," references the '704 Patent in re-examination, but does not cite to any of the references submitted in the Request. Their absence from the ICQ patent is especially significant since both

[3] In fact, there are 43 references to NetBIOS if the search includes any of: NetBIOS, RFC 1001, RFC 1002, NBT and NetBT (excluding references to "NBT" in the medical field). See Exhibit 22.

NetBIOS and Etherphone are well known pieces of art, and each has been cited frequently in the patent literature—33 times and 135 times, respectively. The assignee respectfully submits that there is a simple explanation for this difference: the references in the Request were not cited by the ICQ patent because they did not teach anything plausibly related to "Status Notification," whereas 6,108,704 was cited because it plainly did.

Consequently, in light of the above discussions, the outstanding grounds for rejection are believed to have been overcome and the patentability of the claims subject to re-examination should be indicated as confirmed. An early and favorable action to that effect is respectfully requested.

CHARGE STATEMENT: Deposit Account No. 501860, order no. **2655-0188.**
The Commissioner is hereby authorized to charge any fee specifically authorized hereafter, or any missing or insufficient fee(s) filed, or asserted to be filed, or which should have been filed herewith or concerning any paper filed hereafter, and which may be required under Rules 16-18 (missing or insufficiencies only) now or hereafter relative to this application and the resulting Official Document under Rule 20, or credit any overpayment, to our Accounting/ Order Nos. shown above, for which purpose a duplicate copy of this sheet is attached. **This CHARGE STATEMENT does not authorize charge of the issue fee until/unless an issue fee transmittal sheet is filed.**

CUSTOMER NUMBER 42624	Respectfully submitted, By: / Michael R. Casey / Michael R. Casey, Ph.D. Registration No.: 40,294

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Electronic Acknowledgement Receipt

EFS ID:	6532617
Application Number:	90010416
International Application Number:	
Confirmation Number:	1061
Title of Invention:	Point-to-Point Internet Protocol
First Named Inventor/Applicant Name:	6108704
Customer Number:	42624
Filer:	Michael Raymond Casey
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	NPL Documents	Exhibit_02_Web_Security.pdf	556594 4bd74423389a55af9ac258de7e54aa5b64f82a6d	no	4

Warnings:

Information:

2	NPL Documents	Exhibit_03_ALONCOHEN.pdf	580490 94578c7fd6d923478abb785d39ae17761d08296b	no	6
Warnings:					
Information:					
3	NPL Documents	Exhibit_04_Alon_Cohen_Interview.pdf	228810 be6d458709bfb99e535798ef246de67d832430f0	no	6
Warnings:					
Information:					
4	NPL Documents	Exhibit_05_Alon_Cohen_Bio.pdf	146074 99bf6aa049b59daabb4e9a5b5d2e50284e6db580	no	2
Warnings:					
Information:					
5	NPL Documents	Exhibit_06_WebPhoneKillerApp.pdf	456394 4848fd08e2b060256d3efd20838c7f3a4b5dcd38	no	5
Warnings:					
Information:					
6	NPL Documents	Exhibit_07_VocalChatHistory.pdf	556244 1f2972379c1ff1f97726a600fb7cb1acb8b03767	no	16
Warnings:					
Information:					
7	NPL Documents	Exhibit_08_InternetTelephony_POTYear.pdf	373169 c6f517edf4328aba54c24f7335ac1aeca3d852c5	no	9
Warnings:					
Information:					
8	NPL Documents	Exhibit_09_Durand_PressRelease.pdf	159588 cadcdd5dd535e29b0f018f001bdc3f5f90926a5d	no	4
Warnings:					
Information:					
9	NPL Documents	Exhibit_10_Computer_Telephony.pdf	67848 73983ba053354169aed612bd4c5c16bedc588635	no	2
Warnings:					
Information:					
10	NPL Documents	Exhibit_11_NetSpeak_S-1A.pdf	533615 d519038515799365915b09680239d470ebd3dfb7	no	119
Warnings:					
Information:					

11	NPL Documents	Exhibit_12_Motorola_PressRelease.pdf	143729 5be5574cb711e71e2236ba7fe0266926c8dfe28d	no	3
Warnings:					
Information:					
12	NPL Documents	Exhibit_13_Motorola2.pdf	404162 3dadaf91670273b74a64265b6c264a024c3a89ba	no	4
Warnings:					
Information:					
13	NPL Documents	Exhibit_14_NetSpeak_10K.pdf	144246 11cf8d3b11ba77c1aba129d0742ee1ba3e5653f3	no	37
Warnings:					
Information:					
14	NPL Documents	Exhibit_15_Net2Phone_8-K.pdf	170814 0aca9a1a4c1076a5d6763cd2431ec48a3ecf24be	no	40
Warnings:					
Information:					
15	NPL Documents	Exhibit_16_MCI.pdf	362841 0a897704787d9f249e440324fb2a62e452b7cf76	no	3
Warnings:					
Information:					
16	NPL Documents	Exhibit_17_NetSpeak_CS.pdf	1107085 32c9865c4181a0280e3d93dcb9a48bf545c33343	no	7
Warnings:					
Information:					
17	NPL Documents	Exhibit_18_How_do_I.pdf	2719628 6d1ba9f24834940f8748db648a9ec88e8bd26694	no	16
Warnings:					
Information:					
18	NPL Documents	Exhibit_19_Penny.pdf	3498198 41fb5202c9ecf9a1e3ccecd93c7d6bfe32ce37bc	no	18
Warnings:					
Information:					
19	NPL Documents	Exhibit_20_704_and_family_results.pdf	531202 7616363ed3875788f07fbf116e3afbd8929f72d8	no	4
Warnings:					
Information:					

20	NPL Documents	Exhibit_21_NetBIOS_ReferencesWith_704.pdf	111308 b48c9c979e6ad1cff00d337072b8ce2e2e8448cc	no	2
Warnings:					
Information:					
21	NPL Documents	Exhibit_22_NetBIOS_References.pdf	425223 36870b9db80692a5b18003d908348732fd145f6f	no	3
Warnings:					
Information:					
22	NPL Documents	Exhibit_23_Dynamic_IP_Addresses.pdf	371495 c1dbda9767483c48a40ac518b72d5b6943bbc475	no	5
Warnings:					
Information:					
23	Rule 130, 131 or 132 Affidavits	Exhibit_01_Ketan_704_Declaration.pdf	7412403 a04d64f15529c560e8b93e7236fc0b1beb0febb6	no	50
Warnings:					
Information:					
24	Amendment/Req. Reconsideration-After Non-Final Reject	20091127_cover.pdf	82103 a1dd5a76e6e7344e8e1bd6c3abaac9b1ec3cd7dc	no	1
Warnings:					
Information:					
25	Claims	20091127_claims.pdf	468863 f0626d48f22b75defce91195442a91b1813ec987	no	4
Warnings:					
Information:					
26	Applicant Arguments/Remarks Made in an Amendment	20091127_remarks.pdf	7153482 0fcbe1ff1f495288d345efe97fa80d5f33ed09b4	no	41
Warnings:					
Information:					
27	Reexam Certificate of Service	20091127_COS.pdf	63994 409d88c7a3a40be3cd2ed363d2f21569f0c3c3b9	no	1
Warnings:					
Information:					
		Total Files Size (in bytes):	28829602		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

<u>New Applications Under 35 U.S.C. 111</u>
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Exhibit 1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT APPLICATION OF: Net2Phone, Inc. (Patent No. 6,108,704)

Control No.: 90/010,416

Issue Date: August 22, 2000

Title: **POINT-TO-POINT INTERNET PROTOCOL**

Attorney Docket: 2655-0188

Group Art Unit: 3992

Examiner: KOSOWSKI, Alexander

Confirmation No.: 1061

DECLARATION OF KETAN MAYER-PATEL UNDER 37 C.F.R. 1.132

Hon. Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

I. INTRODUCTION

1. I have been retained as an independent expert witness by Net2Phone, Inc., the assignee of the patent presently undergoing re-examination (i.e., U.S. Patent No. 6,108,704 (hereinafter "the '704 patent")).

2. I am an expert in the field of networking protocols including networking protocols supporting multimedia streams including digital audio data. See Curriculum Vitae attached as Exhibit 1.

3. I received Bachelors of Arts degrees in Computer Science and Economics in 1992, a Masters of Science in 1997 from the Department of Electrical Engineering and Computer Science and a Ph.D. in 1999 from the Department of Electrical Engineering and Computer Science, all from the University of California, Berkeley.

4. I received the National Science Foundation CAREER Award in 2003 while an Assistant Professor at the University of North Carolina, Chapel Hill.

5. I have had extensive experience in both industry and academia as it relates to the technical fields relevant here. For example, I have been a programmer, a visiting researcher, and an Assistant and Associate professor.

6. I am a co-author of numerous articles that have appeared in a number of refereed publications and proceedings.

7. Governmental agencies, such as the National Science Foundation and the Office of Naval Research, have provided funding for my research.

II. RETENTION AND COMPENSATION

8. I have been retained to offer an expert opinion on the prior art relevant to the '704 patent (and other patents currently under re-examination) and the validity of the claims undergoing re-examination.

9. My work on this case is being billed at a rate of $400 per hour, with reimbursement for actual expenses. My compensation is not contingent upon the outcome of the case.

III. BASIS OF MY OPINION AND MATERIALS CONSIDERED

10. In preparation for this report, I have considered and relied on data or other documents identified in this report. For example, I have reviewed the Office Action dated August 27, 2009 as well as the Request for Re-examination that was filed for the '704 patent including the Exhibits to the Request for Re-examination. I have also reviewed the file history of the '704 patent.

11. I have familiarized myself with the state of the art at the time the '704 patent was filed by reviewing both patent and non-patent references from prior to the filing date of the application that became the '704 patent.

12. My opinions are also based upon my education, training, research, knowledge, and experience in this technical field.

IV. SUMMARY OF MY OPINIONS

13. Based on my prior experience in the field of computer systems and networking, including network communication protocols, and based on my review of the documents relating to the

pending re-examination proceeding, I have developed an understanding of the '704 patent and the claimed inventions.

14. I have been asked to compare the claims of the '704 patent to the references applied in the outstanding Office Action. The results of my comparison are provided below.

15. I understand that the assignee's response includes the following amendments to the claims:

10. (Canceled)

11. (Amended) In a computer system, a method for establishing a point-to-point communication link from a caller process to a callee process over a computer network, the caller process having a user interface and being operatively connectable to the callee process and a server over the computer network, the method comprising the steps of:

A. providing a user interface element representing a first communication line;

B. providing a user interface element representing a first callee process; and

C. establishing a point-to-point communication link from the caller process to the first callee process, in response to a user associating the element representing the first callee process with the element representing the first communication line, [The method of claim 10] wherein step C further comprises the steps of:

c.1 querying the server as to the on-line status of the first callee [process] process; and

c.2 receiving a network protocol address of the first callee process over the computer network from the server.

12. (Amended) The method of claim [10] 11 further comprising the step of:

D. providing an element representing a second communication line.

14. (Amended) The method of claim [10] 11 further comprising the steps of:

D. providing a user interface element representing a second callee process; and

E. establishing a conference point-to-point communication link between the caller process and the first and second callee process, in response to the user associating the element representing the second callee process with the element representing the first communication line.

15. (Amended) The method of claim [10] 11 further comprising the step of:

F. removing the second callee process from the conference point-to-point communication link in response to the user disassociating the element representing the second callee process from the element representing the first communication line.

16. (Amended) The method of claim [10] 11 further comprising the steps of:

D. providing a user interface element representing a communication line having a temporarily disabled status; and

E. temporarily disabling a point-to-point communication link between the caller process and the first callee process, in response to the user associating the element representing the first callee process with the element representing the communication line having a temporarily disabled status.

19. (Amended) The method of claim [10] 11 wherein the caller process further comprises a visual display and the user interface comprises a graphic user interface.

21. (Canceled)

22. (Amended) A computer program product for use with a computer system comprising:

a computer usable medium having program code embodied in the medium for establishing a point-to-point communication link from a caller process to a callee process over a computer network, the caller process having a user interface and being operatively connectable to the callee process and a server over the computer network, the medium further comprising:

program code for generating an element representing a first communication line;

program code for generating an element representing a first callee process;

program code, responsive to a user associating the element representing the first callee process with the element representing the first communication line, for establishing a point-to-point communication link from the caller process to the first callee process, [The computer program product of claim 21] wherein the program code for establishing a point-to-point communication link further comprises:

program code for querying the server as to the on-line status of the first callee process; and

program code for receiving a network protocol address of the first callee process over the computer network from the server.

23. (Amended) A computer program product of claim [21] <u>22</u> further comprising:

program code for generating an element representing a second communication line.

25. (Amended) The computer program product of claim [21] <u>22</u> further comprising:

program code for generating an element representing a second callee process; and

program code means, responsive to the user associating the element representing the second callee process with the element representing the first communication line, for establishing a conference communication link between the caller process and the first and second callee process.

27. (Amended) The computer program product of claim [21] <u>22</u> further comprising:

program code for generating an element representing a communication line having a temporarily disabled status; and

program code, responsive association of the element representing the first callee process with the element representing the communication line having a temporarily disabled status, for temporarily disabling the point-to-point communication link between the caller process and the first callee process.

30. (Amended) A computer program product of claim [21] <u>22</u> wherein the computer system further comprises a visual display and the user interface comprises a graphic user interface.

16. In general, it is my opinion that all of the pending claims undergoing re-examination (i.e., claims 1-7, 11-20 and 22-44) are patentable over the applied references for at least the reasons set forth below.

The rejection of the claims over NetBIOS, either alone or in combination with at least one other reference

17. Claims 43 and 44 were rejected under 35 U.S.C. § 102 as being anticipated by Protocols for X/Open PC Interworking SMB, Version 2, The Open Group (1992) (hereinafter "NetBIOS").

18. I understand that a claim is rejected under 35 U.S.C. § 102(b) when an examiner believes that each and every limitation of the claim is taught by the applied reference.

19. Pending claims 1-7, 11-20 and 22-42 were rejected under 35 U.S.C. § 103(a) as being obvious over NetBIOS in combination with at least one other reference.

20. I understand that a rejection under 35 U.S.C. § 103(a) means that an examiner believes that although no single reference includes all of the claimed limitations, nonetheless the combination of references made by the examiner would have been obvious to one of ordinary skill in the art at the time the invention was made.

The Rejection of Claims 43 and 44 over NetBIOS

21. Claim 43 recites "a. program code configured to access a directory database, the database having a network protocol address for a selected plurality of processes having on-line status with respect to the computer network, the network protocol address of each respective process forwarded to the database following connection to the computer network." This limitation is not taught by the NetBIOS reference as NetBIOS does not provide dynamic addressing or on-line status.

22. In rejecting claim 43, the Office Action adopts the positions of the third-party requester and states "See claim mapping chart in Exhibit M, pages 36-40, incorporated by reference."

With respect to this limitation (a), the claim mapping does not show that NetBIOS teaches "the network protocol address of each respective process forwarded to the database ***following connection to the computer network.***" In fact, the Office Action appears to have agreed (e.g., with respect to claim 1) that the NetBIOS reference does not teach that the processes receive network protocol addresses "following connection to the computer network." The Office Action did this by rejecting the requester's arguments under 35 U.S.C. § 102 and instead adopting "claim chart mapping utilizing alternative 103 rejections" -- rejections that rely on RFC 1531 to teach dynamic addressing.

23. Even assuming that the Office Action intended the rejection to be a rejection under 35 U.S.C. § 103 by combining NetBIOS with RFC 1531, the rejection would still not show that the claims were unpatentable. When alleging that one of ordinary skill in the art would have combined NetBIOS with RFC 1531, the Office Action states "it would have been obvious ... to utilize the limitations taught by RFC 1531 in the invention taught by NetBIOS ...since this would allow for automatic reuse of an address ... and since examiner notes the use of dynamic IP address assignment in a TCP/IP network are old and well known ... and are useful to eliminate the burdensome task of manually assigning IP addresses for all networked computers."

24. I do not agree with the conclusion drawn by the Office Action on the combinability of NetBIOS and RFC 1531. The Office Action speculates, with hindsight, as to why a person of ordinary skill might want to combine the two references, but does not acknowledge the problems that would arise in doing so, and does not provide any prior art that would indicate how the problems that dynamic addressing would bring into a NetBIOS type system could be resolved by those of ordinary skill at the time the patent was filed. In the context of point-to-point communication, widespread use of dynamically assigned addresses does not solve NetBIOS's problems, it creates further problems.

25. Dynamically assigned addresses were known, and the patent in re-examination specifically states in that regard, "Due to the dynamic nature of temporary IP addresses of some devices accessing the Internet, point-to-point communications in realtime of voice and video

have been generally difficult to attain." Col. 1, lines 53-56. However, the Office Action has not shown that one of ordinary skill in the art would have made the proposed combination of dynamically assigned addresses with NetBIOS.

26. Section 15.1.7 of the NetBIOS reference (entitled "Consistency of the NBNS Data Base") recognizes that the association between a node, a registered name and an IP address is tenuous, even in an environment that uses static IP addresses. "Even in a properly running NetBIOS scope the NBNS and its community of end-nodes may occasionally lose synchronization with respect to the true state of name registrations." To minimize the impact of this problem, the reference states, "Various approaches have been incorporated into the NetBIOS-over-TCP protocols" which it then proceeds to describe.

27. However, by incorporating DHCP and adopting dynamic address allocation as used by Internet access providers, the synchronization problem would become more disruptive, not less. Dynamic addressing would have introduced a new uncertainty to the relationships among the NBNS and its community of end-nodes and a new set of obstacles to NetBIOS synchronization that ***are not addressed by the NetBIOS reference***. Consider the case of a node that is turned-off and then subsequently turned back on, or a node that has simply lost its Internet connection for some technical reason or whose DHCP lease has expired and then re-established a connection. In a dynamic addressing environment, such a node would most likely obtain a new IP address when it was turned back on that was different than the one it had when it registered its name. This change could lead to any number of node-name-IP address synchronization problems for the disclosed NetBIOS protocols.

28. For example, because the NBNS does not know the node's new address, the NBNS would be unable to send to the node a Name Release Request or a Name Conflict Demand or request that the node send it a Name Status Request. Because communication from the node would be originating at a new address that was not recognized by the NBNS, a node's response to a Name Query Request (assuming it somehow knew that its name had been challenged, perhaps from before it lost network connectivity) would not be recognized. A node would also

be unable to confirm its association with registered names by sending Name Refresh Request packets to the NBNS. If a session between two NetBIOS applications were cut-off, re-establishing the communication would be especially difficult where the ability of a called entity to obtain both its associated name and its associated IP address were in doubt. As a result, the Office Action has not demonstrated that a solution to the problems created by exposure of NetBIOS to DHCP and dynamic addressing has been addressed by any of the applied references.[1]

29. The Office Action also has not identified anything in the cited art that suggests how a person of ordinary skill is to go about the redesign of NetBIOS and the solving of obstacles to NetBIOS operation that are created by Internet access; problems that were recognized and left as warnings unresolved in the NetBIOS reference.[2]

30. In view of the foregoing, claim 43 is patentable over NetBIOS alone or over NetBIOS in combination with RFC 1531.

31. NetBIOS and RFC 1531 also do not teach "a. program code configured to access a directory database...having a network protocol address for a selected plurality of processes ***having on-line status with respect to the computer network***." While NetBIOS uses name entries with "active" statuses as part of its name management process, an analysis of how that "active" status is used shows that "an active name" is not synonymous with an "on-line status with respect to the computer network." An active name simply refers to a name that has been

[1] Besides dynamic addressing, Internet access would pose other challenges to a NetBIOS system. For example, because NetBIOS was designed for use on local area networks with small numbers of computers, trust among the network participants is assumed. That assumption cannot be transferred to a global Internet made up of unknown, and sometimes malevolent, entities. An implementation of NetBIOS on the public Internet would necessitate non-trivial adaptations to ensure that its services perform correctly and return accurate information. There is no discussion of security issues in the cited references. See Exhibit 2, from http://www.w3schools.com/Site/site_security.asp which instructs Microsoft Windows users whose computers access the Internet to disable NetBIOS over TCP/IP in order to solve their security problems.

[2] The cited references go out of their way *to avoid* describing how a NetBIOS protocol might work in inter-connected network environments that that are *less complex* than the Internet and that *predate* DHCP. See Section 4.6 ("The proposed standard recognizes the need for NetBIOS operation across a set of networks interconnected by network (IP) level relays (gateways.) However, the standard assumes that this form of operation will be less frequent than on the local MAC bridged-LAN.")

registered and that has not yet been de-registered, independent of whether the associated computer is or is not on-line. As shown on page 447 (and reproduced below), the Node_Name entries stored with respect to a NetBIOS Name Server contain a series of fields including the "ACT" field.

```
The NAME_FLAGS field:

                                          1   1   1   1   1   1
  0   1   2   3   4   5   6   7   8   9   0   1   2   3   4   5
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| G |  ONT  |DRG|CNF|ACT|PRM|          RESERVED                 |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

The NAME_FLAGS field is defined as:

Symbol      Bit(s)   Description:

RESERVED     7-15    Reserved for future use.  Must be zero (0).
PRM             6    Permanent Name Flag.  If one (1) then entry
                     is for the permanent node name.  Flag is zero
                     (0) for all other names.
ACT             5    Active Name Flag.  All entries have this flag
                     set to one (1).
CNF             4    Conflict Flag.  If one (1) then name on this
                     node is in conflict.
DRG             3    Deregister Flag.  If one (1) then this name
                     is in the process of being deleted.
ONT           1,2    Owner Node Type:
                        00 = B node
                        01 = P node
                        10 = M node
                        11 = Reserved for future use
G               0    Group Name Flag.
                     If one (1) then the name is a GROUP NetBIOS
                     name.
                     If zero (0) then it is a UNIQUE NetBIOS name.
```

32. The ACT field is a single bit field (in bit 5) that signifies an "Active Name Flag. ***All entries have this flag set to one (1).***" (Emphasis added.) If all name entries have this flag set to one (1), then the NetBIOS name server cannot be using the Active Name Flag as a means of separately tracking whether the entity that owns the name is "active," let alone what its "on-line status" might be.

33. The NetBIOS reference also does not teach that the active status of a name in the NetBIOS server is an indication of the active status of the owner of that name. To the contrary, when information about whether the owner of a name is "active" may be relevant, for example when a new entity seeks to register a name that has already been registered in the NetBIOS name server, the NetBIOS reference describes an elaborate set of interactions used to test whether the existing owner of the registered name is active or inactive. It does not rely on the fact that the name is active in the NetBIOS name server (See Section 15.2.2.2 and 15.2.2.3 entitled "Existing Name and Owner is Inactive").

34. The NetBIOS reference also does not teach that an acquired IP address can be reasonably relied upon by a requesting end-node to confirm the "on-line status" of an end-node associated with a sought name. The NetBIOS reference describes at least two different scenarios where a second end-node sends a ***rejection response*** to the first end-node ***notwithstanding the fact that a second end-node is connected*** to the computer network and active with respect to the sought name. See Section 16.1.1 ("There exists a NetBIOS LISTEN compatible with the incoming call, but there are inadequate resources to permit establishment of a session...The called name does, in fact, exist on the called node, but there is no pending NetBIOS LISTEN compatible with the incoming call."). No distinction is made in the reference between the rejection response in these cases and the rejection response in cases where the called name does not exist on the called end-node. See also section 16.1.1 which state "In all but the first case, a rejection response is sent back over the TCP connection to the caller."

35. Thus, the limitation "program code configured to access a directory database, the database having a network protocol address for a selected plurality of processes having on-line status with respect to the computer network, the network protocol address of each respective process forwarded to the database following connection to the computer network" of claim 43 is not taught by the NetBIOS reference alone or in combination with RFC 1531, and I believe that the patentability of claim 43 should be confirmed.

36. Claim 44 recites "***following connection of the first process to the computer network*** forwarding to the address server a network protocol address at which the first process is connected to the computer network." As was discussed above with respect to the recitation of "the network protocol address of each respective process forwarded to the database following connection to the computer network" in claim 43, NetBIOS does not teach the claimed dynamic address assignment. Moreover, it would not have been obvious to combine NetBIOS and RFC 1531 for the reasons set forth above with respect to claim 43.

37. Claim 44 also recites "querying the address server as to ***whether the second process is connected to the computer network***." As was discussed above with respect to the recitation of "processes having on-line status with respect to the computer network" in claim 43, NetBIOS does not teach that an active name in NetBIOS is synonymous with "whether the second process is connected to the computer network." An active name simply refers to a name that has been registered and that has not yet been de-registered, independent of whether the associated computer is or is not connected to the computer network. Thus, claim 44 is patentable over both NetBIOS alone and the combination of NetBIOS and RFC 1531.

<u>Claims 1-7 and 32-42</u>

38. Claim 1 recites "program code for transmitting to the server ***a network protocol address received by the first process following connection to the computer network***." Claim 1 further recites "program code for receiving a network protocol address of the second process from the server, ***when the second process is connected to the computer network***." As was discussed above with respect to the recitation of "the network protocol address of each respective process forwarded to the database following connection to the computer network" in claim 43, NetBIOS does not teach this dynamic address assignment. Further, it would not have been obvious to combine NetBIOS and RFC 1531 for the reasons set forth above with respect to claim 43.

39. Claim 1 also recites "program code for transmitting, to the server, a query as to ***whether the second process is connected to the computer network***." As was discussed above with

respect to the recitation of "processes having on-line status with respect to the computer network" in claim 43, NetBIOS does not teach that an active name in NetBIOS is synonymous with "whether the second process is connected to the computer network." An active name simply refers to a name that has been registered and that has not yet been de-registered, independent of whether the associated computer is or is not connected to the computer network. Thus, claim 1 patentable over the combination of NetBIOS and RFC 1531.

40. Claim 2 recites "each network protocol address stored in the memory ***following connection of a respective process to the computer network***." As was discussed above with respect to the recitation of "the network protocol address of each respective process forwarded to the database following connection to the computer network" in claim 43, NetBIOS does not teach this dynamic address assignment. Further, it would not have been obvious to combine NetBIOS and RFC 1531 for the reasons set forth above with respect to claim 43.

41. Claim 2 also recites "means... for determining the ***on-line status of the second process*** and for ***transmitting a network protocol address of the second process*** to the first process ***in response to a positive determination of the on-line status of the second process***." As was discussed above with respect to the recitation of "processes having on-line status with respect to the computer network" in claim 43, NetBIOS does not teach that an active name in NetBIOS is synonymous with "an on-line status of the second process." An active name simply refers to a name that has been registered and that has not yet been de-registered, independent of whether the associated computer is or is not connected to the computer network. Thus, claim 2 and its dependent claim 3 are patentable over the combination of NetBIOS and RFC 1531.

42. Claim 4 recites "each of the network protocol addresses received following connection of the respective process to the computer network." As was discussed above with respect to the recitation of "the network protocol address of each respective process forwarded to the database following connection to the computer network" in claim 43, NetBIOS does not teach this dynamic address assignment. Further, it would not have been obvious to combine NetBIOS and RFC 1531 for the reasons set forth above with respect to claim 43.

43. Claim 4 also recites "receiving and storing into a computer memory a respective network protocol address for selected of a plurality of processes that have an ***on-line status*** with respect to the computer network." Claim 4 further recites "determining the ***on-line status*** of the second process." As was discussed above with respect to the recitation of "processes having on-line status with respect to the computer network" in claim 43, NetBIOS does not teach that an active name in NetBIOS is synonymous with "an on-line status" of a process. An active name simply refers to a name that has been registered and that has not yet been de-registered, independent of whether the associated computer is or is not connected to the computer network. Thus, claim 4 and its dependent claims 5-7 are patentable over the combination of NetBIOS and RFC 1531.

44. Claim 32 recites "the Internet Protocol address ***added to the list following connection of the process to the computer network***." As was discussed above with respect to the recitation of "the network protocol address of each respective process forwarded to the database following connection to the computer network" in claim 43, NetBIOS does not teach this dynamic address assignment. Further, it would not have been obvious to combine NetBIOS and RFC 1531 for the reasons set forth above with respect to claim 43.

45. Claim 32 also recites "an Internet accessible list having a plurality of selected entries, each entry comprising an identifier and a corresponding Internet protocol address of ***a process currently connected to the Internet***." As was discussed above with respect to the recitation of "processes having on-line status with respect to the computer network" in claim 43, NetBIOS does not teach that an active name in NetBIOS is synonymous with "a process currently [being] connected to the Internet." An active name simply refers to a name that has been registered and that has not yet been de-registered, independent of whether the associated computer is or is not connected to the Internet. Thus, claim 32 is patentable over the combination of NetBIOS and RFC 1531.

46. Claim 33 recites "***the network protocol address*** of the corresponding process ***assigned to the process upon connection to the computer network***." As was discussed above with respect to the recitation of "the network protocol address of each respective process forwarded to the

database following connection to the computer network" in claim 43, NetBIOS does not teach this dynamic address assignment. Further, it would not have been obvious to combine NetBIOS and RFC 1531 for the reasons set forth above with respect to claim 43.

