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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR § 1.53(b))

Attorney Docket No.	*1719.0050002*
First Inventor or Application Identifier	*Jeffrey J. ROTHSCHILD*
Title	*Server-Group Messaging System for Interactive Applications*
Express Mail Label No.	

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents

ADDRESS TO: Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

1. ☐ * Fee Transmittal Form (*e.g.*, PTO/SB/17)
(Submit an original, and a duplicate for fee processing)

2. ☒ Specification [Total Pages 60]
(preferred arrangement set forth below)
- Descriptive title of the Invention
- Cross References to Related Applications
- Background of the Invention
- Brief Summary of the Invention
- Brief Description of the Drawings *(if filed)*
- Detailed Description
- Claim(s)
- Abstract of the Disclosure

3. ☒ Drawings (35 U.S.C. 113) [Total Sheets 11]

4. ☐ Oath or Declaration [Total Pages ____]
a. ☐ Newly executed (original or copy)
b. ☐ Copy from a prior application (37 CFR 1.63(d)) *(for continuation/divisional with Box 17 completed)* ***[Note Box 5 below]***
i. ☐ DELETION OF INVENTOR(S)
Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR §§ 1.63(d)(2) and 1.33(b).

5. ☐ Incorporation By Reference *(useable if Box 4b is checked)*
The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

6. ☐ Microfiche Computer Program *(Appendix)*

7. Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all necessary)*
a. ☐ Computer Readable Copy
b. ☐ Paper Copy (identical to computer copy)
c. ☐ Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

8. ☐ Assignment Papers (cover sheet & document(s))
9. ☐ 37 CFR 3.73(b) Statement ☐ Power of Attorney (when there is an assignee)
10. ☐ English Translation Document *(if applicable)*
11. ☐ Information Disclosure Statement (IDS)/PTO-1449 ☐ Copies of IDS Citations
12. ☐ Preliminary Amendment
13. ☒ Return Receipt Postcard (MPEP 503) *(Should be specifically itemized)*
14. ☐ *Small Entity Statement(s) *(PTO/SB/09-12)* ☐ Statement filed in prior application, Status still proper and desired
15. ☐ Certified Copy of Priority Document(s) *(if foreign priority is claimed)*
16. ☒ Other: 37 C.F.R. § 1.136(a)(3) Authorization
☐ Other:

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17. If a CONTINUING APPLICATION, *check appropriate box, and supply the requisite information below and in a preliminary amendment*
☒ Continuation ☐ Divisional ☐ Continuation-in-Part (CIP) of prior application No: **08/896,797**
Prior application information: *Examiner* ***Zarni Maung*** *Group/Art Unit:* ***2758***

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Box Patent Application

Re: U.S. Continuation Utility Patent Application under 37 C.F.R. § 1.53(b)
(Based on Appl. No. 08/896,797; Filed: July 18, 1997)
Appl. No. To be assigned; Filed: September 28, 1999
For: **Server-Group Messaging System for Interactive Applications**
Inventors: Jeffrey J. ROTHSCHILD, Daniel J. SAMUEL and Marc P. KWIATKOWSKI
Our Ref: 1719.0050002

Sir:

The following documents are forwarded herewith for appropriate action by the U.S. Patent and Trademark Office:

1. PTO Utility Patent Application Transmittal Form (PTO/SB/05);

2. U.S. Utility Patent Application entitled:

Server-Group Messaging System for Interactive Applications

and naming as inventors:

Jeffrey J. ROTHSCHILD, Daniel J. SAMUEL and Marc P. KWIATKOWSKI

the application consisting of:

a. A specification containing:

(i) 55 pages of description prior to the claims;
(ii) 4 pages of claims (16 claims);
(iii) a one (1) page abstract;

b. Eleven (11) sheets of drawings: (Figures 1-11);

3. USPTO Utility Patent Application Transmittal Form PTO/SB/05;

4. 37 C.F.R. § 1.136(a)(3) Authorization to Treat a Reply As Incorporating An Extension of Time (in duplicate); and

5. Two (2) return postcards.

It is respectfully requested that, of the two attached postcards, one be stamped with the filing date of these documents and returned to our courier, and the other, prepaid postcard, be stamped with the filing date and unofficial application number and returned as soon as possible.

This application claims priority to U.S. Application No. 08/896,797, filed July 18, 1997, now allowed, which is a continuation of U.S. Application No. 08/595,323, filed, February 1, 1996, now U.S. Patent No. 5,822,523.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036. A duplicate copy of this letter is enclosed.

This patent application is being submitted under 37 C.F.R. § 1.53(b) without Declaration and without filing fee.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

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PATENT
Attorney Docket No. 16326-701

SERVER-GROUP MESSAGING SYSTEM FOR INTERACTIVE APPLICATIONS

Inventors: Daniel Joseph Samuel
Marc Peter Kwiatkowski
Jeffrey Jackiel Rothschild

FIELD OF THE INVENTION

The present invention relates to computer network systems, and particularly to server group messaging systems and methods for reducing message rate and latency.

Background of the Invention

There are a wide range of interactive applications implemented on computer systems today. All are characterized by dynamic response to the user. The user provides input to the computer and the application responds quickly. One popular example of interactive applications on personal computers (PCs) are games. In this case, rapid response to the user may mean redrawing the screen with a new picture in between 30ms and 100ms. Interactive applications such as games control the speed of their interaction with the user through an internal time base. The application uses this time base to derive rates at which the user input is sampled, the screen is redrawn and sound is played.

As computers have become more powerful and common, it has become important to connect them together in networks. A network is comprised of nodes and links. The nodes are connected in such a way that there exists a path from each node over the links and through the other nodes to each of the other nodes in the network. Each node may be connected to the network with one or more links. Nodes are further categorized into hosts, gateways and routers. Hosts are computer systems that are connected to the network by one link. They communicate with the other nodes on the network by sending messages and receiving messages. Gateways are computer systems connected to the network by more than one link. They not only communicate with the other nodes as do hosts, but they also forward messages on one of their network links to other nodes on their other network links. This processing of forwarding messages is called routing. In addition to sending and receiving messages and their routing functions, gateways may perform other functions in a network. Routers are nodes that are connected to the network by more than one link and whose sole function is the forwarding of messages on one network link to the other network links to which it is connected. A network consisting of many network links can be thought of as a network of sub-networks with gateways and/or routers connecting the sub-networks together into what is called an internet. Today the widely known example of a world wide internet is the so called "Internet" which in 1995 has over 10 million computers connected full time world-wide.

With so many computers on a single world-wide network, it is desirable to create interactive networked applications that bring together many people in a shared, networked, interactive application. Unfortunately, creating such

shared, networked, interactive applications runs into the limitations of the existing network technology.

As an example, consider a game designed to be deployed over a network which is to be played by multiple players simultaneously. The game could be implemented in software on a PC connected to a network. A rate set by its internal time base, it would sample the inputs of the local user, receive messages from the network from the PCs of the other players and send messages out to the PCs of the other players. A typical rate will be ten time per second for a time period of 100ms. The messages sent between the PCs would contain information that was needed to keep the game consistent between all of the PCs. In a game that created the illusion of a spatial environment where each player could move, the packets could contain information about the new positions of the players as they moved. Today there are many commercial example of PC games that can be played between multiple players on Local Area Networks (LANs) or by two players over dial-up phone lines using modems. The network messages sent by such games contain a wide variety of information specific to the game. This can include position and velocity information of the objects in the game along with special actions taken by a player that effect the other players in the game.

The case of a two player game played over a modem is particularly simple. If the message rate is 10 messages per second, each PC sends 10 messages per second to the other PC and receives 10 messages per second. The delay introduced by the modems and phone line is small and will not be noticed in most games. Unfortunately, the case of two players is uninteresting for networked interactive applications. With the same game played with 8 players on a LAN, the message rate increases. Each PC must send 7 messages, one to

each of the other 7 players every time period and will receive 7 messages from the other players in the same time period. If the messaging time period is 100ms, the total message rate will be 70 messages sent per second and 70 messages received per second. As can be seen the message rate increases linearly with the number of players in the game. The message rates and data rates supported by popular LANs are high enough to support a large number of players at reasonable message sizes. Unfortunately, LANs are only deployed in commercial applications and cannot be considered for deploying a networked interactive application to consumer users.

The wide area networks available today to consumer users all must be accessed through dial-up phone lines using modems. While modem speeds have increased rapidly, they have now reached a bit rate of 28.8 Kbits/sec which is close to the limit set by the signal-to-noise ratio of conventional phone lines. Further speed increases are possible with ISDN, but this technology is not ready for mass market use. Other new wide area networking technologies are being discussed that would provide much higher bandwidth, but none are close to commercial operation. Therefore, in deploying a networked, interactive application to consumers, it is necessary to do so in a way that operates with existing networking and communications infrastructures.

In the example of the 8 player networked game, consider a wide area network implementation where the PCs of each of the players is connected to the network with a 28.8 Kbit/sec modem. Assume that the network used in this example is the Internet so that all of the network protocols and routing behavior is well defined and understood. If the game uses TCP/IP to send its messages between the PCs in the game, the PPP protocol over the dial-up phone lines can be advantageously used to compress the TCP/IP headers.

Even so, a typical message will be approximately 25 bytes in size. Sent through the modem, this is 250 bits. The messages are sent 10 times per second to each of the other PCs in the game and received 10 times per second from the other PCs. This is 35.0 Kbits/sec which exceeds the capabilities of the modem by 20%. If the messages are reduced to 20 bytes, just 8 players can be supported, but this approach clearly cannot support networked interactive applications with large numbers of participants. There are other problems beyond just the bandwidth of the network connection. There is the loading on each PC caused by the high packet rates and there is the latency introduced by the time needed to send all of the outbound packets. Each packet sent or received by a PC will require some amount of processing time. As the packet rate increases with the number of players in the game, less and less of the processor will be available for running the game software itself. Latency is important in an interactive application because it defines the responsiveness of the system. When a player provides a new input on their system, it is desirable for that input to immediately affect the game on all of the other players systems. This is particularly important in any game where the game outcome depends on players shooting at targets that are moved by the actions of the other players. Latency in this case will be the time from when a player acts to move a target to the time that the target has moved on the screens of the other players in the game. A major portion of this latency will come from the time needed to send the messages to the other seven players in the game. In this example the time to send the messages to the other 7 players will be approximately 50 ms. While the first player of the seven will receive the message quickly, it will not be until 50 ms have passed that the last player of the seven will have received the message.

Internet Protocol Multicasting

As mentioned before, the Internet is a widely known example of a wide area network. The Internet is based on a protocol appropriately called the Internet Protocol (IP). In the OSI reference model for layers of network protocols, IP corresponds to a layer 3 or Network layer protocol. It provides services for transmission and routing of packets between two nodes in an internet. The addressing model provides a 32 bit address for all nodes in the network and all packets carry source and destination addresses. IP also defines the routing of packets between network links in an inter-network. Gateways and routers maintain tables that are used to lookup routing information based on the destination addresses of the packets they receive. The routing information tells the gateway/router whether the destination of the packet is directly reachable on a local network link connected to the gateway/router or if not, the address of another gateway/router on one of the local network links to which the packet should be forwarded. On top of IP are the layer 4 transport protocols TCP and UDP. UDP provides datagram delivery services to applications that does not guarantee reliable or in-order delivery of the datagrams. TCP is a connection oriented service to applications that does provide reliable delivery of a data stream. It handles division of the stream into packets and ensures reliable, in-order delivery. See the Internet Society RFCs: RFC-791 "Internet Protocol", RFC-793 "Transmission Control Protocol" and RFC-1180 "A TCP/IP Tutorial". IP, TCP and UDP are unicast protocols: packets, streams or datagrams are transmitted from a source to a single destination.

As an example, consider Figures 1 and 2. Figure 1 shows a conventional unicast network with hosts 1, 2, 3 and 4 and network links 11, 12, 13, 14,

15,16,17, 18 and 19 and routers 5, 6, 7, 8, 9 and 10. In this example, each host wants to send a data payload to each of the other hosts. Host 1 has network address A, host 2 has network address C, host 3 has network address B and host 4 has network address D. Existing network protocols are typically based on packet formats that contain a source address, destination address and a payload. This is representative of commonly used wide area network protocols such as IP. There are other components in an actual IP packet, but for sake of this example, only these items will be considered. Figure 2 shows the example packets that are sent by the hosts to one another using a conventional unicast network protocol such as IP. Host 1 send packets 20, to host 3, packet 21 to host 2 and packet 22 to host 4. Host 1 wants to send the same data P1 to each of the other three hosts, therefore the payload in all three packets is the same. Packet 20 travels over network links 11, 12, 15 and 18 and through routers 5, 6, and 8 to reach host 3. In a similar fashion host 3 sends packets 23 to host 1, packet 24 to host 2 and packet 25 to host 4. Host 2 and host 4 send packets 26, 27, 28 and 29, 30, 31 respectively to the other three hosts. All of these packets are carried by the unicast network individually from the source host to the destination host. So in this example each host must send three packets and receive three packets in order for each host to send its payload to the other three hosts.

As can be seen, each host must send a packet to every other host that it wishes to communicate with in an interactive application. Further, it receives a packet from every other host that wishes to communicate with it. In an interactive application, this will happen at a regular and high rate. All of the hosts that wish to communicate with one another will need to send packets to each other eight to ten times per second. With four hosts communicating with

one another as in this example, each host will send three messages and receive three messages eight to ten times per second. As the number of hosts in the application that need to communicate with one another grows, the message rate will reach a rate that cannot be supported by conventional dial-up lines. This makes unicast transport protocols unsuitable for delivering interactive applications for multiple participants since their use will result in the problem of high packet rates that grow with the number of participants.

Work has been done to attempt to extend the IP protocol to support multicasting. See RFC-1112 "Host Extensions for IP Multicasting.". This document describes a set of extensions to the IP protocol that enable IP multicasting. IP multicasting supports the transmission of a IP datagram to a host group by addressing the datagram to a single destination address. Multicast addresses are a subset of the IP address space and identified by class D IP addresses - these are IP addresses with "1110" in the high order 4 bits. The host group contains zero or more IP hosts and the IP multicasting protocol transmits a multicast datagram to all members of the group to which it is addressed. Hosts may join and leave groups dynamically and the routing of multicast datagrams is supported by multicast routers and gateways. It is proper to describe this general approach to multicast messaging as "distributed multicast messaging". It is a distributed technique because the job of message delivery and duplication is distributed throughout the network to all of the multicast routers. For distributed multicast messaging to work in a wide area network, all of the routers handling datagrams for multicast hosts must support the routing of multicast datagrams. Such multicast routers must be aware of the multicast group membership of all of the hosts locally connected to the

router in order to deliver multicast datagrams to local hosts. Multicast routers must also be able to forward multicast packets to routers on their local network links. Multicast routers must also decide to which if any local routers they must forward multicast datagrams. When a multicast datagram is received, by a multicast router, its group address is compared to a list for each local multicast router of group addresses. When there is a match, the datagram is then forwarded to that local multicast router. Therefore, the multicast routers in the network must maintain an accurate and up to date list of group addresses for which they are to forward datagrams to. These lists are updated when hosts join or leave multicast groups. Hosts do this by sending messages using Internet Group Management Protocol (IGMP) to their immediately-neighboring multicast routers. A further attribute of distributed multicast messaging is that the routers must propagate the group membership information for a particular group throughout the network to all of the other routers that will be forwarding traffic for that group. RFC-1112 does not describe how this is to be done. Many different approaches have been defined for solving this problem that will be mentioned later in descriptions of related prior art. Despite their differences, all of these approaches are methods for propagation of multicast routing information between the multicast routers and techniques for routing the multicast datagrams in an inter-network supporting distributed multicast messaging.

The distributed multicast messaging approach has a number of undesirable side effects. The process of propagation of group membership information to all of the relevant routers is not instantaneous. In a large complex network it can even take quite a period of time depending on the number of routers that must receive that updated group membership information and how many

routers the information for the group membership update must past through. This process can easily take many seconds and even minutes depending on the specifics of the algorithm that is used. RFC-1112 mentions this problem and some of the side effects that must be handled by an implementation of a practical routing algorithm for multicast messaging. One problem results when groups are dynamically created and destroyed. Since there is no central authority in the network for assigning group addresses, it is easily possible in a distributed network for there to be duplication of group address assignment. This will result in incorrect datagram delivery, where hosts will receive unwanted datagrams from the duplicate group. This requires a method at each host to filter out the unwanted datagrams. Another set of problems result from the time delay from when a group is created, destroyed or its membership changed to when all of the routers needed to route the datagrams to the member hosts have been informed of these changes. Imagine the case where Host N joins an existing group by sending a join message to its local router. The group already contains Host M which is a number of router hops away from Host N in the network. Shortly after Host N has sent it join message, Host M sends a datagram to the group, but the local router of Host M has not yet been informed of the change in group membership and as a result the datagram is not forwarded to one of the particular network links connected to the local router of Host M that is the only path in the network from that router that ultimately will reach Host N. The result is that Host N will receive no datagrams addressed to the group from Host M until the local router of M has its group membership information updated. Other related problems can also occur. When a host leaves a group, messages addressed to the group will continue for some time to be routed to that host up to the local router of that

host. The local router will know at least not to route the datagram onto the local network of that host. This can still result in a great deal of unnecessary datagrams being carried in a large network when there are many active message groups with rapidly changing memberships.

Finally, distributed multicast messaging does not sufficiently reduce the message rate between the hosts. With distributed multicast messaging, each host need only send one message addressed to the message group in order to send a message to all of other hosts in the group. This is an improvement over conventional unicast messaging where one message would need to be sent to each of the other hosts in a group. However, distributed multicast messaging does nothing to reduce the received message rate at each of the hosts when multiple hosts in a group are sending messages to the group closely spaced in time. Let us return to the example of a group of ten hosts sending messages seven times per-second to the group. With conventional unicast messaging, each host will need to send 9 messages to the other hosts, seven times per-second and will receive 9 messages, seven times per-second. With distributed multicast messaging, each host will need to send only one message to the group containing all of the hosts seven times per-second, but will still receive 9 messages, seven times per-second. It is desirable to further reduce the number of received messages.

An example of distributed multicasting is shown in Figures 3 and 4. Figure 3 shows a network with multicast routers 39, 40, 41, 42, 43 and 44 and hosts 35, 36, 37, 38 and network links 45, 46, 47, 48, 49, 50, 51, 52 and 53. The four hosts have unicast network addresses **A, B, C, D** and are also all members of a message group with address **E.** In advance the message group was created and each of the hosts joined the message group so that each of the multicast

routers is aware of the message group and has the proper routing information. A network protocol such IP with multicast extensions is assumed to be used in this example. Host 35 sends packet 54 with source address **A** and destination multicast address **E** to the entire message group. In the same manner host 37 sends packet 55 to the group, host 36 sends packet 56 to the group and host 38 sends packet 57 to the group. As the packets are handled by the multicast routers they are replicated as necessary in order to deliver them to all the members of the group. Let us consider how a packets sent by host 35 is ultimately delivered to the other hosts. Packet 54 is carried over network link 45 to multicast router 39. The router determines from its routing tables that the multicast packet should be sent onto network links 46 and 47 and duplicates the packet and sends to both of these network links. The packet is received by multicast routers 40 and 43. Multicast router 43 sends the packet onto network link 50 and router 40 sends its onto links 48 and 49. The packet is then received at multicast routers 44, 42 and 41. Router 41 sends the packet over network link 51 where it is received by host 36. Router 42 sends the packet over network link 52 to host 37 and router 44 sends the packet over link 53 to host 38. A similar process is followed for each of the other packets sent by the hosts to the multicast group **E**. The final packets received by each host are shown in Figure 4.

While distributed multicasting does reduce the number of messages that need to be sent by the hosts in a networked interactive application, it has no effect on the number of messages that they receive. It has the further disadvantages of poor behavior when group membership is rapidly changing and requires a special network infrastructure of multicast routers. It also has no support for message aggregation and cannot do so since message delivery is

distributed. Distributed multicasting also has no support for messages that define logical operations between message groups and unicast host addresses.

All of these problems can be understood when placed in context of the design goals for distributed multicast messaging. Distributed multicast messaging was not designed for interactive applications where groups are rapidly created, changed and destroyed. Instead it was optimized for applications where the groups are created, changed and destroyed over relatively long time spans perhaps measured in many minutes or even hours. An example would be a video conference where all the participants agreed to connect the conference at a particular time for a conference that might last for an hour. Another would be the transmission of an audio or video program from one host to many receiving hosts, perhaps measured in the thousands or even millions. The multicast group would exist for the duration of the audio/video program. Host members would join and leave dynamically, but in this application it would be acceptable for there to be a significant time lag from joining or leaving before the connection was established or broken.