47. Claim 33 also recites "selected … entries comprising **a network protocol address** and a corresponding identifier ***of a process connected to the computer network***." As was discussed above with respect to the recitation of "processes having on-line status with respect to the computer network" in claim 43, NetBIOS does not teach that an active name in NetBIOS is synonymous with "a process [being] connected to the computer network." An active name simply refers to a name that has been registered and that has not yet been de-registered, independent of whether the associated computer is or is not connected to the computer network. Thus, claim 33 and its dependent claims 34-37 are patentable over the combination of NetBIOS and RFC 1531.

48. Claim 38 recites "***the network protocol address*** of the corresponding process ***assigned to the process upon connection to the computer network***." As was discussed above with respect to the recitation of "the network protocol address of each respective process forwarded to the database following connection to the computer network" in claim 43, NetBIOS does not teach this dynamic address assignment. Further, it would not have been obvious to combine NetBIOS and RFC 1531 for the reasons set forth above with respect to claim 43.

49. Claim 38 also recites "selected … entries comprising a network protocol address and a corresponding identifier of ***a process connected to the computer network***." As was discussed above with respect to the recitation of "processes having on-line status with respect to the computer network" in claim 43, NetBIOS does not teach that an active name in NetBIOS is synonymous with "a process [being] connected to the computer network." An active name simply refers to a name that has been registered and that has not yet been de-registered, independent of whether the associated computer is or is not connected to the computer network. Thus, claim 38 and its dependent claims 39-42 are patentable over the combination of NetBIOS and RFC 1531.

Claims 10-31

50. Claims 10-31 are rejected under 35 U.S.C. § 103(a) as being obvious over NetBIOS in view of Pinard, either alone or in combination with VocalChat User's Guide. In light of the cancelation of claim 10 and the amendment to claim 11, I will address this rejection with respect to claim 11.

51. Amended claim 11 recites "the caller process having a user interface and being operatively connectable to the callee process" and "establishing a point-to-point communication link ***from the caller process*** to the first callee process." When taken together, it is clear that the Office Action has not shown that the caller process, having a user interface, establishes a point-to-point communication link with a first callee process. The Exhibit M of the Request for Re-examination (the "Request") states that "Pinard discloses that a point-to-point communication link is established in response to a user associating an element representing ***the first callee process*** with the element representing a first communication line." However, as shown in Figure 1, Pinard discloses that conventional telephones connected to a telephony server via telephony interface circuits make calls to other conventional telephones. Those telephones are not caller and callee processes. In fact, with respect to the limitation "providing a user interface element representing a first callee process," Exhibit M identifies, instead of a callee process, two people, Mary and John. Clearly neither is a callee ***process***.

52. Exhibit M further states that "Applications which utilize NetBIOS application services ***inherently*** include 'user interfaces.'" This assertion is disputed. Page 356 of NetBIOS states "Protocols supporting NetBIOS services have been constructed on diverse protocol and ***hardware*** foundations." Thus, the NetBIOS applications could be running on a computer system (e.g., an embedded system) such that there are no user interfaces at all. In fact, the example provided in Exhibit M is disingenuous. Exhibit M states that "NetBIOS provides a vendor independent interface for the IBM Personal Computer (PC) and compatible systems." The "interface" discussed in that sentence is a software ***communications*** interface, between NetBIOS

service elements and NetBIOS-compatible applications, not a ***user*** interface. Moreover, the reference to "IBM Personal Computer (PC) and compatible systems" is a reference to the hardware, not the software with user interfaces that is running on the hardware. Exhibit M itself admits the deficiency in the inherency argument when it states "it is ***expected*** that on computers operating under the PC-DOS and MS-DOS operating systems that the existing NetBIOS interface will be preserved." This says nothing about what processes with user interfaces can participate in the claimed point-to-point communications.

53. With respect to the establishing step, Exhibit M does not even assert that one of the processes running on one of the DOS-style computers is the caller process. This is because neither the phone application not the device agent are part of the point-to-point communication -- the telephones are. Thus, this limitation is not met.

54. In addition, the Office Action has not established that one of ordinary skill in the art would have made the proposed combination. The Office Action alleges that "it would have been obvious … to utilize the user-interface elements and interaction taught by Pinard in the invention taught by NetBIOS since Pinard teaches that the invention can be used with any system in which a personal computer in conjunction with a server operates … since NetBIOS teaches that it can be implemented using different operating systems … and since examiner notes that both NetBIOS and Pinard relate to communications between at least two users implemented in a computerized environment." However, Pinard already discloses a personal computer 1 interacting with a server 5 without any indication that there is something missing from Pinard. Thus, without an indication that Pinard was somehow deficient, one of ordinary skill in the art would not have been motivated to include NetBIOS with Pinard. Accordingly, amended claim 11 and its dependent claims 12-20 are not rendered obvious by the combination of NetBIOS and Pinard.

55. Amended claim 22, like amended claim 11, recites "***the caller process having a user interface*** and being operatively connectable to the callee process" and "establishing a ***point-to-point communication link from the caller process*** to the first callee process." As was set forth

for the patentability of amended claim 11 above, that combination of elements is not taught by the applied combination of references. Thus, amended claim 22 and its dependent claims 23-31 are patentable over the applied combination of references.

The rejection of claims the pending claims over the Etherphone papers, either alone or in combination with at least one other reference

56. Claims 43 and 44 were rejected under 35 U.S.C. § 102 as being anticipated by Etherphone: Collected Papers 1987-1988 (May 1989) (hereinafter "the Etherphone papers"). The Etherphone Collected Papers include *An Overview of the Etherphone System and its Applications* (hereinafter "Zellweger"), *Telephone Management in the Etherphone System* (hereinafter "Swinehart"), and *Managing Stored Voice in the Etherphone System* (hereinafter "Terry").

57. Pending claims 1-7, 11-20 and 22-44 were rejected under 35 U.S.C. § 103(a) as being obvious over the combination of the Etherphone papers with at least one other reference (e.g., Harrick M. Vin, et al. *Multimedia Conferencing in the Etherphone* Environment, IEEE Computer Society (October 1991) (hereinafter "Vin") and RFC 1531).

The rejection of claims 43 and 44 as anticipated by the Etherphone papers

58. Claim 43 recites "a. program code configured to access a directory database, the database having a network protocol address for a selected plurality of processes having on-line status with respect to the computer network, the network protocol address of each respective process forwarded to the database following connection to the computer network." Exhibit N of the Request asserts that this limitation is taught by the system directory database of local Xerox employees and cites Zellweger, page 4. However, in the paragraph just prior to the section cited by Exhibit N, Zellweger states "Figure 3 shows an Etherphone control window, called Finch, and a personal telephone directory window." The caption for Figure 3 further explains that "the

lower window [of Figure 3] shows a portion of a personal telephone directory, which is a set of speed-dialing buttons that can be created easily from an ordinary text file."

59. Figure 3 does not show that the cited database includes the claimed "network protocol address for a selected plurality of processes having on-line status with respect to the computer network" -- rather it simply appears to include phone numbers for the various entries, including phone numbers outside of the Etherphone system. Thus, this limitation is not taught by the Etherphone references, and I believe that the patentability of claim 43 should be confirmed.

60. The Office Action also has not shown that the Etherphone papers disclose "the network protocol address of each respective process forwarded to the database following connection to the computer network" as the Office Action has not shown how such a dynamic addressing technique is taught by the Etherphone papers. Thus, this limitation is not anticipated by the Etherphone papers as well.

61. As described above, claim 43 recites "a selected plurality of processes having on-line status with respect to the computer network." The Request and Exhibit N do not show how the Etherphone papers teach this recitation limitation. In fact, "on-line" status is not mentioned in any of the corresponding support sections for claim 43 in either the Request or Exhibit N. Further, the Etherphone papers do not teach an association between users' on-line status and the maintaining of a network address. To the contrary, the Etherphone system appears to always associate a user with a location, ***whether or not the user is currently at that location,*** and directs telephone calls for that user to that location ***without regard to the users' on-line status***. So, for example, while the Request points out that logging in to a workstation tells the Etherphone system—through unspecified mechanisms—where calls should be directed (citing Swinehart 1, page 2 as stating "Calls are to individuals, not locations...Logging in tells the telephone system where Karmen is."), the Request neglects to point out that ***logging out also tells the telephone system where calls should be directed.*** ("Since Karmen has signed off from her workstation, the call rings immediately at an attendant's workstation..." Swinehart page 3).

62. Even assuming that the Office Action intended the rejection of claim 43 to be an obviousness rejection, claim 43 still is patentable over the Etherphone papers in view of Vin and RFC 1531. The Office Action alleges, with respect to claim 1, that it would have been obvious … to utilize dynamically assigned IP address from Internet access servers as taught by Vin and RFC 1531 since Etherphone was intended for use in multiple networks and communication protocols (Terry, page 3), … [and] since dynamic allocation of IP addresses allows for automatic reuse of an address that is no longer needed by the host to which it was assigned … and since examiner notes the use of dynamic IP address assignment in a TCP/IP network are old and well known in the art, and are useful to eliminate the burdensome task of manually assigning IP addresses for all networked components."

63. Terry, page 3, however, does not indicate under what circumstances the "multiple networks and communications protocols" would be used. The full paragraph that appears to be referenced by the Office Action states:

> The Etherphone system is intended for use in a locally distributed computing environment containing multiple workstations and programming environments, multiple networks and communication protocols, and perhaps even multiple telephone transmission and switching choices. The system is intended to be extensible in that introducing new applications, network services, workstations, networks, and other components is possible.

64. Thus, it is probable that the "multiple networks and communications protocols" refers to uses of the workstations and not the Etherphones. Similarly, Vin does not disclose how/where the IP address of Figure 5 is obtained. In addition, Figure 5 shows that the IP address is below a "datagram multicast" layer, so there is no evidence that one of ordinary skill in the art would have been motivated to use -- let alone know how to adapt -- the techniques of a multicast system when implementing a "point-to- point communication link between the first and second processing units through the Internet."

65. Furthermore, the Office Action has not shown that one of ordinary skill in the art would have been motivated to combine the Etherphone papers with Vin and RFC 1531 without additional modifications to the combination -- modifications which are not specified in the Office Action. For example, the Office Action has not identified that one of ordinary skill in the art would have been motivated to combine the Etherphone papers with RFC 1531 in light of the use of "leases" on network addresses within the RFC 1531 framework. As described in section 3.6 "If the lease expires before the host can contact a DHCP server, the host must immediately discontinue use of the previous network address and may inform local users of the problem." Similarly, section 4.4.4 of RFC 1531 states "If the lease expires before the client receives a DHCPACK, the client moves to INIT state, MUST immediately stop any other network processing and requests network initialization parameters as if the client were uninitialized. … If the client is given a new network address, it MUST NOT continue using the previous network address and SHOULD notify the local users of the problem." However, if the system of the Etherphone papers and Vin is using "datagram multicast," how is the system supposed to deal with the loss of the address? Other processes that were communicating with the process that lost its lease would now begin sending the packets to the wrong destination. Moreover, by having to rely on another server that can go down such that a lease cannot be renewed and the computer has to stop using its network address, the combination is less robust than a system using static address assignment. Thus, the Office Action has not shown that one of ordinary skill in the art would have been motivated to combine the Etherphone papers with Vin and RFC 1531.

66. Thus, claim 43 is neither anticipated by the Etherphone papers nor rendered obvious by the Etherphone papers in combination with Vin and RFC 1531.

67. Claim 44 recites "following connection of the first process to the computer network forwarding to the address server a network protocol address at which the first process is connected to the computer network." As discussed above with respect to claim 43, the Office Action has not shown how such a dynamic addressing technique is taught by the Etherphone papers or rendered obvious by the combination of the Etherphone papers and Vin and RFC 1531.

68. Claim 44 also recites "querying the address server as to whether the second process is connected to the computer network." Exhibit N alleges that "conversations are established between two or more parties (Etherphones, servers, and so on) by performing remote procedure calls to the Voice Control Server." It then alleges that "when a first user at a first Etherphone (a first 'process') calls a second user at a second Etherphone (a second 'process'), the first Etherphone ***transmits a query*** in the form of a remote procedure call to determine the location of the second Etherphone." This allegation is made without citation to any portion of the Etherphone papers -- because the conclusion is not supported.

69. As admitted in the Exhibit N, Swinehart states "The telephone control server manages voice switching by sending to each Etherphone or service the network addresses of the other participants. ... Thereafter, voice datagrams are transmitted directly among the participants, bypassing the control server." Neither the Exhibit N nor Swinehart discloses when this information is sent, thus there is no evidence that a query is sent to an address server (e.g., such that the network address information is returned as part of the result of the query). In fact, if the Voice Control Server were periodically sending out information to Etherphones or other services, there would be no need to "querying the address server as to whether the second process is connected to the computer network." Thus, this limitation is not inherently met by the Etherphone references, and I believe that the patentability of claim 44 should be confirmed.

70. As described above, claim 44 recites "querying the address server ***as to whether the second process is connected to the computer network***." As was discussed above with respect to claim 43, the Request and Exhibit N do not show how the Etherphone papers teach this tracking of on-line status. Thus, claim 44 is patentable over the Etherphone papers.

<u>The rejection of claims 1-7 and 10-42 as obvious over the Etherphone papers in combination with at least one other reference</u>

71. Claims 1-7 and 10-42 have been rejected under 35 U.S.C. § 103(a) as obvious over the combination of the Etherphone papers in combination with (1) Vin and RFC 1531, (2) Pinard,

(3) Vin, RFC 1531 and NetBIOS, and (4) Pinard and VocalChat User's Guide. However, I believe that each of the pending claims in that group of claim is non-obvious as set forth below.

72. Claims 1, 2, 4-7 and 32-42 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the Etherphone papers in view of Vin and RFC 1531. As was discussed above with respect to claim 43, the Office Action has not shown that one of ordinary skill in the art would have been motivated to make the proposed combination of references in light of the problems associated with the use of dynamic addresses.

73. Claim 1 also recites "program code for ***transmitting***, to the server, ***a query*** as to whether the second process is connected to the computer network." As was discussed above with respect to claim 44, the Office Action has not provided any evidence to support the allegation that such a query is taught by the Etherphone papers. Further, as was discussed with respect to claim 43, the Office Action has not shown that the Etherphone papers teach determining "whether the second process is connected to the computer network." Thus, claim 1 is not rendered obvious by the proposed combination of references.

74. Claim 2 recites "a memory, operatively coupled to the processor, for storing a network protocol address for selected of a plurality of processes, ***each network protocol address stored in the memory following connection of a respective process to the computer network***." As was discussed above with respect to claim 43, the Office Action has not shown that one of ordinary skill in the art would have been motivated to make the proposed combination of references in light of the problems associated with the use of dynamic addresses.

75. Claim 2 also recites "means, ***responsive to a query from the first process***, for determining the on-line status of the second process and for transmitting a network protocol address of the second process to the first process in response to a positive determination of the on-line status of the second process." As was discussed above with respect to claim 44, the Office Action has not provided any evidence to support the allegation that such a query is taught by the Etherphone papers. Further, as was discussed with respect to claim 43, the Office Action has not shown that the Etherphone papers teach "determining the on-line status of the second

process." Thus, claim 2 and its dependent claim 3 are not rendered obvious by the proposed combination of references.

76. Claim 4 recites "A. receiving and storing into a computer memory a respective network protocol address for selected of a plurality of processes that have an on-line status with respect to the computer network, ***each of the network protocol addresses received following connection of the respective process to the computer network***." As was discussed above with respect to claim 43, the Office Action has not shown that one of ordinary skill in the art would have been motivated to make the proposed combination of references in light of the problems associated with the use of dynamic addresses.

77. Claim 4 also recites "B. ***receiving a query*** from the first process to determine the on-line status of the second process." As was discussed above with respect to claim 44, the Office Action has not provided any evidence to support the allegation that such a query is taught by the Etherphone papers. Further, as was discussed with respect to claim 43, the Office Action has not shown that the Etherphone papers teach "determine[ing] the on-line status of the second process." Thus, claim 4 and its dependent claim 5-7 are not rendered obvious by the proposed combination of references.

78. Claim 32 recites "a. maintaining an Internet accessible list having a plurality of selected entries, each entry comprising an identifier and a corresponding Internet protocol address of a process currently connected to the Internet, ***the Internet Protocol address added to the list following connection of the process to the computer network***." As was discussed above with respect to claim 43, the Office Action has not shown that one of ordinary skill in the art would have been motivated to make the proposed combination of references in light of the problems associated with the use of dynamic addresses. Further, as was discussed with respect to claim 43, the Office Action has not shown that the Etherphone papers teach determining the on-line status of processes such that the Etherphone papers would disclose entries for processes that are "***currently connected*** to the Internet." Thus, claim 32 is patentable over the applied combination of references.

79. Claim 33 recites "maintaining, in a computer memory, a network accessible compilation of entries, selected of the entries comprising a network protocol address and a corresponding identifier of a process connected to the computer network, the network protocol address of the corresponding process assigned to the process upon connection to the computer network." As was discussed above with respect to claim 43, the Office Action has not shown that one of ordinary skill in the art would have been motivated to make the proposed combination of references in light of the problems associated with the use of dynamic addresses. Further, as was discussed with respect to claim 43, the Office Action has not shown that the Etherphone papers teach determining the on-line status of processes such that the Etherphone papers would disclose entries for processes that are "***connected to*** the computer network." Thus, claim 33 and its dependent claims 34-37 are patentable over the applied combination of references.

80. Claim 38 recites "program code configured to maintain, in the computer memory, a network accessible compilation of entries, selected of the entries comprising a network protocol address and a corresponding identifier of a process connected to the computer network, ***the network protocol address of the corresponding process assigned to the process upon connection to the computer network***." As was discussed above with respect to claim 43, the Office Action has not shown that one of ordinary skill in the art would have been motivated to make the proposed combination of references in light of the problems associated with the use of dynamic addresses. Further, as was discussed with respect to claim 43, the Office Action has not shown that the Etherphone papers teach determining the on-line status of processes such that the Etherphone papers would disclose entries for processes that are "***connected to*** the computer network." Thus, claim 38 and its dependent claims 39-42 are patentable over the applied combination of references.

81. Claims 10-30 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the Etherphone papers in view of Pinard, either alone or in combination with the VocalChat User's Guide. Amended claim 11 recites "the caller process having a user interface and being operatively connectable to the callee process" and "establishing a point-to-point communication

link ***from the caller process*** to the first callee process." When taken together, it is clear that the Request (including Exhibit N) and Office Action have not shown that the caller process, having a user interface, establishes a point-to-point communication link with a first callee process. The Request states on page 119 that "Etherphone describes establishing a point-to-point communication link between a caller process and a callee process. … Pinard discloses that a point-to-point communication link is established in response to a user associating an element representing the first callee process with the element representing a first communication line." Neither of those assertions actually state that any of the user interface elements described in the Request establish a point-to-point communication with a callee process. In fact, Exhibit N admits that the user interface elements are on the workstation, not on the Etherphones that conduct the voice communications. Page 12 of Exhibit N directly states that the "GUI features [are] presented on the workstation display."

82. In addition, the Office Action has not established that one of ordinary skill in the art would have made the proposed combination. The Office Action alleges that "it would have been obvious … to utilize[e] the user-interface elements and interactions taught by Pinard in the invention taught by Etherphone since Pinard teaches that the invention can be used with any system in which a person computer in conjunction with a server operate." However, Pinard already discloses a personal computer 1 interacting with a server 5 without any indication that there is something missing from Pinard. Thus, without an indication that Pinard was somehow deficient, one of ordinary skill in the art would not have been motivated to include Etherphone with Pinard. Accordingly, amended claim 11 and its dependent claims 12-20 are not rendered obvious by the combination of NetBIOS and Pinard.

83. Amended Claim 22, like amended claim 11, recites "***the caller process having a user interface*** and being operatively connectable to the callee process" and "establishing a ***point-to-point communication link from the caller process*** to the first callee process." As was set forth for the patentability of claim 11 above, that combination of elements is not taught by the applied

combination of references. Thus, amended claim 22 and its dependent claims 23-31 are patentable over the applied combination of references.

The rejection of the pending claims over the VocalChat References, either alone or in combination with at least one other reference

84. Claims 43 and 44 were rejected under 35 U.S.C. § 103(a) as being obvious over VocalChat User's Guide in view of VocalChat Readme, VocalChat Networking, VocalChat Help File and VocalChat Troubleshooting Help file (collectively the "VocalChat References"), either alone or in combination with at least one other reference.

Claims 43 and 44

85. Claim 43 recites "program code configured to access a directory database, the database having a network protocol address for a selected plurality of processes having on-line status with respect to the computer network." The Office Action alleges that this limitation is met because "the network protocol address of clients are transmitted to and stored in a Connection List / USERS file located on the network." However, each VocalChat process actually reads the file and locally processes it, writing back the whole contents of the file when it has added its changes to it. Thus, in the context of multiple, independently-operating VocalChat clients each being able to read from and write to the "shared CONNLIST.VC" file, that file is not acting as a directory database, just a file whose contents could readily become inconsistent with the actual state of processes. For example, if a first process reads the file and then a second process reads the file, then the first process writes the file and then the second process writes the file, the changes written by the first process will be lost when the second process writes back its changes. Similarly, if the second process wrote back the file before the first, then the second process's changes would be lost when the first process wrote back its version of the file. Thus, the VocalChat References do not anticipate the claimed "program code configured to access a

directory database, the database having a network protocol address for a selected plurality of processes having on-line status with respect to the computer network."

86. In addition, claim 43 also recites "the network protocol address of each respective process forwarded to the database following connection to the computer network." This limitation is not taught by the VocalChat References, and the Office Action does not identify how this dynamic addressing is taught by the VocalChat References. Even assuming that the Office Action had intended to apply the combination of the VocalChat references and RFC 1531, the combination of references still would not have rendered claim 43 obvious.

87. With respect to claim 1, the Office Action asserts that "it would have been obvious to utilize the limitations taught by RFC 1531 in the invention taught by VocalChat … since this allows for automatic reuse of an address that is no longer needed by the host to which it was assigned … and since examiner notes the use of dynamic IP address assignment in a TCP/IP network are old and well known … and are useful to eliminate the burdensome task of manually assigning IP addresses for all network computers." I do not agree with the conclusion drawn in by the Office Action on the combinability of the references.

88. In the context of point-to-point communication, widespread use of dynamically assigned addresses is not the solution to a problem, it is the problem itself. Dynamically assigned addresses were known, and the patent in re-examination specifically states in that regard, "Due to the dynamic nature of temporary IP addresses of some devices accessing the Internet, point-to-point communications in realtime of voice and video have been generally difficult to attain." Col. 1, lines 53-56.

89. The development history of the VocalChat products indicates that the developers of the VocalChat products had problems addressing dynamic addressing issues. The Request cites a Generic version of the VocalChat client which, according to Mr. Cohen, was used on local area networks. See Cohen Declaration, paragraph 3. There apparently was a subsequent version of VocalChat that was also released by VocalTec to the public in 1994, at least in beta. This version, called VocalChat Gateway To Interent (or "VocalChat GTI") was designed for use on

the Internet, and I have been informed that Net2Phone believes that VocalChat GTI used static local address files into which static callee addresses were manually input. I have also been informed that Net2Phone believes that VocalChat GTI did not utilize a server at all.

90. Based on the above, I believe the use of manual inputting of static addresses and the absence of a server suggests that the VocalTec designers—presumably software developers of at least ordinary skill in the art—did not consider the alleged combination of their own VocalChat references with RFC 1531, or it suggests that they did consider it but were unable to overcome the non-trivial obstacles to doing so.

91. I have also been informed that Net2Phone believes that soon after the release of the VocalChat GTI version, VocalTec released another VocalChat version that used Internet Relay Chat (IRC) to help VocalChat clients with dynamically assigned IP addresses find one another. This change from VocalChat GTI to VocalChat IRC appears to be further objective evidence that even the VocalChat designers recognized that the "improvement" to the Generic VocalChat implementation was still deficient. If the designers of the VocalChat Generic implementation did not see fit to combine dynamic addressing with the Generic implementation disclosed in the VocalChat references, then I do not believe that one of ordinary skill in the art would not have done so either. Thus, claim 43 is not anticipated by or rendered obvious by the VocalChat References.

92. Claim 44 recites "querying the address server as to whether the second process is connected to the computer network." The Office Action cites the Help file, pages 2 and 26, and the Network Information file, page 10, as disclosing this element and states "clients query the network server and … the server stores addresses of logged in users." However, the Office Action has not identified how the cited portions of those references teach the claimed "querying." At best, the references teach that a local process reads a "USERS" file or a Connections file. As can be seen from page 4 of the VocalChat Network Information (reproduced below), when the VocalChat system uses the Generic mode, a USERS file is used.

> ***2.5. Network parameters in the VocalChat INI files***
>
> These are the network parameters in the VocalChat VOCLCHAT.INI and VCSETUP.INI files (under the `NetWork` section):
>
> ```
> [NetWork]
> NetWork=               / description of the selected network
> NetWorkUsers=          / user services: NetWare/WinWorkgroups/Generic*
> NetWorkProtocol=       / network protocol: IPX/NetBIOS
> NetWorkType=           / name of the selected network, for future use
> UsersFile=             / path name of users file (when Generic is set)
> MyUserName=            / the name of the user (when Generic is set)**
> ```
>
> * When `Generic` is set, a USERS file is used.
> ** This line appears only in the VOCALCHAT.INI file of each user.
>
> The VOCLCHAT.INI files are in the windows directory of each user. The VCSETUP.INI file is in the VOCLCHAT directory, where VocalChat was installed, and is used only to supply default values for the different installations.

93. The USERS file configuration parameter includes a "UsersFile" entry that specifies the "path name of users file (when Generic is set)." However, it is also stated that "The VOCLCHAT.INI files are in the windows directory of each user." Thus, this "UsersFile" entry is a local configuration parameter such that the local VocalChat client reads and writes the USERS file on its own -- without performing the claimed query.

94. Similarly, page 8 of the VocalChat Help file states "If your network type is not NetWare or Windows for Workgroups, the Setup program creates a Connection List file which is used to identify and access users." The Connection List file and the USERS file apparently have the same function. Thus, the identification and access enabled by the Connection List is performed by the local VocalChat client reading and writing the file itself -- without performing the claimed query. Accordingly, claim 44 is not rendered obvious by the applied combination of references.

95. Claim 44 further recites "following connection of the first process to the computer network forwarding to the address server a network protocol address at which the first process is

connected to the computer network." As discussed above with respect to the "querying" step, in the VocalChat Generic implementation, a local process reads a "USERS" file or a Connections file in its entirety and writes it back in its entirety rather than "forwarding to the address server a network protocol address at which the first process is connected to the computer network." This causes the VocalChat system to have to send an increasing amount of information as the number of users increases. Sending the whole file such that the new file replaces the old file also creates problems with consistency such that one user's changes could overwrite the changes of another user -- especially as networks got larger which would have increased the problem of inconsistent files being written.

96. In addition, with respect to "following connection of the first process to the computer network forwarding … a network protocol address at which the first process is connected to the computer network," the Office Action has not shown how this dynamic address-based limitation is taught by the VocalChat References. Thus, this limitation has not been shown to be taught by the applied references.

97. Further, even if the Office Action had proposed a combination of the VocalChat References and RFC 1531, the combination would still not render obvious claim 44. As was discussed above with respect to claim 43, there is no motivation for combining VocalChat References and RFC 1531. Thus, claim 44 is not rendered obvious by the VocalChat References, either alone or in combination with RFC 1531.

<u>Claims 1-7 and 31-42</u>

98. Claim 1 recites "program code for transmitting, to the server, a query as to whether the second process is connected to the computer network." As was discussed above with respect to claim 44, the VocalChat References do not teach "querying." In addition, the Office Action has not shown how the VocalChat references teach such a server capable of receiving a query. Thus, this limitation is not taught by the proposed combination.

99. Claim 1 also recites "program code for transmitting to the server a network protocol address received by the first process ***following connection to the computer network***." As was discussed above with respect to claim 43, it would not have been obvious to combine the VocalChat References and RFC 1531. Thus, claim 1 is nonobvious in view of the applied references.

100. Claim 2 recites "means, ***responsive to a query from the first process***, for determining the on-line status of the second process and for transmitting a network protocol address of the second process to the first process in response to a positive determination of the on-line status of the second process." As was discussed above with respect to claim 44, the Office Action has not provided any evidence to support the allegation that such a query is taught by the VocalChat References.

101. Claim 2 further recites "each network protocol address stored in the memory ***following connection of a respective process to the computer network***." As was discussed above with respect to claim 43, the VocalChat References do not teach this dynamic address assignment. Further, it would not have been obvious to combine the VocalChat References and RFC 1531 for the reasons set forth above with respect to claim 43. Thus, claim 2 and its dependent claim 3 are patentable over the combination of the VocalChat References and RFC 1531.

102. Claim 4 recites "A. receiving and storing into a computer memory a respective network protocol address for selected of a plurality of processes that have an on-line status with respect to the computer network, ***each of the network protocol addresses received following connection of the respective process to the computer network***." As was discussed above with respect to claim 43, the Office Action has not shown that one of ordinary skill in the art would have been motivated to make the proposed combination of references.

103. Claim 4 also recites "B. ***receiving a query*** from the first process to determine the on-line status of the second process." As was discussed above with respect to claim 44, the Office Action has not provided any evidence to support the allegation that such a query is taught by the

VocalChat references. Thus, claim 4 and its dependent claim 5-7 are not rendered obvious by the proposed combination of references.

104. Claim 32 recites "a. maintaining an ***Internet accessible*** list having a plurality of selected entries, each entry comprising an identifier and a corresponding Internet protocol address of a process currently connected to the Internet." Exhibit O of the Request admits that "While VocalChat does not explicitly describe a server with stored names and addresses is accessible over 'the Internet,' it describes the use of TCP/IP, which is the protocol used on the Internet." Exhibit O then states that "VocalChat inherently describes that the list of users and network addresses is accessible over the Internet"; however, this is not inherently true. There may be any range of local area networks running TCP/IP communications that are not connected to the Internet. Thus, just because the Internet is a type of TCP/IP network does not mean that all TCP/IP networks must be the Internet.

105. In fact, the security and privacy concerns that arise in a secure, local area network are very different than the issues that arise on the Internet. The VocalChat References describe that "All users must use the same Post-Office, otherwise they won't be able to communicate or leave messages to each other. This means that all users must … have write permission for the Post-Office directory." This would mean opening up one's network to outsiders across the Internet. The Office Action has not cited any evidence that one of ordinary skill in the art would have been motivated to do so in light of the inherent risks. Further, the VocalChat development history discussed above is illuminating about how one of ordinary skill in the art would have modified the VocalChat system. The VocalChat designers went from a Generic implementation with a shared directory with a shared file that can be remotely updated, to locally processed files that were manually updated in the VocalChat GTI version. Thus, the trend on how to modify the VocalChat system was the opposite of what is being proposed.

106. Claim 32 also recites "***the Internet Protocol address added to the list following connection of the process to the computer network***." As was discussed above with respect to claim 43, the Office Action has not shown that one of ordinary skill in the art would have been

motivated to make the proposed combination of references. Thus, claim 32 is patentable over the applied combination of references.

107. Claim 33 recites "maintaining, in a computer memory, a network accessible compilation of entries, selected of the entries comprising a network protocol address and a corresponding identifier of a process connected to the computer network, the network protocol address of the corresponding process assigned to the process upon connection to the computer network." As was discussed above with respect to claim 43, the Office Action has not shown that one of ordinary skill in the art would have been motivated to make the proposed combination of references in light of the problems associated with the use of dynamic addresses. Thus, claim 33 and its dependent claims 34-37 are patentable over the applied combination of references.

108. Claim 38 recites "program code configured to maintain, in the computer memory, a network accessible compilation of entries, selected of the entries comprising a network protocol address and a corresponding identifier of a process connected to the computer network, ***the network protocol address of the corresponding process assigned to the process upon connection to the computer network***." As was discussed above with respect to claim 43, the Office Action has not shown that one of ordinary skill in the art would have been motivated to make the proposed combination of references in light of the problems associated with the use of dynamic addresses. Thus, claim 38 and its dependent claims 39-42 are patentable over the applied combination of references.

109. Amended claim 11 recites "c.1 querying the server as to the on-line status of the first callee process; and c.2 receiving a network protocol address of the first callee process over the computer network from the server." As was discussed above with respect to claim 44, the VocalChat References do not disclose such a querying step. Thus, amended claim 11 and its dependent claims 12-20 are patentable over the applied combination of references.

110. Amended claim 22 recites "program code for querying the server as to the on-line status of the first callee process; and program code for receiving a network protocol address of the first callee process over the computer network from the server." As was discussed above with respect

to claim 44, the VocalChat References do not disclose such a querying step. Thus, amended claim 22 and its dependent claims 23-30 are patentable over the applied combination of references.

111. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Dated: November 27, 2009

Ketan Mayer-Patel, Ph.D.

EXHIBIT 1 TO MAYER-PATEL DECLARATION

Ketan Mayer-Patel

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Department of Computer Science, CB #3175
University of North Carolina, Chapel Hill

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Education

Ph.D. University of California, Berkeley, 1999
Parallel Software-only Video Effects Processing

M.S. University of California, Berkeley, 1997
Design and Performance of the Berkeley Continuous Media Toolkit

B.A. University of California, Berkeley, 1992
Majors: Computer Science and Economics

Professional Experience

Associate Professor
University of North Carolina, Chapel Hill, NC (August 2005 – present)

Assistant Professor
University of North Carolina, Chapel Hill, NC. (January 2000 – August 2005)

Visiting Researcher
Microsoft Bay Area Research Center (BARC), San Francisco, CA. (June 2003 – December 2003)

Graduate Student Researcher
University of California, Berkeley, CA. (June 1993 – November 1999)

Graduate Student Instructor
University of California, Berkeley, CA. (August 1997 – December 1997)

Programmer
University of California, Berkeley, CA. (June 1992 – June 1993)

Programmer
United States Department of Agriculture, Albany, CA. (May 1991 – June 1992)

Honors and Notables

- National Science Foundation CAREER Award, 2003
- Computer Science Student Association Teaching Award, 2003
- Invited to three major meetings (one domestic and two international) of top multimedia researchers to discuss future directions for the field.
- In the sixteen-year history of the ACM SIGMultimedia Conference, considered to be the premier conference in the field of multimedia, I have published twelve papers in ten different years.

Publications

Refereed Journals

K. Mayer-Patel and D. Gotz, "Scalable, Adaptive Streaming for Nonlinear Media," *IEEE Multimedia,* vol. 14, no. 3 (15 pages).

D. Ott and K. Mayer-Patel, "An open architecture for transport-level protocol coordination for distributed multimedia applications," *ACM Transactions on Multimedia Computing, Communications, and Applications*, vol. 3, no. 3 (22 pages).

D. Gotz and K. Mayer-Patel, "GAL: A middleware library for multidimensional adaptation," under review for *ACM Transactions on Multimedia Computing, Communications, and Applications* (21 pages).

K. Mayer-Patel, B. Smith, and L.A. Rowe, "The Berkeley software MPEG-1 video decoder," to appear in *ACM Transactions on Multimedia Computing, Communications, and Applications,* vol. 1, no. 1 (23 pages).

K. Mayer-Patel and S.-U. Kum, "Real-time multi depth stream compression," *ACM Transactions on Multimedia Computing, Communications, and Applications,* vol. 1, no. 2 (26 pages).

D. Gotz and K. Mayer-Patel, "A Framework for Scalable Delivery of Digitized Spaces," *International Journal on Digital Libraries*, vol. 5, no. 3 (14 pages).

J. Considine, K. Mayer-Patel, and J. Byers, "A case for testbed embedding services," *Computer Communication Review*, vol. 34, no. 1, January 2004, pp. 137-142.

Refereed Conferences and Workshops

K. Mayer-Patel, "Systems challenges of media collectives: Supporting media collectives with adaptive MDC," *Proceedings of the 15th International ACM Conference on Multimedia,* Augsberg, Germany, 2007, pp. 625-630.

S. Krishnan and K. Mayer-Patel, "A utility-driven framework for loss and encoding aware video adaptation," *Proceedings of the 15th International ACM Conference on Multimedia,* Augsberg, Germany, 2007, pp. 1026-1035.

D. Gotz and K. Mayer-Patel, "A general framework for multidimensional adaptation," *Proceedings of the 12th International ACM Conference on Multimedia,* New York, 2004, pp 612-619.

D. Ott and K. Mayer-Patel, "Coordinated multi-streaming for 3D tele-immersion," *Proceedings of the 12th International ACM Conference on Multimedia*, New York, NY, 2004, pp. 596-603.

D. Ott and K. Mayer-Patel, "Aggregate congestion control for distributed multimedia applications," *Proceedings of IEEE Infocom '04*, Hong Kong, 7-11 March 2004, vol. 1, pp. 13-23.

K. Mayer-Patel and W. Miaw, "Evaluating the effectiveness of automatic PVR management," *Proceedings of the SPIE Conference on Storage and Retrieval Methods and Applications for Multimedia*, San Jose, CA, January 2004, vol. 5307, pp. 360-365.

S.-U. Kum, K. Mayer-Patel and H. Fuchs, "Real-time compression for dynamic 3D environments," *Proceedings of the 11th International ACM Conference on Multimedia*, Berkeley, CA, 2003, pp. 185-194.

N. Kelshikar, X. Zabulis, J. Mulligan, K. Daniilidis, V. Sawant, S. Sinha, T. Sparks, S. Larsen, H. Towles, K. Mayer-Patel, H. Fuchs, J. Urbanic, K. Benninger, R. Reddy and G. Huntoon, "Real-time terascale implementation of tele-immersion," *Proceedings of the International Conference on Computation Science*, Melbourne, Australia, 2003, Springer-Verlag Lecture Notes in Computer Science vol. 2660, pp. 33-42.

K. Mayer-Patel, L. Le and G. Carle, "An MPEG performance model and its application to adaptive forward error correction," *Proceedings of the 10th International ACM Conference on Multimedia*, Juan-les-Prins, France, 2002, pp. 1-10.

D. Gotz and K. Mayer-Patel, "IRW: an incremental representation for image-based walkthroughs," *Proceedings of the 10th International ACM Conference on Multimedia*, Juan-les-Prins, France, 2002, pp. 67-76.

D. Ott and K. Mayer-Patel, "A mechanism for TCP-friendly transport-level protocol coordination," *Proceedings of the USENIX Technical Conference*, Monterrey, CA, 2002 (14 pages).

A. Wilson, K. Mayer-Patel and D. Manocha, "Spatially-encoded far-field representations for interactive walkthroughs," *Proceedings of the 9th International ACM Conference on Multimedia*, Ottawa, Canada, 2001, pp. 348-357.

D. Ott and K. Mayer-Patel, "Transport-level protocol coordination in cluster-to-cluster applications," *Proceedings of the 8th International Workshop on Interactive Distributed Multimedia Systems (Lecture Notes in Computer Science)*, vol. 2158, Springer, 2001, pp. 10-22.

D. Yu, D. Wu, K. Mayer-Patel and L.A. Rowe, "dc: a live webcast control system," *Proceedings of the SPIE Conference on Multimedia Computing and Networking*, vol. 4312, San Jose, CA, 2001, pp. 111-122.

K. Mayer-Patel, "Incorporating application-level knowledge into the MPEG-2 coding model," *Proceedings of the Workshop on Network and Operating System Support for Digital Audio and Video (NOSSDAV)*, Chapel Hill, CA, 2000, (6 pages).

K. Mayer-Patel and L.A. Rowe, "Exploiting spatial parallelism for software-only video effects processing," *Proceedings of the SPIE Conference on Multimedia Computing and Networking*, vol. 3654, San Jose, CA, 1999, pp. 252-263.

K. Mayer-Patel and L.A. Rowe, "A multicast control scheme for parallel software-only video effects processing," *Proceedings of the 7th International ACM Conference on Multimedia*, Orlando, FL, 1999, pp. 409-418.

K. Mayer-Patel and L.A. Rowe, "Exploiting temporal parallelism for software-only video effects processing," *Proceedings of the 6th International ACM Conference on Multimedia*, Bristol, England, 1998, pp. 161-169.

T.H. Wong, K. Mayer-Patel and L.A. Rowe, "A software-only video production switcher for the Internet MBone," *Proceedings of the SPIE conference on Multimedia Computing and Networking*, vol. 3310, San Jose, CA, 1998, pp. 28-41.

K. Mayer-Patel and L.A. Rowe, "Design and performance of the Berkeley Continuous Media Toolkit," *Proceedings of the SPIE conference on Multimedia Computing and Networking*, vol. 3020, San Jose, CA, 1997, pp. 194-206.

K. Mayer-Patel, D. Simpson, D. Wu, and L.A. Rowe, "Synchronized continuous media playback through the World Wide Web," *Proceedings of the 4th International ACM Conference on Multimedia,* Boston, MA, 1997, pp. 435-436.

L.A. Rowe, K. Patel, and B. Smith, "MPEG video in software: representation, transmission, and playback," *Proceedings of the SPIE conference on High-Speed Networking and Multimedia Computing*, vol. 2188, San Jose, CA, 1994, pp. 134-144.

K. Patel, B. Smith, and L.A. Rowe, "Performance of a software MPEG video decoder," *Proceedings of the 1st International ACM Conference on Multimedia,* Los Angeles, CA, 1993, pp. 75-82.

Software Artifacts

mpeg_play

The first publicly available MPEG-1 video decoder originally released in 1993. Over 1,000,000 copies of this program have been downloaded. It has been used as a code base for innumerable research and open source systems. Mayer-Patel was the architect of the original code that was later refactored and maintained by a number of other individuals.

The Berkeley Continuous Media Toolkit

The Berkeley CMT provided a framework within which to develop experimental multimedia tools and applications. Although primarily used by researchers at UC Berkeley, it was employed by a number of different research groups world-wide. Development of CMT ended in approximately 1998.

MPEG2Event

This recently released C# library allows researchers to rapidly develop MPEG-2 analysis tools that are interested in the details of bit-level coding elements. Although currently in use by only a small number of researchers, it is freely available at http://www.cs.unc.edu/~kmp/mpeg2event. Further development of the library is on-going.

Teaching

COMP 416: Introduction to Web Programming
My goal with this course is to pique student interest for more detailed upper-division courses in operating systems, networking, databases, security, etc. while satisfying their practical interest in developing web programming skills.

COMP 426: Advanced Web Programming
A follow-on course to COMP 416, this course expands on client-server programming concepts and concentrates more attention to the design and use of databases and XML-related technologies.

COMP 249: Multimedia Computing and Networking
This course is an advanced graduate-level course that covers the fundamental concepts in multimedia computing and networking. Students are expected to complete an extensive final project, some of which have led to publications in refereed conferences and workshops.

COMP 249-080: Topics in Multimedia Systems
This seminar course provides students with an opportunity to read and present the most research literature in multimedia systems.

Research Areas

Coordinated Multistreaming
In this project, we are developing mechanisms to address the needs of distributed multimedia applications that employ many (i.e., 10's or 100's) of different media flows with complex inter-stream semantics and adaptation requirements. This project addresses fundamental problems in protocol coordination and aggregate congestion control.

Multidimensional Adaptation
We are developing a framework for compactly expressing and evaluating adaptation policies that must negotiate tradeoffs in real-time within very large multiresolutional datasets with high dimensionality.

StrandCast
StrandCast is an application-layer multicast protocol intended for latency-insensitive multimedia applications such as receiver-driven layered multicast and pyramid broadcasting. The design and implementation of StrandCast exploits the lax latency requirements of these applications to optimize for link stress, rapid joins and leaves, and robustness in the face of node failure.

Encoding and Transmission of 3D Scenes from Multiple Cameras
The project explores ways to efficiently transmit video data from a set of cameras viewing the same scene. This problem is at the heart of most tele-immersion applications. Our hypothesis is that it is possible to exploit depth information (even if imperfect) derived from stereo correlation between cameras to more efficiently encode the original color information.

Recoverable Video Adaptation
Existing video adaptation techniques generally lead to irreversibly loss of video quality. In this project, we are exploring adaptation techniques that can be used to recover high (or at least higher) quality video from a set of independently constructed lower quality representations.

Funding

CAREER: Enabling Futuristic Distributed Applications with Integrative Multistream Networking
PI's: K. Mayer-Patel
Agency: National Science Foundation (ANI-0238260)
Amount: $404,387
Duration: 8/15/2003 – 8/14/2008

ITR: Protocol Coordination for Multi-Stream Applications
PI's: K. Mayer-Patel
Agency: National Science Foundation (ANI-0219780)
Amount: $368, 047
Duration: 10/1/2002 – 9/30/2005

RI: Tera-Pixels - Using High-Resolution Pervasive Displays to Transform Collaboration and Teaching
PI's: K. Jeffay, A. Lastra, F.D. Smith, K. Mayer-Patel and L. McMillan
Agency: National Science Foundation (EIA-0303590)
Amount: $590,986
Duration: 8/15/2003 – 8/14/2008

3D Telepresence for Medical Consultation: Extending Medical Expertise Throughout, Between, and Beyond Hospitals
PI's: H. Fuchs, B. Cairns, K. Mayer-Patel, D. Sonnenwald, G. Welch
Agency: National Library of Medicine
Amount: $2,549,980
Duration: 09/30/2003-09/29/2006

Video-Based Representation and Rendering of Large Real and Synthetic Environments
PI's: D. Manocha and K. Mayer-Patel
Agency: Office of Naval Research
Amount: $112,384
Duration: 01/01/2001-12/31/2003

Video Quality Metric Oracle
PI's: K. Mayer-Patel
Agency: North Carolina Networking Initiative Fellowship Program
Amount: $20,000
Duration: 08/15/2001 – 5/15/2002

SCOUT: An On-Line Network Path Measurement and Characterization Tool
PI's: K. Mayer-Patel
Agency: North Carolina Networking Initiative Fellowship Program
Amount: $20,000
Duration: 08/15/2000 – 5/15/2001

Professional Activities

Editorships
- Associate Editor, ACM Transactions on Multimedia Communications, Computing, and Applications (TOMCCAP)
- Associate Editor, IEEE Multimedia Magazine

Executive Committees
- Co-Chair, International Workshop on Network and Operating System Support for Digital Audio and Video (NOSSDAV)

Organizing Committees
- Program Chair, ACM Multimedia Systems 2010
- General Co-Chair, Multimedia Networking and Computing 2009
- Program Co-Chair, Multimedia Modeling (MMM) 2009
- General Co-Chair, NOSSDAV 2005
- Program Co-Chair, ACM Multimedia, 2006
- Open Source Software Competition Chair, ACM Multimedia (2004, 2005)
- Tutorial Program Chair, ACM Multimedia (2003)
- Doctoral Symposium Chair, ACM Multimedia (2000, 2001)

Program Committees
- ACM Multimedia
- NOSSDAV
- Multimedia Computing and Networking (MMCN)
- Multimedia Interactive Protocols and Systems Workshop
- IFIP Networking Conference
- Multimedia Information Systems Conference
- International World Wide Web Conference
- SPIE Conference on Multimedia Computing and Networking
- IEEE International Conference on Distributed Computing Systems
- Interactive Distributed Multimedia Systems Workshop
- Global Internet Symposium

Other Professional Service

- Guest Editor, Special Issue of Multimedia Systems Journal featuring expanded papers from the SPIE Conference on Multimedia Computing and Networking, 2003.
- In 2004, participated in a by invitation-only meeting of leaders within ACM SIGMultimedia. A report of the meeting outlining important directions for multimedia research will appear in Transactions on Multimedia Computing, Communications, and Applications.
- Invited to an international meeting of leading multimedia researchers being organized for Spring 2005 in Dagstuhl, Germany to discuss the future of multimedia research.

Past Ph.D. Students

- David Gotz, *Supporting adaptive scalable access to multiresolutional multidimensional data,* May 2005.
- David Ott, *Coordination mechanisms for distributed multistream applications*, November 2005.
- Sang-Uok Kum, *Encoding and transmission of 3D depth streams*, November 2008.

University Service

University Committees

- Tar Heel Bus Tour Advisory Committee (Fall 2001).

Department Service

- Chair of Undergraduate Curriculum Committee (Fall 2009 – present).
- Chair of Graduate Admissions Committee (Spring 2005 – Fall 2009).
- Member of Graduate Admissions Committee (Spring 2001 – Spring 2005).

Other Service

- Project UPLIFT participant (recruitment of minority high school students)
- Co-coach of the UNC ACM Programming Competition team (Fall 2000 – present).

EXHIBIT 2 TO MAYER-PATEL DECLARATION

Web Building Security

« Previous   Next Chapter »

You are offering your IP address to the entire world at this very moment.

Make sure you are not offering access to your private data at the same time.

YOUR IP ADDRESS IS PUBLIC

Accessing the Internet is a security risk.

When you are connected to the Internet, an IP address is used to identify your computer. If you don't protect yourself, this IP address can be used to access your computer from the outside world.

A fixed IP address is a larger security risk.

If you're using a modem with a dial-up connection, you will get a new IP address every time you connect to Internet.

With an ADSL or cable connection users sometimes keep the same IP address for several months, this represents an increased security risk.

If you have a fixed IP address, you give Internet hackers all the time they need to search for entrances on your computer, and to store and share (with other hackers) information they find on your computer.

Your Network Shares

Personal computers are often connected to a shared network. Personal computers in large companies are connected to large corporate networks. Personal computers in small companies are connected to a small local network, and computers in private homes often share a network between family members.

Most often networks are used to share resources like printers, files and disk storage.

When you are connected to the Internet, your shared resources can be accessed by the rest of the world.

A Common Windows Security Problem

Unfortunately, many Microsoft Windows users are unaware of a common security leak in their network settings.

This is a common setup for network computers in Microsoft Windows:

- Client for Microsoft Networks
- File and Printer Sharing for Microsoft Networks
- NetBEUI Protocol
- Internet Protocol TCP/IP

If your setup allows NetBIOS over TCP/IP, you have a security problem:

- Your files can be shared all over the Internet
- Your logon-name, computer-name, and workgroup-name are visible to others

If your setup allows File and Printer Sharing over TCP/IP, you also have a problem:

- Your files can be shared all over the Internet

Computers that are not connected to any network can also have unsecure network settings, because the settings were changed when Internet was installed.

Solving the Problem

For Windows 2000 users:

You can solve your security problem by **disabling NetBIOS over TCP/IP**:

- Open Windows Explorer
- Right-click on My Network Places
- Select: Properties
- Right-click on Local Area Network
- Select: Properties

- Select: Internet Protocol TCP/IP
- Click on Properties
- Click on Advanced
- Select the WINS tab
- Select Disable NetBIOS over TCP/IP
- Click OK

If you get the message: "This connection has an empty......", ignore the message and click on YES to continue, and click OK to close the other setup windows.

You should restart your computer after the changes.

For Windows 95, 98, or ME users:

You can solve your security problem by **disabling NetBIOS over TCP/IP**:

- Open Windows Explorer
- Right-click on My Network Places
- Select: Properties
- Select: Internet Protocol TCP/IP
- Click on Properties
- Select the NetBIOS tab
- Uncheck: Enable NetBIOS over TCP/IP
- Click OK

You must also **disable the TCP/IP Bindings** to Client for Microsoft Networks and File and Printer Sharing:

- Open Windows Explorer
- Right-click on My Network Places
- Select: Properties
- Select: Internet Protocol TCP/IP
- Click on Properties
- Select the Bindings tab
- Uncheck: Client for Microsoft Networks
- Uncheck: File and Printer Sharing
- Click OK

If you get a message with something like: "You must select a driver.........", ignore the message and click on YES to continue, and click OK to close the other setup windows.

If you still want to **share your Files and Printer** over the network, you must use the NetBEUI protocol instead of the TCP/IP protocol. Make sure you have enabled it for your local network:

- Open Windows Explorer
- Right-click on My Network Places
- Select: Properties
- Select: NetBEUI
- Click on Properties
- Select the Bindings tab
- Check: Client for Microsoft Networks
- Check: File and Printer Sharing
- Click OK

You should restart your computer after the changes.

Protect Your Server

« Previous   Next Chapter »

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DEC 03 2009

CENTRAL REEXAMINATION UNIT

Michael R Casey DAVIDSON BERQUIST JACKSON & GOWDEY LLP 4300 WILSON BLVD., 7TH FLOOR ARLINGTON VA 22203	:	(For Patent Owner)
BLAKELY SOKOLOFF TAYLOR & ZAFMAN LLP 1279 OAKMEAD PARKWAY SUNNYVALE, CA 94085-4040	:	(For Third Party Requester)
In re: Hutton *et alia* *Ex Parte* Reexamination Proceeding Control No. 90/010,416 Deposited: 17 February 2009 For: US Patent No. 6,108,704	:	DECISION DISMISSING PETITION FOR EXTENSION OF TIME 37 CFR § 1.550(c) & 1.181

This is a decision on the 23 November 2009, "Supplemental Request for Extension of Time in a Re-Examination" filed under 37 CFR § 1.550(c) requesting that the time for responding to the non-final Office action dated 27 August 2009, be further extended by one (1) week. The petition was filed with the required certificate of service and petition fee. The petition was timely filed.

The petition is before the Director of the Central Reexamination Unit for consideration.

The petition is dismissed for the reasons set forth below.

DISCUSSION

The Patent Owner requests the period of time be further extended in which to file a response to non-final Office action dated 27 August 2009 which set a two (2) month period for response thereto. A first petition for extension of time was granted extending the response period by one month in the decision dated 26 October 2009. The subsequent petition was timely filed with the required certificate of service and petition fee pursuant to 37 CFR §§ 1.550(c) and 1.17(g). Second requests for extension of time will only be granted in exception circumstances.

The petition for extension of time dated 23 November 2009 is dismissed.

37 CFR § 1.550 (c) states:

> (c) The time for taking any action by a patent owner in an *ex parte* reexamination proceeding will be extended only for sufficient cause and for a reasonable time specified. Any request for such extension must be filed on or before the day on which action by the patent owner is due, but in no case will the mere filing of a request effect any extension. Any request for such extension must be accompanied by the petition fee set forth in § 1.17(g). See § 1.304(a) for extensions of time for filing a notice of appeal to the U.S. Court of Appeals for the Federal Circuit or for commencing a civil action. (emphasis added)

MPEP § 2265 Extension of Time (in-part)

> ...
>
> *Ex parte* prosecution will be conducted by initially setting either a 1-month or a 2-month shortened period for response, see MPEP § 2263. The patent owner also will be given a 2-month period after the order for reexamination to file a statement >(by statute (35 U.S.C. § 304), this period cannot be less than 2-months, even in a proceeding where the patent is being litigated). See 37 CFR § 1.530(b). First requests for extensions of these statutory time periods will be granted for sufficient cause, and for a reasonable time specified — usually 1 month. The reasons stated in the request will be evaluated by the CRU or TC Director, and the requests will be favorably considered where there is a factual accounting of reasonably diligent behavior by all those responsible for preparing a response within the statutory time period. Second or subsequent requests for extensions of time or requests for more than 1 month will be granted only in extraordinary situations.
>
> ...

ANALYSIS AND FINDINGS

The patent owner's representative petitions to extend the period for response by adding thirty (30) days to the period for response. The decision to extend the period for response is evaluated based upon a showing of "sufficient cause." There is always the consideration to balance the need for the patent owner to have a fair opportunity to respond to the Office action between the need for special dispatch.

The patent owner timely submitted a first petition for extension which was granted on 26 October 2009. This first extension of time granted one additional month for which the patent owner to respond to the outstanding Office action. Second or subsequent requests for extensions of time or requests for more than 1 month will be granted only in extraordinary situations. The factual accounting presented by the petitioner does not meet the level of extraordinary circumstances.

The petition request to extend the response time is hereby <u>dismissed.</u>

CONCLUSION

1. The patent owner's petition for extension of time is hereby **<u>dismissed.</u>**

2. The time to respond continues to run.

3. Response is due on **27 November 2009.**

4. Response and/or submissions to the Office should be addressed as follows:

By Mail to: Mail Stop *Ex Parte* Reexam
Central Reexamination Unit
Commissioner for Patents
United States Patent & Trademark Office
P. O. Box 1450
Alexandria, VA 22313-1450

By Fax to: (571) 273-9900
Central Reexamination Unit

By Hand: Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314

By EFS: Registered users of EFS-Web may alternatively submit such correspondence via the electronic filing system EFS-Web, at https://sportal.uspto.gov/authenticate/authenticateuserlocalepf.html. EFS-Web offers the benefit of quick submission to the particular area of the Office that needs to act on the correspondence. Also, EFS-Web submissions are "soft scanned" (i.e., electronically uploaded) directly into the official file for the reexamination proceeding, which offers parties the opportunity to review the content of their submissions after the "soft scanning" process is complete.

5. Telephone inquiries with regard to this decision should be directed to Mark Reinhart, at (571) 272-1611, in the event that Mark Reinhart is unavailable Eric Keasel at (571) 272-4929, or Jessica Harrison at (571) 272-4449; all are Supervisory Patent Examiners in the Central Reexamination Unit, Art Unit 3992 may also be contacted..