While IP and multicast extensions to IP are based on the routing of packets, another form of wide area networking technology called Asynchronous Transfer Mode (ATM) is based on switching fixed sized cells through switches. Unlike IP which supports both datagram and connection oriented services, ATM is fundamentally connection oriented. An ATM network consists of ATM switches interconnected by point-to-point links. The host systems are connected to the leaves of the network. Before any communication can occur between the hosts through the network, a virtual circuit must be setup across the network. Two forms of communication can be supported by an ATM network. Bi-directional point-to-point between two hosts and point-to-

multipoint in one direction from one host to multiple hosts. ATM, however, does not directly support any form of multicasting. There are a number of proposals for layering multicasting on top of ATM. One approach is called a multicast server, shown in Figure 8. Host systems 112, 113, 114, 115 setup point-to-point connections 106, 107,108 and 109 to a multicast server 105. ATM cells are sent by the hosts to the multicast server via these links. The multicast server sets up a point-to-multipoint connection 111 to the hosts which collectively constitute a message group. Cells sent to the server which are addressed to the group are forwarded to the point-to-multipoint link 111. The ATM network 110 is responsible for the transport and switching for maintaining all of the connections between the hosts and the server. The cells carried by the point-to-multipoint connection are duplicated when necessary by the ATM switches at the branching points in the network tree between and forwarded down the branching network links. Therefore, the network is responsible for the replication of the cells and their payloads, not the server. This method has the same problems as distributed multicasting when used for an interactive application. Each host still receives individual cells from each of the other hosts, so there is no aggregation of the payloads of the cells targeted at a single host. There is no support for addressing cells to hosts based on logical operations on the sets of members of host groups.

Related Prior Art

There are a number of existing patents and European patent applications that are related to the area of the invention. These can be organized into two separate categories: multicast routing/distribution and source to destination multicast streams.

Multicast routing and distribution

These patents are US 4,740,954 by Cotton et al, US 4,864,559 by Perlman, US 5,361,256 by Doeringer et al, US 5,079,767 by Perlman and US 5,309,433 by Cidon et al. Collectively these patents cover various algorithms for the routing and distribution of the datagrams in distributed multicast networks. None deal with the problems described previously for this class of multicast routing and message distribution such as poor behaviors when the message groups change rapidly. In all of these patents, messages are transmitted from a host via a distributed network of routers to a plurality of destination hosts which are members of a group. Since these patents deal only with variants of distributed multicasting they provide no means to reduce the received message rate, no method to aggregate messages and provide no method in the messages to perform logical operation on message groups.

Source to destination multicast streams

These are PCTs and a European patent application. They are EP 0 637 149 A2 by Perlman et al, PCT/US94/11282 by Danneels et al and PCT/US94/11278 by Sivakumar et al. These three patent applications deal with the transmission of data streams from a source to a group of destinations. In none of these patent applications, is a method described for transmitting data between multiple members of a group. In all of these applications, the data transmission is from a source to a plurality of designations. Since these patent applications deal only with point-to-multipoint messaging, they can provide no means to reduce the received message rate, no method to aggregate messages and provide no method in the messages to perform logical operation on message groups.

SUMMARY OF THE INVENTION

The present invention relates to facilitating efficient communications between multiple host computers over a conventional wide area communications network to implement an interactive application such as a computer game between multiple players. In such an application, the hosts will be dynamically sending to each other information that the other hosts need in order to keep the interactive application operating consistently on each of the hosts. The invention is comprised of a group messaging server connected to the network that maintains a set of message groups used by the hosts to communicate information between themselves. The invention further comprises a server-group messaging protocol used by the hosts and the server. The server-group messaging protocol is layered on top of the Transport Level Protocol (TLP) of the network and is called the Upper Level Protocol (or ULP). In the OSI reference model the ULP can be thought of as a session layer protocol built on top of a transport or applications layer protocol. The ULP protocol uses a server-group address space that is separate from the address space of the TLP. Hosts send messages to addresses in the ULP address space to a group messaging server using the underlying unicast transport protocol of the network. The ULP address space is segmented into unicast addresses, implicit group messaging addresses and logical group messaging addresses. The implicit and logical group messaging addresses are collectively called group messaging addresses.

Host systems must first establish connections to a group messaging server before sending messages to any ULP addresses. The process of establishing this connection is done by sending TLP messages to the server. The server establishes the connection by assigning a unicast ULP address to the host and

returning this address in an acknowledgment message to the host. Once connected, hosts can inquire about existing message groups, join existing message groups, create new message groups, leave message groups they have joined and send messages to ULP addresses known by the server. Each message group is assigned either an implicit or logical ULP address depending on its type.

Figure 5 shows an example of a wide area network with a group messaging server ("GMS"). Hosts 58 has TLP address **A** and ULP address **H**, host 59 has TLP address **C** and ULP address **J**, host 60 has TLP address **B** and ULP address **I** and host 61 has TLP address **D** and ULP address **K**. The network is a conventional unicast network of network links 69, 70, 71, 72, 73, 74, 75, 76, and 77 and unicast routers 63, 64, 65, 66, 67, and 68. The group messaging server 62 receives messages from the hosts addressed to a message group and send the contents of the messages to the members of the message group. Figure 6 shows an example of datagrams sent from the hosts to a message group that they are members of. As before, a TLP such as IP (where the message header contain the source and destination TLP addresses) is assumed to be used here. Host 58 sends message 80 which contains the TLP source address **A** of the host and the destination TLP address **S** for the GMS 62. The destination ULP address **G** is an implicit ULP address handled by the GMS and the payload P1 contains both the data to be sent and the source ULP address **H** of the host. It is assumed that prior to sending their ULP messages to the GMS, that each host as already established a connection to the GMS and joined the message group **G**. Host 60 sends message 81 with payload P2 containing data and source ULP address **I**. Hosts 59 sends message 82 with payload P3 containing data and source ULP address **J**. Host 61 sends message

83 with payload P4 containing data and source ULP address **K**. The GMS receives all of these messages and sees that each message is addressed to implicit message group **G** with members **H**, **I**, **J**, and **K**. The GMS can either process the message with or without aggregating their payloads. Figure 6 shows the case where there is no aggregation and Figure 7 shows the case with aggregation.

Without aggregation, the GMS generates the outbound messages 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, and 95 which it sends to the hosts. The datagrams have TLP headers with the source and destination TLP addresses of the GMS and the hosts respectively. The next field in the datagrams is the destination ULP of the datagram. Datagrams 84, 85, and sent to host 58 with TLP address **A** and ULP address **H**. Datagrams 87, 88, and 89 are sent to host 60 with TLP address **B** and ULP address **I**. Datagrams 90, 91 and 92 are sent to host 59 with TLP address **C** and ULP address **J**. Datagrams 93, 94 and 95 are sent to host 61 with TLP address **D** and ULP address **K** respectively. As can be seen from the payloads that each host has received, each host has received the payloads from the other three hosts. Note that each host has not received a copy of its own original message. This is because the GMS has performed echo suppression. This is selectable attribute of the GMS since in some applications it is useful for the hosts to receive and echo of each message that they send to a group that they are also members of. In the example of Figure 6, it has been shown how the present invention can achieve the same message delivery as distributed multicasting without its disadvantages. Without aggregation, the present invention enables a host to send a single message to multiple other hosts that are members of a message group. It reduces the message traffic that a host must process in an interactive

application by reducing the number of messages that each host must send to the others. Without aggregation, however, there is no reduction in the number of messages received by the hosts. Without aggregation we can achieve the same message rate as distributed multicasting without the need for a network with multicast routers, we can use a conventional unicast network such as the Internet. The present invention also avoids the problems that dynamic group membership causes for distributed multicasting. Group membership can be changed very rapidly. Groups can be created, joined and left by single unicast messages from hosts to the GMS. These messages will be point-to-point messages and will not have to propagate in throughout the network nor have to cause routing table changes in the routers. This ability to rapidly and accurately change group membership is critical to the implementation of networked interactive applications. Consider a computer game for multiple players that supports hundreds of players that are spread throughout a three dimensional space created by the game. At any time only a few players will be able to see and effect one another in the game since other players will be in other areas that are out of sight. Using conventional phone lines to carry the data from each players computer to the network, it will not be possible to send all actions of each player to all of the other players, but because only a few players will be in close proximity at any one time, it will not be necessary to do so. It is only necessary to send data between the players that are in close proximity to one another. These "groups" of players naturally map onto the message groups of the invention. As players move about the three dimensional space of the game, game will cause them to join and leave message groups as necessary. If this does not happen rapidly it will limit the interactivity of the game or cause inconsistent results for the different players in the game.

The invention also allows aggregating message payloads of multiple messages destined to a single host into a single larger message. This can be done because of the GMS where all of the messages are received prior to being sent to the hosts. Figure 7 shows an example of how this works. The hosts send their messages to the GMS in exactly the same fashion as in Figure 6 using the same addresses previously defined in Figure 5. Host 58 sends message 96, host 60 sends message 97, host 59 sends message 98 and host 61 sends message 99. The GMS receives all of these messages and creates four outbound messages 100, 101, 102 and 103. The process by which these messages will be explained in detail in the detailed description of the invention. Each message is destined to a single host and contains an aggregated payload with multiple payload items. Message 100 has a destination ULP address **H** for host 58 and aggregated payload P2, P3 and P4 from the messages from hosts 59, 60 and 61. Message 101 is targeted at host 60, message 102 is targeted at host 59 and message 103 is targeted at host 61. As can be seen, each host sends one message and receives one message. The received message is longer and contains multiple payloads, but this is a significant improvement over receiving multiple messages with the wasted overhead of multiple message headers and message processing time. Overall the invention has dramatically reduced the amount of data that must be sent and received by each host. Since the bit rate over conventional phone lines using a modem is low, a reduction in the amount of data that must be sent and received directly translates into improved time and latency for message communications between the hosts.

Hosts create, join and leave message groups using control messages in the ULP protocol to the GMS. Hosts may also read and write application specific state information that is stored in the GMS. When hosts send messages to

other hosts, the message must be at least addressed to an implicit group address. The ULP implicit address will always be the primary address in a message from one host to another. The message may optionally specify auxiliary destination addresses. In many cases the implicit ULP address will be the only destination ULP address in the message. The GMS will handle delivery of the ULP messages addressed to the implicit message group to all of the hosts that are members of the group. A ULP send message may optionally specify an address list of auxiliary addresses in addition to the primary destination of the implicit ULP address. This auxiliary address list can contain only unicast and logical ULP addresses. The address list can also specify set operators to be performed between the sets of host ULP addresses defined by the unicast addresses and logical groups. Once the address list has been processed to yield a set of hosts, this set is intersected with the set of hosts that are members of the implicit message group specified by the primary implicit ULP address in the message. This ability to perform logical set operators on message groups is very useful in interactive applications. It allows a single ULP message to selectively deliver a message to hosts that fit a set of computed criteria without the sending host having to know the anything about the members of the groups in the address list. Recall the example of a networked game with hundreds of players in a three dimensional environment created by the game. Consider an implicit message group consisting of all of the game players in a certain area of the game where all of the players can interact with one another. Consider that the players are organized into multiple teams. Logical message groups could be created for each team within the game. To send a message to all the players within the area that were on one team, a ULP message would be sent to the ULP implicit message group for all

the players in the area with an auxiliary address of the logical message group for all the players on the selected team. The GMS would perform the proper set intersection prior to sending the resulting messages to the targeted hosts. The result of this will be that the message will only be delivered to the players on the selected team in the selected area of the game.

In summary, the present invention deals with the issues of deploying an interactive application for multiple participants on wide area networks by providing a method for reducing the overall message rate and reducing latency. This invention uses a server group messaging approach, as oppose to the above described "distributed multicast messaging" approach. The present invention overcomes the undesirable side effects of the distributed multicast messaging approach. Further, it reduces the message rate between the hosts. As pointed out in an example discussed above, with prior art distributed multicast messaging, each host will need to send only one message to the group containing all of the hosts seven times per-second, but will still receive 9 messages, seven times per-second. The present invention of server group messaging has each host sending one message, seven times per-second and receiving one message, seven times per-second.

The present invention is different from the multicast routing and distribution method disclosed in U.S. Patent Nos. 4,740,954, 4,864,559, 5,361,256, 5,079,767 and 5,309,433. Since these patents deal only with variants of distributed multicasting they provide no means to reduce the received message rate, no method to aggregate messages and provide no method in the messages to perform logical operation on message groups. This differs from the present invention where messages from multiple hosts

addressed to a message group are received by a group server which processes the contents of the messages and transmits the results to the destination hosts.

The present invention is also different from the source to destination multicast streams approach disclosed in EP 0 637 149 A2, PCT/US94/11282 and PCT/US94/11278. In all of these references, the data transmission is from a source to a plurality of designations, whereas the present invention describes data transmission from a sending host to a server host system and then from the server host to the destination hosts.

These and other features and advantages of the present invention can be understood from the following detailed description of the invention together with the accompanying drawings.

DESCRIPTION OF DRAWINGS

Figure 1 shows a conventional unicast network consisting of hosts, network links and routers.

Figure 2 shows the unicast datagrams on a conventional unicast network that would be needed to implement an interactive application between four hosts.

Figure 3 shows a prior art multicast network consisting of hosts, network links and multicast routers.

Figure 4 shows a multicast datagrams on a prior art multicast network that would be needed to implement an interactive application between four hosts.

Figure 5 shows a unicast network equipped with a group messaging server in accordance with the present invention.

Figure 6 shows the ULP datagrams without payload aggregation on a network according to the present invention that would be needed to implement an interactive application between four hosts.

Figure 7 shows the ULP datagrams with payload aggregation on a network according to the present invention that would be needed to implement an interactive application between four hosts.

Figure 8 shows a prior art ATM network with a multicast server.

Figure 9 shows the detailed datagram format and address format for ULP messages in accordance with the present invention.

Figure 10 shows the internal functions of the GMS according to the present invention.

Figure 11 shows the host software interface and functions needed to support the ULP according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The present invention provides a method for multiple host computers to efficiently communicate information to one another over a wide area network for the purposes of implementing an interactive application between multiple users. The method consists of three components: a host protocol interface, a protocol and a server. The protocol is between the host protocol interface and the server and is implemented on top of the network transport protocol of a wide area network. The protocol is called the Upper Level Protocol (ULP) since it is layered above the existing network Transport Level Protocol (TLP). In the OSI reference model the protocol can be described as a Session Layer protocol on top of the Transport Layer of the network. Figure 11 shows the host protocol interface, 151, relative to the interactive application, 150, and the host interface for the Transport Level Protocol , 153. The network interface, 155, provides the physical connection for the host to the network. The network communications stack, 154, is the communications protocol stack that provides network transport services for the host and the host interface for the

Transport Level Protocol, 153, is and interface between host application software and the network transport services of the network communications stack.

The interactive application can send and receive conventional network messages using the host interface to the TLP. The interactive application also can send and receive ULP messages through the host interface for the ULP. Internal to the host interface for the ULP is a table, 152, of all ULP addresses which the host can send messages to. Each entry in the table contains a pair of addresses, a ULP address and its corresponding TLP address. When the host sends a message to a ULP address, that message is encapsulated in a TLP message sent to the TLP address corresponding to that ULP address. This allows the ULP messages to be handled transparently by the transport mechanisms of the existing network. A core function of the ULP is group messaging where hosts send messages to message groups populated by multiple hosts. This allows a host to send a message to multiple hosts with one ULP message. Since the ULP is layered on top of the TLP, the group messaging functions of the ULP operate on a conventional unicast network where TLP messages can only be sent from one host to only one other host.

The group based messaging is implemented through the use of a server called a group messaging server. All ULP messages from the hosts are sent from the hosts to a group messaging server using the TLP protocol. The server processes the ULP portion of the messages and takes the necessary required by the ULP message. Control ULP messages are processed locally by the server and may be acknowledged to the sending host. ULP messages addressed to other hosts are processed by the group messaging server and then

re-transmitted to the proper ULP destination hosts, again using the TLP protocol to encapsulate and transport these messages.

In Figure 5, hosts 58, 59, 60 and 61 send messages to one another using the ULP over a conventional unicast network using a group messaging server 62. The network consists of conventional routers 63, 64, 65, 66, 67 and 68 connected with conventional network links 69, 70, 71, 72, 73, 74, 75, 76 and 77. Host 58 can send a message to hosts 59, 60 and 61 by sending a single ULP message to the group messaging server 62 where the ULP message specifies a destination address that is a ULP message group. The ULP message is encapsulated in a TLP message addressed to the group messaging server. This causes the message to be properly routed by router 63 to network link 71 to router 67 to the server 62. The group messaging server receives the ULP message and determines that the message is addressed to a message group containing hosts 59, 60 and 61 as members. The server sends the payload of the received message to each of the hosts in three new ULP messages individually sent to the three hosts. Since each message is encapsulated in a TLP message, the messages are properly carried over the conventional unicast network. The first ULP message is sent by the group messaging server to host 61. This message is carried by network links 71, 70, 72 and 75 and routers 67, 63, 64 and 65. The second ULP message is sent by the group messaging server to host 60. This message is carried by network links 71, 70, 73 and 76 and routers 67, 63, 64 and 66. The third ULP message is sent by the group messaging server to host 61. This message is carried by network links 74 and 77 and routers 67 and 68.

The invention can be implemented both in a datagram form and in a connection oriented form. To best understand the details of the invention, it is best to first consider a datagram implementation.

Datagram Transport Implementation

The ULP can be implemented as a datagram protocol by encapsulating addresses, message type information and the message payload within a datagram of the underlying network transport protocol. The general form of the ULP datagram message format is shown in Figure 9 as elements 123, 124, 125, 126, 127, 128 and 129. The transport header 123 is the datagram header of the TLP that is encapsulating the ULP datagram. The ULP message type field 124 indicates whether it is a send or receive message, if it is a control message or a state message. The following table shows the different message types. The ULP message type field must be present in a ULP datagram.

Message Types	
1	Send
2	Receive
3	Send Control
4	Receive Control
5	Send State
6	Receive State

Send messages are always sent from a host to a group messaging server. Messages from a group server to the hosts are always receive messages. Send Control messages are messages from hosts to a group messaging server requesting a control function be performed. Receive Control messages are acknowledgments from a group messaging server to the hosts in response to a

prior Send Control messages. The Send and Receive State messages are special cases of the Send and Receive Control messages that allow hosts to read and write application specific state storage in the group messaging server. The specific control functions supported by the ULP will be explained later.

The destination ULP address 125 is required in ULP datagrams and specifies the primary destination of the ULP message. The address count field 126 is required in ULP send message types and is not present in ULP receive message types. When the address count field in a ULP send message is non-zero, it specifies the number of auxiliary destination addresses for the send message that follow the address count field. These auxiliary destination addresses are shown as items 127 and 128, but it is understood that there are as many auxiliary ULP destination addresses as specified by the address count field. Finally there is the payload 129.

The payload format for ULP datagrams is defined by items 116, 117, 118, 119, 120, 121 and 122. Item 116 is the message count and defines how many payload elements will be contained in the payload. A single payload element consists of a triplet of source ULP address, data length and data. Items 117, 118 and 119 comprise the first payload element of the payload. Item 117 is the ULP address of the source of the payload element, item 118 is the data length for the data in the payload element and item 119 is the actual data. Items 120, 121 and 122 comprise the last payload element in the payload. ULP send messages only support payloads with a single payload element, so the message count is required to be equal to one. ULP receive messages may have payloads with one or more payload elements.

ULP Address Space

The address space of the ULP is divided into three segments: unicast host addresses, implicit group addresses and logical group addresses. All source and destination addresses in ULP must be in this address space. The ULP address space is unique to a single group messaging server. Therefore each group messaging server has a unique ULP address space. Multiple group messaging servers may be connected to the network and hosts may communicate with multiple group messaging servers without confusion since each ULP datagram contains the header of the TLP. Different group messaging servers will have unique TLP addresses which can be used by the hosts to uniquely identify multiple ULP address spaces. The format for ULP addresses is shown in Figure 9 comprised of items 130, 131 and 132. The address format field 130 is a variable length field used to allow multiple address lengths to be supported. The address type field 131 indicates the type of ULP address: unicast host, implicit group or logical group. The encoding is as follows:

Address Type Encoding	
0 0	Unicast Host Address
0 1	Unicast Host Address
1 0	Implicit Group Address
1 1	Logical Group Address

The address format encoding determines the length of the address field and therefore the total length of the ULP address. This encoding is shown below. Note that when the address type specifies a unicast host address, the low bit of the address type field is concatenated to the address field to become the most significant bit of the address. This doubles the size of the address space for

unicast host addresses which is useful since there will generally be more hosts than group messaging servers.

Address Format Encoding	
0	29 Bit Address Field
1 0	4 Bit Address Field
1 1 0	11 Bit Address Field

ULP unicast host addresses are assigned to each host when it first connects to a group messaging server. When a host sends a message to other ULP address, the unicast ULP address of the host will appear as the source ULP address in the received payload element. Unicast ULP host addresses can also be used as destination addresses only as auxiliary addresses in a ULP send message. They are not allowed to be used to as the primary ULP destination address. This means that hosts cannot send ULP directly to one another, but always must send the messages to one another through a group messaging server.

Implicit group addresses are created by a group messaging server in response to a control message to the server requesting the creation of an implicit message group. The host requesting the creation of the implicit message group becomes a member of the message group when it is created. Other hosts can send inquiry control messages to the group messaging server to learn of its existence and then send a implicit group join message in order to join the group. The group messaging server maintains a list of ULP addresses of hosts that are members of the implicit message group. Implicit ULP group addresses are the only ULP addresses allowed to be the primary destination of a ULP send message. Implicit ULP addresses will never appear as ULP source addresses in a payload element.

Logical ULP addresses are used both to address logical message groups and for specifying set operations between the group members of the auxiliary ULP addresses in a ULP send message. Logical message groups are created and joined similarly to implicit message groups, however, logical ULP addresses may only be used as auxiliary ULP addresses in a ULP send message. Logical ULP addresses will also never appear as source ULP addresses in a payload element. The support of set operations between message groups as part of a ULP send message will be explained in a later section on ULP send messages.