/Mark Reinhart/

Mark Reinhart,
Supervisory Patent Examiner,
AU 3992,
Central Reexamination Unit
571-272-1611

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 1 of 30		
	Reexam number	90/010,416
	First Named Inventor	Hutton
	Patent Under Re-Exam	6108704
	Issue Date	2000/08/22
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0188
	Confirmation No.	1061

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document No.	Publication/ Issue Date	Name of Patentee or Applicant of Cited Document
	1-1	US-2003/0050075	2003/13/03	Rangarajan et al.
	1-2	US-2004/0204146	2004/14/10	Deeds
	1-3	US-2005/0032435	2005/10/02	Tischer et al.
	1-4	US-2005/0130611	2005/16/06	Lu et al.
	1-5	US-4332982	1982/01/06	Thomas
	1-6	US-4410765	1983/18/10	Hestad et al.
	1-7	US-4446519	1984/01/05	Thomas
	1-8	US-4450554	1984/22/05	Steensma, et al.
	1-9	US-4468529	1984/28/08	Samuel et al.
	1-10	US-4528659	1985/09/07	Jones, Jr.
	1-11	US-4589107	1986/13/05	Middleton, et al.
	1-12	US-4594477	1986/10/06	Noirot
	1-13	US-4598397	1986/01/07	Nelson, et al.
	1-14	US-4630262	1986/16/12	Callens, et al.
	1-15	US-4652703	1987/24/03	Lu, et al.
	1-16	US-4654483	1987/03	Imai et al.
	1-17	US-4694492	1987/09	Wirstrom et al.
	1-18	US-4740963	1988/26/04	Eckley
	1-19	US-4782485	1988/01/11	Gollub
	1-20	US-4799153	1989/01	Hann et al.
	1-21	US-4809271	1989/28/02	Kondo, et al.
	1-22	US-4813040	1989/14/03	Futato
	1-23	US-4819228	1989/04/04	Baran, et al.
	1-24	US-4821263	1989/04	Lundh

Examiner Signature		Date Considered	

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U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document No.	Publication/ Issue Date	Name of Patentee or Applicant of Cited Document
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	2-2	US-4837797	1989/06	Freeny, Jr., Charles C.
	2-3	US-4866704	1989/12/09	Bergman
	2-4	US-4866732	1989/12/09	Carey, et al.
	2-5	US-4873715	1989/10/10	Shibata
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	2-7	US-4890282	1989/26/12	Lambert, et al.
	2-8	US-4912705	1990/27/03	Paneth, et al.
	2-9	US-4932022	1990/05/06	Keeney, et al.
	2-10	US-4981371	1991/01/01	Gurak, et al.
	2-11	US-4989230	1991/29/01	Gillig et al.
	2-12	US-4995074	1991/02	Goldman et al.
	2-13	US-5031089	1991/07	Liu et al.
	2-14	US-5036513	1991/30/07	Greenblatt
	2-15	US-5040141	1991/13/08	Yazima et al
	2-16	US-5056140	1991/10	Kimbell
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	2-18	US-5107443	1992/04	Smith et al.
	2-19	US-5121385	1992/09/06	Tominaga, et al.
	2-20	US-5127003	1992/30/06	Dell Jr. et al
	2-21	US-5130985	1992/14/07	Kondo, et al.
	2-22	US-5150410	1992/22/09	Bertrand
	2-23	US-5155726	1992/13/10	Spinney, et al.
	2-24	US-5157592	1992/20/10	Walters

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U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document No.	Publication/ Issue Date	Name of Patentee or Applicant of Cited Document
	3-1	US-5187591	1993/16/02	Guy, et al.
	3-2	US-5212789	1993/18/05	Rago
	3-3	US-5214650	1993/25/05	Renner, et al.
	3-4	US-5220599	1993/06	Sasano et al
	3-5	US-5241594	1993/31/08	Kung
	3-6	US-5241625	1993/08	Epard et al.
	3-7	US-5247620	1993/09/21	Fukuzawa et al.
	3-8	US-5249290	1993/28/09	Heizer
	3-9	US-5274635	1993/12	Rahman et al.
	3-10	US-5282197	1994/25/01	Kreitzer
	3-11	US-5283819	1994/01/02	Glick, et al.
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	3-13	US-5305312	1994/19/04	Fornek, et al.
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	3-23	US-5440547	1995/08/08	Esaki Hiroshi et al
	3-24	US-5446891	1995/29/08	Kaplan et al.

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	Issue Date	2000/08/22
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	Attorney Docket No.	2655-0188
	Confirmation No.	1061

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document No.	Publication/ Issue Date	Name of Patentee or Applicant of Cited Document
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	4-2	US-5457738	1995/10/10	Sylvan
	4-3	US-5459864	1995/10	Brent et al.
	4-4	US-5461611	1995/10	Drake, Jr. et al.
	4-5	US-5465286	1995/07/11	Clare et al.
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	4-7	US-5473531	1995/10	Flora-Holmquist et al.
	4-8	US-5474741	1995/12/12	Mikeska et al.
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	4-10	US-5475741	1995/12/12	Davis et al.
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	4-12	US-5487100	1996/01	Kane
	4-13	US-5491800	1996/13/02	Goldsmith et al.
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	4-20	US-5544164	1996/08	Baran
	4-21	US-5544322	1996/06/08	Cheng et al.
	4-22	US-5546448	1996/08	Caswell et al.
	4-23	US-5546452	1996/13/08	Andrews et al.
	4-24	US-5548636	1996/08	Bannister et al.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 5 of 30		
	Reexam number	90/010,416
	First Named Inventor	Hutton
	Patent Under Re-Exam	6108704
	Issue Date	2000/08/22
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0188
	Confirmation No.	1061

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document No.	Publication/ Issue Date	Name of Patentee or Applicant of Cited Document
	5-1	US-5548694	1996/08	Frisken Gibson
	5-2	US-5563882	1996/10	Bruno et al.
	5-3	US-5572643	1996/11	Judson, David H.
	5-4	US-5574774	1996/11	Ahlberg et al.
	5-5	US-5574934	1996/12/11	Mirashrafi et al.
	5-6	US-5581522	1996/12/03	Shibuya et al.
	5-7	US-5581702	1996/12	McArdle et al.
	5-8	US-5586257	1996/17/12	Perlman
	5-9	US-5586260	1996/17/12	Hu
	5-10	US-5591800	1996/02	Goldsmith et al.
	5-11	US-5604737	1997/02	Iwami et al.
	5-12	US-5606669	1997/25/02	Bertin et al.
	5-13	US-5614940	1997/25/03	Cobbley et al.
	5-14	US-5619557	1997/08/04	Van Berkum
	5-15	US-5623483	1997/22/04	Agrawal et al.
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	5-19	US-5636282	1997/06	Holmquist et al.
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	5-22	US-5644629	1997/07	Chow
	5-23	US-5651006	1997/07	Fujino et al.
	5-24	US-5652759	1997/07	Stringfellow, Jr.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 6 of 30		
	Reexam number	90/010,416
	First Named Inventor	Hutton
	Patent Under Re-Exam	6108704
	Issue Date	2000/08/22
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0188
	Confirmation No.	1061

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document No.	Publication/ Issue Date	Name of Patentee or Applicant of Cited Document
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	6-2	US-5659542	1997/08	Bell et al.
	6-3	US-5659596	1997/19/08	Dunn
	6-4	US-5668862	1997/09	Bannister et al.
	6-5	US-5671428	1997/23/09	Muranaga et al.
	6-6	US-5675507	1997/10	Bobo
	~~6-7~~	~~US-5680392~~	~~1997/10~~	~~Semaan~~
	6-8	US-5684800	1997/11	Dobbins et al.
	6-9	US-5689553	1997/18/11	Ahuja et al.
	6-10	US-5692192	1997/11	Sudo
	6-11	US-5694594	1997/02/12	Chang
	6-12	US-5701463	1997/23/12	Malcolm
	6-13	US-5708422	1998/13/01	Blonder et al.
	6-14	US-5708655	1998/01	Toth et al.
	6-15	US-5710884	1998/20/01	Dedrick
	6-16	US-5717923	1998/10/02	Dedrick
	6-17	US-5719786	1998/02	Nelson et al.
	6-18	US-5721827	1998/24/02	Logan et al.
	6-19	US-5724092	1998/03/03	Davidsohn et al.
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	6-21	US-5724506	1998/03/03	Cleron et al.
	6-22	US-5726984	1998/10/03	Kubler et al.
	6-23	US-5729748	1998/03	Robbins et al.
	6-24	US-5732078	1998/03	Arango

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 7 of 30		
	Reexam number	90/010,416
	First Named Inventor	Hutton
	Patent Under Re-Exam	6108704
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	Examiner Name	KOSOWSKI, ALEXANDER J
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U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document No.	Publication/ Issue Date	Name of Patentee or Applicant of Cited Document
	7-1	US-5736968	1998/04	Tsakiris, Alexander L.
	7-2	US-5742668	1998/04	Pepe et al.
	7-3	US-5742675	1998/21/04	Kilander et al.
	7-4	US-5742762	1998/21/04	Scholl et al.
	7-5	US-5742905	1998/04	Pepe et al.
	7-6	US-5745642	1998/28/04	Ahn
	7-7	US-5745702	1998/04	Morozumi
	7-8	US-5745711	1998/04	Kitahara et al.
	7-9	US-5751712	1998/05	Farwell et al.
	7-10	US-5751961	1998/05	Smyk
	7-11	US-5754636	1998/05	Bayless et al.
	7-12	US-5754939	1998/19/05	Herz et al.
	7-13	US-5758110	1998/05	Boss et al.
	7-14	US-5758257	1998/26/03	Herz et al.
	7-15	US-5761606	1998/06	Wolzien
	7-16	US-5764736	1998/06	Shachar et al.
	7-17	US-5764741	1998/09/06	Barak
	7-18	US-5764756	1998/09/06	Onweller
	7-19	US-5767897	1998/16/06	Howell
	7-20	US-5768527	1998/06	Zhu et al.
	7-21	US-5771355	1998/23/06	Kuzma
	7-22	US-5774660	1998/30/06	Brendel et al.
	7-23	US-5774666	1998/30/06	Portuesi
	7-24	US-5778181	1998/07	Hidary et al.

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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0188
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U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document No.	Publication/ Issue Date	Name of Patentee or Applicant of Cited Document
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	8-2	US-5784564	1998/21/07	Camaisa et al.
	8-3	US-5784619	1998/21/07	Evans et al.
	8-4	US-5787253	1998/07	McCreery et al.
	8-5	US-5790548	1998/08	Sistanizadeh et al.
	8-6	US-5790792	1998/08	Dudgeon et al.
	~~8-7~~	~~US-5790793~~	~~1998/08~~	~~Higley~~
	8-8	US-5793365	1998/11/08	Tang et al.
	8-9	US-5794018	1998/08	Vrvilo et al.
	8-10	US-5794257	1998/08	Liu et al.
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	8-12	US-5799063	1998/08	Krane
	8-13	US-5799072	1998/08	Vulcan et al.
	8-14	US-5799150	1998/08	Hamilton et al.
	8-15	US-5805587	1998/09	Norris et al.
	8-16	US-5805810	1998/09	Maxwell
	8-17	US-5805822	1998/08/09	Long et al.
	8-18	US-5809233	1998/15/09	Shur
	8-19	US-5812819	1998/22/08	Rodwin et al.
	8-20	US-5816919	1998/10	Scagnelli et al.
	8-21	US-5818510	1998/10	Cobbley et al.
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	8-23	US-5822524	1998/10	Chen et al.
	8-24	US-5828837	1998/10	Eikeland

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
FORM PTO-1449 (modified)

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	9-1	US-5828843	1998/27/10	Grimm et al.
	9-2	US-5828846	1998/10	Kirby et al.
	9-3	US-5832119	1998/11	Rhoads
	9-4	US-5832240	1998/11	Larsen et al.
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	Issue Date	2000/08/22
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0188
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	Reexam number	90/010,416
	First Named Inventor	Hutton
	Patent Under Re-Exam	6108704
	Issue Date	2000/08/22
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0188
	Confirmation No.	1061

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Point-to-point internet protocol

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199672476

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Abstract

An apparatus for establishing a point-to-point communication link, the apparatus operating in a computer system operatively coupled to another computer system and a server over a computer network, the apparatus comprising means for transmitting an E-mail signal containing a network protocol address from a first process to a second process over the computer network, means for receiving a second network protocol address from the second process over the computer network, and means, responsive to the second network protocol address, for establishing a point-to-point communication link between the first process and the second process over the computer network.

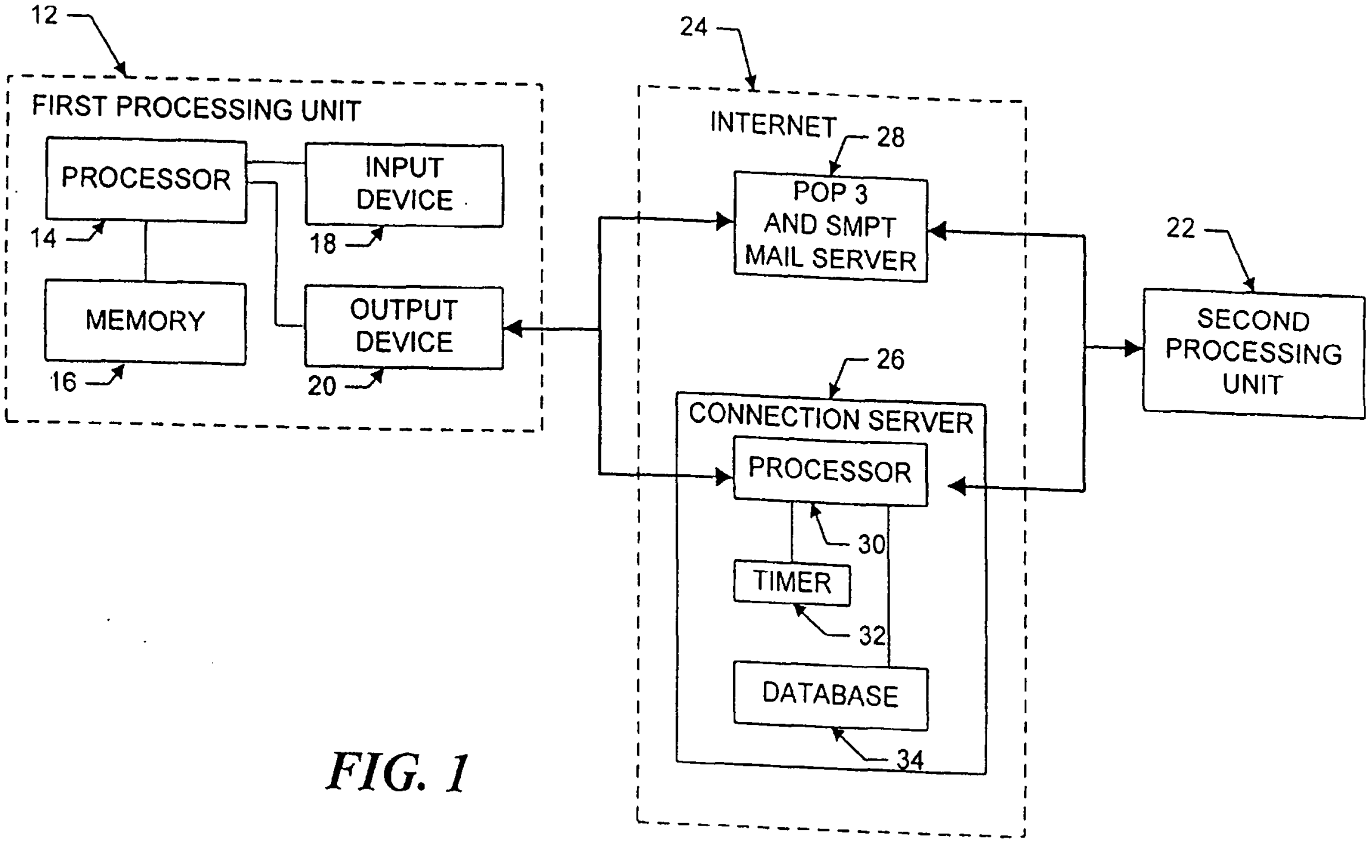
12
FIRST PROCESSING UNIT
PROCESSOR
14
INPUT DEVICE
18
MEMORY
16
OUTPUT DEVICE
20
24
INTERNET
28
POP 3 AND SMPT MAIL SERVER
26
CONNECTION SERVER
PROCESSOR
30
TIMER
32
DATABASE
34
22
SECOND PROCESSING UNIT

FIG. 1

P/00/011 28/5/91
Regulation 3.2

AUSTRALIA

Patents Act 1990

COMPLETE SPECIFICATION

STANDARD PATENT

(ORIGINAL)

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Invention Title: **"Point-to-Point Internet Protocol"**

The following statement is a full description of this invention, including the best method of performing it known to us:

POINT-TO-POINT INTERNET PROTOCOL

The present invention relates, in general, to data processing systems, and more specifically, to a method and apparatus for facilitating audio communications over computer networks.

The increased popularity of on-line services such as AMERICA ONLINE™, COMPUSERVE®, and other services such as Internet gateways have spurred applications to provide multimedia, including video and voice clips, to online users. An example of an online voice clip application is VOICE E-MAIL FOR WINCIM and VOICE E-MAIL FOR AMERICA ONLINE™, available from Bonzi Software, as described in "Simple Utilities Send Voice E-Mail Online", MULTIMEDIA WORLD, VOL. 2, NO. 9, August 1995, p. 52. Using such Voice E-Mail software, a user may create an audio message to be sent to a predetermined E-mail address specified by the user.

Generally, devices interfacing to the Internet and other online services may communicate with each other upon establishing respective device addresses. One type of device address is the Internet Protocol (IP) address, which acts as a pointer to the device associated with the IP address. A typical device may have a Serial Line Internet Protocol or Point-to-Point Protocol (SLIP/PPP) account with a permanent IP address for receiving E-mail, voicemail, and the like over the Internet. E-mail and voicemail is generally intended to convey text, audio, etc., with any routing information such as an IP address and routing headers generally

being considered an artifact of the communication, or even gibberish to the recipient.

Devices such as a host computer or server of a company may include multiple modems for connection of users to the Internet, with a temporary IP address allocated to each user. For example, the host computer may have a general IP address "XXX.XXX.XXX," and each user may be allocated a successive IP address of XXX.XXX.XXX.10, XXX.XXX.XXX.11, XXX.XXX.XXX.12, etc. Such temporary IP addresses may be reassigned or recycled to the users, for example, as each user is successively connected to an outside party. For example, a host computer of a company may support a maximum of 254 IP addresses which are pooled and shared between devices connected to the host computer.

Permanent IP addresses of users and devices accessing the Internet readily support point-to-point communications of voice and video signals over the Internet. For example, realtime video teleconferencing has been implemented using dedicated IP addresses and mechanisms known as reflectors.

A technique for matching domain names to Internet Protocol addresses is described in the text entitled "Internetworking With TCP/IP", 2nd Edition, by Douglas E. Comer, November 1992, Prentice Hall, Englewood Cliffs, New Jersey, U.S.A. Comer describes a domain name system and cooperative systems of name servers for matching domain names to network addresses. Each name server is a server program that supplies mapping of domain names to IP addresses. The system described in Comer, however, is not designed for use with network nodes whose network names or name to address bindings change frequently.

International Publication WO 92/19054 discloses a network

monitoring system including an address tracking module which uses passive monitoring of all packet communications over a local area network to maintain a name table of IP address mappings. The disclosed address tracking module is capable of monitoring only a small number of nodes on a local area network and is not suitable for use with a multitude of nodes over a wide area network.

None of the above-described systems are suitable for use with processes which have dynamically assigned network protocol addresses and which are communicating over wide area or global networks.

Due to the dynamic nature of temporary IP addresses of some devices accessing the Internet, point-to-point communications in realtime of voice and video have been generally difficult to attain.

In accordance with the present invention, there is provided an apparatus for establishing a point-to-point communication link, said apparatus operating in a computer system operatively coupled to another computer system and a server over a computer network, said apparatus comprising:

a. means for transmitting an E-mail signal containing a network protocol address from a first process to a second process over the computer network;

b. means for receiving a second network protocol address from the second process over the computer network; and

c. means, responsive to the second network protocol address, for establishing a point-to-point communication link between the first process and the second process over the computer network.

The present invention also provides a method of establishing a point-to-point communication between a first process and a second process, said method for use in a first computer process operatively coupled over a computer network to a second process and a mail server process, said method comprising:

a. transmitting an E-mail signal to the mail server process over the computer network, the E-mail signal containing a first network protocol address assigned to the first process upon connection to the computer network;

b. receiving a second network protocol address from the second process over the computer network, the second network protocol address assigned to the second process upon connection to the computer network; and

c. establishing a point-to-point communication link between the first process and the second process over the computer network, in response to receiving the second network protocol address.

The present invention also provides an apparatus for establishing a point-to-point communication link, said apparatus operating in a computer system operatively connectable to other processes and a server process over a computer network, said apparatus comprising:

a. program logic configured to transmit an E-mail signal containing a network protocol address from a first process to a second process over the computer network;

b. program logic configured to receive a second network protocol address from the second process over the computer network; and

c. program logic, responsive to the second network protocol address, and configured to establish a point-to-point communication link between the first process and the second process over the computer network.

The present invention also provides a computer program product for use with a computer system, the computer system capable of executing a first process and operatively connectable to a second process and a server over a computer network, the computer program product comprising a computer useable medium having program code embodied in the medium, the program code further comprising:

program code for transmitting an E-mail signal comprising a network protocol address of the first process to the second processor over the computer network;

program code for receiving a second network protocol address from the second process over the computer network; and

program code, responsive to the second network protocol address, for establishing a point-to-point communication link between the first process and the second process over the computer network.

The present invention also provides a method of establishing a point-to-point communication between a first process and second process, said method for use in a first computer process operatively coupled over a computer network to a second process and an E-mail server, said method comprising the steps of:

A. transmitting to the second process over the computer network an E-mail signal comprising a network protocol address of the first process;

B. receiving from the second process over the computer network a second network protocol address; and

C. in response to the second network protocol address, establishing a point-to-point communication link between the first process and the second process over the computer network.

Preferred embodiments of the present invention are hereinafter described, by way of example only, with reference to the following drawings, wherein:

FIG 1 illustrates, in block diagram format, a system for the disclosed point-to-point Internet protocol:

FIG 2 illustrates, in block diagram format, the system using a secondary point-to-point Internet protocol;

FIG 3 illustrates, in block diagram format; the system of FIGS 1-2 with the point-to-point Internet protocol established;

FIG 4 is another block diagram of the system of FIGS 1-2 with audio communications being conducted;

FIG. 5 illustrates a display screen for a processing unit;

FIG. 6 illustrates another display screen for a processing unit;

FIG. 7 illustrates a flowchart of the initiation of the point-to-point Internet protocols;

FIG. 8 illustrates a flowchart of the performance of the primary point-to-point Internet protocols; and

FIG. 9 illustrates a flowchart of the performance of the secondary point-to-point Internet protocol.

Referring now in specific detail to the drawings, with like reference numerals identifying similar or identical elements, as shown in FIG. 1, the present disclosure describes a point-to-point network protocol and system 10 for using such a protocol.

In an exemplary embodiment, the system 10 includes a first processing unit 12 for sending at least a voice signal from a first user to a second user. The first processing unit 12 includes a processor 14, a memory 16, an input device 18, and an output device 20. The output device 20 includes at least one modem capable of, for example, 14.4 kbaud communications and operatively connected via wired and/or wireless communication connections to the Internet or other computer networks such as an Intranet, i.e., a private computer network. One skilled in the art would understand that the input device 18 may be implemented at least in part by the modem of the output device 20 to allow input signals from the communication connections to be received. The second processing unit 22 may have a processor, memory, and input and output devices, including at least one modem and associated communication connections, as described above for the first processing unit 12. In an exemplary embodiment, each of the processing units 12, 22 may execute the WEBPHONE™ Internet telephony application available from NetSpeak Corporation, Boca Raton, FL, which is capable of performing the disclosed point-to-point Internet protocol and system 10, as described herein.

The first processing unit 12 and the second processing unit 22 are operatively connected to the Internet 24 by communication devices and software known in the art, such as an Internet Service Provider (ISP) or an Internet gateway. The processing units 12, 22 may be operatively interconnected through the Internet 24 to a connection server 26, and may also be operatively connected to a mail server 28 associated with the Internet 24.

The connection server 26 includes a processor 30, a timer 32 for generating time stamps, and a memory such as a database 34 for storing, for example, E-mail and Internet Protocol (IP) addresses of logged-in units. In an exemplary embodiment, the connection server 26 may be a SPARC 5 server or a SPARC 20 server, available from SUN MICROSYSTEMS, INC., Mountain View, CA, having a central processing unit (CPU) as processor 30, an operating system (OS) such as UNIX, for providing timing operations such as maintaining the timer 32, a hard drive or fixed drive, as well as dynamic random access memory (DRAM) for storing the database 34, and a keyboard and display and/or other input and output devices (not shown in FIG. 1). The database 34 may be an SQL database available from ORACLE or INFORMIX.

In an exemplary embodiment, the mail server 28 may be a Post Office Protocol (POP) Version 3 mail server including a processor, memory, and stored programs operating in a UNIX environment, or, alternatively, another OS, to process E-mail capabilities between processing units and devices over the Internet 24.

The first processing unit 12 may operate the disclosed point-to-point Internet protocol by a computer program described hereinbelow in conjunction with FIG. 6, which may be implemented from compiled and /or interpreted source code in the C++ programming language and which may be downloaded to the first processing unit 12 from an external computer. The operating computer program may be stored in the memory 16, which may include about 8 MB RAM and/or a hard or fixed drive having about 8 MB. Alternatively, the source code may be implemented in the first processing unit 12 as firmware, as an erasable read only memory (EPROM), etc. It is understood that one skilled in the art would be able to use programming languages other than C++ to implement the disclosed point-to-point network protocol and system 10.

The processor 14 receives input commands and data from a first user associated with the first processing unit 12 though the input device 18, which may be an input port connected by a wired, optical, or a wireless connection for electromagnetic transmissions, or alternatively may be transferable storage media, such as floppy disks, magnetic tapes, compact disks, or other storage media including the input data from the first user.

The input device 18 may include a user interface (not shown) having, for example, at least one button actuated by the user to input commands to select from a plurality of operating modes to operate the first processing unit 12. In alternative embodiments, the input device 18 may include a keyboard, a mouse, a touch screen, and/or a data reading device such as a disk drive for receiving the input data from input data files stored in storage media such as a floppy disk or, for example, an 8 mm storage tape. The input device 18 may alternatively include connections to other computer systems to receive the input commands and data therefrom.

The first processing unit 12 may include a visual interface for use in conjunction with the input device 18 and output device 20 similar to those screens illustrated in FIGS. 5-6, discussed below. It is also understood that alternative devices may be used to receive commands and data from the user, such as keyboards, mouse devices, and graphical user interfaces (GUI) such as WINDOWS™ 3.1 available form MICROSOFT Corporation, Redmond, WA., and other operating systems and GUIs, such as OS/2 and OS/2 WARP, available from IBM CORPORATION, Boca Raton, FL. Processing unit 12 may also include microphones and/or telephone handsets for receiving audio voice data and commands, speech or voice recognition devices, dual tone multi-frequency (DTMF) based devices, and/or software known in the art to accept voice data and commands and to operate the first processing unit 12.

In addition, either of the first processing unit 12 and the second processing unit 22 may be implemented in a personal digital assistant (PDA) providing modem and E-mail capabilities and Internet access, with the PDA providing the input/output screens for mouse interactions or for touchscreen activation as shown, for example, in FIGS. 5-6, as a combination of the input device 18 and output device 20.

For clarity of explanation, the illustrative embodiment of the disclosed point-to-point Internet protocol and system 10 is presented as having individual functional blocks, which may include functional blocks labeled as "processor" and "processing unit". The functions represented by these blocks may be provided through the use of either shared or dedicated hardware, including, but not limited to, hardware capable of executing software. For example, the functions of each of the processors and processing units presented herein may be provided by a shared processor or by a plurality of individual processors. Moreover, the use of the functional blocks with accompanying labels herein is not to be construed to refer exclusively to hardware capable of executing software. Illustrative embodiments may include digital signal processor (DSP) hardware, such as the AT&T DSP16 or DSP32C, read-only memory (ROM) for storing software performing the operations discussed below, and random access memory (RAM) for storing DSP results. Very large scale integration (VLSI) hardware embodiments, as well as custom VLSI circuitry in combination with a general purpose DSP circuit, may also be provided. Any and all of these embodiments may be deemed to fail within the meaning of the labels for the functional blocks as used herein.

The processing units 12, 22 are capable of placing calls and connecting to other processing units connected to the Internet 24, for example, via dialup SLIP/PPP lines. In an exemplary embodiment, each processing unit assigns an unsigned long session number, for example, a 32- bit long sequence in a *.ini file for each call. Each call may be assigned a successive session number in sequence, which may be used by the respective processing unit to associate the call with one of the SLIP/PPP lines, to associate a <ConnectOK> response signal with a <Connect Request> signal, and to allow for multiplexing and demultiplexing of inbound and outbound conversations on conference lines, as explained hereinafter.

For callee (or called) processing units with fixed IP addresses, the caller (or calling) processing unit may open a "socket", i.e. a file handle or address indicating where data is to be sent, and transmit a <Call> command to establish communication with the callee utilizing, for example, datagram services such as Internet Standard network layering as well as transport layering, which may include a Transport Control Protocol (TCP) or a User Datagram Protocol (UDP) on top of the IP. Typically, a processing unit having a fixed IP address may maintain at least one open socket and a called processing unit waits for a <Call> command to assign the open socket to the incoming signal. If all lines are in use, the callee processing unit sends a BUSY signal or message to the callee processing unit. As shown in FIG. 1, the disclosed point-to-point Internet protocol and system 10 operate when a callee processing unit does not have a fixed or predetermined IP address. In the exemplary embodiment and without loss of generality, the first processing unit 12 is the caller processing unit and the second processing unit 22 is the called processing unit. When either of processing units 12, 22 logs on to the Internet via a dial-up connection, the respective unit is provided a dynamically allocated IP address by the a connection service provider.