Group Messaging Server Internal Functions

The internal components of the group messaging server are shown in Figure 10.

In the preferred embodiment, the group messaging server is a general purpose computer system with a network interface to connect it to a wide area network. Item 135 is the network interface for the group messaging server and includes not only the hardware connection to the network but the communications protocol stack used to implement the TLP on the server.

Item 136 is an overall control function for the group messaging server. This control function is responsible for all ULP messages that are sent or received by the GMS. Internal to this control function are several important storage and processing functions. Item 137 is an address map for all hosts currently connected to the GMS. This address map is a list of the ULP host address of each host connected to GMS and its corresponding TLP address. This enables the control function to construct the necessary TLP headers for sending ULP messages to the hosts connected to the GMS. Item 138 is a list of all of the currently active implicit ULP addresses currently recognized by the

GMS. Item 139 is an application specific state storage and processing function. Many interactive applications deployed over a network will be able to be implemented solely with host based processing. In these cases all data that needs to be sent between the hosts can be transported using the ULP. However, some applications will need maintain a centrally stored and maintained repository of application state information. This is useful when hosts may join or leave the application dynamically. When hosts join such an application, they will need a place from which they can obtain a snapshot of the current state of the application in order to be consistent with the other hosts that already where part of the application. To read and write this state storage area, the ULP supports send and receive state message types. Within these messages, there is the ability to access a state address space so that different portions of the state can be individually accessed. Application specific processing of state written into this state storage area can also be implemented.

Items 140 and 141 are two of multiple ULP server processes running on the GMS. These are software processes that are at the heart of the ULP. Each implicit ULP addresses recognized by the GMS has a one-to-one correspondence to a ULP server process and to a message group maintained by the process. Since all ULP send messages must have an implicit ULP address as the primary destination address of the message, every ULP send message is sent to and processed by a ULP server process. These processes are created by the GMS control function in response to ULP control messages to create new implicit ULP addresses. They are destroyed when the last host which is a member of its message group has left the message group. Internal to a ULP server process is a list, 142, of the ULP host addresses of the members of the message group, a set of message queues 143 for each host which is a member

of the message group and a message aggregation function 149 which is used to aggregate multiple messages to a single host into a single message.

Item 145 maintains a list of all of the logical ULP addresses and message groups in the GMS. Items 144 and 146 represent two of multiple logical ULP addresses. For each logical ULP address, there is a corresponding list, 147 and 148 of the host ULP addresses of the members of the logical message group. The logical message groups are not tied to specific ULP server processes, but are global with a GMS to all of the ULP server processes.

Control Functions

The control functions consist of connect, disconnect, create group, close group, join group, leave group, query groups, query group members, query group attributes. These control functions are implemented by a ULP send and receive control messages. The control functions are initiated by a host sending a ULP send control message to a GMS. These messages only allow a primary ULP destination address in the message and do no allow auxiliary addresses. The primary ULP address is interpreted as a control address space with a unique fixed address assigned to each of the control functions enumerated above. The contents of data in the payload supplies any arguments needed by the control function. Returned values from the control function are returned in a ULP receive control message that is addressed to the host that sent the original control message for which data is being returned. The detailed operation of these control functions is described below.

Connect

This control function allows a host to connect to a GMS. The destination ULP address in the message is a fixed address that indicates the connect function. The source ULP address and any data in the payload are ignored.

Upon receiving this message, the GMS control function, 136, creates a new host address and enters the host address in the host address map 136 along with the source TLP address from the TLP header of the message. Upon successful completion, the GMS control function responds with a receive control ULP message addressed to the host along with a function code in the data portion of the payload that indicates successful host connection. The destination ULP address in the message is the ULP address assigned to the host. The host saves this and uses it for any future messages to the GMS. If there is an error, the control function returns a message to the host with a function code in the data portion of the payload indicating failed host connection.

Disconnect

This function allows a host to disconnect from a GMS. The destination ULP address in the message is a fixed address that indicates the disconnect function. The source ULP address is used to remove the host from membership in any implicit or logical groups prior to disconnecting. Any data in the payload is ignored. The GMS control function also removes the entry for the host from the host address map. Upon successful completion, the GMS control function responds with a receive control ULP message addressed to the host along with a function code in the data portion of the payload that indicates successful host disconnection. The destination ULP address in the message is the ULP address assigned to the host. If there is an error, the control function returns a message to the host with a function code in the data portion of the payload indicating failed host disconnection.

Create implicit group

This function allows a host to create a new implicit message group and associated implicit ULP address and server process. The payload in the message may contain a single payload item whose data field holds attributes of the group. These attributes can be used to define any optional functions of the group. The destination ULP address in the message is a fixed address that indicates the create implicit group function. The GMS control function allocates a new implicit ULP address, adds it to the implicit ULP address list 138 and creates a new ULP server process 140. The host that sends this message is added to the membership list of the implicit group. This is done by adding the source ULP address in the message to the group membership list 142 in the ULP server process. Upon successful completion, the GMS control function responds with a receive control ULP message addressed to the host along with a function code in the data portion of the payload that indicates successful implicit group creation. The source ULP address in the payload is the ULP address assigned to the new implicit group. If there is an error, the control function returns a message to the host with a function code in the data portion of the payload indicating failed implicit group creation.

Create logical group

This function allows a host to create a new logical message group and associated logical ULP address. The payload in the message may contain a single payload item whose data field holds attributes of the group. These attributes can be used to define any optional functions of the group The destination ULP address in the message is a fixed address that indicates the create logical group function. The GMS control function allocates a new logical ULP address and adds it to the logical ULP address list 145. The host

that sends this message is added to the membership list of the logical group. This is done by adding the source ULP address in the message to the group membership list 147 for the new logical message group 144. Upon successful completion, the GMS control function responds with a receive control ULP message addressed to the host along with a function code in the data portion of the payload that indicates successful logical group creation. The source ULP address in the payload is the ULP address assigned to the new logical group. If there is an error, the control function returns a message to the host with a function code in the data portion of the payload indicating failed implicit group creation.

Join group

This function allows a host to join an existing logical or implicit message group. The destination ULP address in the message is a fixed address that indicates the join group function. The data portion of the payload contains the ULP address of the group that is to be joined. The GMS control function looks at this address and determines if it is an implicit or logical ULP address. If it is an implicit ULP address, the GMS control function finds the ULP server process selected by the address in the message payload and adds the source ULP host address from the message to the group membership list 142. If it is a logical ULP address, the GMS control function finds the logical ULP address 144 selected by the address in the message payload and adds the source ULP host address from the message to the group membership list 147. Upon successful completion, the GMS control function responds with a receive control ULP message addressed to the host along with a function code in the data portion of the payload that indicates successful group join. The source ULP address in the payload is the ULP address of the group that was joined. If

there is an error, the control function returns a message to the host with a function code in the data portion of the payload indicating failed implicit group creation.

Leave group

This function allows a host to leave an existing logical or implicit message group that it is a member of. The destination ULP address in the message is a fixed address that indicates the leave group function. The data portion of the payload contains the ULP address of the group that is to be left. The GMS control function looks at this address and determines if it is an implicit or logical ULP address. If it is an implicit ULP address, the GMS control function finds the ULP server process selected by the address in the message payload and removes from the group membership list 142 the source ULP host address from the message. If the host is the last member of the group, the ULP server process is terminated and the implicit ULP address is de-allocated. If it is a logical ULP address, the GMS control function finds the logical ULP address 144 selected by the address in the message payload and removes from the group membership list 147 the source ULP host address from the. If the host is the last member of the group, the ULP address is de-allocated. Upon successful completion, the GMS control function responds with a receive control ULP message addressed to the host along with a function code in the data portion of the payload that indicates successful group leave. If there is an error, the control function returns a message to the host with a function code in the data portion of the payload indicating failed implicit group creation.

Query groups

This function allows a host to get a list of all implicit and logical message groups currently active on a GMS. The destination ULP address in the

message is a fixed address that indicates the query groups function. Any data portion of the payload is ignored. Upon successful completion, the GMS control function responds with a receive control ULP message addressed to the host along with a payload with multiple payload elements. The first payload element contains a function code indicating successful query groups. The source ULP address in the first payload element is ignored. Each of the subsequent payload elements contain a ULP group address in the source address field of the payload element that is one of the active group addresses on the GMS. There is no data field in these subsequent payload elements. If there is an error, the control function returns a message to the host with a function code in the data portion of a payload with a single payload element indicating failed query groups.

Query group members

This function allows a host to get a list of all hosts that are members of a message group. The destination ULP address in the message is a fixed address that indicates the query group members function. The data portion of the payload carries the address of the message group for the query. Upon successful completion, the GMS control function responds with a receive control ULP message addressed to the host along with a payload with multiple payload elements. The first payload element contains a function code indicating successful query group members. The source ULP address in the first payload element is ignored. Each of the subsequent payload elements contain a ULP host address in the source address field of the payload element that is one of the active group addresses on the GMS. There is no data field in these subsequent payload elements. If there is an error, the control function

returns a message to the host with a function code in the data portion of a payload with a single payload element indicating failed query group members.

Query group attributes

This function allows a host to get a list of the attributes of a message group. The destination ULP address in the message is a fixed address that indicates the query group attributes function. The data portion of the payload carries the address of the message group for the query. Upon successful completion, the GMS control function responds with a receive control ULP message addressed to the host along with a payload with a two payload elements. The first payload element contains a function code indicating successful query group members. The second payload element contains the attributes of the message group. If there is an error, the control function returns a message to the host with a function code in the data portion of a payload with a single payload element indicating failed query group attributes.

Send Message Operation

In order to fully understand the operations of the send message function, a number of individual cases are worth considering.

Single implicit destination

The most simple case is a send message to a single implicit ULP address. In all send message datagrams, the destination ULP address 125 must be an implicit ULP address. In this case of a single implicit destination, this is the only destination address in the datagram. The auxiliary address count 126 is zero and there are no auxiliary destination addresses 127 or 128. The payload consists of a message count 116 of one, the ULP of the host sending the message in the source ULP address 117 and the data length 118 and data 119.

Send message datagrams may only have a single payload item so their message count field 116 must always be one.

The host sends the send message onto the network with a TLP header addressing the datagram to the GMS that is the selected target of the message. The GMS receives the message and the GMS control function 136 determines that it is a send message datagram and looks up the implicit destination address in its implicit ULP address list 138. If the address does not exist, an error message is returned to the sending host with a ULP receive message datagram. If the address is valid, the GMS control function removes the TLP header from the datagram and sends the ULP portion to the ULP server process corresponding to the destination implicit ULP address. Assume for discussion that this is the ULP server process 140. The ULP server process 140 will extract the single payload item from the message 117, 118 and 119 and place the payload item in each of the message queues 143. There will be one message queue for each member of the message group served by the ULP server process 140. The members of the group will have their host ULP addresses listed in the host address list 142. Each message queue in a ULP server process will fill with payload items that are targeted at particular destination hosts. The mechanisms by which payload items are removed from the queues and sent to the hosts will be described later.

Auxiliary unicast destination

In this case in addition to an implicit destination 125, there is also a single auxiliary address 127 in the datagram. The auxiliary address count 126 is one and the auxiliary destination addresses 127 is a unicast host ULP address. The payload consists of a message count 116 of one, the ULP of the host sending

the message in the source ULP address 117 and the data length 118 and data 119.

The host sends the send message onto the network with a TLP header addressing the datagram to the GMS that is the selected target of the message. The GMS receives the message and the GMS control function 136 determines that it is a send message datagram and looks up the implicit destination address in its implicit ULP address list 138 and the unicast host ULP auxiliary address in the host address map 137. If either of addresses does not exist, an error message is returned to the sending host with a ULP receive message datagram. If the addresses are valid, the GMS control function removes the TLP header from the datagram and sends the ULP portion to the ULP server process corresponding to the destination implicit ULP address. Assume for discussion that this is the ULP server process 140. The ULP server process extracts the auxiliary ULP address from the message and determines from the address that it is a unicast host ULP address. The server process then checks to see if this address is a member of the message group defined by the host address list 142. If it is not, no further action is taken and the payload item in the message is not placed in any of the message queues 143. If the host address is in the message group, the payload item in the message is placed in the single message queue corresponding to that host. The net effect is that the ULP server process has performed a set intersection operation on the members of the message group selected by the implicit ULP destination address and defined by the group membership list 142 with the members of the set of hosts defined by the auxiliary address. The payload item is them sent only to the hosts that are members of this set intersection.

Auxiliary logical destination

In this case in addition to an implicit destination 125, there is also a single auxiliary address 127 in the datagram. The auxiliary address count 126 is one and the auxiliary destination addresses 127 is a logical ULP address. The payload consists of a message count 116 of one, the ULP of the host sending the message in the source ULP address 117 and the data length 118 and data 119.

The host sends the send message onto the network with a TLP header addressing the datagram to the GMS that is the selected target of the message. The GMS receives the message and the GMS control function 136 determines that it is a send message datagram and looks up the implicit destination address in its implicit ULP address list 138 and the logical ULP auxiliary address in list of logical ULP addresses 145. If either of addresses does not exist, an error message is returned to the sending host with a ULP receive message datagram. If the addresses are valid, the GMS control function removes the TLP header from the datagram and sends the ULP portion to the ULP server process corresponding to the destination implicit ULP address. Assume for discussion that this is the ULP server process 140. The ULP server process extracts the auxiliary ULP address from the message and determines from the address that it is a logical ULP address. Assume for this example that this logical ULP address is the logical address 144. The server process fetches the group membership list 147 corresponding to the logical address and performs a set intersection operation with the group membership list 142 of the server process. If there are no members of this set intersection, no further action is taken and the payload item in the message is not placed in any of the message queues 143. If there are members of the set intersection operation, the payload

item in the message is placed in the queues corresponding to the hosts that are members of the set intersection.

Multiple auxiliary addresses with logical operations

In its most sophisticated form, a send message can perform set operations between the implicit message group of the ULP server process and multiple logical and unicast ULP addresses. This is done by placing multiple auxiliary destination ULP addresses in the message with logical operators imbedded in the address list. The address count 126 holds a count of the total auxiliary addresses in the address list 127 and 128. The auxiliary addresses are a mix of logical ULP addresses and unicast host ULP addresses. Two logical ULP addresses in the ULP address space are assigned the role of specifying set operations to be performed between the logical message groups and unicast host addresses in the message list. They are specially assigned addresses for the functions set intersection, set union. A third logical address is used to indicate set complement. The payload consists of a message count 116 of one, the ULP of the host sending the message in the source ULP address 117 and the data length 118 and data 119.

The host sends the send message onto the network with a TLP header addressing the datagram to the GMS that is the selected target of the message. The GMS receives the message and the GMS control function 136 determines that it is a send message datagram and looks up the implicit ULP message in the implicit ULP address list 138 and all of the addresses in the address list either in the host ULP address map 137 or in the logical ULP address list 145 as appropriate. If any of addresses does not exist, an error message is returned to the sending host with a ULP receive message datagram. If the addresses are valid, the GMS control function removes the TLP header from the datagram

and sends the ULP portion to the ULP server process corresponding to the destination implicit ULP address. Assume for discussion that this is the ULP server process 140. The ULP server process extracts the auxiliary ULP address list from the message and scans it from beginning to end. The scanning and processing of the set operators is done in post-fix fashion. This means that arguments are read followed by an operator that is then applied to the arguments. The result of the operator becomes the first argument of the next operation. Therefore at the start of scanning two addresses are read from the address list. The next address will be an operator that is applied to the arguments and the result of this operator is the first argument to be used by the next operator. From then on a single address is read from the address list followed by a logical ULP address which is operator on the two arguments consisting of the new argument and the results of the last operator. The logical address used to indicate set complement is not a set operator, by an argument qualifier since it can precede any address in the address list. The meaning of the set complement argument qualifier is relative to the group membership of implicit group address in the send message. If the set complement qualifier precedes a unicast host address which is not a member of the message group selected by the implicit ULP address in the send message, the effective argument is the set of all hosts that are members of the implicit message group. If the set complement qualifier precedes a unicast host address which is a member of the message group selected by the implicit ULP address in the send message, the effective argument is the set of all hosts that are members of the implicit message group except for the original unicast host address qualified by the complement function. If the set complement qualifier precedes a logical ULP address the effective argument is the set of all hosts that are members of

the implicit message group specified by the send message except hosts that are members of the logical message group preceded by the set complement modifier. Once the entire address list has been processed to a single result set of hosts, a set intersection operation is performed on this set and the set of members of the implicit message group 142 defined by the implicit address in the send message. If there are no members of this set intersection, no further action is taken and the payload item in the message is not placed in any of the message queues 143. If there are members of the set intersection operation, the payload item in the message is placed in the queues corresponding to the hosts that are members of the set intersection.

Message Delivery and Aggregation

Once messages are entered into the message queues in the ULP server processes, there are a variety of ways that they can ultimately be delivered to the targeted hosts. In the invention, the delivery method is set on a per-ULP server process basis by attributes that are provided at the time that an implicit ULP message group and server process are created. It is important during the description of these methods to keep in mind that the invention is intended to provide an efficient means for a group of hosts to send messages to each other at a rapid rate during the implementation of a networked interactive application. Also assumed in the following description is that the GMS performs echo suppression when a host sends a message to a group that it belongs to. This means that the host will not receive a copy of its own message to the group either as a single un-aggregated message or as a payload item in an aggregated message. This is controlled by a ULP server process attribute that can be changed to stop echo suppression, but echo suppression is the default.

Immediate Delivery

The most simple delivery method is to immediately deliver the payload items to their targeted hosts as soon as they are placed in the message queues. Each payload item in a message queue will contain a ULP source address, a data length and the data to be sent. To implement immediate delivery, the ULP server process will remove a payload item from a message queue for a particular host 143. The host address for this host will be obtained from the group membership list 142. The payload item and the destination host address will be sent to the GMS control function 136 where it will be used to create a ULP receive message sent to the destination host. The GMS control function 136 will use the destination ULP host address to look up the TLP address of the host from the host address map 137. This will be used to create a TLP header for the message 123. The ULP message type 124 will be ULP receive, the destination ULP address 125 will be the destination host, the address count will be 0 and there will be no auxiliary addresses. The payload in this case will have a message count 116 of 1 and the payload item comprised of fields 117, 118, and 119 will be the payload element taken from the message queue.

Immediate delivery is useful when the message rate between a group of hosts is low. Consider four hosts that are members of an implicit message group where each member of the group sends a message to every other member of the group at a fixed rate. With immediate delivery, each host will send three messages to the other members of the group and receive three messages from the other members of the group at the fixed rate. This is acceptable is the size of the group is small and the message rate is low. However, it is obvious that total message rate is the product of the underlying message rate and the total number of members of the group minus one. Clearly

this will result in unacceptably high message rates for large groups and highly interactive message rates. A group of 20 members that had an underlying message rate of 10 messages per second would yield a total message rate at each host of 190 messages sent and 190 messages received every second. This message rate will be unsupportable over a conventional dial-up connection to a conventional wide area network such as the internet.

Aggregation

A key concept in the present invention is the aggregation of multiple messages in a message queue into a single ULP receive message to a host that contains multiple payload items in the payload. The ULP server process 140 removes payload items from a message queue 143 for a host and accumulates them in an aggregation buffer 149. The aggregation buffer has buffer areas for each host for which there is a message queue. These individual host areas within the aggregation buffer are called host aggregation buffers. The start and end of this aggregation period can be controlled in a number of ways that will be described in the next sections. At the end of the aggregation period, the each host aggregation buffer may hold multiple payload items. The host aggregation buffer will hold a message count of the payload items followed by the multiple payload items. The contents of a host aggregation buffer along with the ULP host address of the corresponding host are sent to the GMS control function 136 where it will be used to create a ULP receive message sent to the destination host. The GMS control function 136 will use the destination ULP host address to look up the TLP address of the host from the host address map 137. This will be used to create a TLP header for the message 123. The ULP message type 124 will be ULP receive, the destination ULP address 125 will be the destination host, the address count will be 0 and

there will be no auxiliary addresses. The payload in this case will have a message count 116 set by the message count value from the host aggregation buffer. The payload will contain all of the payload items from the host aggregation buffer.

The effect of aggregation will be to greatly reduce the total message rate received by the hosts. A single message to a host will be able to carry multiple payload items received from the other hosts during the aggregation period. This fits very well the interactive applications of this invention where groups of hosts will be sending messages to all the other hosts in the group at a periodic rate. Aggregation will be very effective in collecting together all of the messages from all of the other hosts into a single message for each member of the group. The reduces processing at each receiving host since a single message will be received rather than many separate messages. Aggregation will also reduce the total data rate to the hosts since aggregation eliminates the need for separate message headers for each payload item. The savings will be significant for small payload items since there will be only one message header comprising fields 123, 124 and 125 for multiple payload items. In cases where a group of hosts are sending messages to the group at a periodic rate, it is often the case in many interactive applications that the data being sent by each host to the group is very similar to the messages sent by the other hosts. This affords the opportunity within an aggregated payload of multiple payload items to apply a data compression method across the multiple data elements of the payload elements. A wide variety of known data compression methods will lend themselves to this application. The first data element in the first payload item can be sent in uncompressed form with each subsequent data element being compressed using some form of difference coding method. A variety of

known data compression methods use the concept of a predictor with differences from the predicted value being encoded. The first data element in an aggregated payload can be used as this predictor with the subsequent data elements coded using such a data compression method. These conventional data compression methods do not assume any knowledge of the internal structure or function of portions of a data element to compress. It is also possible to make use of application specific coding techniques that take advantage of such knowledge to potentially achieve much higher coding efficiency.