Upon the first user initiating the point-to-point Internet protocol when the first user is logged on to the Internet 24, the first processing unit 12 automatically transmits its associated E-mail address and its dynamically allocated IP address to the connection server 26. The connection server 26 then stores these addresses in the database 34 and time stamps the stored addresses using timer 32. The first user operating the first processing unit 12 is thus established in the database 34 as an active on-line party available for communication using the disclosed point-to-point Internet protocol. Similarly, a second user operating the second processing unit 22, upon connection to the Internet 24 through the a connection service provider, is processed by the connection server 26 to be established in the database 34 as an active on-line party.

The connection server 26 may use the time stamps to update the status of each processing unit; for example, after 2 hours, so that the on-line status information stored in the database 34 is relatively current. Other predetermined time periods, such as a default value of 24 hours, may be configured by a systems operator.

The first user with the first processing unit 12 initiates a call using, for example, a Send command and/or a command to speeddial an N^{TH} stored number, which may be labeled [SND] and [SPD] [N], respectively, by the input device 18 and/or the output device 20, such as shown in FIGS. 5-6. In response to either the Send or speeddial commands, the first processing unit 12 retrieves from memory 16 a stored E-mail address of the callee corresponding to the N^{TH} stored number. Alternatively, the first user may directly enter the E-mail address of the callee.

The first processing unit 12 then sends a query, including the E-mail address of the callee, to the connection server 26. The connection server 26 then searches the database 34 to determine whether the callee is logged-in by finding any stored information corresponding to the callee's E-mail address indicating that the callee is active and on-line. If the callee is active and on-line, the connection server 26 then performs the primary point-to-point Internet protocol; i.e. the IP address of the callee is retrieved from the database 34 and sent to the first processing unit 12. The first processing unit 12 may then directly establish the point-to-point Internet communications with the callee using the IP address of the callee.

If the callee is not on-line when the connection server 26 determines the callee's status, the connection server 26 sends an OFF-LINE signal or message to the first processing unit 12. The first processing unit 12 may also display a message such as "Called Party Off-Line" to the first user.

When a user logs off or goes off-line from the Internet 24, the connection server 26 updates the status of the user in the database 34; for example, by removing the user's information, or by flagging the user as being off-line. The connection server 26 may be instructed to update the user's information in the database 34 by an off-line message, such as a data packet, sent automatically from the processing unit of the user prior to being disconnected from the connection server 26. Accordingly, an off-line user is effectively disabled from making and/or receiving point-to-point Internet communications.

As shown in FIGS. 2-4, the disclosed secondary point-to-point Internet protocol may be used as an alternative to the primary point-to-point Internet protocol described above, for example, if the connection server 26 is non-responsive, inoperative, and/or unable to perform the primary point-to-point Internet protocol, as a non-responsive condition. Alternatively, the disclosed secondary point-to-point Internet protocol may be used independent of the primary point-to-point Internet protocol. In the disclosed secondary point-to-point Internet protocol, the first processing unit 12 sends a <ConnectRequest> message via E-mail over the Internet 24 to the mail server 28. The E-mail including the <ConnectRequest> message may have, for example, the subject

[*wp#XXXXXXXX#nnn.nnn.nnn.#emailAddr]

where nnn.nnn.nnn.nnn. is the current (i.e. temporary or permanent) IP address of the first user, and XXXXXXXX is a session number, which may be unique and associated with the request of the first user to initiate point-to-point communication with the second user.

As described above, the first processing unit 12 may send the <ConnectRequest> message in response to an unsuccessful attempt to perform the primary point-to-point Internet protocol. Alternatively, the first processing unit 12 may send the <ConnectRequest> message in response to the first user initiating a SEND command or the like.

After the <ConnectRequest> message via E-mail is sent, the first processing unit 12 opens a socket and waits to detect a response from the second processing unit 22. A timeout timer, such as timer 32, may be set by the first processing unit 12, in a manner known in the art, to wait for a predetermined duration to receive a <ConnectOK> signal. The processor 14 of the first processing unit 12 may cause the output device 20 to output a Ring signal to the user, such as an audible ringing sound, about every 3 seconds . For example, the processor 14 may output a *.wav file, which may be labeled RING.WAV, which is processed by the output device 20 to output an audible ringing sound.

The mail server 28 then polls the second processing unit 22, for example, every 3-5 seconds, to deliver the E-mail. Generally, the second processing unit 22 checks the incoming lines, for example, at regular intervals to wait for and to detect incoming E-mail from the mail server 28 through the Internet 24.

Typically, for sending E-mail to users having associated processing units operatively connected to a host computer or server operating an Internet gateway, E-mail for a specific user may be sent over the Internet 24 and directed to the permanent IP address or the SLIP/PPP account designation of the host computer, which then assigns a temporary IP address to the processing unit of the specified user for properly routing the E-mail. The E-mail signal may include a name or other designation such as a user name which identifies the specific user regardless of the processing unit assigned to the user; that is, the host computer may track and store the specific device where a specific user is assigned or logged on, independent of the IP address system, and so the host computer may switch the E-mail signal to the device of the specific user. At that time, a temporary IP address may be generated or assigned to the specific user and device.

Upon detecting and/or receiving the incoming E-mail signal from the first processing unit 12, the second processing unit 22 may assign or may be assigned a temporary IP address. Therefore, the delivery of the E-mail through the Internet 24 provides the second processing unit 22 with a session number as well as IP addresses of both the first processing unit 12 and the second processing unit 22.

Point-to-point communication may then be established by the processing unit 22 processing the E-mail signal to extract the <ConnectRequest> message, including the IP address of the first processing unit 12 and the session number. The second processing unit 22 may then open a socket and generate a <ConnectOK> response signal, which includes the temporary IP address of the second processing unit 22 as well as the session number of the first processing unit.

The second processing unit 22 sends the <ConnectOK> signal directly over the Internet 24 to the IP address of the first processing unit 12 without processing by the mail server 28, and a timeout timer of the second processing unit 22 may be set to wait and detect a <Call> signal expected from the first processing unit 12.

Realtime point-to-point communication of audio signals over the Internet 24, as well as video and voicemail, may thus be established and supported without requiring permanent IP addresses to be assigned to either of the users or processing units 12, 22. For the duration of the realtime point-to-point link, the relative permanence of the current IP addresses of the processing units 12, 22 is sufficient, whether the current IP addresses were permanent (i.e. predetermined or preassigned) or temporary (i.e. assigned upon initiation of the point-to-point communication).

In the exemplary embodiment, a first user operating the first processing unit 12 is not required to be notified by the first processing unit 12 that an E-mail is being generated and sent to establish the point-to-point link with the second user at the second processing unit 22. Similarly, the second user is not required to be notified by the second processing unit 22 that an E-mail has been received and/or a temporary IP address is associated with the second processing unit 22. The processing units 12, 22 may perform the disclosed point-to-point Internet protocol automatically upon initiation of the point-to-point communication command by the first user without displaying the E-mail interactions to either user. Accordingly, the disclosed point-to-point Internet protocol may be transparent to the users. Alternatively, either of the first and second users may receive, for example, a brief message of "CONNECTION IN PROGRESS" or the like on a display of the respective output device of the processing units 12, 22.

After the initiation of either the primary or the secondary point-to-point Internet protocols described above in conjunction with FIGS. 1-2, the point-to-point communication link over the Internet 24 may be established as shown in FIGS. 3-4 in a manner known in the art. For example, referring to FIG. 3, upon receiving the <ConnectorOK> signal from the second processing unit 22, the first processing unit 12 extracts the IP address of the second processing unit 22 and the session number, and the session number sent from the second processing unit 22 is then checked with the session number originally sent from the first processing unit 12 in the <ConnectRequest> message as E-mail. If the session numbers sent and received by the processing unit 12 match, then the first processing unit 12 sends a <Call> signal directly over the Internet 24 to the second processing unit 22; i.e. using the IP address of the second processing unit 22 provided to the first processing unit 12 in the <ConnectOK> signal.

Upon receiving the <Call> signal, the second processing unit 22 may then begin a ring sequence, for example, by indicating or annunciating to the second user that an incoming call is being received. For example, the word "CALL" may be displayed on the output device of the second processing unit 22. The second user may then activate the second processing unit 22 to receive the incoming call.

Referring to FIG. 4, after the second processing unit 22 receives the incoming call, realtime audio and/or video conversations may be conducted in a manner known in the art between the first and second users through the Internet 24, for example, by compressed digital audio signals. Each of the processing units 12, 22 also display to each respective user the words "IN USE" to indicate that the point-to-point communication link is established and audio or video signals are being transmitted.

In addition, either user may terminate the point-to-point communication link by, for example, activating a termination command, such as by activating an [END] button or icon on a respective processing unit, causing the respective processing unit to send an <End> signal which causes both processing units to terminate the respective sockets, as well as to perform other cleanup commands and functions known in the art.

FIGS. 5-6 illustrate examples of display screens 36 which may be output by a respective output device of each processing unit 12, 22 of FIGS. 1-4 for providing the disclosed point-to-point Internet protocol and system 10. Such display screens may be displayed on a display of a personal computer (PC) or a PDA in a manner known in the art.

As shown in FIG. 5, a first display screen 36 includes a status area 38 for indicating, for example, a called user by name and/or by IP address or telephone number; a current function such as C2; a current time; a current operating status such as "IN USE", and other control icons such as a down arrow icon 40 for scrolling down a list of parties on a current conference line. The operating status may include such annunciators as "IN USE," "IDLE," "BUSY," "NO ANSWER," "OFFLINE," "CALL," "DIALING," "MESSAGES," and "SPEEDDIAL."

Other areas of the display screen 36 may include activation areas or icons for actuating commands or entering data. For example, the display screen 36 may include a set of icons 42 arranged in columns and rows including digits 0-9 and commands such as END, SND, HLD, etc. For example, the END and SND commands may be initiated as described above, and the HLD icon 44 may be actuated to place a current line on hold. Such icons may also be configured to substantially simulate a telephone handset or a cellular telephone interface to facilitate ease of use, as well as to simulate function keys of a keyboard. For example, icons labeled L1-L4 may be mapped to function keys F1-F4 on standard

PC keyboards, and icons C1-C3 may be mapped to perform as combinations of function keys, such as CTRL-F1, CTRL-F2, and CTRL-F3, respectively. In addition, the icons labeled L1-L4 and C1-C3 may include circular regions which may simulate light emitting diodes (LEDs) which indicate that the function or element represented by the respective icon is active or being performed.

Icons L1-L4 may represent each of 4 lines available to the caller, and icons C1-C3 may represent conference calls using at least one line to connect, for example, two or more parties in a conference call. The icons L1-L4 and C1-C3 may indicate the activity of each respective line or conference line. For example, as illustrated in FIG. 5, icons L1-L2 may have lightly shaded or colored circles, such as a green circle, indicating that each of lines 1 and 2 are in use, while icons L3-L4 may have darkly shaded or color circles, such as a red or black circle, indicating that each of lines 3 and 4 are not in use. Similarly, the lightly shaded circle of the icon labeled C2 indicates that the function corresponding to C2 is active, as additionally indicated in the status are 38, while darkly shaded circles of icons labeled C1 and C3 indicate that such corresponding functions are not active.

The icons 42 are used in conjunction with the status area 38. For example, using a mouse for input, a line that is in use, as indicated by the lightly colored circle of the icon, may be activated to indicate a party's name by clicking a right mouse button for 5 seconds until another mouse click is actuated or the [ESC] key or icon is actuated. Thus, the user may switch between multiple calls in progress on respective lines.

Using the icons as well as an input device such as a mouse, a user may enter the name or alias or IP address, if known, of a party to be called by either manually entering the name, by using the speeddial feature, or by double clicking on an entry in a directory stored in the memory, such as the memory 16 of the first processing unit 12, where the directory entries may be scrolled using the status area 38 and the down arrow icon 40.

Once a called party is listed in the status area 38 as being active on a line, the user may transfer the called party to another line or a conference line by clicking and dragging the status area 38, which is represented by a reduced icon 46. Dragging the reduced icon 46 to any one of line icons L1-L4 transfers the called party in use to the selected line, and dragging the reduced icon 46 to any one of conference line icons C1-C3 adds the called party to the selected conference call.

Other features may be supported, such as icons 48-52, where icon 48 corresponds to, for example, an ALT-X command to exit the communication facility of a processing unit, and icon 50 corresponds to, for example, an ALT-M command to minimize or maximize the display screen 36 by the output device of the processing unit. Icon 52 corresponds to an OPEN command, which may, for example, correspond to pressing the O key on a keyboard, to expand or contract the display screen 36 to represent the opening and closing of a cellular telephone. An "opened" configuration is shown in FIG. 5, and a "closed" configuration is shown in FIG. 6. In the "opened" configuration, additional features such as output volume (VOL) controls, input microphone (MIC) controls, waveform (WAV) sound controls, etc.

The use of display screens such as those shown in FIGS. 5-6 provided flexibility in implementing various features available to the user. It is to be understood that additional features such as those known in the art may be supported by the processing units 12, 22.

Alternatively, it is to be understood that one skilled in the art may implement the processing units 12, 22 to have the features of the display screens in FIGS. 5-6 in hardware; i.e. a wired telephone or wireless cellular telephone may include various keys, LEDs, liquid crystal displays (LCDs), and touchscreen actuators corresponding to the icons and features shown in FIGS. 5-6. In addition, a PC may have the keys of a keyboard and mouse mapped to the icons and features shown in FIGS. 5-6.

Referring to FIG. 7, the disclosed point-to-point Internet protocol and system 10 is illustrated. First processing unit 12 initiates the point-to-point Internet protocol in step 56 by sending a query from the first processing unit 12 to the connection server 26. If connection server 26 is operative to perform the point-to-point Internet protocol, in step 58, first processing unit 12 receives an on-line status signal from the connection server 26, such signal may include the IP address of the callee or a "Callee Off-Line" message. Next, first processing unit 12 performs the primary point-to-point Internet protocol in step 60, which may include receiving, at the first processing unit 12, the IP address of the callee if the callee is active and on-line. Alternatively, processing unit 60 may initiate and perform the secondary point-to-point Internet protocol in step 62, if the called party is not active and/or on-line.

Referring to FIG. 8, in conjunction with FIGS. 1 and 3-4, the disclosed point-to-point Internet protocol and system 10 is illustrated. Connection server 26 starts the point-to-point Internet protocol, in step 64, and timestamps and stores E-mail and IP addresses of logged-in users and processing units in the database 34 in step 66. Connection server 26 receives a query from a first processing unit 12 in step 68 to determine whether a second user or second processing unit 22 is logged-in to the Internet 24, with the second user being specified, for example, by an E-mail address. Connection server 26 retrieves the IP address of the specified user from the database 34 in step 70, if the specified user is logged-in to the Internet, and sends the retrieved IP address to the first processing unit 12 in step 72 to enable first processing unit 12 to establish point-to-point communications with the specified second user.

The disclosed secondary point-to-point Internet protocol operates as shown in FIG. 9. First processing unit 12 generates an E-mail signal, including a session number and a first IP address corresponding to a first processing unit in step 76. First processing unit 12 transmits the E-mail signal as a <ConnectRequest> signal to the Internet 24 in step 78. The E-mail signal is delivered through the Internet 24 using a mail server 28 to the second processing unit 22 in step 80. Second processing unit 22 extracts the session number and the first IP address from the E-mail signal in step 82 and transmits or sends the session number and a second IP address corresponding to the second processing unit 22, back to the first processing unit 12 through the Internet 24, in step 84. First processing unit 12 verifies the session number received from the second processing unit 22 in step 86, and establishes a point-to-point Internet communication link between the first processing unit 12 and second processing unit 22 using the first and second IP addresses in step 88.

While the disclosed point-to-point Internet protocols and system have been particularly shown and described with reference to the preferred embodiments, it is understood by those skilled in the art that various modifications in form and detail may be made therein without departing from the scope and spirit of the invention. Accordingly, modifications such as those suggested above, but not limited thereto, are to be considered within the scope of the invention.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

The reference to any prior art in this specification is not, and should not be taken as, an acknowledgment or any form of suggestion that that prior art forms part of the common general knowledge in Australia.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Apparatus for establishing a point-to-point communication link, said apparatus operating in a computer system operatively coupled to another computer system and a server over a computer network, said apparatus comprising:

a. means for transmitting an E-mail signal containing a network protocol address from a first process to a second process over the computer network;

b. means for receiving a second network protocol address from the second process over the computer network; and

c. means, responsive to the second network protocol address, for establishing a point-to-point communication link between the first process and the second process over the computer network.

2. A method of establishing a point-to-point communication between a first process and a second process, said method for use in a first computer process operatively coupled over a computer network to a second process and a mail server process, said method comprising:

a. transmitting an E-mail signal to the mail server process over the computer network, the E-mail signal containing a first network protocol address assigned to the first process upon connection to the computer network;

b. receiving a second network protocol address from the second process over the computer network, the second network protocol address assigned to the second process upon connection to the computer network; and

c. establishing a point-to-point communication link between the first process and the second process over the computer network, in response to receiving the second network protocol address.

3. Apparatus for establishing a point-to-point communication link, said apparatus operating in a computer system operatively connectable to other

processes and a server process over a computer network, said apparatus comprising:

a. program logic configured to transmit an E-mail signal containing a network protocol address from a first process to a second process over the computer network;

b. program logic configured to receive a second network protocol address from the second process over the computer network; and

c. program logic, responsive to the second network protocol address, and configured to establish a point-to-point communication link between the first process and the second process over the computer network.

4. A computer program product for use with a computer system, the computer system capable of executing a first process and operatively connectable to a second process and a server over a computer network, the computer program product comprising a computer useable medium having program code embodied in the medium, the program code further comprising:

program code for transmitting an E-mail signal comprising a network protocol address of the first process to the second processor over the computer network;

program code for receiving a second network protocol address from the second process over the computer network; and

program code, responsive to the second network protocol address, for establishing a point-to-point communication link between the first process and the second process over the computer network.

5. A method of establishing a point-to-point communication between a first process and second process, said method for use in a first computer process operatively coupled over a computer network to a second process and an E-mail server, said method comprising the steps of:

A. transmitting to the second process over the computer network an E-mail signal comprising a network protocol address of the first process;

B. receiving from the second process over the computer network a second network protocol address; and

C. in response to the second network protocol address, establishing a point-to-point communication link between the first process and the second process over the computer network.

6. Apparatus substantially as hereinbefore described with reference to the accompanying drawings.

7. A method substantially as hereinbefore described with reference to the accompanying drawings.

8. A computer program product substantially as hereinbefore described with reference to the accompanying drawings.

DATED this 8th day of September 2000

NetSpeak Corporation
By its Patent Attorneys
DAVIES COLLISON CAVE

13 09 00 59377

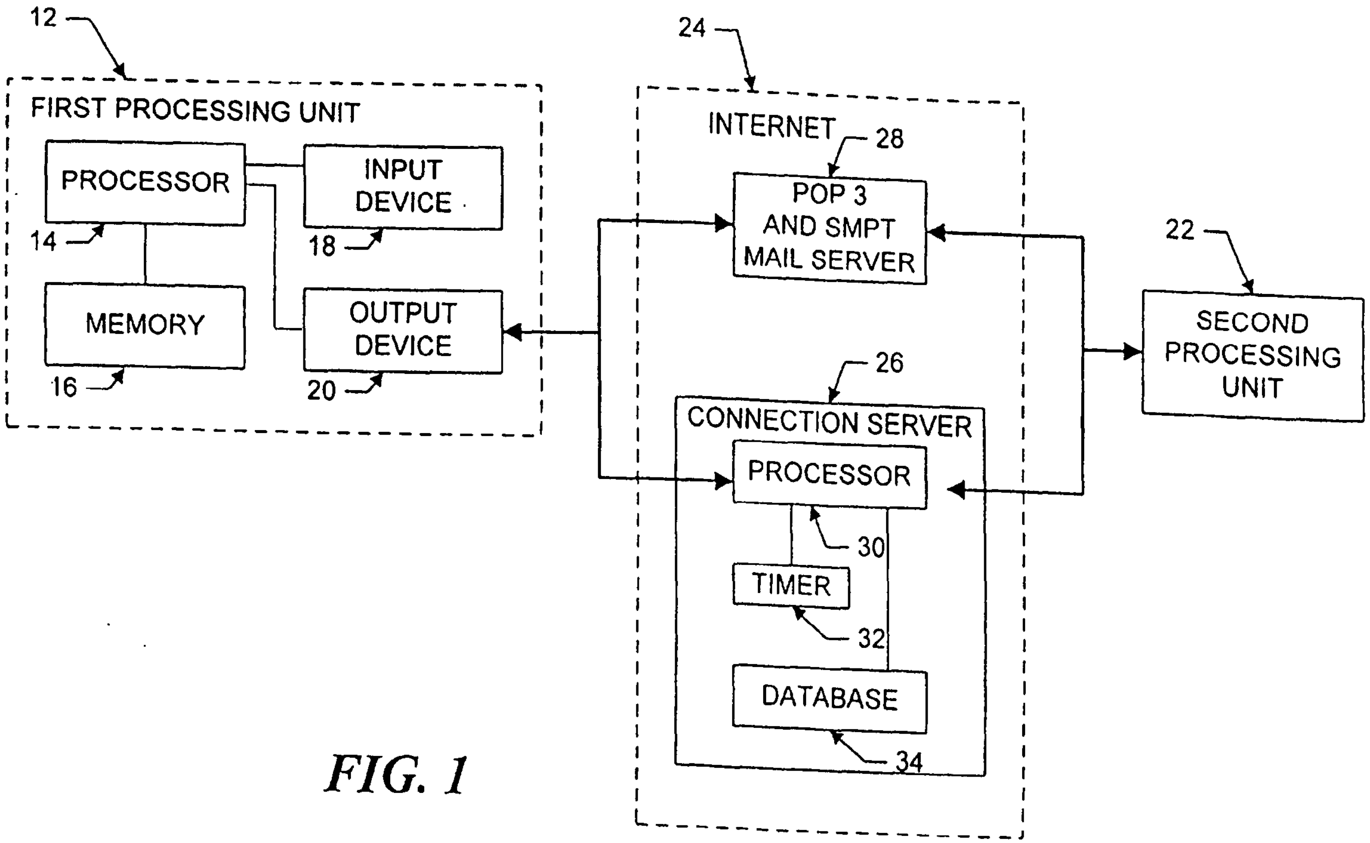

FIG. 1

13 09 00 59377

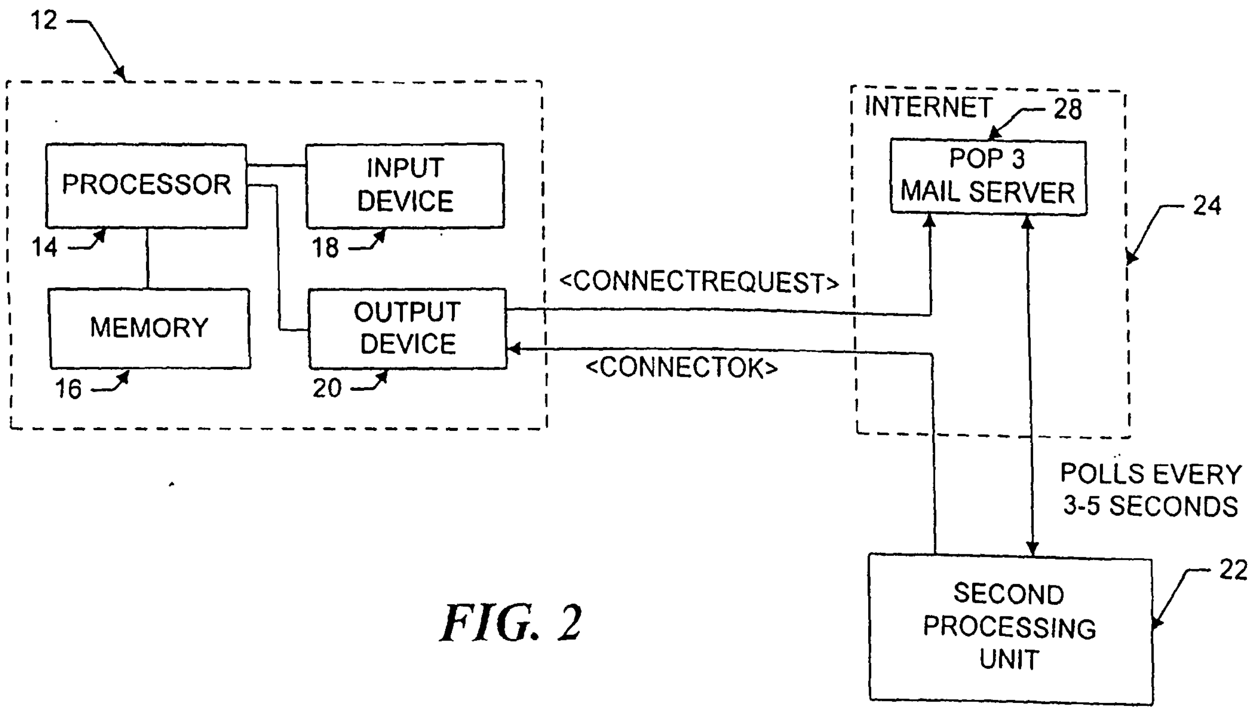

FIG. 2

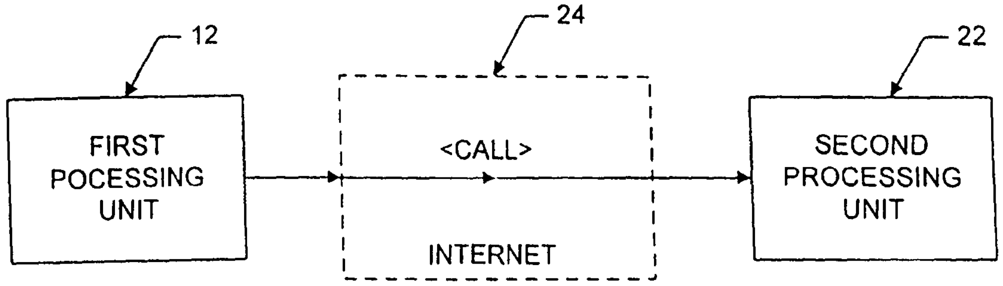
12
24
22
FIRST POCESSING UNIT
<CALL>
INTERNET
SECOND PROCESSING UNIT

FIG. 3

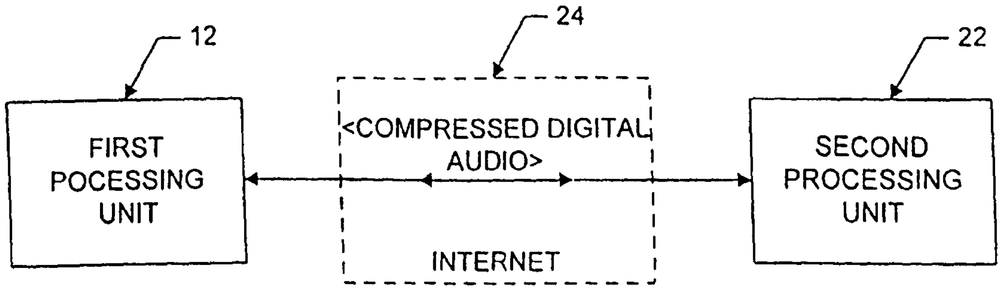
12
24
22
FIRST POCESSING UNIT
<COMPRESSED DIGITAL AUDIO>
INTERNET
SECOND PROCESSING UNIT

FIG. 4

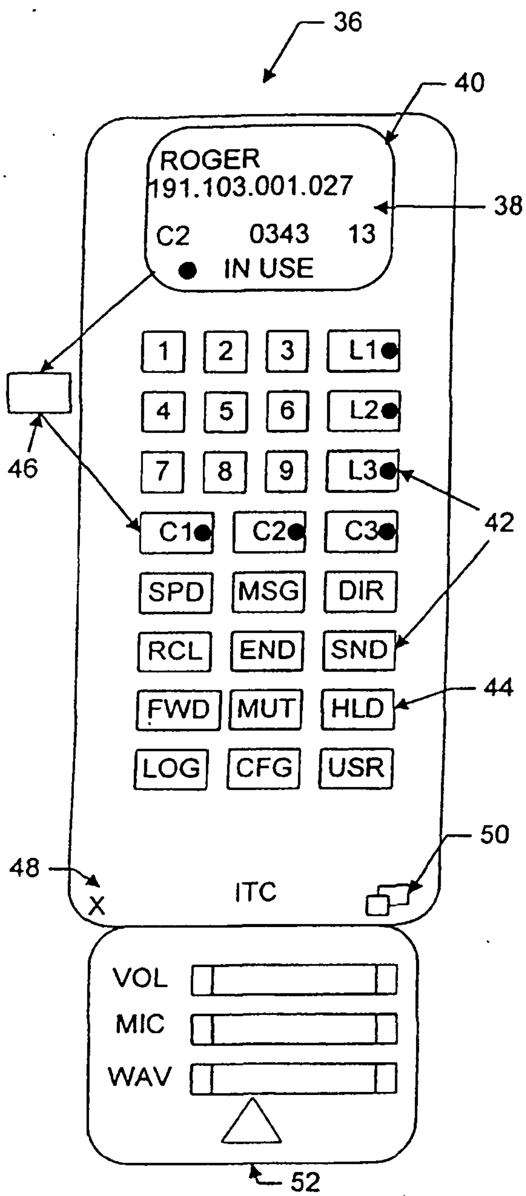
36
40
ROGER
191.103.001.027
38
C2 0343 13
IN USE
1 2 3 L1
4 5 6 L2
46
7 8 9 L3
C1 C2 C3
42
SPD MSG DIR
RCL END SND
FWD MUT HLD
44
LOG CFG USR
50
48
X
ITC
VOL
MIC
WAV
52

FIG. 5

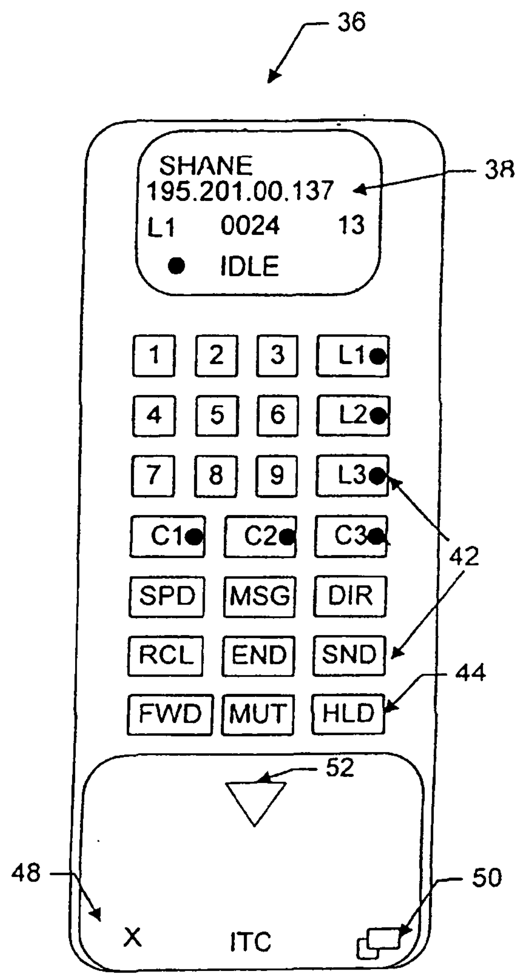
36
SHANE
195.201.00.137
38
L1 0024 13
IDLE
1 2 3 L1
4 5 6 L2
7 8 9 L3
C1 C2 C3
42
SPD MSG DIR
RCL END SND
44
FWD MUT HLD
52
48
50
X
ITC

FIG. 6

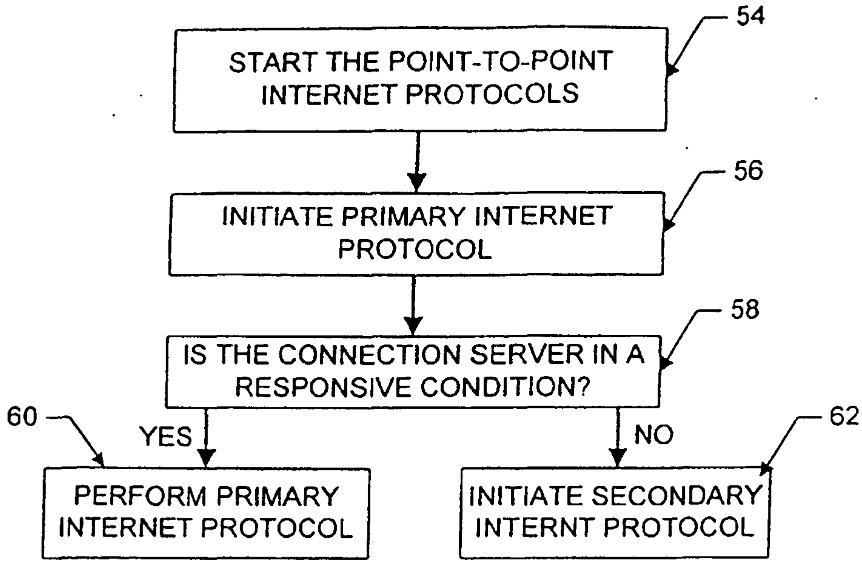
54
START THE POINT-TO-POINT INTERNET PROTOCOLS
56
INITIATE PRIMARY INTERNET PROTOCOL
58
IS THE CONNECTION SERVER IN A RESPONSIVE CONDITION?
60
YES
NO
62
PERFORM PRIMARY INTERNET PROTOCOL
INITIATE SECONDARY INTERNT PROTOCOL

FIG. 7

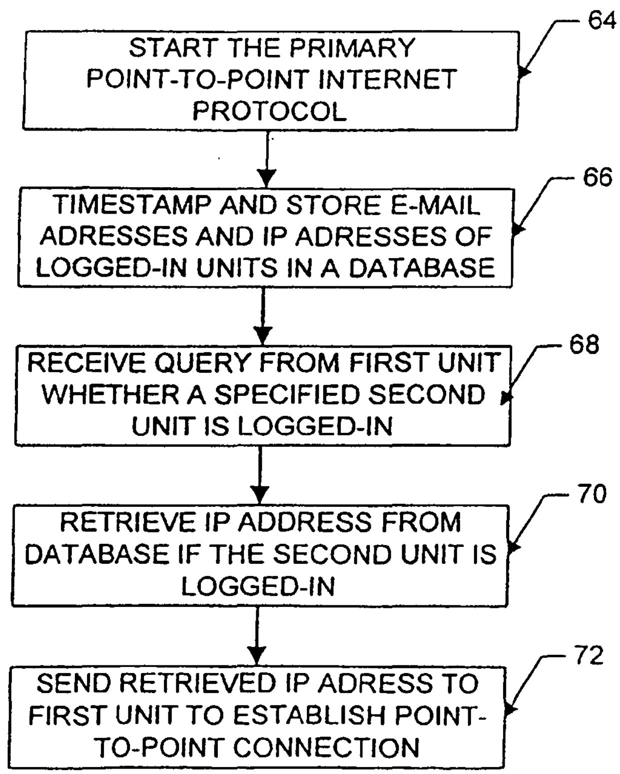
64
START THE PRIMARY POINT-TO-POINT INTERNET PROTOCOL
66
TIMESTAMP AND STORE E-MAIL ADRESSES AND IP ADRESSES OF LOGGED-IN UNITS IN A DATABASE
68
RECEIVE QUERY FROM FIRST UNIT WHETHER A SPECIFIED SECOND UNIT IS LOGGED-IN
70
RETRIEVE IP ADDRESS FROM DATABASE IF THE SECOND UNIT IS LOGGED-IN
72
SEND RETRIEVED IP ADRESS TO FIRST UNIT TO ESTABLISH POINT-TO-POINT CONNECTION

FIG. 8

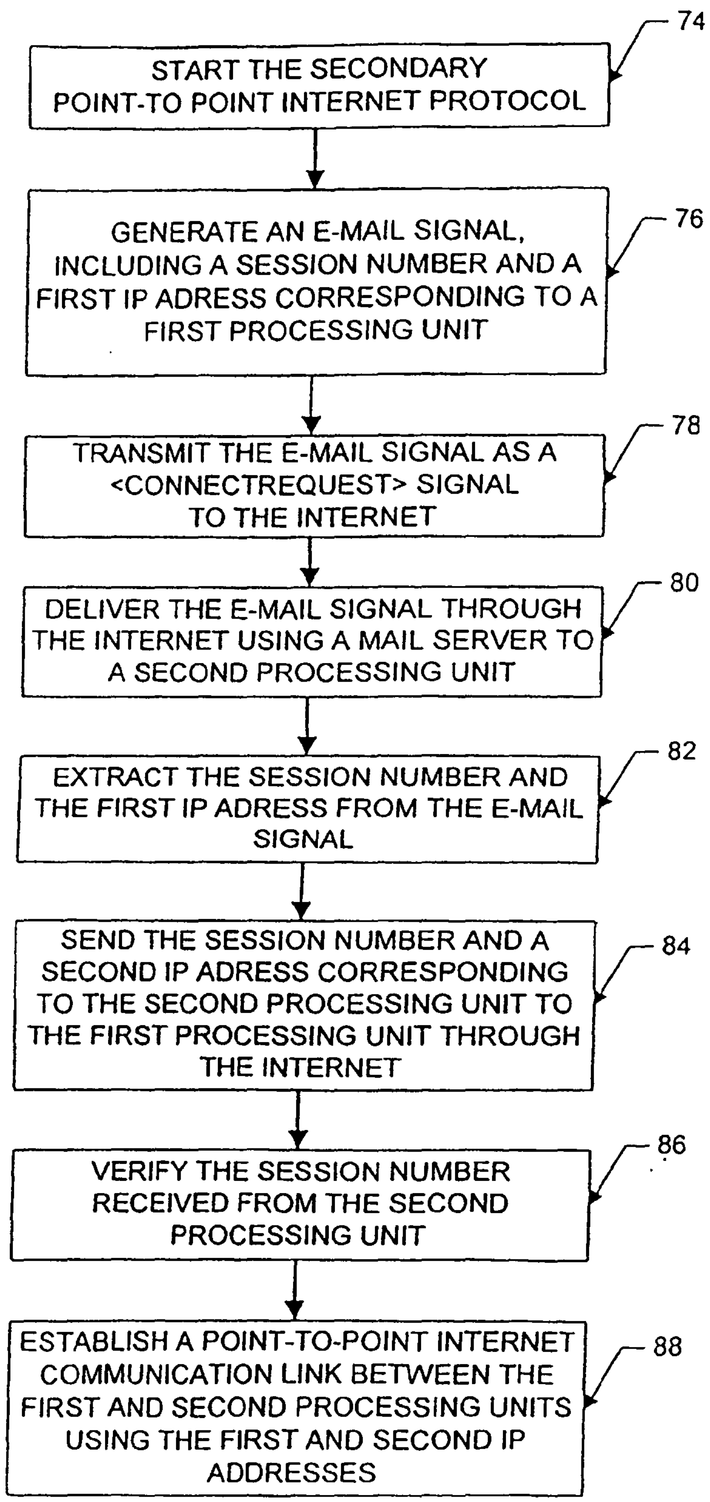
74
START THE SECONDARY POINT-TO POINT INTERNET PROTOCOL
76
GENERATE AN E-MAIL SIGNAL, INCLUDING A SESSION NUMBER AND A FIRST IP ADRESS CORRESPONDING TO A FIRST PROCESSING UNIT
78
TRANSMIT THE E-MAIL SIGNAL AS A <CONNECTREQUEST> SIGNAL TO THE INTERNET
80
DELIVER THE E-MAIL SIGNAL THROUGH THE INTERNET USING A MAIL SERVER TO A SECOND PROCESSING UNIT
82
EXTRACT THE SESSION NUMBER AND THE FIRST IP ADRESS FROM THE E-MAIL SIGNAL
84
SEND THE SESSION NUMBER AND A SECOND IP ADRESS CORRESPONDING TO THE SECOND PROCESSING UNIT TO THE FIRST PROCESSING UNIT THROUGH THE INTERNET
86
VERIFY THE SESSION NUMBER RECEIVED FROM THE SECOND PROCESSING UNIT
88
ESTABLISH A POINT-TO-POINT INTERNET COMMUNICATION LINK BETWEEN THE FIRST AND SECOND PROCESSING UNITS USING THE FIRST AND SECOND IP ADDRESSES

FIG. 9

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Abstract

A method for establishing a point-to-point communication link from a caller process to a callee process over a computer network, the caller process having a user interface and being operatively connectable to the callee process and a server over the computer network, said method for use in a computer system, the method comprising, providing a user interface element representing a first communication line, providing a user interface element representing a first callee process, and establishing a point-to-point communication link from the caller process to the first callee process, in response to a user associating the element representing the first callee process with the element representing the first communication line.

9. The method of claim 7 wherein the element provided in step D represents a communication line on mute status.

10. The method of claim 1 wherein the caller process further comprises a visual display and the user interface comprises a graphic user interface.

11. The method of claim 10 wherein the steps of establishing a point-to-point link as described in step C is performed in response to manipulation of the graphic elements on the graphic user interface.

12. A computer program product for use with a computer system comprising:

a computer useable medium having program code embodied in the medium for establishing a point-to-point communication link from a caller process to a callee process over a computer network, the caller process having a user interface and being operatively connectable to the callee process and a server over the computer network, the medium further comprising:

program code for generating an element representing a first communication line;

program code for generating an element representing a first callee process;

program code, responsive to a user associating the element representing the first callee process with the element representing the first communication line, for establishing a point-to-point communication link from the caller process to the first callee process.

13. The computer program product of claim 12 wherein the program code for establishing a point-to-point communication link further comprises:

program code for querying the server as to the on-line status of the first callee process; and

program code for receiving a network protocol address of the first callee process over the computer network from the server.

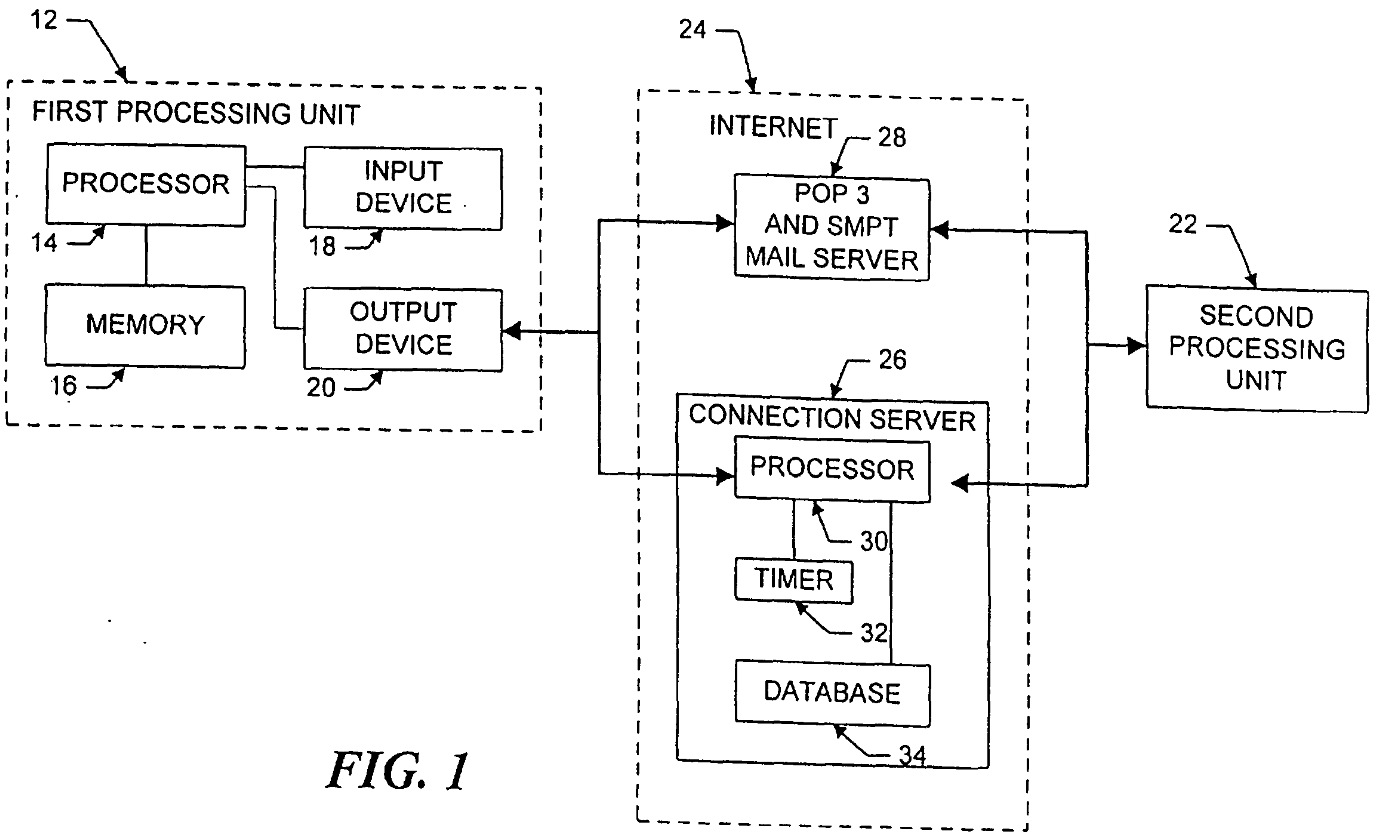
12
FIRST PROCESSING UNIT
PROCESSOR
14
INPUT DEVICE
18
MEMORY
16
OUTPUT DEVICE
20
24
INTERNET
28
POP 3 AND SMPT MAIL SERVER
26
CONNECTION SERVER
PROCESSOR
30
TIMER
32
DATABASE
34
22
SECOND PROCESSING UNIT

FIG. 1

P/00/011 28/5/91
Regulation 3.2

AUSTRALIA

Patents Act 1990

COMPLETE SPECIFICATION

STANDARD PATENT

(ORIGINAL)

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Invention Title: **"Point-to-Point Internet Protocol"**

The following statement is a full description of this invention, including the best method of performing it known to us:

POINT-TO-POINT INTERNET PROTOCOL

The present invention relates, in general, to data processing systems, and more specifically, to a method and apparatus for facilitating audio communications over computer networks.

The increased popularity of on-line services such as AMERICA ONLINE™, COMPUSERVE®, and other services such as Internet gateways have spurred applications to provide multimedia, including video and voice clips, to online users. An example of an online voice clip application is VOICE E-MAIL FOR WINCIM and VOICE E-MAIL FOR AMERICA ONLINE™, available from Bonzi Software, as described in "Simple Utilities Send Voice E-Mail Online", MULTIMEDIA WORLD, VOL. 2, NO. 9, August 1995, p. 52. Using such Voice E-Mail software, a user may create an audio message to be sent to a predetermined E-mail address specified by the user.

Generally, devices interfacing to the Internet and other online services may communicate with each other upon establishing respective device addresses. One type of device address is the Internet Protocol (IP) address, which acts as a pointer to the device associated with the IP address. A typical device may have a Serial Line Internet Protocol or Point-to-Point Protocol (SLIP/PPP) account with a permanent IP address for receiving E-mail, voicemail, and the like over the Internet. E-mail and voicemail is generally intended to convey text, audio, etc., with any routing information such as an IP address and routing headers generally

being considered an artifact of the communication, or even gibberish to the recipient.

Devices such as a host computer or server of a company may include multiple modems for connection of users to the Internet, with a temporary IP address allocated to each user. For example, the host computer may have a general IP address "XXX.XXX.XXX," and each user may be allocated a successive IP address of XXX.XXX.XXX.10, XXX.XXX.XXX.11, XXX.XXX.XXX.12, etc. Such temporary IP addresses may be reassigned or recycled to the users, for example, as each user is successively connected to an outside party. For example, a host computer of a company may support a maximum of 254 IP addresses which are pooled and shared between devices connected to the host computer.

Permanent IP addresses of users and devices accessing the Internet readily support point-to-point communications of voice and video signals over the Internet. For example, realtime video teleconferencing has been implemented using dedicated IP addresses and mechanisms known as reflectors.

A technique for matching domain names to Internet Protocol addresses is described in the text entitled "Internetworking With TCP/IP", 2nd Edition, by Douglas E. Comer, November 1992, Prentice Hall, Englewood Cliffs, New Jersey, U.S.A. Comer describes a domain name system and cooperative systems of name servers for matching domain names to network addresses. Each name server is a server program that supplies mapping of domain names to IP addresses. The system described in Comer, however, is not designed for use with network nodes whose network names or name to address bindings change frequently.

International Publication WO 92/19054 discloses a network

monitoring system including an address tracking module which uses passive monitoring of all packet communications over a local area network to maintain a name table of IP address mappings. The disclosed address tracking module is capable of monitoring only a small number of nodes on a local area network and is not suitable for use with a multitude of nodes over a wide area network.

None of the above-described systems are suitable for use with processes which have dynamically assigned network protocol addresses and which are communicating over wide area or global networks.

Due to the dynamic nature of temporary IP addresses of some devices accessing the Internet, point-to-point communications in realtime of voice and video have been generally difficult to attain.

In accordance with the present invention, there is provided a method for establishing a point-to-point communication link from a caller process to a callee process over a computer network, the caller process having a user interface and being operatively connectable to the callee process and a server over the computer network, said method for use in a computer system, said method comprising:

A. providing a user interface element representing a first communication line;

B. providing a user interface element representing a first callee process; and

C. establishing a point-to-point communication link from the caller process to the first callee process, in response to a user associating the element representing the first callee process with the element representing the first communication line.

The present invention also provides a computer program product for use with a computer system comprising:

a computer useable medium having program code embodied in the medium for establishing a point-to-point communication link from a caller process to a callee process over a computer network, the caller process having a user interface and being operatively connectable to the callee process and a server over the computer network, the medium further comprising:

program code for generating an element representing a first communication line;

program code for generating an element representing a first callee process; program code, responsive to a user associating the element representing the first callee process with the element representing the first communication line, for establishing a point-to-point communication link from the caller process to the first callee process.

The present invention also provides a computer data signal embodied in a carrier wave comprising:

program code for generating a element representing a first communication line;

program code for generating an element representing a first callee process;

program code, responsive to association of the element representing the first callee process with the element representing the first communication line, for establishing a point-to-point communication link from the caller process to the first callee process over a computer network.

Preferred embodiments of the present invention are hereinafter described, by way of example only, with reference to the following drawings, wherein:

FIG 1 illustrates, in block diagram format, a system for the disclosed point-to-point Internet protocol:

FIG 2 illustrates, in block diagram format, the system using a secondary point-to-point Internet protocol;

FIG 3 illustrates, in block diagram format; the system of FIGS 1-2 with the point-to-point Internet protocol established;

FIG 4 is another block diagram of the system of FIGS 1-2 with audio communications being conducted;

FIG. 5 illustrates a display screen for a processing unit;

FIG. 6 illustrates another display screen for a processing unit;

FIG. 7 illustrates a flowchart of the initiation of the point-to-point Internet protocols;

FIG. 8 illustrates a flowchart of the performance of the primary point-to-point Internet protocols; and

FIG. 9 illustrates a flowchart of the performance of the secondary point-to-point Internet protocol.

Referring now in specific detail to the drawings, with like reference numerals identifying similar or identical elements, as shown in FIG. 1, the present disclosure describes a point-to-point network protocol and system 10 for using such a protocol.

In an exemplary embodiment, the system 10 includes a first processing unit 12 for sending at least a voice signal from a first user to a second user. The first processing unit 12 includes a processor 14, a memory 16, an input device 18, and an output device 20. The output device 20 includes at least one modem capable of, for example, 14.4 kbaud communications and operatively connected via wired and/or wireless communication connections to the Internet or other computer networks such as an Intranet, i.e., a private computer network. One skilled in the art would understand that the input device 18 may be implemented at least in part by the modem of the output device 20 to allow input signals from the communication connections to be received. The second processing unit 22 may have a processor, memory, and input and output devices, including at least one modem and associated communication connections, as described above for the first processing unit 12. In an exemplary embodiment, each of the processing units 12, 22 may execute the WEBPHONE™ Internet telephony application available from NetSpeak Corporation, Boca Raton, FL, which is capable of performing the disclosed point-to-point Internet protocol and system 10, as described herein.

The first processing unit 12 and the second processing unit 22 are operatively connected to the Internet 24 by communication devices and software known in the art, such as an Internet Service Provider (ISP) or an Internet gateway. The processing units 12, 22 may be operatively interconnected through the Internet 24 to a connection server 26, and may also be operatively connected to a mail server 28 associated with the Internet 24.

The connection server 26 includes a processor 30, a timer 32 for generating time stamps, and a memory such as a database 34 for storing, for example, E-mail and Internet Protocol (IP) addresses of logged-in units. In an exemplary embodiment, the connection server 26 may be a SPARC 5 server or a SPARC 20 server, available from SUN MICROSYSTEMS, INC., Mountain View, CA, having a central processing unit (CPU) as processor 30, an operating system (OS) such as UNIX, for providing timing operations such as maintaining the timer 32, a hard drive or fixed drive, as well as dynamic random access memory (DRAM) for storing the database 34, and a keyboard and display and/or other input and output devices (not shown in FIG. 1). The database 34 may be an SQL database available from ORACLE or INFORMIX.

In an exemplary embodiment, the mail server 28 may be a Post Office Protocol (POP) Version 3 mail server including a processor, memory, and stored programs operating in a UNIX environment, or, alternatively, another OS, to process E-mail capabilities between processing units and devices over the Internet 24.

The first processing unit 12 may operate the disclosed point-to-point Internet protocol by a computer program described hereinbelow in conjunction with FIG. 6, which may be implemented from compiled and /or interpreted source code in the C++ programming language and which may be downloaded to the first processing unit 12 from an external computer. The operating computer program may be stored in the memory 16, which may include about 8 MB RAM and/or a hard or fixed drive having about 8 MB. Alternatively, the source code may be implemented in the first processing unit 12 as firmware, as an erasable read only memory (EPROM), etc. It is understood that one skilled in the art would be able to use programming languages other than C++ to implement the disclosed point-to-point network protocol and system 10.

The processor 14 receives input commands and data from a first user associated with the first processing unit 12 though the input device 18, which may be an input port connected by a wired, optical, or a wireless connection for electromagnetic transmissions, or alternatively may be transferable storage media, such as floppy disks, magnetic tapes, compact disks, or other storage media including the input data from the first user.

The input device 18 may include a user interface (not shown) having, for example, at least one button actuated by the user to input commands to select from a plurality of operating modes to operate the first processing unit 12. In alternative embodiments, the input device 18 may include a keyboard, a mouse, a touch screen, and/or a data reading device such as a disk drive for receiving the input data from input data files stored in storage media such as a floppy disk or, for example, an 8 mm storage tape. The input device 18 may alternatively include connections to other computer systems to receive the input commands and data therefrom.

The first processing unit 12 may include a visual interface for use in conjunction with the input device 18 and output device 20 similar to those screens illustrated in FIGS. 5-6, discussed below. It is also understood that alternative devices may be used to receive commands and data from the user, such as keyboards, mouse devices, and graphical user interfaces (GUI) such as WINDOWS™ 3.1 available form MICROSOFT Corporation, Redmond, WA., and other operating systems and GUIs, such as OS/2 and OS/2 WARP, available from IBM CORPORATION, Boca Raton, FL. Processing unit 12 may also include microphones and/or telephone handsets for receiving audio voice data and commands, speech or voice recognition devices, dual tone multi-frequency (DTMF) based devices, and/or software known in the art to accept voice data and commands and to operate the first processing unit 12.

In addition, either of the first processing unit 12 and the second processing unit 22 may be implemented in a personal digital assistant (PDA) providing modem and E-mail capabilities and Internet access, with the PDA providing the input/output screens for mouse interactions or for touchscreen activation as shown, for example, in FIGS. 5-6, as a combination of the input device 18 and output device 20.

For clarity of explanation, the illustrative embodiment of the disclosed point-to-point Internet protocol and system 10 is presented as having individual functional blocks, which may include functional blocks labeled as "processor" and "processing unit". The functions represented by these blocks may be provided through the use of either shared or dedicated hardware, including, but not limited to, hardware capable of executing software. For example, the functions of each of the processors and processing units presented herein may be provided by a shared processor or by a plurality of individual processors. Moreover, the use of the functional blocks with accompanying labels herein is not to be construed to refer exclusively to hardware capable of executing software. Illustrative embodiments may include digital signal processor (DSP) hardware, such as the AT&T DSP16 or DSP32C, read-only memory (ROM) for storing software performing the operations discussed below, and random access memory (RAM) for storing DSP results. Very large scale integration (VLSI) hardware embodiments, as well as custom VLSI circuitry in combination with a general purpose DSP circuit, may also be provided. Any and all of these embodiments may be deemed to fail within the meaning of the labels for the functional blocks as used herein.

The processing units 12, 22 are capable of placing calls and connecting to other processing units connected to the Internet 24, for example, via dialup SLIP/PPP lines. In an exemplary embodiment, each processing unit assigns an unsigned long session number, for example, a 32- bit long sequence in a *.ini file for each call. Each call may be assigned a successive session number in sequence, which may be used by the respective processing unit to associate the call with one of the SLIP/PPP lines, to associate a <ConnectOK> response signal with a <Connect Request> signal, and to allow for multiplexing and demultiplexing of inbound and outbound conversations on conference lines, as explained hereinafter.

For callee (or called) processing units with fixed IP addresses, the caller (or calling) processing unit may open a "socket", i.e. a file handle or address indicating where data is to be sent, and transmit a <Call> command to establish communication with the callee utilizing, for example, datagram services such as Internet Standard network layering as well as transport layering, which may include a Transport Control Protocol (TCP) or a User Datagram Protocol (UDP) on top of the IP. Typically, a processing unit having a fixed IP address may maintain at least one open socket and a called processing unit waits for a <Call> command to assign the open socket to the incoming signal. If all lines are in use, the callee processing unit sends a BUSY signal or message to the callee processing unit. As shown in FIG. 1, the disclosed point-to-point Internet protocol and system 10 operate when a callee processing unit does not have a fixed or predetermined IP address. In the exemplary embodiment and without loss of generality, the first processing unit 12 is the caller processing unit and the second processing unit 22 is the called processing unit. When either of processing units 12, 22 logs on to the Internet via a dial-up connection, the respective unit is provided a dynamically allocated IP address by the a connection service provider.