Server Isochronous

One method by which the aggregation time period can be defined is called Server Isochronous or SI. In this method, A ULP Server Process defines a uniform time base for defining the aggregation time period. This time base is defined by three parameters: the time period, the aggregation offset and the transmit offset. These parameters are set by the attributes provided in the create implicit group control function at the time the implicit group and the ULP server process are created. The time period is a fixed time interval during which the ULP server process will accumulate messages in the message queues, aggregate the messages in the queues and send the aggregated messages to the targeted hosts. The aggregation offset defines the point after the start of the time period after which arriving messages will be stored in the message queues for delivery in the next time period. Therefore, at the aggregation offset after the start of the time period, a snapshot will be taken of all of the messages in each message queue. New messages will continue to arrive and be entered into the queues after the aggregation offset. Only those messages in the queues before the aggregation offset point will be aggregated

into outbound messages. The resulting aggregated messages will then be sent to their targeted hosts at the point in time which is the transmit offset after the start of the time period. The result is that messages arrive continuously and are stored in the message queues. Once per time period the are aggregated into single messages to each host which is the target of messages and once per time period these aggregated messages are sent to the hosts.

Another embodiment of the SI method is to allow the ULP server process to dynamically vary the time period based on some criteria such as the received message rates, and/or received data rate. The ULP server could use a function to define the aggregation period based on the number of messages received per second or the total number of payload bytes received per second. One reasonable function would be to shorten the aggregation period as the rate or received messages or data rate of the received payloads increased. This would tend to keep the size of the outbound messages from growing too much as received messages and/or received data rate grew. Other possible functions could be used that varied the aggregation period based on received message rates, received payload data rates or other parameters available to the ULP server process.

Host Synchronous

The host synchronous or HS method of defining the aggregation time period allows the definition of a flexible time period that is controlled by the hosts. It is based on the concept of a turn which is a host sending a message to one or more members of the implicit message group which is operating is HS mode. Once every host in the message group has taken a turn, the aggregation period ends. A snapshot of the contents of the message queues is taken, the contents of each of the queues is aggregated and the aggregated messages are

sent to the hosts targeted by each message queue. A refinement to this technique qualifies which of the three ULP send message types to the group constitute a host turn: a send only to the implicit address of the group, a send to a unicast host address within the group or a send to a logical ULP address which shares members with the group. The attributes of the group not only will define HS aggregation, but one or more ULP send message types that will be considered a host turn. A further refinement sets the total number of turns that a host can take in a single aggregation time period. The default will be one turn, but multiple turns can be allowed. If a host attempts to take more turns than allowed, the messages are ignored.

This aggregation technique has the additional benefit of causing the hosts which are member of an HS implicit message group to have their processing functions synchronized when they are executing the same interactive application. Many networked interactive applications are based on a simple overall three step operational model: wait for messages from other hosts, process the messages and the local users inputs to update the local application, send messages to the other hosts. This basic application loop is repeated at a rate fast enough to provide an interactive experience such as 5 to 30 times per second. It is desirable to keep such applications synchronized so that the states of the applications is consistent on the different host machines. When such applications communicate using the HS model of the present invention their operations will become naturally synchronized. The HS ULP server process will wait until all of the members of the message group has completed their turns and sent a message to the group before sending the aggregated messages to the members of the group. This will cause the applications on the hosts to wait until they have received the aggregated messages. They will all then start

processing these messages along with the local user inputs. Even if they perform their processing at different speeds and send their next messages to the group at different times, the HS ULP server will wait until all have completed their processing and reported in with a message to the group. This will keep all of the host applications synchronized in that every host will be at the same application loop iteration as all of the others. This will keep the application state consistent on all of the hosts. Only network propagation delays from the GMS to the hosts and different processing speeds of the hosts will cause the start and completion of their processing to begin at different times. It is not a requirement in networked applications to keep all of the hosts precisely synchronized, only that that application state is consistent. The HS method provides a natural way to do this in the context of the present invention.

Preferred Embodiment

The detailed description of the invention has described a datagram implementation of the invention as the best way to explain the invention. The preferred embodiment of the invention is as follows.

In the preferred embodiment, the wide area network is the Internet and the TLP protocol is TCP/IP. The GMS is a general purpose computer system connected to the Internet and the hosts are personal computers connected to the Internet.

TCP/IP provides an number of advantages that provide for a more efficient applications interface on the hosts 151. TCP/IP supports the concept of source and destination port numbers in its header. The ULP can make use of the port numbers to identify source and destination ULP connections. Most ULP send messages will be from hosts to a implicit ULP group addresses and most ULP receive messages will be from the implicit ULP addresses to the ULP host

addresses. All of these and the ULP message type field can represented by source and destination port addresses within the TCP/IP header. This means that for most ULP messages, the ULP message encapsulated within the TCP/IP message need only contain the payload. There is the slight complication of the aggregated ULP receive messages sent from a ULP server process to a hosts. Here the destination port will be the host the source port will be for the implicit ULP group address and the payload will still contain the source host ULP addresses in each the payload items.

TCP/IP also supports header compression for low speed dial-up lines which is also important in this application. See RFC 1144. TCP/IP is a connection oriented protocol which provides reliable end-to-end transport. It handles re-transmission on errors and fragmentation and reassembly of data transparently to upper level protocols. Header compression allows much of the TCP/IP header to be omitted with each packet to be replaced by a small connection identifier. This connection ID will uniquely define a connection consisting of a source and destination IP address and source and destination TCP/IP port numbers.

At the interface to the application on the hosts, the preferred embodiment of the ULP is as a session layer protocol. In the preferred embodiment the application on a host opens a session with a ULP server process. This session is identified with a unique session ID on the host. The host application then sends data to the ULP host interface 151 tagged with this session ID. The session ID defines a host and implicit ULP pair including the TCP/IP TLP address of the GMS server that is running the particular ULP server process for the implicit ULP address. By binding the transport address of the GMS of a ULP server process to the session ID, we can transparently to the application

support multiple group messaging servers on the network and a single host can have multiple active sessions with different physical group messaging servers. This avoids any address space collision problems that could arise from the fact that the ULP address space is unique to each GMS.

Alternate Embodiments

One possible extension to the invention is to extend the ULP to support a common synchronized time base on the GMS and the hosts that are connected to it. This would be most interesting in context of the SI message aggregation mode. The SI time base on the GMS could be replicated on all of the hosts and all of the hosts and the GMS could lock these time bases together. There are known methods to synchronize time bases on multiple computer systems. One such method is called NTP.

Another extension to the invention is to define ULP server processes that perform specific application specific processing on the contents of the messages that are received. A variety of different application specific processing functions can be defined and implemented. A particular function would be selected by attributes provided in the create implicit group function. These functions could process the data in the message payloads and replace the data elements in the payloads with processed results. Separately, or in combination with processing the message payloads, the processing could store either raw message payload data in the application specific state storage area or could store processed results.

Clearly, the host system need not be personal computers, but could also be dedicated game consoles or television set top boxes or any other device with a programmable controller capable of implementing the ULP protocol.

The wide area network used to transport the ULP protocol need not be the Internet or based on IP. Other networks with some means for wide area packet or datagram transport are possible including ATM networks or a digital cable television network.

The invention now being fully described, it will be apparent to one of ordinary skill in the art that any changes and modifications can be made thereto without departing from the spirit or scope of the invention as set forth herein. Accordingly, the present invention is to be limited solely by the scope of the appended claims.

WHAT IS CLAIMED IS:

1. A method for providing group messages to a plurality of host computers connected over a unicast wide area communication network, comprising the steps of:

providing a group messaging server coupled to said network, said server communicating with said plurality of host computers using said unicast network and maintaining a list of message groups, each message group containing at least one host computer;

sending, by a first host computer belonging to a first message group, a message to said server via said unicast network, said message containing a payload portion and a portion for identifying said first message group; and

transmitting, by said server via said unicast network, said payload portion to selected host computers belonging to said first group.

2. The method of claim 1 wherein said selected host computers comprising all host computers belong to said first group except said first host computer.

3. The method of claim 1 wherein said message also contains a portion for identifying a second message group, said selected host computers being selected from a set operation of members in said first and said second message groups.

4. The method of claim 1 further comprising the step of creating, by a second host computer, said first message group by sending a first control message to said server via said unicast network.

5. The method of claim 4 further comprising the step of joining, by said first host computer, said first message group by sending via said unicast network a second control message to said server specifying said first message group.

6. The method of claim 1 wherein said network is Internet and said server communicates with said plurality of host computers using a session layer protocol

7. A method for providing group messages to a plurality of host computers connected over a unicast wide area communication network, comprising the steps of:

providing a group messaging server coupled to said network, said server communicating with said plurality of host computers using said unicast network and maintaining a list of message groups, each message group containing at least one host computer;

sending, by a plurality of host computers belonging to a first message group, messages to said server via said unicast network, said messages containing a payload portion and a portion for identifying said first message group;

aggregating, by said server in a time interval determined in accordance with a predefined criterion, said payload portions of said messages to create an aggregated payload;

forming an aggregated message using said aggregated payload; and

transmitting, by said server via said unicast network, said aggregated message to a recipient host computer belonging to said first message group.

8. The method of claim 7 wherein said time interval is a fixed period of time.

9. The method of claim 7 wherein said time interval corresponds to a time for said server to receive at least one message from each host computer belonging to said first message group.

10. The method of claim 7 further comprising the step of creating, by one of said plurality of host computers, said first message group by sending a first control message to said server via said unicast network.

11. The method of claim 10 further comprising the step of joining, by some of said plurality of host computers, said first message group by sending control messages via said unicast network to said server specifying said first message group.

12. The method of claim 7 wherein said network is Internet and said server communicates with said plurality of host computers using a session layer protocol

13. A method for providing group messages to a plurality of host computers connected over a unicast wide area communication network, comprising the steps of:

providing a group messaging server coupled to said network, said server communicating with said plurality of host computers using said unicast network and maintaining a list of message groups, each message group containing at least one host computer;

dynamically joining, by a first host computer, message groups on said list by sending a first control message to said server via said unicast network, said first control message specifying a message group desired to be joined by said first host computer; and

dynamically leaving, by said first host computer, message groups on said list by sending a second control message to said server via said unicast

network, said second control message specifying a message group said first host computer desires to leave.

14. The method of claim 13 wherein said first host computer belongs to a first message group, said method further comprising the steps of:

sending, by said first host computer, a message to said server via said unicast network, said message containing a payload portion and a portion for identifying said first message group; and

transmitting, by said server via said unicast network, said payload portion to selected host computers belonging to said first group.

15. The method of claim 14 wherein said selected host computers comprising all host computers belong to said first group except said first host computer.

16. The method of claim 14 wherein said message also contains a portion for identifying a second message group, said selected host computers being selected from a set operation of members in said first and said second message groups.

ABSTRACT

A method for deploying interactive applications over a network containing host computers and group messaging servers is disclosed. The method operates in a conventional unicast network architecture comprised of conventional network links and unicast gateways and routers. The hosts send messages containing destination group addresses by unicast to the group messaging servers. The group addresses select message groups maintained by the group messaging servers. For each message group, the group messaging servers also maintain a list of all of the hosts that are members of the particular group. In its most simple implementation, the method consists of the group server receiving a message from a host containing a destination group address. Using the group address, the group messaging server then selects a message group which lists all of the host members of the group which are the targets of messages to the group. The group messaging server then forwards the message to each of the target hosts. In an interactive application, many messages will be arriving at the group server close to one another in time. Rather than simply forward each message to its targeted hosts, the group messaging server aggregates the contents of each of messages received during a specified time period and then sends an aggregated message to the targeted hosts. The time period can be defined in a number of ways. This method reduces the message traffic between hosts in a networked interactive application and contributes to reducing the latency in the communications between the hosts.