Upon the first user initiating the point-to-point Internet protocol when the first user is logged on to the Internet 24, the first processing unit 12 automatically transmits its associated E-mail address and its dynamically allocated IP address to the connection server 26. The connection server 26 then stores these addresses in the database 34 and time stamps the stored addresses using timer 32. The first user operating the first processing unit 12 is thus established in the database 34 as an active on-line party available for communication using the disclosed point-to-point Internet protocol. Similarly, a second user operating the second processing unit 22, upon connection to the Internet 24 through the a connection service provider, is processed by the connection server 26 to be established in the database 34 as an active on-line party.

The connection server 26 may use the time stamps to update the status of each processing unit; for example, after 2 hours, so that the on-line status information stored in the database 34 is relatively current. Other predetermined time periods, such as a default value of 24 hours, may be configured by a systems operator.

The first user with the first processing unit 12 initiates a call using, for example, a Send command and/or a command to speeddial an N^{TH} stored number, which may be labeled [SND] and [SPD] [N], respectively, by the input device 18 and/or the output device 20, such as shown in FIGS. 5-6. In response to either the Send or speeddial commands, the first processing unit 12 retrieves from memory 16 a stored E-mail address of the callee corresponding to the N^{TH} stored number. Alternatively, the first user may directly enter the E-mail address of the callee.

The first processing unit 12 then sends a query, including the E-mail address of the callee, to the connection server 26. The connection server 26 then searches the database 34 to determine whether the callee is logged-in by finding any stored information corresponding to the callee's E-mail address indicating that the callee is active and on-line. If the callee is active and on-line, the connection server 26 then performs the primary point-to-point Internet protocol; i.e. the IP address of the callee is retrieved from the database 34 and sent to the first processing unit 12. The first processing unit 12 may then directly establish the point-to-point Internet communications with the callee using the IP address of the callee.

If the callee is not on-line when the connection server 26 determines the callee's status, the connection server 26 sends an OFF-LINE signal or message to the first processing unit 12. The first processing unit 12 may also display a message such as "Called Party Off-Line" to the first user.

When a user logs off or goes off-line from the Internet 24, the connection server 26 updates the status of the user in the database 34; for example, by removing the user's information, or by flagging the user as being off-line. The connection server 26 may be instructed to update the user's information in the database 34 by an off-line message, such as a data packet, sent automatically from the processing unit of the user prior to being disconnected from the connection server 26. Accordingly, an off-line user is effectively disabled from making and/or receiving point-to-point Internet communications.

As shown in FIGS. 2-4, the disclosed secondary point-to-point Internet protocol may be used as an alternative to the primary point-to-point Internet protocol described above, for example, if the connection server 26 is non-responsive, inoperative, and/or unable to perform the primary point-to-point Internet protocol, as a non-responsive condition. Alternatively, the disclosed secondary point-to-point Internet protocol may be used independent of the primary point-to-point Internet protocol. In the disclosed secondary point-to-point Internet protocol, the first processing unit 12 sends a <ConnectRequest> message via E-mail over the Internet 24 to the mail server 28. The E-mail including the <ConnectRequest> message may have, for example, the subject

[*wp#XXXXXXXX#nnn.nnn.nnn.#emailAddr]

where nnn.nnn.nnn.nnn. is the current (i.e. temporary or permanent) IP address of the first user, and XXXXXXXX is a session number, which may be unique and associated with the request of the first user to initiate point-to-point communication with the second user.

As described above, the first processing unit 12 may send the <ConnectRequest> message in response to an unsuccessful attempt to perform the primary point-to-point Internet protocol. Alternatively, the first processing unit 12 may send the <ConnectRequest> message in response to the first user initiating a SEND command or the like.

After the <ConnectRequest> message via E-mail is sent, the first processing unit 12 opens a socket and waits to detect a response from the second processing unit 22. A timeout timer, such as timer 32, may be set by the first processing unit 12, in a manner known in the art, to wait for a predetermined duration to receive a <ConnectOK> signal. The processor 14 of the first processing unit 12 may cause the output device 20 to output a Ring signal to the user, such as an audible ringing sound, about every 3 seconds . For example, the processor 14 may output a *.wav file, which may be labeled RING.WAV, which is processed by the output device 20 to output an audible ringing sound.

The mail server 28 then polls the second processing unit 22, for example, every 3-5 seconds, to deliver the E-mail. Generally, the second processing unit 22 checks the incoming lines, for example, at regular intervals to wait for and to detect incoming E-mail from the mail server 28 through the Internet 24.

Typically, for sending E-mail to users having associated processing units operatively connected to a host computer or server operating an Internet gateway, E-mail for a specific user may be sent over the Internet 24 and directed to the permanent IP address or the SLIP/PPP account designation of the host computer, which then assigns a temporary IP address to the processing unit of the specified user for properly routing the E-mail. The E-mail signal may include a name or other designation such as a user name which identifies the specific user regardless of the processing unit assigned to the user; that is, the host computer may track and store the specific device where a specific user is assigned or logged on, independent of the IP address system, and so the host computer may switch the E-mail signal to the device of the specific user. At that time, a temporary IP address may be generated or assigned to the specific user and device.

Upon detecting and/or receiving the incoming E-mail signal from the first processing unit 12, the second processing unit 22 may assign or may be assigned a temporary IP address. Therefore, the delivery of the E-mail through the Internet 24 provides the second processing unit 22 with a session number as well as IP addresses of both the first processing unit 12 and the second processing unit 22.

Point-to-point communication may then be established by the processing unit 22 processing the E-mail signal to extract the <ConnectRequest> message, including the IP address of the first processing unit 12 and the session number. The second processing unit 22 may then open a socket and generate a <ConnectOK> response signal, which includes the temporary IP address of the second processing unit 22 as well as the session number of the first processing unit.

The second processing unit 22 sends the <ConnectOK> signal directly over the Internet 24 to the IP address of the first processing unit 12 without processing by the mail server 28, and a timeout timer of the second processing unit 22 may be set to wait and detect a <Call> signal expected from the first processing unit 12.

Realtime point-to-point communication of audio signals over the Internet 24, as well as video and voicemail, may thus be established and supported without requiring permanent IP addresses to be assigned to either of the users or processing units 12, 22. For the duration of the realtime point-to-point link, the relative permanence of the current IP addresses of the processing units 12, 22 is sufficient, whether the current IP addresses were permanent (i.e. predetermined or preassigned) or temporary (i.e. assigned upon initiation of the point-to-point communication).

In the exemplary embodiment, a first user operating the first processing unit 12 is not required to be notified by the first processing unit 12 that an E-mail is being generated and sent to establish the point-to-point link with the second user at the second processing unit 22. Similarly, the second user is not required to be notified by the second processing unit 22 that an E-mail has been received and/or a temporary IP address is associated with the second processing unit 22. The processing units 12, 22 may perform the disclosed point-to-point Internet protocol automatically upon initiation of the point-to-point communication command by the first user without displaying the E-mail interactions to either user. Accordingly, the disclosed point-to-point Internet protocol may be transparent to the users. Alternatively, either of the first and second users may receive, for example, a brief message of "CONNECTION IN PROGRESS" or the like on a display of the respective output device of the processing units 12, 22.

After the initiation of either the primary or the secondary point-to-point Internet protocols described above in conjunction with FIGS. 1-2, the point-to-point communication link over the Internet 24 may be established as shown in FIGS. 3-4 in a manner known in the art. For example, referring to FIG. 3, upon receiving the <ConnectorOK> signal from the second processing unit 22, the first processing unit 12 extracts the IP address of the second processing unit 22 and the session number, and the session number sent from the second processing unit 22 is then checked with the session number originally sent from the first processing unit 12 in the <ConnectRequest> message as E-mail. If the session numbers sent and received by the processing unit 12 match, then the first processing unit 12 sends a <Call> signal directly over the Internet 24 to the second processing unit 22; i.e. using the IP address of the second processing unit 22 provided to the first processing unit 12 in the <ConnectOK> signal.

Upon receiving the <Call> signal, the second processing unit 22 may then begin a ring sequence, for example, by indicating or annunciating to the second user that an incoming call is being received. For example, the word "CALL" may be displayed on the output device of the second processing unit 22. The second user may then activate the second processing unit 22 to receive the incoming call.

Referring to FIG. 4, after the second processing unit 22 receives the incoming call, realtime audio and/or video conversations may be conducted in a manner known in the art between the first and second users through the Internet 24, for example, by compressed digital audio signals. Each of the processing units 12, 22 also display to each respective user the words "IN USE" to indicate that the point-to-point communication link is established and audio or video signals are being transmitted.

In addition, either user may terminate the point-to-point communication link by, for example, activating a termination command, such as by activating an [END] button or icon on a respective processing unit, causing the respective processing unit to send an <End> signal which causes both processing units to terminate the respective sockets, as well as to perform other cleanup commands and functions known in the art.

FIGS. 5-6 illustrate examples of display screens 36 which may be output by a respective output device of each processing unit 12, 22 of FIGS. 1-4 for providing the disclosed point-to-point Internet protocol and system 10. Such display screens may be displayed on a display of a personal computer (PC) or a PDA in a manner known in the art.

As shown in FIG. 5, a first display screen 36 includes a status area 38 for indicating, for example, a called user by name and/or by IP address or telephone number; a current function such as C2; a current time; a current operating status such as "IN USE", and other control icons such as a down arrow icon 40 for scrolling down a list of parties on a current conference line. The operating status may include such annunciators as "IN USE," "IDLE," "BUSY," "NO ANSWER," "OFFLINE," "CALL," "DIALING," "MESSAGES," and "SPEEDDIAL."

Other areas of the display screen 36 may include activation areas or icons for actuating commands or entering data. For example, the display screen 36 may include a set of icons 42 arranged in columns and rows including digits 0-9 and commands such as END, SND, HLD, etc. For example, the END and SND commands may be initiated as described above, and the HLD icon 44 may be actuated to place a current line on hold. Such icons may also be configured to substantially simulate a telephone handset or a cellular telephone interface to facilitate ease of use, as well as to simulate function keys of a keyboard. For example, icons labeled L1-L4 may be mapped to function keys F1-F4 on standard

PC keyboards, and icons C1-C3 may be mapped to perform as combinations of function keys, such as CTRL-F1, CTRL-F2, and CTRL-F3, respectively. In addition, the icons labeled L1-L4 and C1-C3 may include circular regions which may simulate light emitting diodes (LEDs) which indicate that the function or element represented by the respective icon is active or being performed.

Icons L1-L4 may represent each of 4 lines available to the caller, and icons C1-C3 may represent conference calls using at least one line to connect, for example, two or more parties in a conference call. The icons L1-L4 and C1-C3 may indicate the activity of each respective line or conference line. For example, as illustrated in FIG. 5, icons L1-L2 may have lightly shaded or colored circles, such as a green circle, indicating that each of lines 1 and 2 are in use, while icons L3-L4 may have darkly shaded or color circles, such as a red or black circle, indicating that each of lines 3 and 4 are not in use. Similarly, the lightly shaded circle of the icon labeled C2 indicates that the function corresponding to C2 is active, as additionally indicated in the status are 38, while darkly shaded circles of icons labeled C1 and C3 indicate that such corresponding functions are not active.

The icons 42 are used in conjunction with the status area 38. For example, using a mouse for input, a line that is in use, as indicated by the lightly colored circle of the icon, may be activated to indicate a party's name by clicking a right mouse button for 5 seconds until another mouse click is actuated or the [ESC] key or icon is actuated. Thus, the user may switch between multiple calls in progress on respective lines.

Using the icons as well as an input device such as a mouse, a user may enter the name or alias or IP address, if known, of a party to be called by either manually entering the name, by using the speeddial feature, or by double clicking on an entry in a directory stored in the memory, such as the memory 16 of the first processing unit 12, where the directory entries may be scrolled using the status area 38 and the down arrow icon 40.

Once a called party is listed in the status area 38 as being active on a line, the user may transfer the called party to another line or a conference line by clicking and dragging the status area 38, which is represented by a reduced icon 46. Dragging the reduced icon 46 to any one of line icons L1-L4 transfers the called party in use to the selected line, and dragging the reduced icon 46 to any one of conference line icons C1-C3 adds the called party to the selected conference call.

Other features may be supported, such as icons 48-52, where icon 48 corresponds to, for example, an ALT-X command to exit the communication facility of a processing unit, and icon 50 corresponds to, for example, an ALT-M command to minimize or maximize the display screen 36 by the output device of the processing unit. Icon 52 corresponds to an OPEN command, which may, for example, correspond to pressing the O key on a keyboard, to expand or contract the display screen 36 to represent the opening and closing of a cellular telephone. An "opened" configuration is shown in FIG. 5, and a "closed" configuration is shown in FIG. 6. In the "opened" configuration, additional features such as output volume (VOL) controls, input microphone (MIC) controls, waveform (WAV) sound controls, etc.

The use of display screens such as those shown in FIGS. 5-6 provided flexibility in implementing various features available to the user. It is to be understood that additional features such as those known in the art may be supported by the processing units 12, 22.

Alternatively, it is to be understood that one skilled in the art may implement the processing units 12, 22 to have the features of the display screens in FIGS. 5-6 in hardware; i.e. a wired telephone or wireless cellular telephone may include various keys, LEDs, liquid crystal displays (LCDs), and touchscreen actuators corresponding to the icons and features shown in FIGS. 5-6. In addition, a PC may have the keys of a keyboard and mouse mapped to the icons and features shown in FIGS. 5-6.

Referring to FIG. 7, the disclosed point-to-point Internet protocol and system 10 is illustrated. First processing unit 12 initiates the point-to-point Internet protocol in step 56 by sending a query from the first processing unit 12 to the connection server 26. If connection server 26 is operative to perform the point-to-point Internet protocol, in step 58, first processing unit 12 receives an on-line status signal from the connection server 26, such signal may include the IP address of the callee or a "Callee Off-Line" message. Next, first processing unit 12 performs the primary point-to-point Internet protocol in step 60, which may include receiving, at the first processing unit 12, the IP address of the callee if the callee is active and on-line. Alternatively, processing unit 60 may initiate and perform the secondary point-to-point Internet protocol in step 62, if the called party is not active and/or on-line.

Referring to FIG. 8, in conjunction with FIGS. 1 and 3-4, the disclosed point-to-point Internet protocol and system 10 is illustrated. Connection server 26 starts the point-to-point Internet protocol, in step 64, and timestamps and stores E-mail and IP addresses of logged-in users and processing units in the database 34 in step 66. Connection server 26 receives a query from a first processing unit 12 in step 68 to determine whether a second user or second processing unit 22 is logged-in to the Internet 24, with the second user being specified, for example, by an E-mail address. Connection server 26 retrieves the IP address of the specified user from the database 34 in step 70, if the specified user is logged-in to the Internet, and sends the retrieved IP address to the first processing unit 12 in step 72 to enable first processing unit 12 to establish point-to-point communications with the specified second user.

The disclosed secondary point-to-point Internet protocol operates as shown in FIG. 9. First processing unit 12 generates an E-mail signal, including a session number and a first IP address corresponding to a first processing unit in step 76. First processing unit 12 transmits the E-mail signal as a <ConnectRequest> signal to the Internet 24 in step 78. The E-mail signal is delivered through the Internet 24 using a mail server 28 to the second processing unit 22 in step 80. Second processing unit 22 extracts the session number and the first IP address from the E-mail signal in step 82 and transmits or sends the session number and a second IP address corresponding to the second processing unit 22, back to the first processing unit 12 through the Internet 24, in step 84. First processing unit 12 verifies the session number received from the second processing unit 22 in step 86, and establishes a point-to-point Internet communication link between the first processing unit 12 and second processing unit 22 using the first and second IP addresses in step 88.

While the disclosed point-to-point Internet protocols and system have been particularly shown and described with reference to the preferred embodiments, it is understood by those skilled in the art that various modifications in form and detail may be made therein without departing from the scope and spirit of the invention. Accordingly, modifications such as those suggested above, but not limited thereto, are to be considered within the scope of the invention.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

The reference to any prior art in this specification is not, and should not be taken as, an acknowledgment or any form of suggestion that that prior art forms part of the common general knowledge in Australia.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method for establishing a point-to-point communication link from a caller process to a callee process over a computer network, the caller process having a user interface and being operatively connectable to the callee process and a server over the computer network, said method for use in a computer system, said method comprising:

A. providing a user interface element representing a first communication line;

B. providing a user interface element representing a first callee process; and

C. establishing a point-to-point communication link from the caller process to the first callee process, in response to a user associating the element representing the first callee process with the element representing the first communication line.

2. The method of claim 1 wherein step C further comprises the steps of:

c.1 querying the server as to the on-line status of the first callee process and

c.2 receiving a network protocol address of the first callee process over the computer network from the server.

3. The method of claim 1 further comprising the step of:

D. providing an element representing a second communication line.

4. The method of claim 3 further comprising the step of:

E. terminating the point-to-point communication link from the caller process to the first callee process, in response to the user disassociating the element representing the first callee process from the element representing the first communication line; and

F. establishing a different point-to-point communication link from the caller process to the first callee process, in response to the user associating the element representing the first callee process with the element representing the second communication line.

5. The method of claim 1 further comprising the steps of:

D. providing a user interface element representing a second callee process; and

E. establishing a conference point-to-point communication link between the caller process and the first and second callee process, in response to the user associating the element representing the second callee process with the element representing the first communication line.

6. The method of claim 5 further comprising the step of:

F. removing the second callee process from the conference point-to-point communication link in response to the user disassociating the element representing the second callee process from the element representing the first communication line.

7. The method of claim 1 further comprising the steps of:

D. providing a user interface element representing a communication line having a temporarily disabled status; and

E. temporarily disabling a point-to-point communication link between the caller process and the first callee process, in response to the user associating the element representing the first callee process with the element representing the communication line having a temporarily disabled status.

8. The method of claim 7 wherein the element provided in step D represents a communication line on hold status.

9. The method of claim 7 wherein the element provided in step D represents a communication line on mute status.

10. The method of claim 1 wherein the caller process further comprises a visual display and the user interface comprises a graphic user interface.

11. The method of claim 10 wherein the steps of establishing a point-to-point link as described in step C is performed in response to manipulation of the graphic elements on the graphic user interface.

12. A computer program product for use with a computer system comprising:

a computer useable medium having program code embodied in the medium for establishing a point-to-point communication link from a caller process to a callee process over a computer network, the caller process having a user interface and being operatively connectable to the callee process and a server over the computer network, the medium further comprising:

program code for generating an element representing a first communication line;

program code for generating an element representing a first callee process;

program code, responsive to a user associating the element representing the first callee process with the element representing the first communication line, for establishing a point-to-point communication link from the caller process to the first callee process.

13. The computer program product of claim 12 wherein the program code for establishing a point-to-point communication link further comprises:

program code for querying the server as to the on-line status of the first callee process; and

program code for receiving a network protocol address of the first callee process over the computer network from the server.

14. A computer program product of claim 12 further comprising:

program code for generating an element representing a second communication line.

15. The computer program product of claim 14 further comprising:

program code, responsive to the user disassociating the element representing the first callee process from the element representing the first communication line, for terminating the point-to-point communication link from the caller process to the first callee process; and

program code, responsive to the user associating the element representing the first callee process with the element presenting the second communication line, for establishing a different point-to-point communication link from the caller process to the first callee process.

16. The computer program product of claim 12 further comprising:

program code for generating an element representing a second callee process; and

program code means, responsive to the user associating the element representing the second callee process with the element representing the first communication line, for establishing a conference communication link between the caller process and the first and second callee process.

17. The computer program product of claim 16 further comprising:

program code, responsive to the user disassociating the element representing the second callee process from the element representing the first communication line, for removing the second callee process from the conference communication link.

18. The computer program product of claim 12 further comprising:

program code for generating an element representing a communication line having a temporarily disabled status; and program code, responsive to the association of the element representing the first callee process with the element representing the communication line having a temporarily disabled status, for temporarily disabling the point-to-point communication link between the caller process and the first callee process.

19. The computer program product of claim 18 wherein the communication line having a temporarily disabled status comprises a communication line on hold status.

20. The computer program product of claim 18 wherein the communication line having a temporarily disabled status comprises a communication line on mute status.

21. A computer program product of claim 12 wherein the computer system further comprises a visual display and the user interface comprises a graphic user interface.

22. The computer program product of claim 21 wherein the element representing the first communication line and the element representing the first callee process are graphic elements and wherein the program code for establishing a point-to-point communication link from the caller process to the first callee process further comprises:

program code, responsive to manipulation of the graphic elements on the graphic user interface, for establishing the point-to-point communication link from the caller process to the first callee process.

23. A computer data signal embodied in a carrier wave comprising:

program code for generating a element representing a first communication line;

program code for generating an element representing a first callee process;

program code, responsive to association of the element representing the first callee process with the element representing the first communication line, for establishing a point-to-point communication link from the caller process to the first callee process over a computer network.

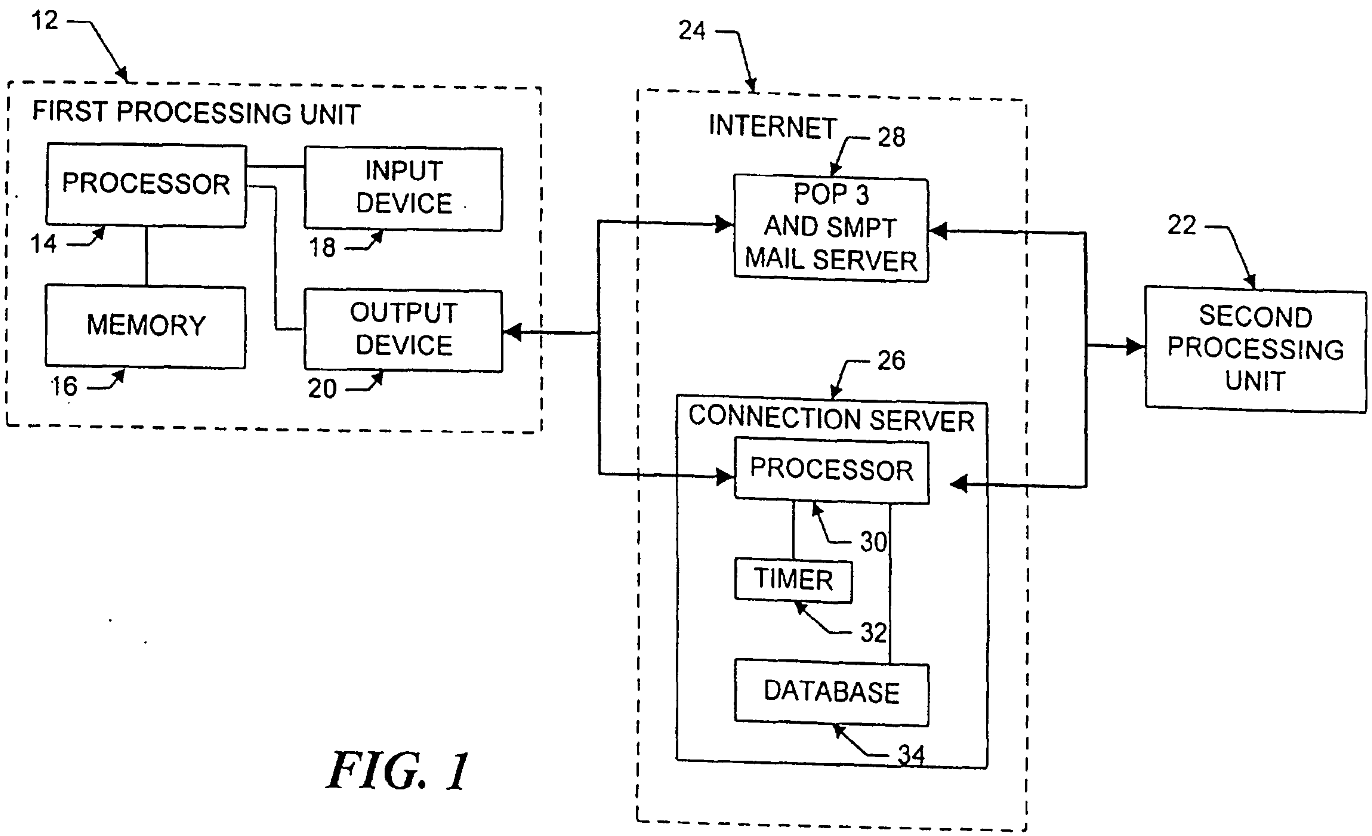
24. A method substantially as hereinbefore described with reference to the accompanying drawings.

25. A computer program product substantially as hereinbefore described with reference to the accompanying drawings.

26. A computer data signal substantially as hereinbefore described with reference to the accompanying drawings.

DATED this 8th day of September 2000

NetSpeak Corporation
By its Patent Attorneys
DAVIES COLLISON CAVE



12
FIRST PROCESSING UNIT
PROCESSOR
14
INPUT DEVICE
18
MEMORY
16
OUTPUT DEVICE
20
24
INTERNET
28
POP 3 AND SMPT MAIL SERVER
26
CONNECTION SERVER
PROCESSOR
30
TIMER
32
DATABASE
34
22
SECOND PROCESSING UNIT

FIG. 1

13 09 00 59376

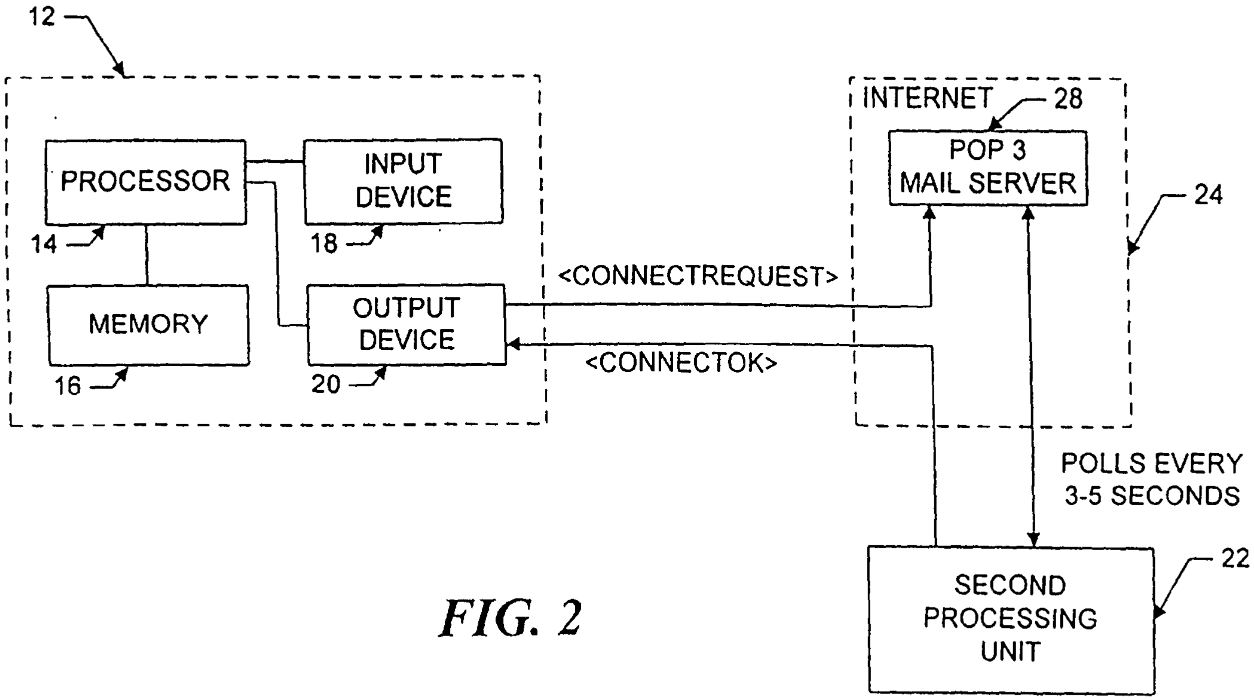


FIG. 2

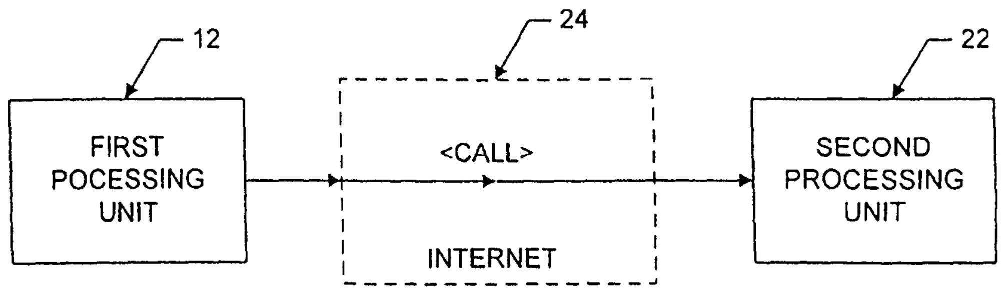

12
24
22
FIRST POCESSING UNIT
<CALL>
INTERNET
SECOND PROCESSING UNIT

FIG. 3

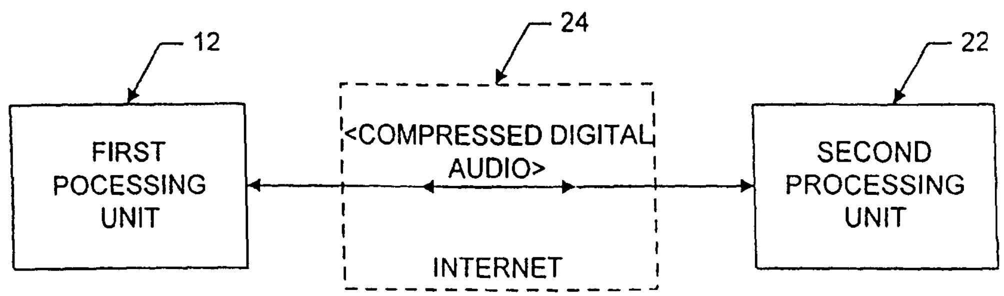

12
24
22
FIRST POCESSING UNIT
<COMPRESSED DIGITAL AUDIO>
INTERNET
SECOND PROCESSING UNIT

FIG. 4

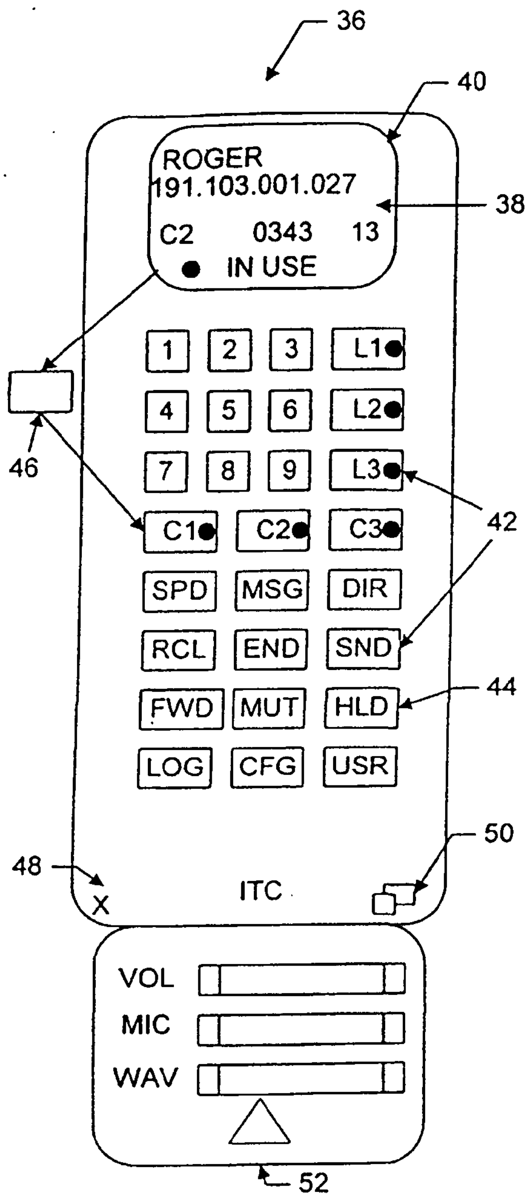

36
40
ROGER
191.103.001.027
C2 0343 13
IN USE
38
1 2 3 L1
4 5 6 L2
7 8 9 L3
C1 C2 C3
SPD MSG DIR
RCL END SND
FWD MUT HLD
LOG CFG USR
42
44
46
48
X
ITC
50
VOL
MIC
WAV
52

FIG. 5

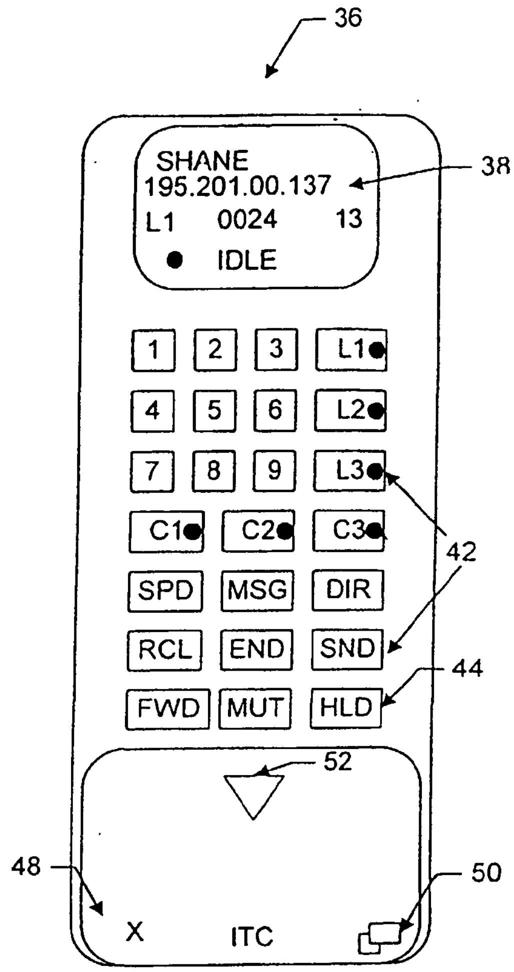

36
SHANE
195.201.00.137
L1 0024 13
IDLE
38
1 2 3 L1
4 5 6 L2
7 8 9 L3
C1 C2 C3
SPD MSG DIR
RCL END SND
FWD MUT HLD
42
44
52
48
X
ITC
50

FIG. 6

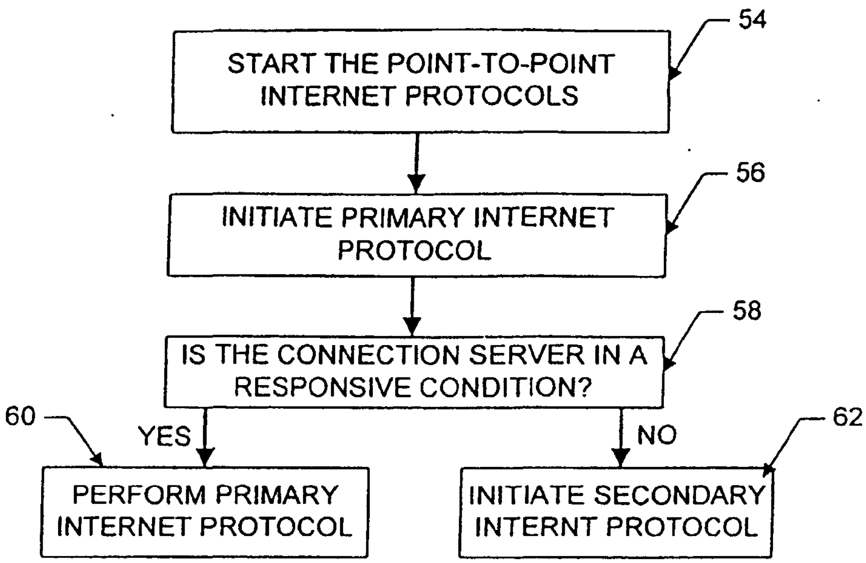

54
START THE POINT-TO-POINT INTERNET PROTOCOLS
56
INITIATE PRIMARY INTERNET PROTOCOL
58
IS THE CONNECTION SERVER IN A RESPONSIVE CONDITION?
60
YES
NO
62
PERFORM PRIMARY INTERNET PROTOCOL
INITIATE SECONDARY INTERNT PROTOCOL

FIG. 7

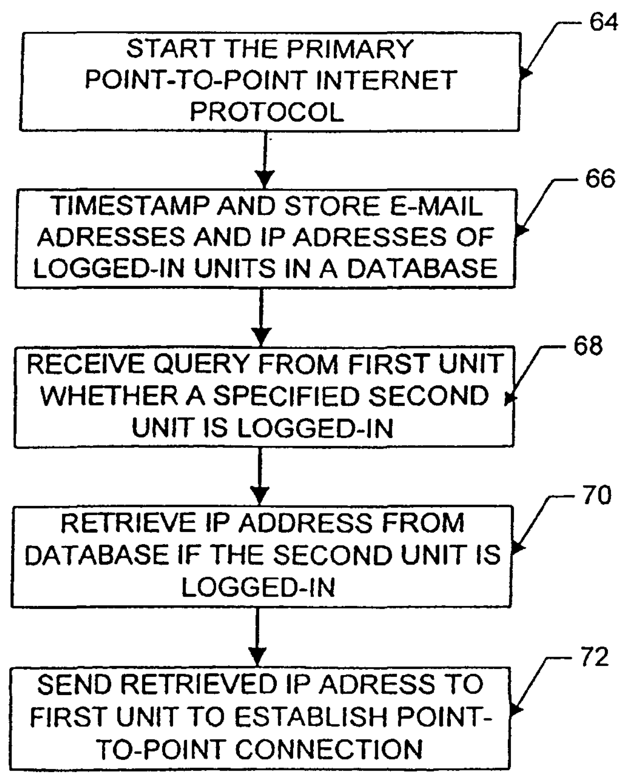

64
START THE PRIMARY POINT-TO-POINT INTERNET PROTOCOL
66
TIMESTAMP AND STORE E-MAIL ADRESSES AND IP ADRESSES OF LOGGED-IN UNITS IN A DATABASE
68
RECEIVE QUERY FROM FIRST UNIT WHETHER A SPECIFIED SECOND UNIT IS LOGGED-IN
70
RETRIEVE IP ADDRESS FROM DATABASE IF THE SECOND UNIT IS LOGGED-IN
72
SEND RETRIEVED IP ADRESS TO FIRST UNIT TO ESTABLISH POINT-TO-POINT CONNECTION

FIG. 8

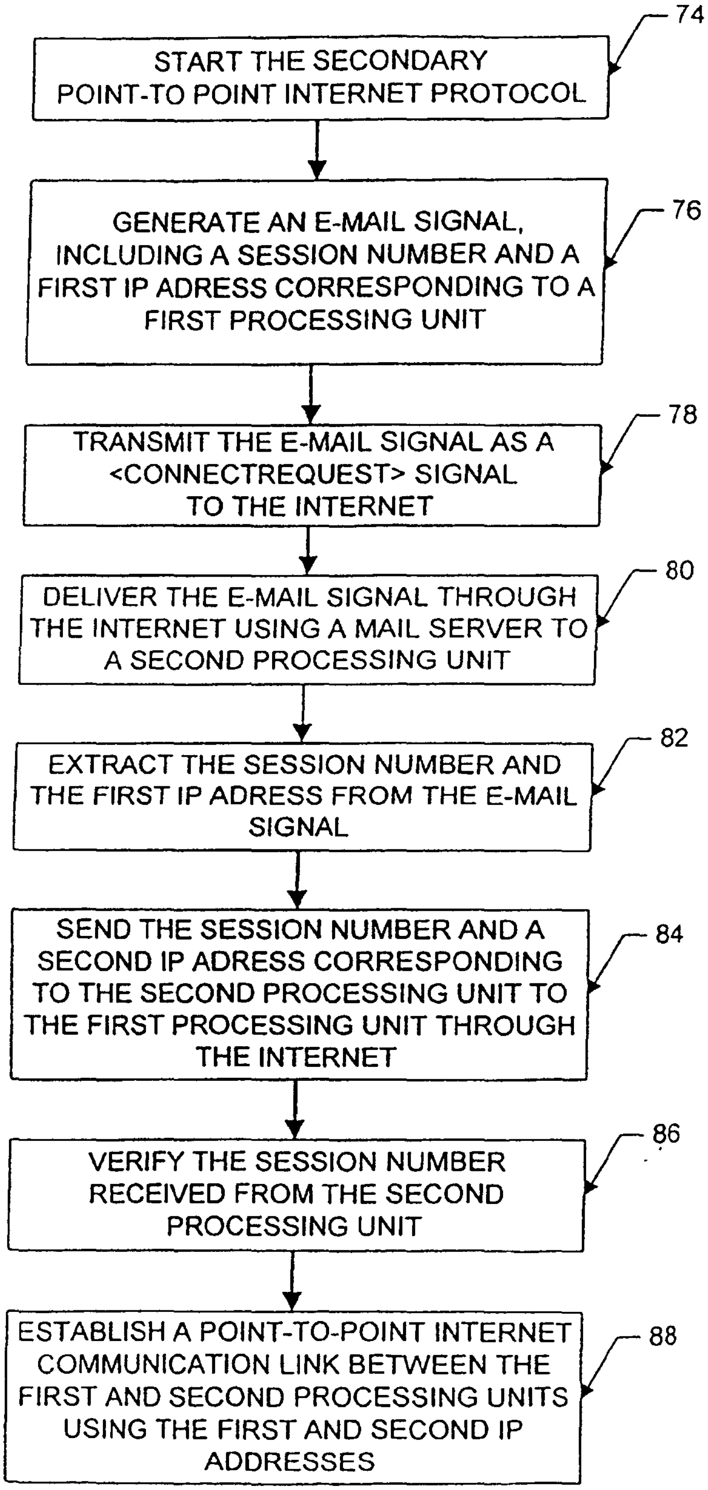

74
START THE SECONDARY POINT-TO POINT INTERNET PROTOCOL
76
GENERATE AN E-MAIL SIGNAL, INCLUDING A SESSION NUMBER AND A FIRST IP ADRESS CORRESPONDING TO A FIRST PROCESSING UNIT
78
TRANSMIT THE E-MAIL SIGNAL AS A <CONNECTREQUEST> SIGNAL TO THE INTERNET
80
DELIVER THE E-MAIL SIGNAL THROUGH THE INTERNET USING A MAIL SERVER TO A SECOND PROCESSING UNIT
82
EXTRACT THE SESSION NUMBER AND THE FIRST IP ADRESS FROM THE E-MAIL SIGNAL
84
SEND THE SESSION NUMBER AND A SECOND IP ADRESS CORRESPONDING TO THE SECOND PROCESSING UNIT TO THE FIRST PROCESSING UNIT THROUGH THE INTERNET
86
VERIFY THE SESSION NUMBER RECEIVED FROM THE SECOND PROCESSING UNIT
88
ESTABLISH A POINT-TO-POINT INTERNET COMMUNICATION LINK BETWEEN THE FIRST AND SECOND PROCESSING UNITS USING THE FIRST AND SECOND IP ADDRESSES

FIG. 9

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(19) **AUSTRALIAN PATENT OFFICE**	

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(62) Divisional of:
199672476

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Abstract

An apparatus for establishing a point-to-point communication link said apparatus operating in a computer system operatively coupled to other computers and a server over a computer network, the apparatus comprising means for transmitting, from the first process to a server a query as to whether a second process is connected to the computer network, means for receiving a network protocol address of the second process from the server when the second process is connected to the computer network, and means, responsive to the network protocol address of the second process, for establishing a point-to-point communication link between the first process and the second process over the computer network.

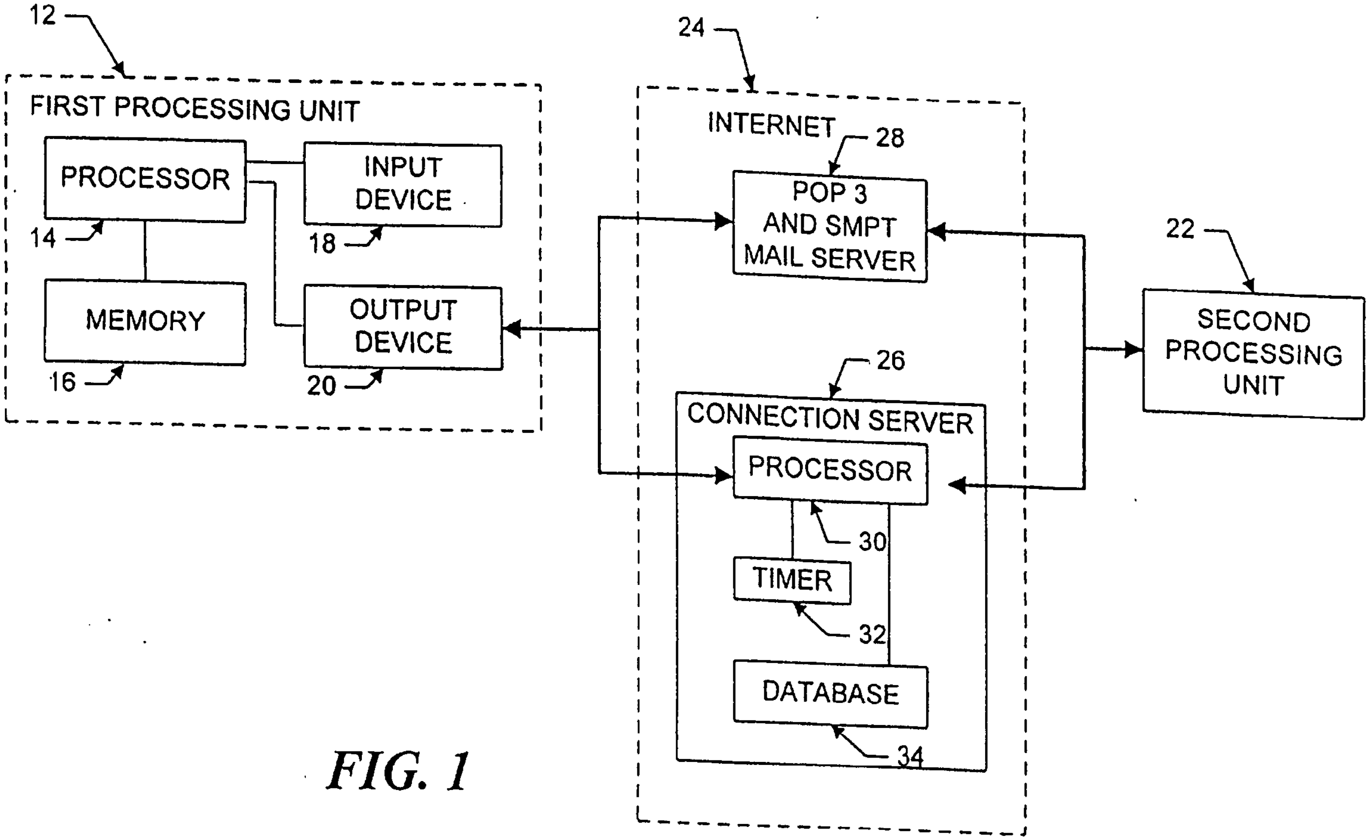
12
FIRST PROCESSING UNIT
PROCESSOR
14
INPUT DEVICE
18
MEMORY
16
OUTPUT DEVICE
20
24
INTERNET
28
POP 3 AND SMPT MAIL SERVER
26
CONNECTION SERVER
PROCESSOR
30
TIMER
32
DATABASE
34
22
SECOND PROCESSING UNIT

FIG. 1

P/00/011 28/5/91
Regulation 3.2

AUSTRALIA

Patents Act 1990

COMPLETE SPECIFICATION

STANDARD PATENT

(ORIGINAL)

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MATTAWAY, Shane D
STRICKLAND, Craig B

Address for Service: **DAVIES COLLISON CAVE**, Patent Attorneys, of 1 Little Collins Street, Melbourne, Victoria 3000, Australia.

Invention Title: **"Point-to-Point Internet Protocol"**

The following statement is a full description of this invention, including the best method of performing it known to us:

POINT-TO-POINT INTERNET PROTOCOL

The present invention relates, in general, to data processing systems, and more specifically, to a method and apparatus for facilitating audio communications over computer networks.

The increased popularity of on-line services such as AMERICA ONLINE™, COMPUSERVE®, and other services such as Internet gateways have spurred applications to provide multimedia, including video and voice clips, to online users. An example of an online voice clip application is VOICE E-MAIL FOR WINCIM and VOICE E-MAIL FOR AMERICA ONLINE™, available from Bonzi Software, as described in "Simple Utilities Send Voice E-Mail Online", MULTIMEDIA WORLD, VOL. 2, NO. 9, August 1995, p. 52. Using such Voice E-Mail software, a user may create an audio message to be sent to a predetermined E-mail address specified by the user.

Generally, devices interfacing to the Internet and other online services may communicate with each other upon establishing respective device addresses. One type of device address is the Internet Protocol (IP) address, which acts as a pointer to the device associated with the IP address. A typical device may have a Serial Line Internet Protocol or Point-to-Point Protocol (SLIP/PPP) account with a permanent IP address for receiving E-mail, voicemail, and the like over the Internet. E-mail and voicemail is generally intended to convey text, audio, etc., with any routing information such as an IP address and routing headers generally

being considered an artifact of the communication, or even gibberish to the recipient.

Devices such as a host computer or server of a company may include multiple modems for connection of users to the Internet, with a temporary IP address allocated to each user. For example, the host computer may have a general IP address "XXX.XXX.XXX," and each user may be allocated a successive IP address of XXX.XXX.XXX.10, XXX.XXX.XXX.11, XXX.XXX.XXX.12, etc. Such temporary IP addresses may be reassigned or recycled to the users, for example, as each user is successively connected to an outside party. For example, a host computer of a company may support a maximum of 254 IP addresses which are pooled and shared between devices connected to the host computer.

Permanent IP addresses of users and devices accessing the Internet readily support point-to-point communications of voice and video signals over the Internet. For example, realtime video teleconferencing has been implemented using dedicated IP addresses and mechanisms known as reflectors.

A technique for matching domain names to Internet Protocol addresses is described in the text entitled "Internetworking With TCP/IP", 2nd Edition, by Douglas E. Comer, November 1992, Prentice Hall, Englewood Cliffs, New Jersey, U.S.A. Comer describes a domain name system and cooperative systems of name servers for matching domain names to network addresses. Each name server is a server program that supplies mapping of domain names to IP addresses. The system described in Comer, however, is not designed for use with network nodes whose network names or name to address bindings change frequently.

International Publication WO 92/19054 discloses a network

monitoring system including an address tracking module which uses passive monitoring of all packet communications over a local area network to maintain a name table of IP address mappings. The disclosed address tracking module is capable of monitoring only a small number of nodes on a local area network and is not suitable for use with a multitude of nodes over a wide area network.

None of the above-described systems are suitable for use with processes which have dynamically assigned network protocol addresses and which are communicating over wide area or global networks.

Due to the dynamic nature of temporary IP addresses of some devices accessing the Internet, point-to-point communications in realtime of voice and video have been generally difficult to attain.

In accordance with the present invention, there is provided an apparatus for establishing a point-to-point communication link said apparatus operating in a computer system operatively coupled to other computers and a server over a computer network, said apparatus comprising:

a. means for transmitting, from the first process to a server a query as to whether a second process is connected to the computer network;

b. means for receiving a network protocol address of the second process from the server when the second process is connected to the computer network; and

c. means, responsive to the network protocol address of the second process, for establishing a point-to-point communication link between the first process and the second process over the computer network.

The present invention also provides an apparatus for use with a computer system capable of executing a first process and communicating with other processes, a directory server process and a mail server process over a computer network, the apparatus comprising:

A. program logic configured to determine the currently assigned network protocol address of the first process upon connection to the computer network;

B. program logic configured to establish a communication connection with the directory server process once the assigned network protocol of the first process is known;

C. program logic configured to forward the assigned network protocol address of the first process to the directory server process upon establishing a communication connection with the directory server process; and

D. program logic configured to establish a point-to-point communication with another process over the computer network.

The present invention also provides an apparatus for use with a computer system, the computer system capable of executing a first process connectable over a computer network to a second process and a directory database server process, the apparatus comprising:

a. program logic configured to access a directory database, the database having a network protocol address for a selected plurality of processes having on-line status with respect to the computer network, the network protocol address of each respective process forwarded to the database following connection to the computer network; and

b. program logic responsive to one of the network protocol addresses and configured to establish a point-to-point communication link from the first process to the second process over the computer network.

The present invention also provides a computer program product for use with a computer system, the computer system executing a first process operatively connectable over a computer network to a second process and a server process, the computer program product comprising a computer useable medium having computer readable program code embodied therein, the program code comprising:

a. program code configured to access a directory database, the database having a network protocol address for a selected plurality of processes having on-line status with respect to the computer network, the network protocol address of each respective process forwarded to the database following connection to the computer network; and

b. program code responsive to one of the network protocol addresses and configured to establish a point-to-point communication link from the first process to the second process over the computer network.

The present invention also provides a method of establishing a point-to-point communication between a first process and a second process, said method for use in a first computer process operatively coupled over a computer network to a second process and an address server, said method comprising:

A. following connection of the first process to the computer network forwarding to the address server a network protocol address at which the first process is connected to the computer network;

B. querying the address server as to whether the second process is connected to the computer network;

C. receiving a network protocol address of the second process from the address server, when the second process is connected to the computer network; and

D. in response to the network protocol address of the second process, establishing a point-to-point communication link with the second process over the computer network.

9 The present invention also provides a method for establishing point-to-point communications with other processes, said method for use in a computer system capable of executing a first process and communicating with other processes and a server process over a computer network, said method comprising:

A. determining the currently assigned network protocol address of the first process upon connection to the computer network;

B. establishing a communication connection with the server process once the assigned network protocol of the first process is known;

C. forwarding the assigned network protocol address of the first process to the server process upon establishing a communication connection with the server process; and

D. establishing a point-to-point communication with another process over the computer network.

The present invention also provides A method of establishing a point-to-point communication between a first process and a second process, said method for use in a first computer process operatively coupled over a computer network to a second process and an address server, said method comprising:

a. accessing a directory database, the database having a network protocol address for a selected plurality of processes having on-line status with respect to the computer network, the network protocol address of each respective process forwarded to the database following connection to the computer network; and

b. in response to one of the network protocol addresses, establishing a point-to-point communication link from the first process to the second process over the computer network.

The present invention also provides a method of establishing a point-to-point communication between a first process and a second process, said method for use in a first computer process operatively coupled over a computer network to a second process and an address server, said method comprising:

a. transmitting to the server a network protocol address received by the first process following connection to the computer network;

b. transmitting, to the server, a query as to whether the second process is connected to the computer network;

c. receiving a network protocol address of the second process from the server, when the second process is connected to the computer network; and

d. in response to the network protocol address of the second process, establishing a point-to-point communication link between the first process and the second process over the computer network.

The present invention also provides an apparatus capable of executing a first process and connecting to other processes and a server process over a computer network, the apparatus comprising:

a. program logic configured to generate a user-interface enabling control of a first process executing on the computer system;

b. program logic configured to determine the currently assigned network protocol address of the first process upon connection to the computer network;

c. program logic, responsive to the currently assigned network protocol address of the first process, and configured to establish a communication connection with the server process and to forward the assigned network protocol address of the first process to the server process upon establishing a communication connection with the server process; and

d. program logic, responsive to user input commands, and configured to establish a point-to-point communications with another process over the computer network.

The present invention also provides an apparatus for use with a computer system, the computer system executing a first process operatively coupled over a computer network to a second process and a directory database server process, the apparatus comprising:

A. program logic configured to, following connection of the first process to the computer network, forward to the address server a network protocol address at which the first process is connected to the computer network;

B. program logic configured to query the address server as to whether the second process is connected to the computer network;

C. program logic configured to receive a network protocol address of the second process from the address server, when the second process is connected to the computer network; and

D. program logic configured to, in response to the network protocol address of the second process, establish a point-to-point communication link with the second process over the computer network.

The present invention also provides Apparatus for establishing a point-to-point communication link, said apparatus operating in a computer system capable of executing a first process and operatively connectable to other processes and a server over a computer network, said apparatus comprising:

a. means for transmitting, from the first process to the server, a query as to whether a second process is connected to the computer network;

b. means for receiving a network protocol address of the second process from the server when the second process is connected to the computer network; and

c. means, responsive to the network protocol address of the second process, for establishing a point-to-point communication link between the first process and the second process over the computer network.

The present invention also provides a computer data signal embodied in a carrier wave comprising:

program code for transmitting to a server a network protocol address received by a first process following connection to a computer network;

program code for transmitting, to the server, a query as to whether a second process is connected to the computer network;

program code for receiving a network protocol address of the second process from the server, when the second process is connected to the computer network; and

program code, responsive to the network protocol address of the second process, for establishing a point-to-point communication link between the first process and the second process over the computer network.

The present invention also provides a computer program product for use with a computer system, the computer system executing a first process and operatively connectable to a second process and a server over a computer network, the computer program product comprising a computer useable medium having program code embodied in the medium, the program code comprising:

program code for transmitting to the server a network protocol address received by the first process following connection to the computer network;

program code for transmitting, to the server, a query as to whether the second process is connected to the computer network;

program code for receiving a network protocol address of the second process from the server, when the second process is connected to the computer network; and

program code, responsive to the network protocol address of the second process, for establishing a point-to-point communication link between the first process and the second process over the computer network.

Preferred embodiments of the present invention are hereinafter described, by way of example only, with reference to the following drawings, wherein:

FIG 1 illustrates, in block diagram format, a system for the disclosed point-to-point Internet protocol:

FIG 2 illustrates, in block diagram format, the system using a secondary point-to-point Internet protocol;

FIG 3 illustrates, in block diagram format; the system of FIGS 1-2 with the point-to-point Internet protocol established;

FIG 4 is another block diagram of the system of FIGS 1-2 with audio communications being conducted;