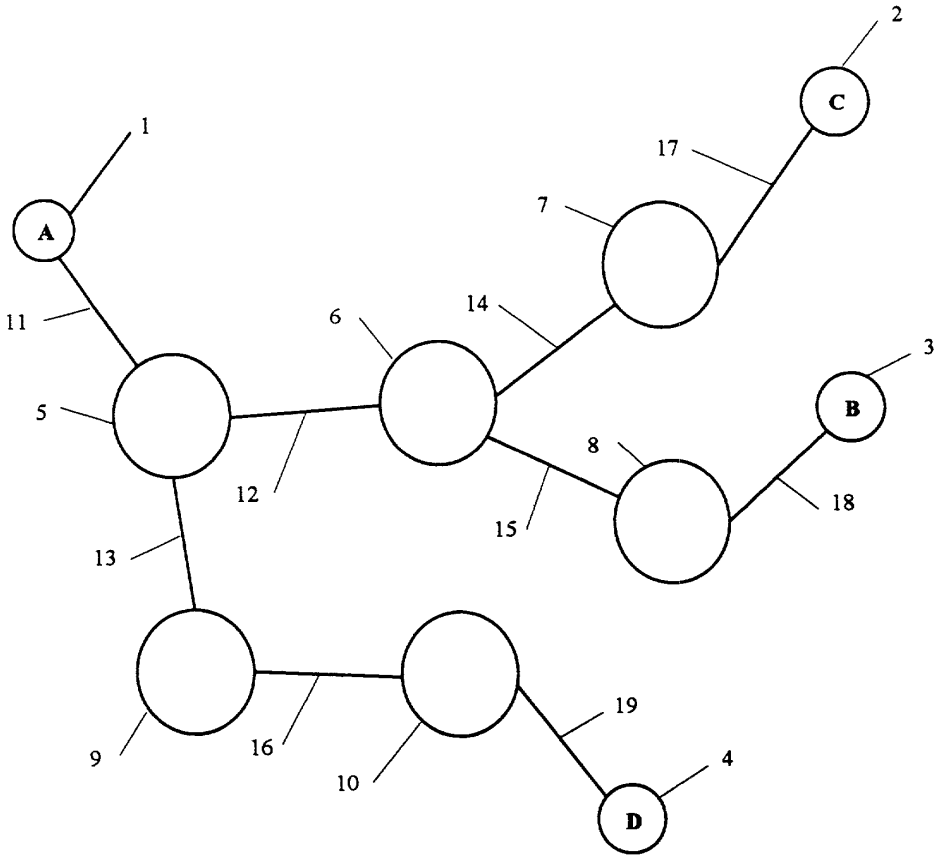


Figure 1
Prior Art - Unicast Network

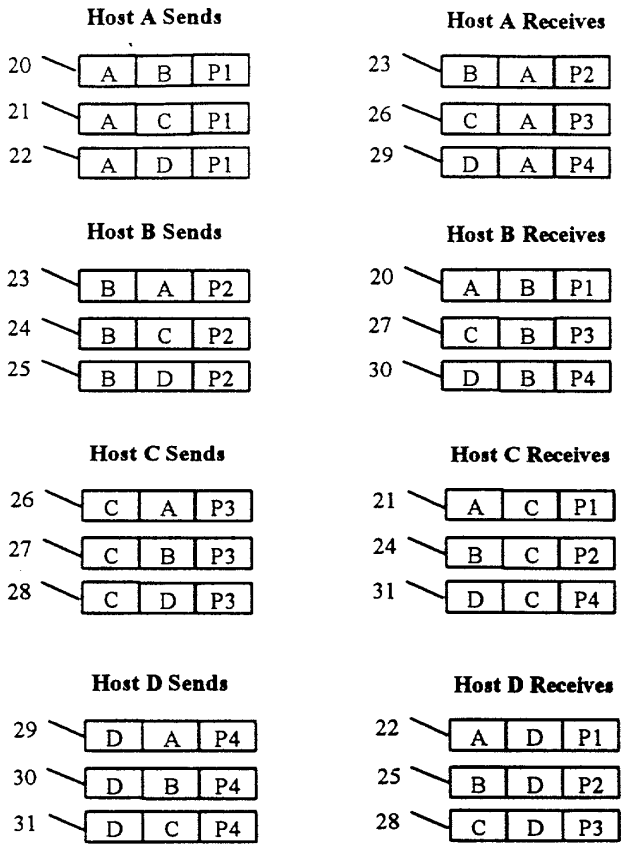


Figure 2
Prior Art - Unicast Datagrams

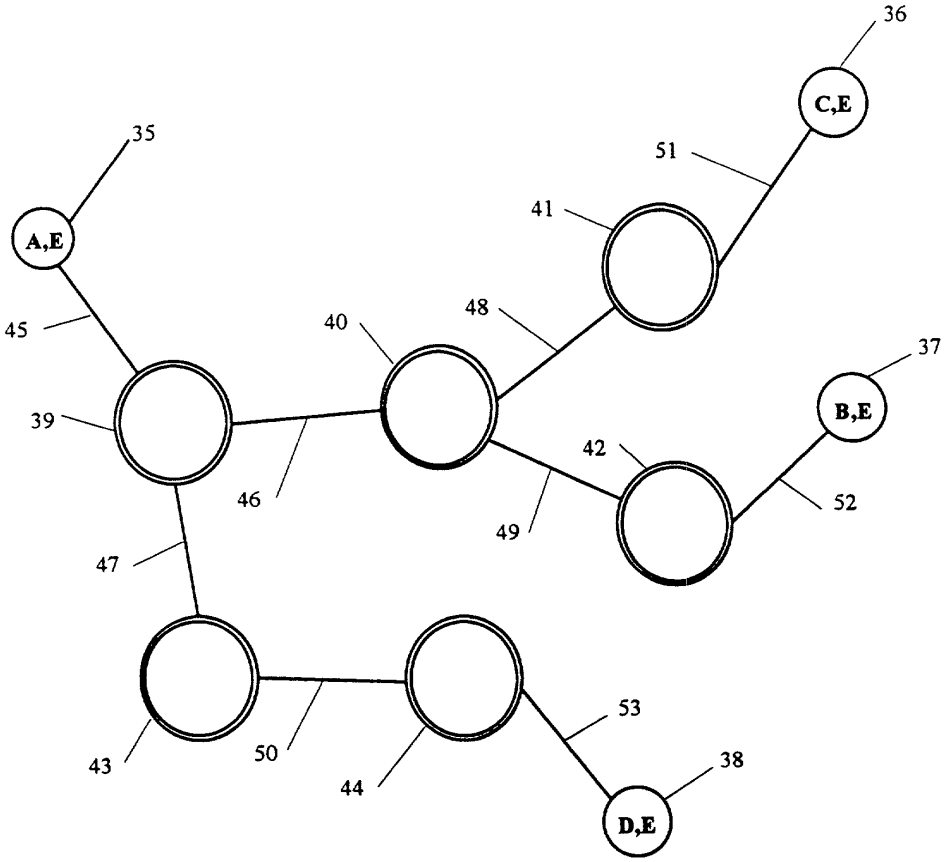


Figure 3
Prior Art - Multicast Network

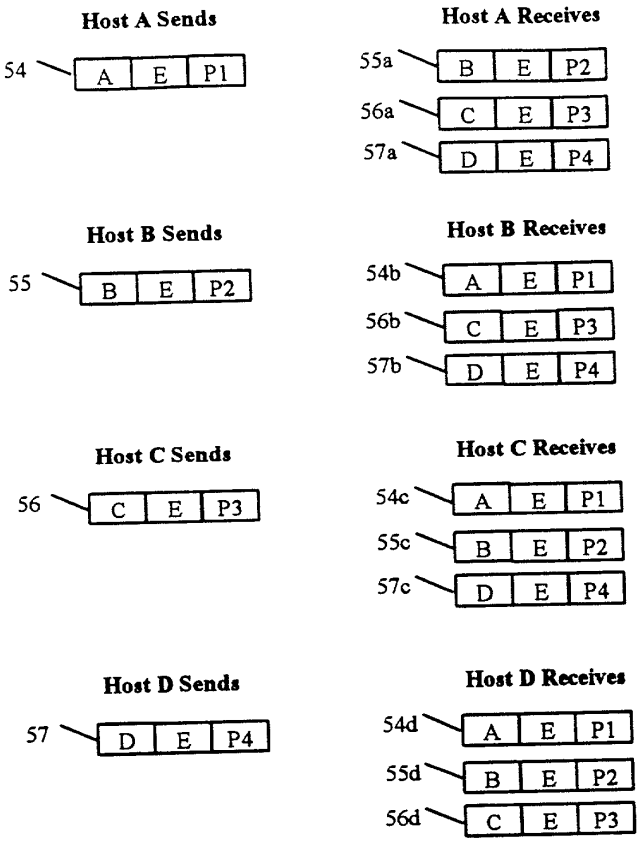


Figure 4
Prior Art - Multicast Datagrams

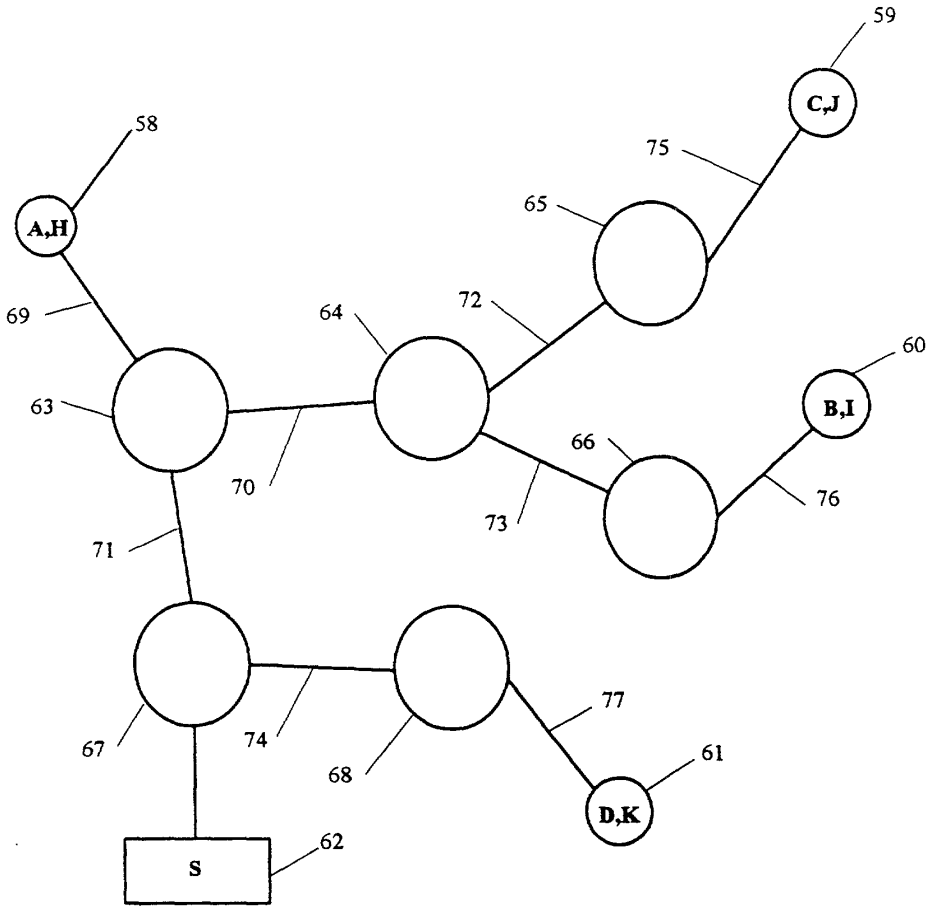


Figure 5
Present Invention - Unicast Network with Group Server

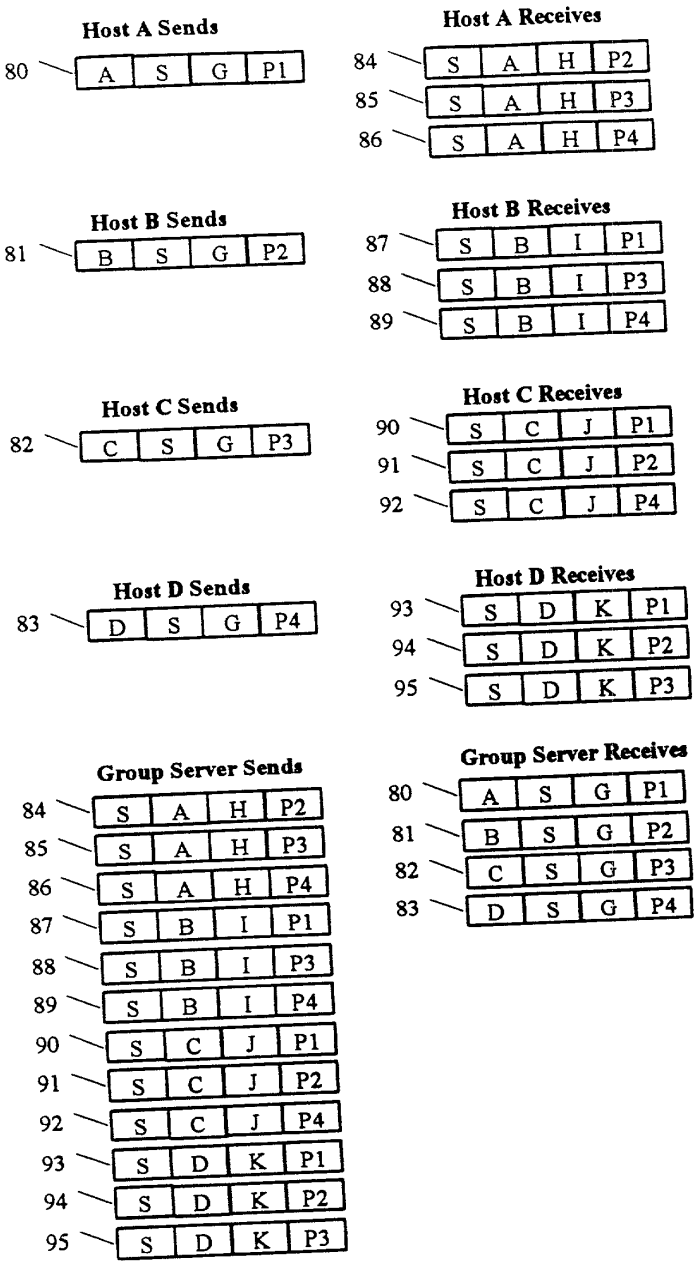


Figure 6
Present Invention - Group Datagrams without Aggregation

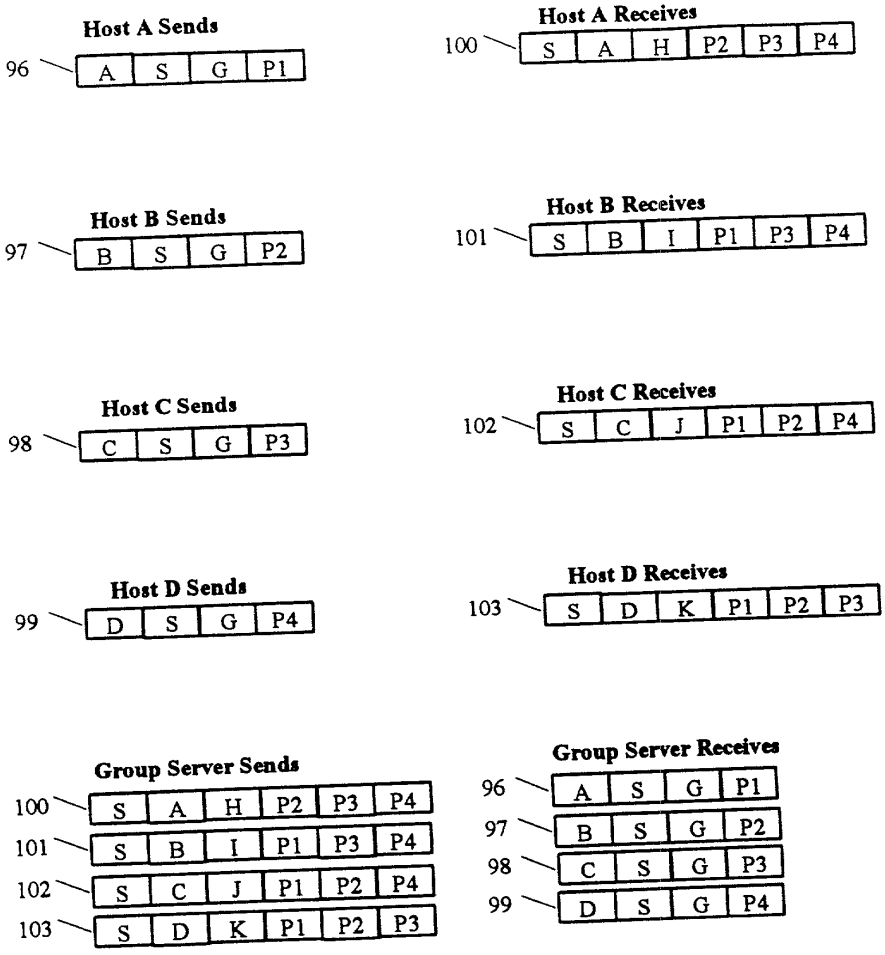


Figure 7
Present Invention - Group Datagrams with Aggregation

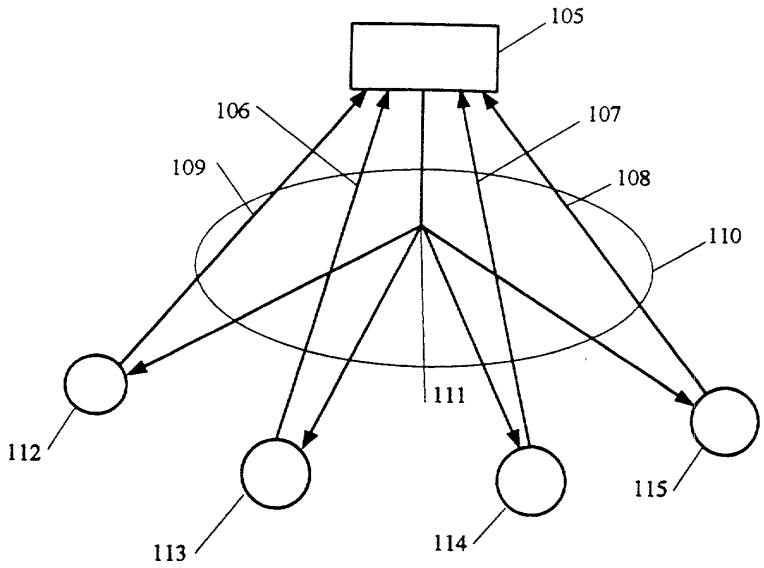
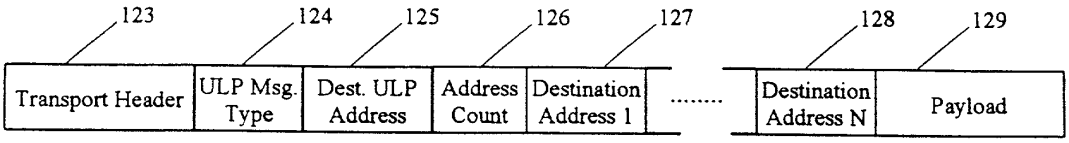
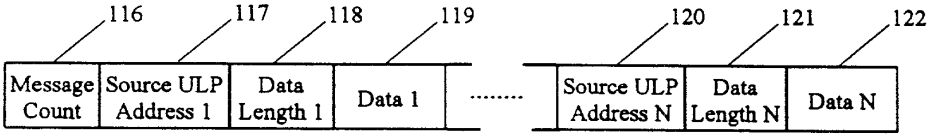


Figure 8
Prior Art - ATM Network with Multicast Server





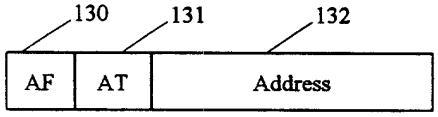


Figure 9
Invention - ULP Message and Address Formats

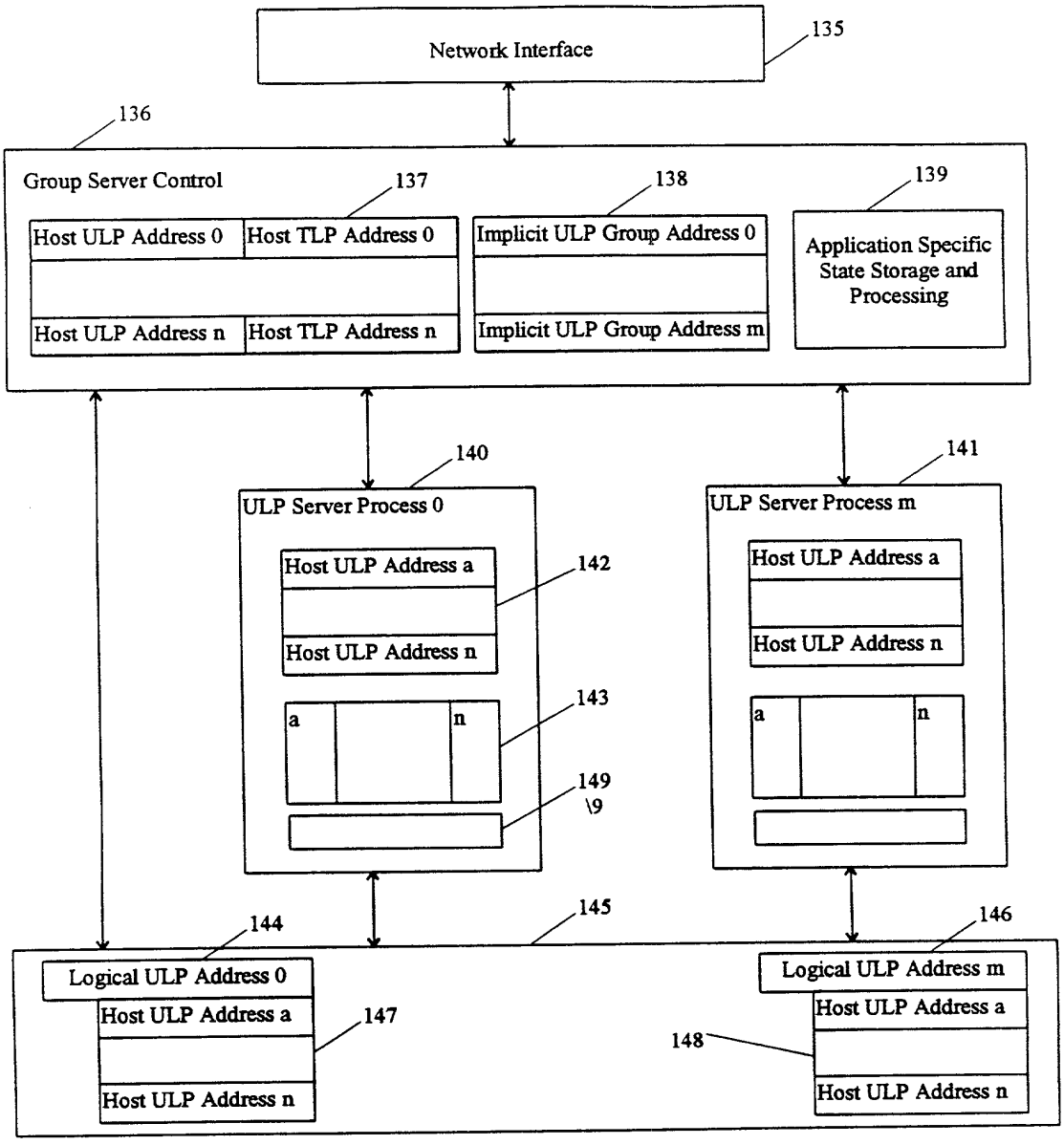


Figure 10
Invention - Group Server Internal Functions

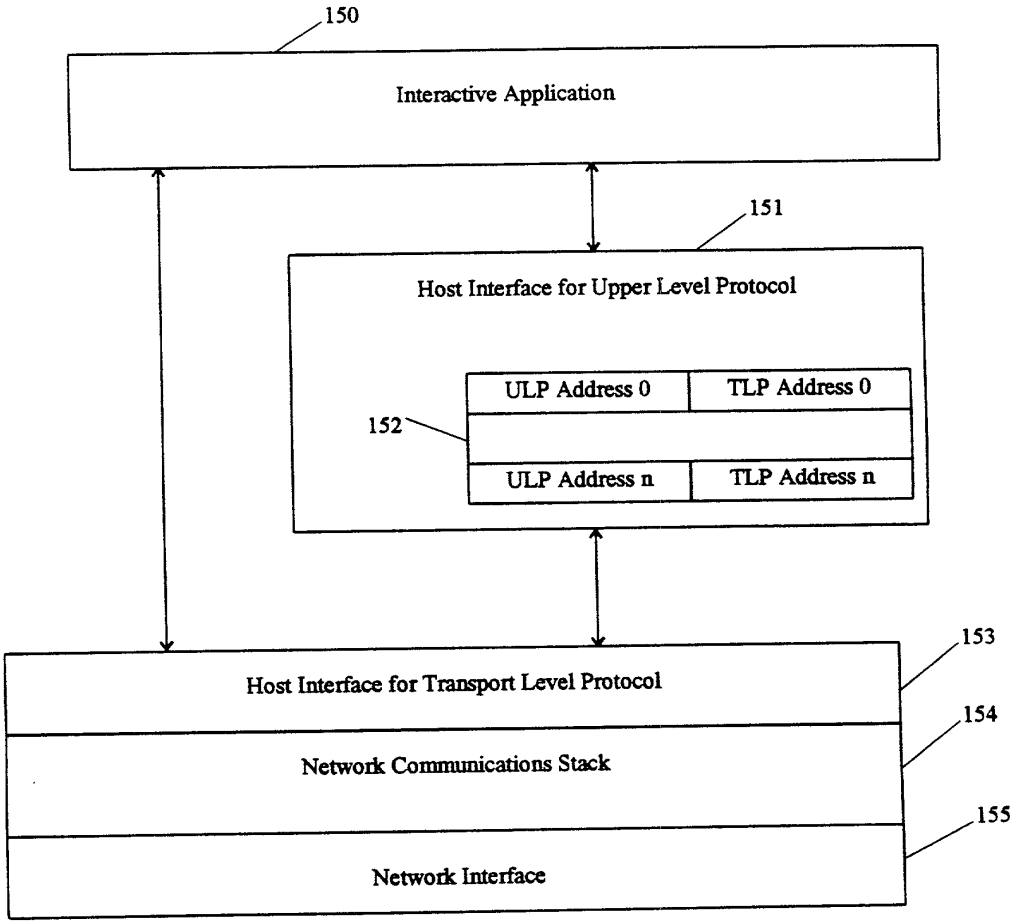


Figure 11
Invention - Host Interface for Upper Level Protocol

Please type a sign(+) inside this box → ⊞

PTO/SB/05 (2/98)

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Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR § 1.53(b))

Attorney Docket No.	*1719.0050002*
First Inventor or Application Identifier	*Jeffrey J. ROTHSCHILD*
Title	*Server-Group Messaging System for Interactive Applications*
Express Mail Label No.	

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

1. ☐ * Fee Transmittal Form (*e.g.*, PTO/SB/17)
(Submit an original, and a duplicate for fee processing)

2. ☒ Specification [Total Pages 60]
(preferred arrangement set forth below)
- Descriptive title of the Invention
- Cross References to Related Applications
- Background of the Invention
- Brief Summary of the Invention
- Brief Description of the Drawings *(if filed)*
- Detailed Description
- Claim(s)
- Abstract of the Disclosure

3. ☒ Drawings (35 U.S.C. 113) [Total Sheets 11]

4. ☐ Oath or Declaration [Total Pages ____]
a. ☐ Newly executed (original or copy)
b. ☐ Copy from a prior application (37 CFR 1.63(d)) *(for continuation/divisional with Box 17 completed)*
[Note Box 5 below]
i. ☐ DELETION OF INVENTOR(S)
Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR §§ 1.63(d)(2) and 1.33(b).

5. ☐ Incorporation By Reference *(useable if Box 4b is checked)*
The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

6. ☐ Microfiche Computer Program *(Appendix)*

7. Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all necessary)*
a. ☐ Computer Readable Copy
b. ☐ Paper Copy (identical to computer copy)
c. ☐ Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

8. ☐ Assignment Papers (cover sheet & document(s))
9. ☐ 37 CFR 3.73(b) Statement (when there is an assignee) ☐ Power of Attorney
10. ☐ English Translation Document *(if applicable)*
11. ☐ Information Disclosure Statement (IDS)/PTO-1449 ☐ Copies of IDS Citations
12. ☐ Preliminary Amendment
13. ☒ Return Receipt Postcard (MPEP 503)
(Should be specifically itemized)
14. ☐ *Small Entity Statement(s) *(PTO/SB/09-12)* ☐ Statement filed in prior application, Status still proper and desired
15. ☐ Certified Copy of Priority Document(s)
(if foreign priority is claimed)
16. ☒ Other: 37 C.F.R. § 1.136(a)(3) Authorization
☐ Other:

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17. If a CONTINUING APPLICATION, *check appropriate box, and supply the requisite information below and in a preliminary amendment:*

☒ Continuation ☐ Divisional ☐ Continuation-in-Part (CIP) of prior application No: **08/896,797**

Prior application information: Examiner ***Zarni Maung*** *Group/Art Unit:* ***2758***

18. CORRESPONDENCE ADDRESS

☐ ***Customer Number or Bar Code Label*** *(Insert Customer No. or Attach bar code label here)* ***or*** ☒ ***Correspondence address below***

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NAME (Print/Type)	**Raymond Millien**	*Registration No. (Attorney/Agent)*	**43,806**
SIGNATURE		*Date* 9/28/99	

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NANCY J. DEGEN**

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*BAR OTHER THAN D.C.
**REGISTERED PATENT AGENTS

September 28, 1999

WRITER'S DIRECT NUMBER:
(202) 789-5506
INTERNET ADDRESS:
RMILLIEN@SKGF.COM

Assistant Commissioner for Patents
Washington, D.C. 20231

Box Patent Application

Re: U.S. Continuation Utility Patent Application under 37 C.F.R. § 1.53(b)
(Based on Appl. No. 08/896,797; Filed: July 18, 1997)
Appl. No. To be assigned; Filed: September 28, 1999
For: **Server-Group Messaging System for Interactive Applications**
Inventors: Jeffrey J. ROTHSCHILD, Daniel J. SAMUEL and Marc P. KWIATKOWSKI
Our Ref: 1719.0050002

Sir:

The following documents are forwarded herewith for appropriate action by the U.S. Patent and Trademark Office:

1. PTO Utility Patent Application Transmittal Form (PTO/SB/05);

2. U.S. Utility Patent Application entitled:

Server-Group Messaging System for Interactive Applications

and naming as inventors:

Jeffrey J. ROTHSCHILD, Daniel J. SAMUEL and Marc P. KWIATKOWSKI

the application consisting of:

a. A specification containing:

(i) 55 pages of description prior to the claims;
(ii) 4 pages of claims (16 claims);
(iii) a one (1) page abstract;

b. Eleven (11) sheets of drawings: (Figures 1-11);

3. USPTO Utility Patent Application Transmittal Form PTO/SB/05;

4. 37 C.F.R. § 1.136(a)(3) Authorization to Treat a Reply As Incorporating An Extension of Time (in duplicate); and

5. Two (2) return postcards.

It is respectfully requested that, of the two attached postcards, one be stamped with the filing date of these documents and returned to our courier, and the other, prepaid postcard, be stamped with the filing date and unofficial application number and returned as soon as possible.

This application claims priority to U.S. Application No. 08/896,797, filed July 18, 1997, now allowed, which is a continuation of U.S. Application No. 08/595,323, filed, February 1, 1996, now U.S. Patent No. 5,822,523.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036. A duplicate copy of this letter is enclosed.

This patent application is being submitted under 37 C.F.R. § 1.53(b) without Declaration and without filing fee.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Raymond Millien
Attorney for Applicants
Registration No. 43,806

0050002.pto

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	
ROTHSCHILD *et al.*	Art Unit: 2758
Appl. No. To be assigned	Examiner: Z. Maung
Filed: September 28, 1999	Atty. Docket: 1719.0050002
For: **Server-Group Messaging System for Interactive Applications**	

Authorization To Treat A Reply As Incorporating An Extension Of Time Under 37 C.F.R. § 1.136(a)(3)

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

The U.S. Patent and Trademark Office is hereby authorized to treat any concurrent or future reply that requires a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. The U.S. Patent and Trademark Office is hereby authorized to charge all required extension of time fees to our Deposit Account No. 19-0036, if such fees are not otherwise provided for in such reply. A duplicate copy of this authorization is enclosed.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Raymond Millien
Attorney for Applicants
Registration No. 43,806

Date: 9/28/99

1100 New York Avenue, N.W.
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(202) 371-2600

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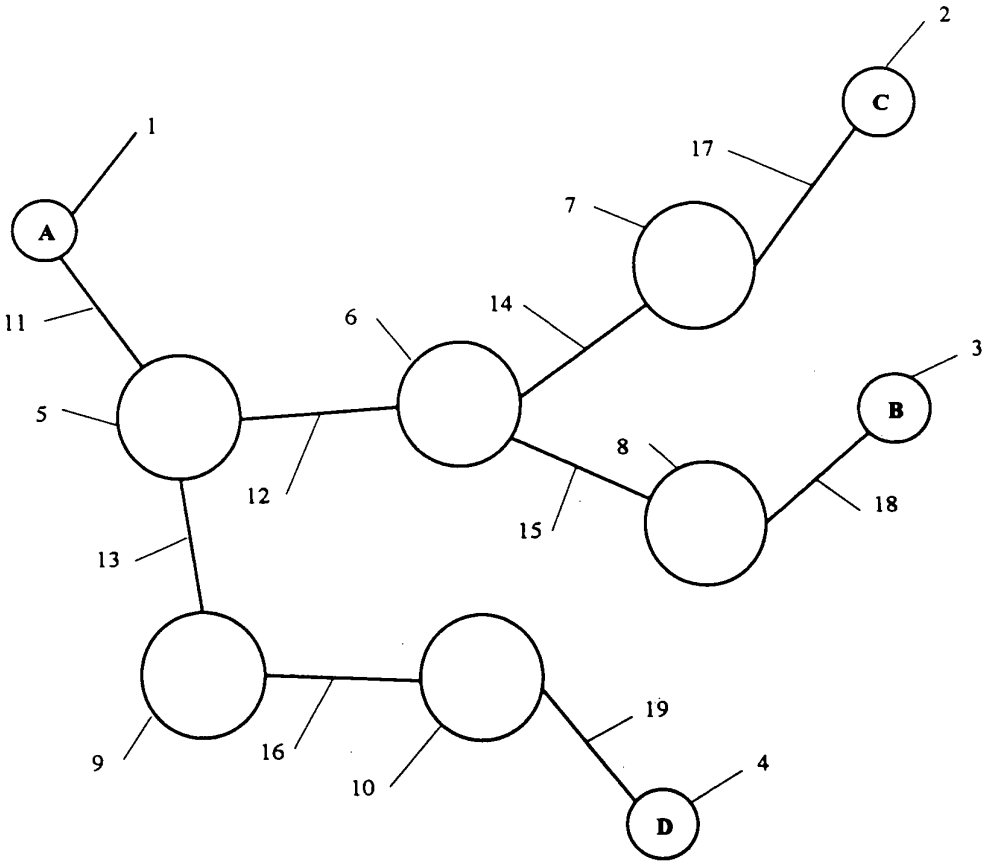

Figure 1
Prior Art - Unicast Network

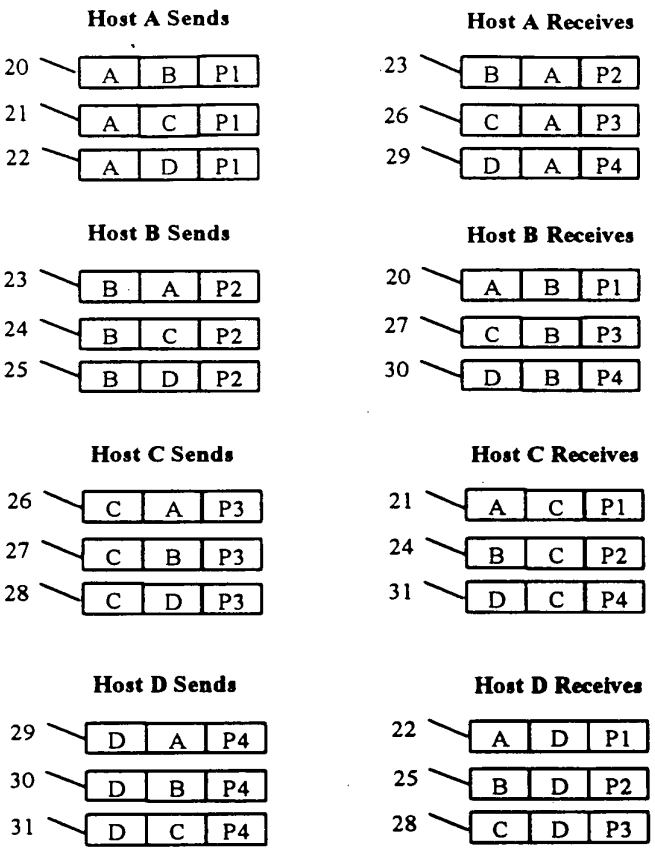

Figure 2
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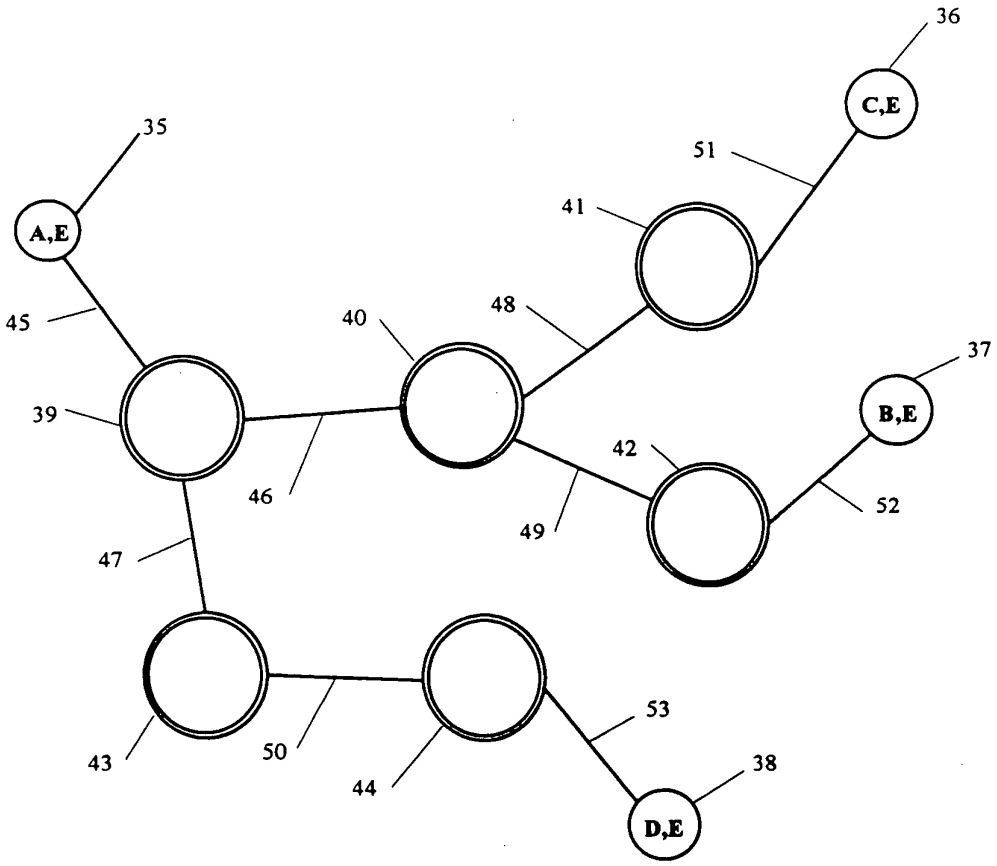


Figure 3
Prior Art - Multicast Network

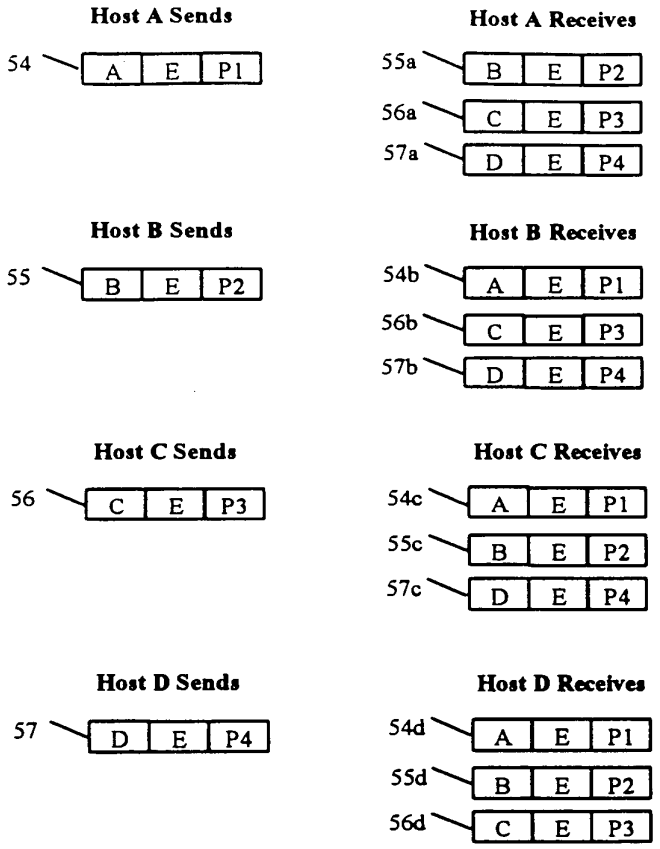


Figure 4
Prior Art - Multicast Datagrams

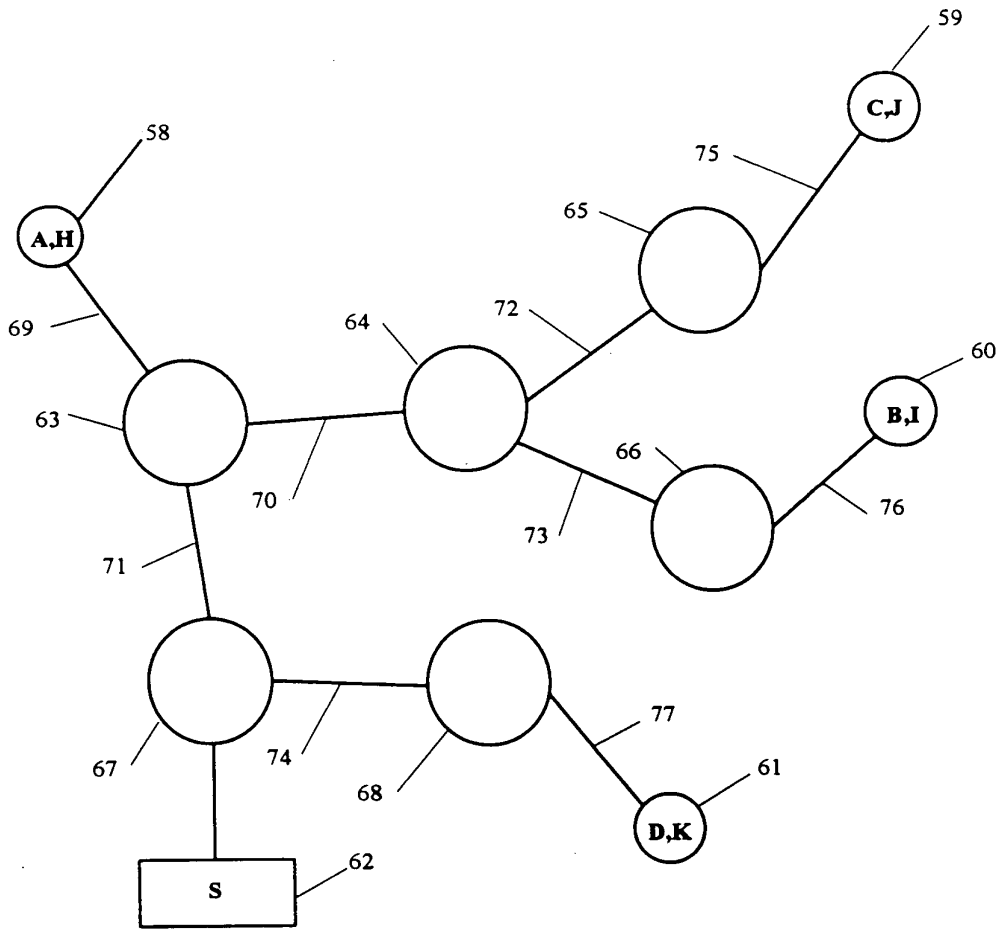


Figure 5
Present Invention - Unicast Network with Group Server

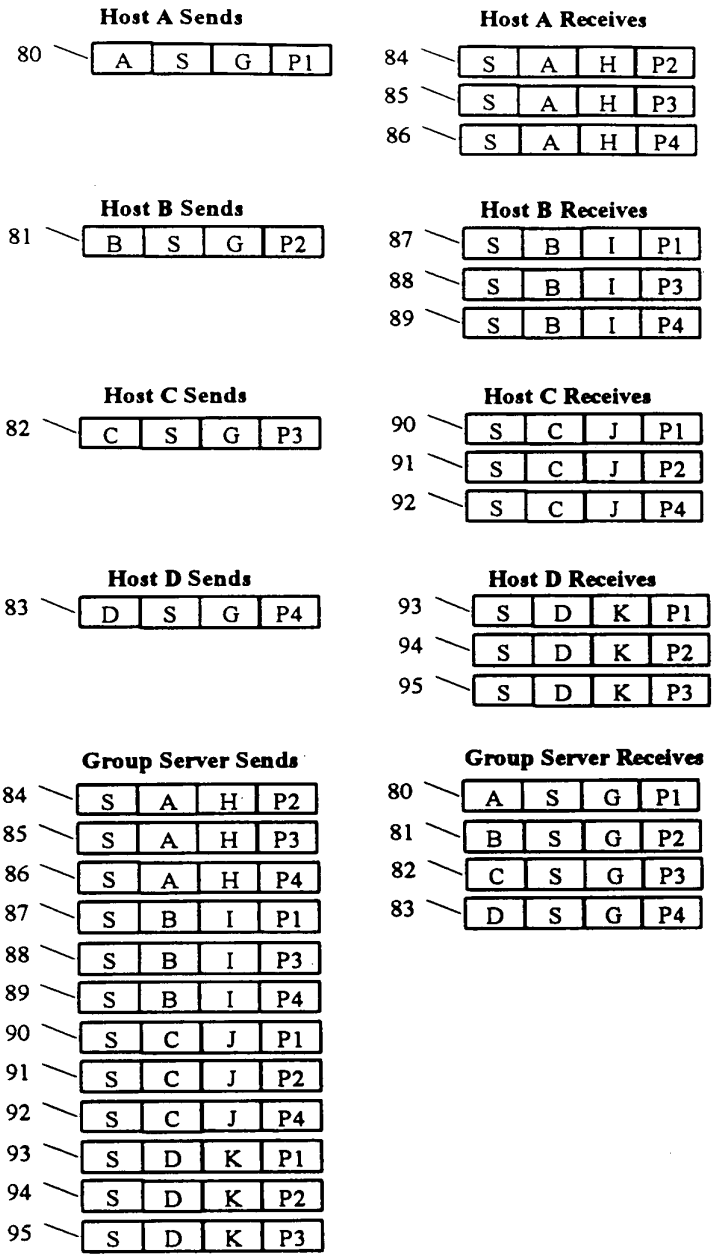


Figure 6
Present Invention - Group Datagrams without Aggregation

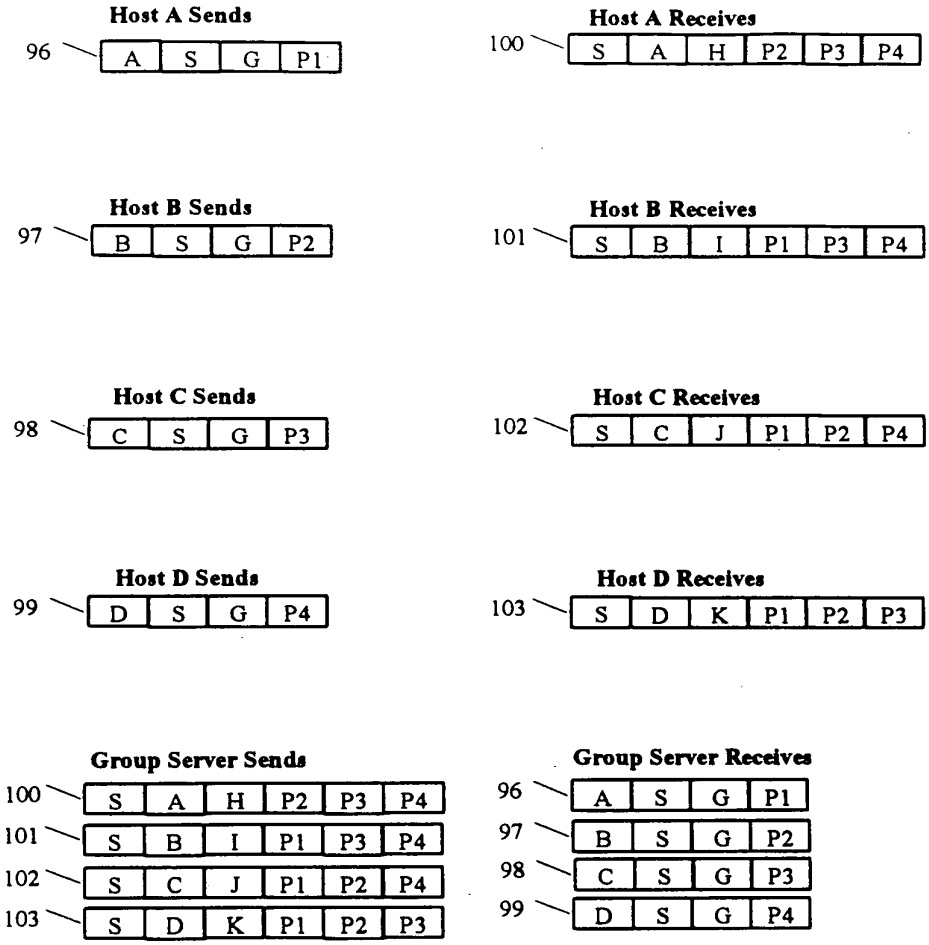


Figure 7
Present Invention - Group Datagrams with Aggregation

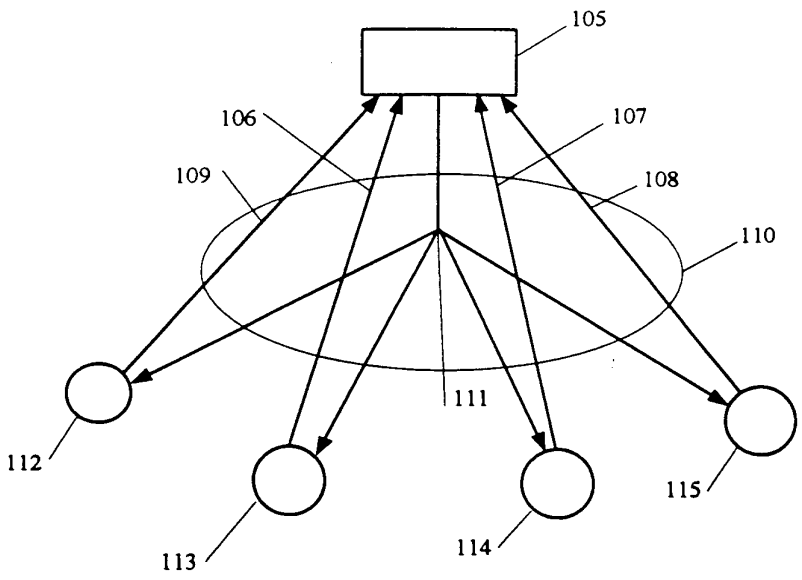
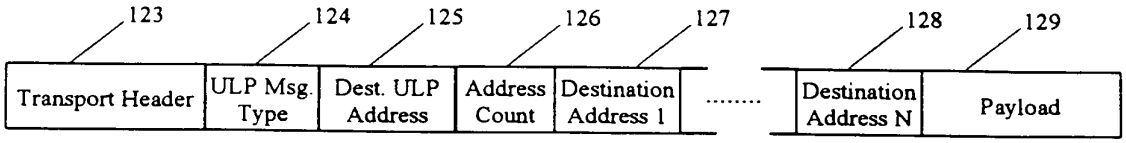
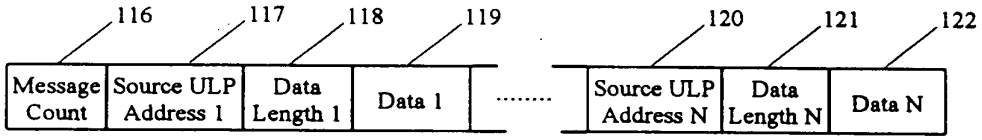


Figure 8
Prior Art - ATM Network with Multicast Server





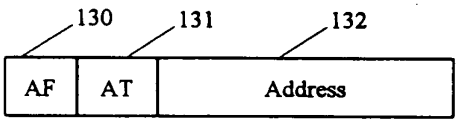


Figure 9
Invention - ULP Message and Address Formats

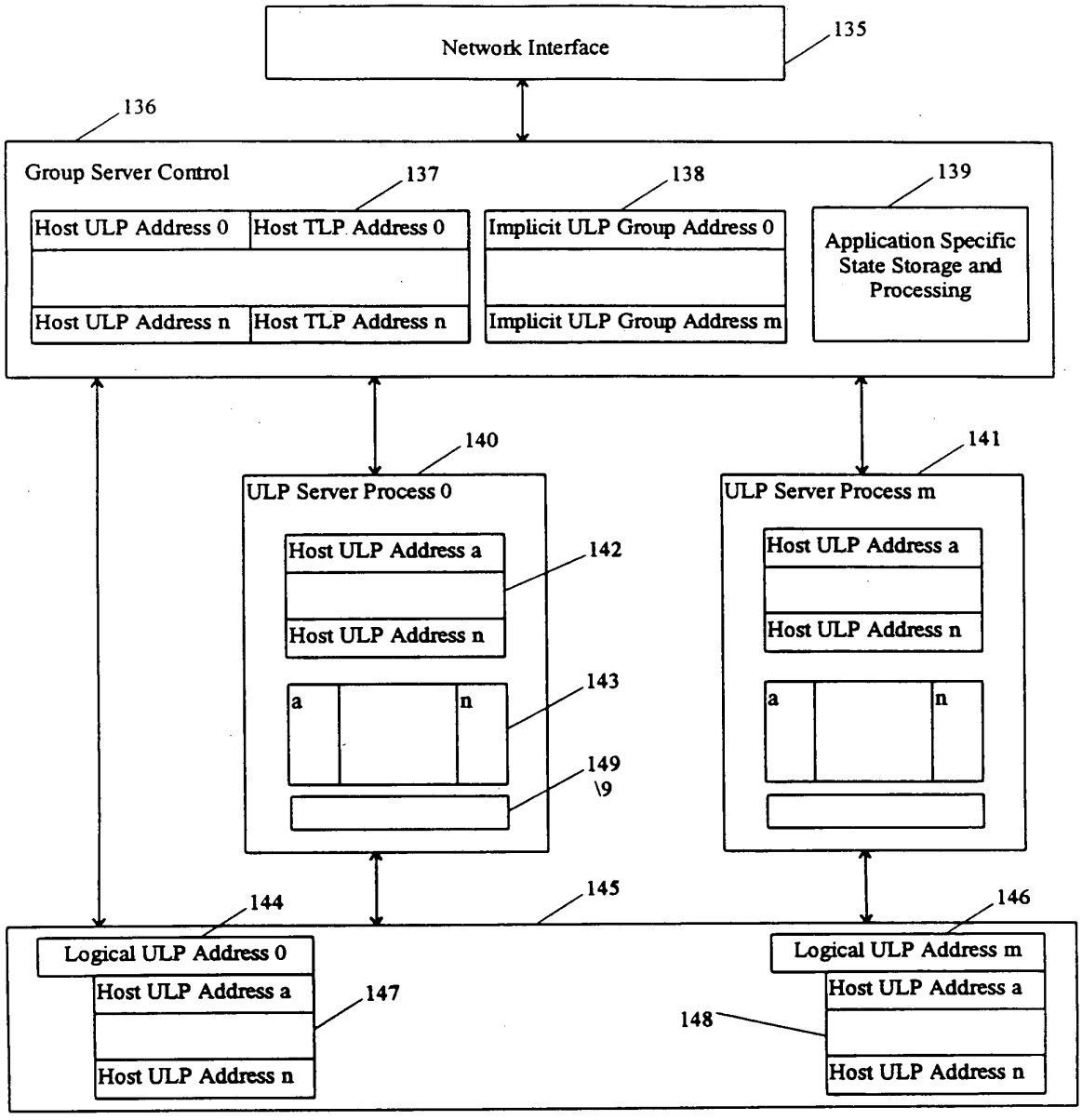


Figure 10
Invention - Group Server Internal Functions

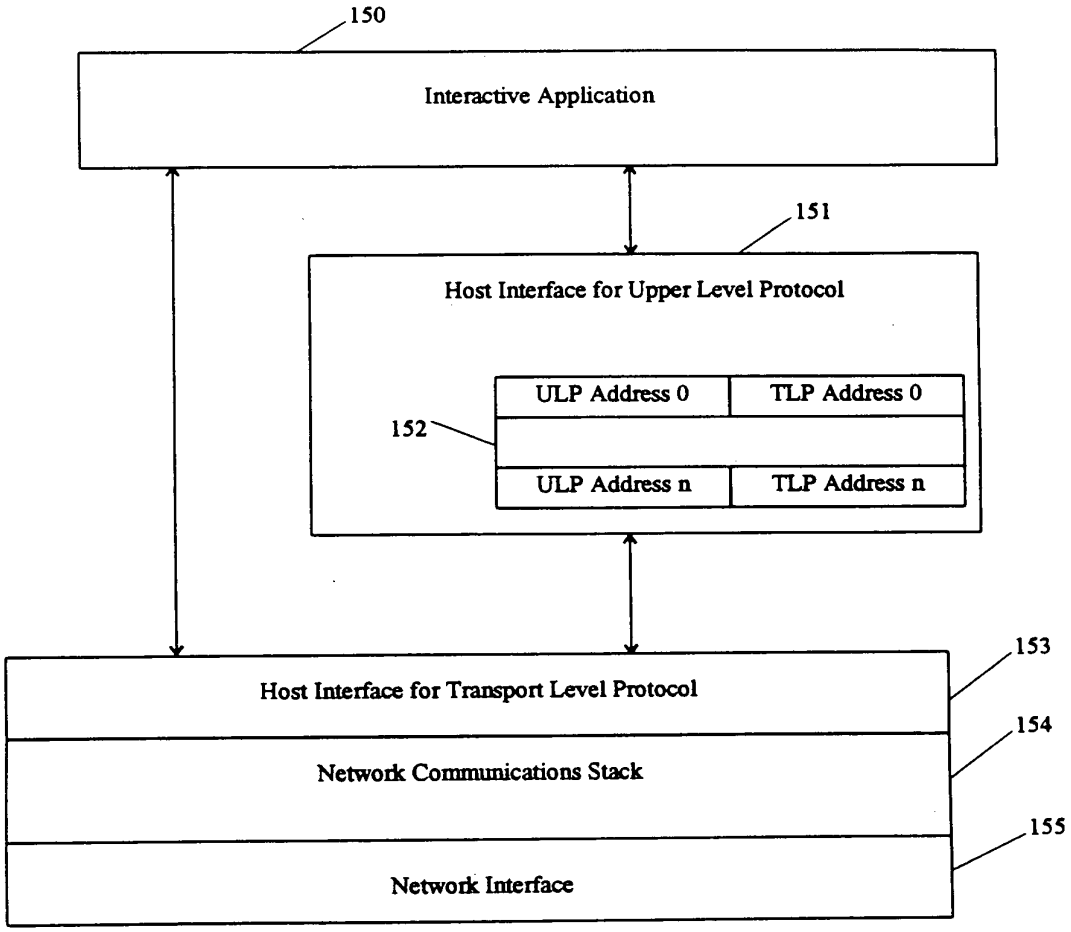


Figure 11
Invention - Host Interface for Upper Level Protocol

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Date of Deposit February 1, 1996. I hereby certify that this paper or fee is being deposited with the United States Postal Services "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231

Donna L. Hengst
Donna L. Hengst

PATENT
Attorney Docket No. 16326-701

SERVER-GROUP MESSAGING SYSTEM FOR INTERACTIVE APPLICATIONS

Inventors: Daniel Joseph Samuel
Marc Peter Kwiatkowski
Jeffrey Jackiel Rothschild

FIELD OF THE INVENTION

The present invention relates to computer network systems, and particularly to server group messaging systems and methods for reducing message rate and latency.

Background of the Invention

There are a wide range of interactive applications implemented on computer systems today. All are characterized by dynamic response to the user. The user provides input to the computer and the application responds quickly. One popular example of interactive applications on personal computers (PCs) are games. In this case, rapid response to the user may mean redrawing the screen with a new picture in between 30ms and 100ms. Interactive applications such as games control the speed of their interaction with the user through an internal time base. The application uses this time base to derive rates at which the user input is sampled, the screen is redrawn and sound is played.

As computers have become more powerful and common, it has become important to connect them together in networks. A network is comprised of nodes and links. The nodes are connected in such a way that there exists a path from each node over the links and through the other nodes to each of the other nodes in the network. Each node may be connected to the network with one or more links. Nodes are further categorized into hosts, gateways and routers. Hosts are computer systems that are connected to the network by one link. They communicate with the other nodes on the network by sending messages and receiving messages. Gateways are computer systems connected to the network by more than one link. They not only communicate with the other nodes as do hosts, but they also forward messages on one of their network links to other nodes on their other network links. This processing of forwarding messages is called routing. In addition to sending and receiving messages and their routing functions, gateways may perform other functions in a network. Routers are nodes that are connected to the network by more than one link and whose sole function is the forwarding of messages on one network link to the other network links to which it is connected. A network consisting of many network links can be thought of as a network of sub-networks with gateways and/or routers connecting the sub-networks together into what is called an internet. Today the widely known example of a world wide internet is the so called "Internet" which in 1995 has over 10 million computers connected full time world-wide.

With so many computers on a single world-wide network, it is desirable to create interactive networked applications that bring together many people in a shared, networked, interactive application. Unfortunately, creating such

shared, networked, interactive applications runs into the limitations of the existing network technology.

As an example, consider a game designed to be deployed over a network which is to be played by multiple players simultaneously. The game could be implemented in software on a PC connected to a network. A rate set by its internal time base, it would sample the inputs of the local user, receive messages from the network from the PCs of the other players and send messages out to the PCs of the other players. A typical rate will be ten times per second for a time period of 100ms. The messages sent between the PCs would contain information that was needed to keep the game consistent between all of the PCs. In a game that created the illusion of a spatial environment where each player could move, the packets could contain information about the new positions of the players as they moved. Today there are many commercial examples of PC games that can be played between multiple players on Local Area Networks (LANs) or by two players over dial-up phone lines using modems. The network messages sent by such games contain a wide variety of information specific to the game. This can include position and velocity information of the objects in the game along with special actions taken by a player that effect the other players in the game.

The case of a two player game played over a modem is particularly simple. If the message rate is 10 messages per second, each PC sends 10 messages per second to the other PC and receives 10 messages per second. The delay introduced by the modems and phone line is small and will not be noticed in most games. Unfortunately, the case of two players is uninteresting for networked interactive applications. With the same game played with 8 players on a LAN, the message rate increases. Each PC must send 7 messages, one to

each of the other 7 players every time period and will receive 7 messages from the other players in the same time period. If the messaging time period is 100ms, the total message rate will be 70 messages sent per second and 70 messages received per second. As can be seen the message rate increases linearly with the number of players in the game. The message rates and data rates supported by popular LANs are high enough to support a large number of players at reasonable message sizes. Unfortunately, LANs are only deployed in commercial applications and cannot be considered for deploying a networked interactive application to consumer users.

The wide area networks available today to consumer users all must be accessed through dial-up phone lines using modems. While modem speeds have increased rapidly, they have now reached a bit rate of 28.8 Kbits/sec which is close to the limit set by the signal-to-noise ratio of conventional phone lines. Further speed increases are possible with ISDN, but this technology is not ready for mass market use. Other new wide area networking technologies are being discussed that would provide much higher bandwidth, but none are close to commercial operation. Therefore, in deploying a networked, interactive application to consumers, it is necessary to do so in a way that operates with existing networking and communications infrastructures.

In the example of the 8 player networked game, consider a wide area network implementation where the PCs of each of the players is connected to the network with a 28.8 Kbit/sec modem. Assume that the network used in this example is the Internet so that all of the network protocols and routing behavior is well defined and understood. If the game uses TCP/IP to send its messages between the PCs in the game, the ~~PPP~~ Point-to-Point Protocol (PPP) protocol over the dial-up phone lines can be advantageously used to compress the TCP/IP headers.

Even so, a typical message will be approximately 25 bytes in size. Sent through the modem, this is 250 bits. The messages are sent 10 times per second to each of the other PCs in the game and received 10 times per second from the other PCs. This is 35.0 Kbits/sec which exceeds the capabilities of the modem by 20%. If the messages are reduced to 20 bytes, just 8 players can be supported, but this approach clearly cannot support networked interactive applications with large numbers of participants. There are other problems beyond just the bandwidth of the network connection. There is the loading on each PC caused by the high packet rates and there is the latency introduced by the time needed to send all of the outbound packets. Each packet sent or received by a PC will require some amount of processing time. As the packet rate increases with the number of players in the game, less and less of the processor will be available for running the game software itself. Latency is important in an interactive application because it defines the responsiveness of the system. When a player provides a new input on their system, it is desirable for that input to immediately affect the game on all of the other players systems. This is particularly important in any game where the game outcome depends on players shooting at targets that are moved by the actions of the other players. Latency in this case will be the time from when a player acts to move a target to the time that the target has moved on the screens of the other players in the game. A major portion of this latency will come from the time needed to send the messages to the other seven players in the game. In this example the time to send the messages to the other 7 players will be approximately 50 ms. While the first player of the seven will receive the message quickly, it will not be until 50 ms have passed that the last player of the seven will have received the message.

Internet Protocol Multicasting

As mentioned before, the Internet is a widely known example of a wide area network. The Internet is based on a protocol appropriately called the Internet Protocol (IP). In the OSI reference model for layers of network protocols, IP corresponds to a layer 3 or Network layer protocol. It provides services for transmission and routing of packets between two nodes in an internet. The addressing model provides a 32 bit address for all nodes in the network and all packets carry source and destination addresses. IP also defines the routing of packets between network links in an inter-network. Gateways and routers maintain tables that are used to lookup routing information based on the destination addresses of the packets they receive. The routing information tells the gateway/router whether the destination of the packet is directly reachable on a local network link connected to the gateway/router or if not, the address of another gateway/router on one of the local network links to which the packet should be forwarded. On top of IP are the layer 4 transport protocols TCP and UDP. UDP provides datagram delivery services to applications that does not guarantee reliable or in-order delivery of the datagrams. TCP is a connection oriented service to applications that does provide reliable delivery of a data stream. It handles division of the stream into packets and ensures reliable, in-order delivery. See the Internet Society RFCs: RFC-791 "Internet Protocol", RFC-793 "Transmission Control Protocol" and RFC-1180 "A TCP/IP Tutorial". IP, TCP and UDP are unicast protocols: packets, streams or datagrams are transmitted from a source to a single destination.

As an example, consider Figures 1 and 2. Figure 1 shows a conventional unicast network with hosts 1, 2, 3 and 4 and network links 11, 12, 13, 14,

15,16,17, 18 and 19 and routers 5, 6, 7, 8, 9 and 10. In this example, each host wants to send a data payload to each of the other hosts. Host 1 has network address A, host 2 has network address C, host 3 has network address B and host 4 has network address D. Existing network protocols are typically based on packet formats that contain a source address, destination address and a payload. This is representative of commonly used wide area network protocols such as IP. There are other components in an actual IP packet, but for sake of this example, only these items will be considered. Figure 2 shows the example packets that are sent by the hosts to one another using a conventional unicast network protocol such as IP. Host 1 send packets 20, to host 3, packet 21 to host 2 and packet 22 to host 4. Host 1 wants to send the same data P1 to each of the other three hosts, therefore the payload in all three packets is the same. Packet 20 travels over network links 11, 12, 15 and 18 and through routers 5, 6, and 8 to reach host 3. In a similar fashion host 3 sends packets 23 to host 1, packet 24 to host 2 and packet 25 to host 4. Host 2 and host 4 send packets 26, 27, 28 and 29, 30, 31 respectively to the other three hosts. All of these packets are carried by the unicast network individually from the source host to the destination host. So in this example each host must send three packets and receive three packets in order for each host to send its payload to the other three hosts.

As can be seen, each host must send a packet to every other host that it wishes to communicate with in an interactive application. Further, it receives a packet from every other host that wishes to communicate with it. In an interactive application, this will happen at a regular and high rate. All of the hosts that wish to communicate with one another will need to send packets to each other eight to ten times per second. With four hosts communicating with

one another as in this example, each host will send three messages and receive three messages eight to ten times per second. As the number of hosts in the application that need to communicate with one another grows, the message rate will reach a rate that cannot be supported by conventional dial-up lines. This makes unicast transport protocols unsuitable for delivering interactive applications for multiple participants since their use will result in the problem of high packet rates that grow with the number of participants.

Work has been done to attempt to extend the IP protocol to support multicasting. See RFC-1112 "Host Extensions for IP Multicasting.". This document describes a set of extensions to the IP protocol that enable IP multicasting. IP multicasting supports the transmission of a IP datagram to a host group by addressing the datagram to a single destination address. Multicast addresses are a subset of the IP address space and identified by class D IP addresses - these are IP addresses with "1110" in the high order 4 bits. The host group contains zero or more IP hosts and the IP multicasting protocol transmits a multicast datagram to all members of the group to which it is addressed. Hosts may join and leave groups dynamically and the routing of multicast datagrams is supported by multicast routers and gateways. It is proper to describe this general approach to multicast messaging as "distributed multicast messaging". It is a distributed technique because the job of message delivery and duplication is distributed throughout the network to all of the multicast routers. For distributed multicast messaging to work in a wide area network, all of the routers handling datagrams for multicast hosts must support the routing of multicast datagrams. Such multicast routers must be aware of the multicast group membership of all of the hosts locally connected to the

router in order to deliver multicast datagrams to local hosts. Multicast routers must also be able to forward multicast packets to routers on their local network links. Multicast routers must also decide to which if any local routers they must forward multicast datagrams. When a multicast datagram is received, by a multicast router, its group address is compared to a list for each local multicast router of group addresses. When there is a match, the datagram is then forwarded to that local multicast router. Therefore, the multicast routers in the network must maintain an accurate and up to date list of group addresses for which they are to forward datagrams to. These lists are updated when hosts join or leave multicast groups. Hosts do this by sending messages using Internet Group Management Protocol (IGMP) to their immediately-neighboring multicast routers. A further attribute of distributed multicast messaging is that the routers must propagate the group membership information for a particular group throughout the network to all of the other routers that will be forwarding traffic for that group. RFC-1112 does not describe how this is to be done. Many different approaches have been defined for solving this problem that will be mentioned later in descriptions of related prior art. Despite their differences, all of these approaches are methods for propagation of multicast routing information between the multicast routers and techniques for routing the multicast datagrams in an inter-network supporting distributed multicast messaging.

The distributed multicast messaging approach has a number of undesirable side effects. The process of propagation of group membership information to all of the relevant routers is not instantaneous. In a large complex network it can even take quite a period of time depending on the number of routers that must receive that updated group membership information and how many

routers the information for the group membership update must past through. This process can easily take many seconds and even minutes depending on the specifics of the algorithm that is used. RFC-1112 mentions this problem and some of the side effects that must be handled by an implementation of a practical routing algorithm for multicast messaging. One problem results when groups are dynamically created and destroyed. Since there is no central authority in the network for assigning group addresses, it is easily possible in a distributed network for there to be duplication of group address assignment. This will result in incorrect datagram delivery, where hosts will receive unwanted datagrams from the duplicate group. This requires a method at each host to filter out the unwanted datagrams. Another set of problems result from the time delay from when a group is created, destroyed or its membership changed to when all of the routers needed to route the datagrams to the member hosts have been informed of these changes. Imagine the case where Host N joins an existing group by sending a join message to its local router. The group already contains Host M which is a number of router hops away from Host N in the network. Shortly after Host N has sent it join message, Host M sends a datagram to the group, but the local router of Host M has not yet been informed of the change in group membership and as a result the datagram is not forwarded to one of the particular network links connected to the local router of Host M that is the only path in the network from that router that ultimately will reach Host N. The result is that Host N will receive no datagrams addressed to the group from Host M until the local router of M has its group membership information updated. Other related problems can also occur. When a host leaves a group, messages addressed to the group will continue for some time to be routed to that host up to the local router of that

host. The local router will know at least not to route the datagram onto the local network of that host. This can still result in a great deal of unnecessary datagrams being carried in a large network when there are many active message groups with rapidly changing memberships.

Finally, distributed multicast messaging does not sufficiently reduce the message rate between the hosts. With distributed multicast messaging, each host need only send one message addressed to the message group in order to send a message to all of other hosts in the group. This is an improvement over conventional unicast messaging where one message would need to be sent to each of the other hosts in a group. However, distributed multicast messaging does nothing to reduce the received message rate at each of the hosts when multiple hosts in a group are sending messages to the group closely spaced in time. Let us return to the example of a group of ten hosts sending messages seven times per-second to the group. With conventional unicast messaging, each host will need to send 9 messages to the other hosts, seven times per-second and will receive 9 messages, seven times per-second. With distributed multicast messaging, each host will need to send only one message to the group containing all of the hosts seven times per-second, but will still receive 9 messages, seven times per-second. It is desirable to further reduce the number of received messages.

An example of distributed multicasting is shown in Figures 3 and 4. Figure 3 shows a network with multicast routers 39, 40, 41, 42, 43 and 44 and hosts 35, 36, 37, 38 and network links 45, 46, 47, 48, 49, 50, 51, 52 and 53. The four hosts have unicast network addresses **A, B, C, D** and are also all members of a message group with address **E.** In advance the message group was created and each of the hosts joined the message group so that each of the multicast

routers is aware of the message group and has the proper routing information. A network protocol such IP with multicast extensions is assumed to be used in this example. Host 35 sends packet 54 with source address A and destination multicast address E to the entire message group. In the same manner host 37 sends packet 55 to the group, host 36 sends packet 56 to the group and host 38 sends packet 57 to the group. As the packets are handled by the multicast routers they are replicated as necessary in order to deliver them to all the members of the group. Let us consider how a packets sent by host 35 is ultimately delivered to the other hosts. Packet 54 is carried over network link 45 to multicast router 39. The router determines from its routing tables that the multicast packet should be sent onto network links 46 and 47 and duplicates the packet and sends to both of these network links. The packet is received by multicast routers 40 and 43. Multicast router 43 sends the packet onto network link 50 and router 40 sends its onto links 48 and 49. The packet is then received at multicast routers 44, 42 and 41. Router 41 sends the packet over network link 51 where it is received by host 36. Router 42 sends the packet over network link 52 to host 37 and router 44 sends the packet over link 53 to host 38. A similar process is followed for each of the other packets sent by the hosts to the multicast group E. The final packets received by each host are shown in Figure 4.

While distributed multicasting does reduce the number of messages that need to be sent by the hosts in a networked interactive application, it has no effect on the number of messages that they receive. It has the further disadvantages of poor behavior when group membership is rapidly changing and requires a special network infrastructure of multicast routers. It also has no support for message aggregation and cannot do so since message delivery is

distributed. Distributed multicasting also has no support for messages that define logical operations between message groups and unicast host addresses.

All of these problems can be understood when placed in context of the design goals for distributed multicast messaging. Distributed multicast messaging was not designed for interactive applications where groups are rapidly created, changed and destroyed. Instead it was optimized for applications where the groups are created, changed and destroyed over relatively long time spans perhaps measured in many minutes or even hours. An example would be a video conference where all the participants agreed to connect the conference at a particular time for a conference that might last for an hour. Another would be the transmission of an audio or video program from one host to many receiving hosts, perhaps measured in the thousands or even millions. The multicast group would exist for the duration of the audio/video program. Host members would join and leave dynamically, but in this application it would be acceptable for there to be a significant time lag from joining or leaving before the connection was established or broken.

While IP and multicast extensions to IP are based on the routing of packets, another form of wide area networking technology called Asynchronous Transfer Mode (ATM) is based on switching fixed sized cells through switches. Unlike IP which supports both datagram and connection oriented services, ATM is fundamentally connection oriented. An ATM network consists of ATM switches interconnected by point-to-point links. The host systems are connected to the leaves of the network. Before any communication can occur between the hosts through the network, a virtual circuit must be setup across the network. Two forms of communication can be supported by an ATM network. Bi-directional point-to-point between two hosts and point-to-

multipoint in one direction from one host to multiple hosts. ATM, however, does not directly support any form of multicasting. There are a number of proposals for layering multicasting on top of ATM. One approach is called a multicast server, shown in Figure 8. Host systems 112, 113, 114, 115 setup point-to-point connections 106, 107,108 and 109 to a multicast server 105. ATM cells are sent by the hosts to the multicast server via these links. The multicast server sets up a point-to-multipoint connection 111 to the hosts which collectively constitute a message group. Cells sent to the server which are addressed to the group are forwarded to the point-to-multipoint link 111. The ATM network 110 is responsible for the transport and switching for maintaining all of the connections between the hosts and the server. The cells carried by the point-to-multipoint connection are duplicated when necessary by the ATM switches at the branching points in the network tree between and forwarded down the branching network links. Therefore, the network is responsible for the replication of the cells and their payloads, not the server. This method has the same problems as distributed multicasting when used for an interactive application. Each host still receives individual cells from each of the other hosts, so there is no aggregation of the payloads of the cells targeted at a single host. There is no support for addressing cells to hosts based on logical operations on the sets of members of host groups.

Related Prior Art

There are a number of existing patents and European patent applications that are related to the area of the invention. These can be organized into two separate categories: multicast routing/distribution and source to destination multicast streams.

Multicast routing and distribution

These patents are US 4,740,954 by Cotton et al, US 4,864,559 by Perlman, US 5,361,256 by Doeringer et al, US 5,079,767 by Perlman and US 5,309,433 by Cidon et al. Collectively these patents cover various algorithms for the routing and distribution of the datagrams in distributed multicast networks. None deal with the problems described previously for this class of multicast routing and message distribution such as poor behaviors when the message groups change rapidly. In all of these patents, messages are transmitted from a host via a distributed network of routers to a plurality of destination hosts which are members of a group. Since these patents deal only with variants of distributed multicasting they provide no means to reduce the received message rate, no method to aggregate messages and provide no method in the messages to perform logical operation on message groups.

Source to destination multicast streams

These are PCTs and a European patent application. They are EP 0 637 149 A2 by Perlman et al, PCT/US94/11282 by Danneels et al and PCT/US94/11278 by Sivakumar et al. These three patent applications deal with the transmission of data streams from a source to a group of destinations. In none of these patent applications, is a method described for transmitting data between multiple members of a group. In all of these applications, the data transmission is from a source to a plurality of designations. Since these patent applications deal only with point-to-multipoint messaging, they can provide no means to reduce the received message rate, no method to aggregate messages and provide no method in the messages to perform logical operation on message groups.

SUMMARY OF THE INVENTION

The present invention relates to facilitating efficient communications between multiple host computers over a conventional wide area communications network to implement an interactive application such as a computer game between multiple players. In such an application, the hosts will be dynamically sending to each other information that the other hosts need in order to keep the interactive application operating consistently on each of the hosts. The invention is comprised of a group messaging server connected to the network that maintains a set of message groups used by the hosts to communicate information between themselves. The invention further comprises a server-group messaging protocol used by the hosts and the server. The server-group messaging protocol is layered on top of the Transport Level Protocol (TLP) of the network and is called the Upper Level Protocol (or ULP). In the OSI reference model the ULP can be thought of as a session layer protocol built on top of a transport or applications layer protocol. The ULP protocol uses a server-group address space that is separate from the address space of the TLP. Hosts send messages to addresses in the ULP address space to a group messaging server using the underlying unicast transport protocol of the network. The ULP address space is segmented into unicast addresses, implicit group messaging addresses and logical group messaging addresses. The implicit and logical group messaging addresses are collectively called group messaging addresses.

Host systems must first establish connections to a group messaging server before sending messages to any ULP addresses. The process of establishing this connection is done by sending TLP messages to the server. The server establishes the connection by assigning a unicast ULP address to the host and

returning this address in an acknowledgment message to the host. Once connected, hosts can inquire about existing message groups, join existing message groups, create new message groups, leave message groups they have joined and send messages to ULP addresses known by the server. Each message group is assigned either an implicit or logical ULP address depending on its type.

Figure 5 shows an example of a wide area network with a group messaging server ("GMS"). Hosts 58 has TLP address **A** and ULP address **H**, host 59 has TLP address **C** and ULP address **J**, host 60 has TLP address **B** and ULP address **I** and host 61 has TLP address **D** and ULP address **K**. The network is a conventional unicast network of network links 69, 70, 71, 72, 73, 74, 75, 76, and 77 and unicast routers 63, 64, 65, 66, 67, and 68. The group messaging server 62 receives messages from the hosts addressed to a message group and sends the contents of the messages to the members of the message group. Figure 6 shows an example of datagrams sent from the hosts to a message group that they are members of. As before, a TLP such as IP (where the message header contain the source and destination TLP addresses) is assumed to be used here. Host 58 sends message 80 which contains the TLP source address **A** of the host and the destination TLP address **S** for the GMS 62. The destination ULP address **G** is an implicit ULP address handled by the GMS and the payload P1 contains both the data to be sent and the source ULP address **H** of the host. It is assumed that prior to sending their ULP messages to the GMS, that each host as already established a connection to the GMS and joined the message group **G**. Host 60 sends message 81 with payload P2 containing data and source ULP address **I**. Hosts 59 sends message 82 with payload P3 containing data and source ULP address **J**. Host 61 sends message

83 with payload P4 containing data and source ULP address **K**. The GMS receives all of these messages and sees that each message is addressed to implicit message group **G** with members **H**, **I**, **J**, and **K**. The GMS can either process the message with or without aggregating their payloads. Figure 6 shows the case where there is no aggregation and Figure 7 shows the case with aggregation.

Without aggregation, the GMS generates the outbound messages 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, and 95 which it sends to the hosts. The datagrams have TLP headers with the source and destination TLP addresses of the GMS and the hosts respectively. The next field in the datagrams is the destination ULP of the datagram. Datagrams 84, 85, and sent to host 58 with TLP address **A** and ULP address **H**. Datagrams 87, 88, and 89 are sent to host 60 with TLP address **B** and ULP address **I**. Datagrams 90, 91 and 92 are sent to host 59 with TLP address **C** and ULP address **J**. Datagrams 93, 94 and 95 are sent to host 61 with TLP address **D** and ULP address **K** respectively. As can be seen from the payloads that each host has received, each host has received the payloads from the other three hosts. Note that each host has not received a copy of its own original message. This is because the GMS has performed echo suppression. This is selectable attribute of the GMS since in some applications it is useful for the hosts to receive and echo of each message that they send to a group that they are also members of. In the example of Figure 6, it has been shown how the present invention can achieve the same message delivery as distributed multicasting without its disadvantages. Without aggregation, the present invention enables a host to send a single message to multiple other hosts that are members of a message group. It reduces the message traffic that a host must process in an interactive

application by reducing the number of messages that each host must send to the others. Without aggregation, however, there is no reduction in the number of messages received by the hosts. Without aggregation we can achieve the same message rate as distributed multicasting without the need for a network with multicast routers, we can use a conventional unicast network such as the Internet. The present invention also avoids the problems that dynamic group membership causes for distributed multicasting. Group membership can be changed very rapidly. Groups can be created, joined and left by single unicast messages from hosts to the GMS. These messages will be point-to-point messages and will not have to propagate in throughout the network nor have to cause routing table changes in the routers. This ability to rapidly and accurately change group membership is critical to the implementation of networked interactive applications. Consider a computer game for multiple players that supports hundreds of players that are spread throughout a three dimensional space created by the game. At any time only a few players will be able to see and effect one another in the game since other players will be in other areas that are out of sight. Using conventional phone lines to carry the data from each players computer to the network, it will not be possible to send all actions of each player to all of the other players, but because only a few players will be in close proximity at any one time, it will not be necessary to do so. It is only necessary to send data between the players that are in close proximity to one another. These "groups" of players naturally map onto the message groups of the invention. As players move about the three dimensional space of the game, the game will cause them to join and leave message groups as necessary. If this does not happen rapidly it will limit the interactivity of the game or cause inconsistent results for the different players in the game.

The invention also allows aggregating message payloads of multiple messages destined to a single host into a single larger message. This can be done because of the GMS where all of the messages are received prior to being sent to the hosts. Figure 7 shows an example of how this works. The hosts send their messages to the GMS in exactly the same fashion as in Figure 6 using the same addresses previously defined in Figure 5. Host 58 sends message 96, host 60 sends message 97, host 59 sends message 98 and host 61 sends message 99. The GMS receives all of these messages and creates four outbound messages 100, 101, 102 and 103. The process by which these messages will be explained in detail in the detailed description of the invention. Each message is destined to a single host and contains an aggregated payload with multiple payload items. Message 100 has a destination ULP address **H** for host 58 and aggregated payload P2, P3 and P4 from the messages from hosts 59, 60 and 61. Message 101 is targeted at host 60, message 102 is targeted at host 59 and message 103 is targeted at host 61. As can be seen, each host sends one message and receives one message. The received message is longer and contains multiple payloads, but this is a significant improvement over receiving multiple messages with the wasted overhead of multiple message headers and message processing time. Overall the invention has dramatically reduced the amount of data that must be sent and received by each host. Since the bit rate over conventional phone lines using a modem is low, a reduction in the amount of data that must be sent and received directly translates into improved time and latency for message communications between the hosts.

Hosts create, join and leave message groups using control messages in the ULP protocol to the GMS. Hosts may also read and write application specific state information that is stored in the GMS. When hosts send messages to

other hosts, the message must be at least addressed to an implicit group address. The ULP implicit address will always be the primary address in a message from one host to another. The message may optionally specify auxiliary destination addresses. In many cases the implicit ULP address will be the only destination ULP address in the message. The GMS will handle delivery of the ULP messages addressed to the implicit message group to all of the hosts that are members of the group. A ULP send message may optionally specify an address list of auxiliary addresses in addition to the primary destination of the implicit ULP address. This auxiliary address list can contain only unicast and logical ULP addresses. The address list can also specify set operators to be performed between the sets of host ULP addresses defined by the unicast addresses and logical groups. Once the address list has been processed to yield a set of hosts, this set is intersected with the set of hosts that are members of the implicit message group specified by the primary implicit ULP address in the message. This ability to perform logical set operators on message groups is very useful in interactive applications. It allows a single ULP message to selectively deliver a message to hosts that fit a set of computed criteria without the sending host having to know the anything about the members of the groups in the address list. Recall the example of a networked game with hundreds of players in a three dimensional environment created by the game. Consider an implicit message group consisting of all of the game players in a certain area of the game where all of the players can interact with one another. Consider that the players are organized into multiple teams. Logical message groups could be created for each team within the game. To send a message to all the players within the area that were on one team, a ULP message would be sent to the ULP implicit message group for all

the players in the area with an auxiliary address of the logical message group for all the players on the selected team. The GMS would perform the proper set intersection prior to sending the resulting messages to the targeted hosts. The result of this will be that the message will only be delivered to the players on the selected team in the selected area of the game.

In summary, the present invention deals with the issues of deploying an interactive application for multiple participants on wide area networks by providing a method for reducing the overall message rate and reducing latency. This invention uses a server group messaging approach, as oppose to the above described "distributed multicast messaging" approach. The present invention overcomes the undesirable side effects of the distributed multicast messaging approach. Further, it reduces the message rate between the hosts. As pointed out in an example discussed above, with prior art distributed multicast messaging, each host will need to send only one message to the group containing all of the hosts seven times per-second, but will still receive 9 messages, seven times per-second. The present invention of server group messaging has each host sending one message, seven times per-second and receiving one message, seven times per-second.

The present invention is different from the multicast routing and distribution method disclosed in U.S. Patent Nos. 4,740,954, 4,864,559, 5,361,256, 5,079,767 and 5,309,433. Since these patents deal only with variants of distributed multicasting they provide no means to reduce the received message rate, no method to aggregate messages and provide no method in the messages to perform logical operation on message groups. This differs from the present invention where messages from multiple hosts

addressed to a message group are received by a group server which processes the contents of the messages and transmits the results to the destination hosts.

The present invention is also different from the source to destination multicast streams approach disclosed in EP 0 637 149 A2, PCT/US94/11282 and PCT/US94/11278. In all of these references, the data transmission is from a source to a plurality of designations, whereas the present invention describes data transmission from a sending host to a server host system and then from the server host to the destination hosts.

These and other features and advantages of the present invention can be understood from the following detailed description of the invention together with the accompanying drawings.

DESCRIPTION OF DRAWINGS

Figure 1 shows a conventional unicast network consisting of hosts, network links and routers.

Figure 2 shows the unicast datagrams on a conventional unicast network that would be needed to implement an interactive application between four hosts.

Figure 3 shows a prior art multicast network consisting of hosts, network links and multicast routers.

Figure 4 shows a multicast datagrams on a prior art multicast network that would be needed to implement an interactive application between four hosts.

Figure 5 shows a unicast network equipped with a group messaging server in accordance with the present invention.

Figure 6 shows the ULP datagrams without payload aggregation on a network according to the present invention that would be needed to implement an interactive application between four hosts.

Figure 7 shows the ULP datagrams with payload aggregation on a network according to the present invention that would be needed to implement an interactive application between four hosts.

Figure 8 shows a prior art ATM network with a multicast server.

Figure 9 shows the detailed datagram format and address format for ULP messages in accordance with the present invention.

Figure 10 shows the internal functions of the GMS according to the present invention.

Figure 11 shows the host software interface and functions needed to support the ULP according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The present invention provides a method for multiple host computers to efficiently communicate information to one another over a wide area network for the purposes of implementing an interactive application between multiple users. The method involves three components: a host protocol interface, a protocol and a server. The protocol is between the host protocol interface and the server and is implemented on top of the network transport protocol of a wide area network. The protocol is called the Upper Level Protocol (ULP) since it is layered above the existing network Transport Level Protocol (TLP). In the OSI reference model the protocol can be described as a Session Layer protocol on top of the Transport Layer of the network. Figure 11 shows the host protocol interface, 151, relative to the interactive application, 150, and the host interface for the Transport Level Protocol , 153. The network interface, 155, provides the physical connection for the host to the network. The network communications stack, 154, is the communications protocol stack that provides network transport services for the host and the host interface for the

Transport Level Protocol, 153, is ~~and~~ an interface between host application software and the network transport services of the network communications stack.

The interactive application can send and receive conventional network messages using the host interface to the TLP. The interactive application also can send and receive ULP messages through the host interface for the ULP. Internal to the host interface for the ULP is a table, 152, of all ULP addresses which the host can send messages to. Each entry in the table contains a pair of addresses, a ULP address and its corresponding TLP address. When the host sends a message to a ULP address, that message is encapsulated in a TLP message sent to the TLP address corresponding to that ULP address. This allows the ULP messages to be handled transparently by the transport mechanisms of the existing network. A core function of the ULP is group messaging where hosts send messages to message groups populated by multiple hosts. This allows a host to send a message to multiple hosts with one ULP message. Since the ULP is layered on top of the TLP, the group messaging functions of the ULP operate on a conventional unicast network where TLP messages can only be sent from one host to only one other host.

The group based messaging is implemented through the use of a server called a group messaging server. All ULP messages from the hosts are sent from the hosts to a group messaging server using the TLP protocol. The server processes the ULP portion of the messages and takes the necessary steps required by the ULP message. Control ULP messages are processed locally by the server and may be acknowledged to the sending host. ULP messages addressed to other hosts are processed by the group messaging server and then

re-transmitted to the proper ULP destination hosts, again using the TLP protocol to encapsulate and transport these messages.

In Figure 5, hosts 58, 59, 60 and 61 send messages to one another using the ULP over a conventional unicast network using a group messaging server 62. The network consists of conventional routers 63, 64, 65, 66, 67 and 68 connected with conventional network links 69, 70, 71, 72, 73, 74, 75, 76 and 77. Host 58 can send a message to hosts 59, 60 and 61 by sending a single ULP message to the group messaging server 62 where the ULP message specifies a destination address that is a ULP message group. The ULP message is encapsulated in a TLP message addressed to the group messaging server. This causes the message to be properly routed by router 63 to network link 71 to router 67 to the server 62. The group messaging server receives the ULP message and determines that the message is addressed to a message group containing hosts 59, 60 and 61 as members. The server sends the payload of the received message to each of the hosts in three new ULP messages individually sent to the three hosts. Since each message is encapsulated in a TLP message, the messages are properly carried over the conventional unicast network. The first ULP message is sent by the group messaging server to host 61. This message is carried by network links 71, 70, 72 and 75 and routers 67, 63, 64 and 65. The second ULP message is sent by the group messaging server to host 60. This message is carried by network links 71, 70, 73 and 76 and routers 67, 63, 64 and 66. The third ULP message is sent by the group messaging server to host 61. This message is carried by network links 74 and 77 and routers 67 and 68.

The invention can be implemented both in a datagram form and in a connection oriented form. To best understand the details of the invention, it is best to first consider a datagram implementation.

Datagram Transport Implementation

The ULP can be implemented as a datagram protocol by encapsulating addresses, message type information and the message payload within a datagram of the underlying network transport protocol. The general form of the ULP datagram message format is shown in Figure 9 as elements 123, 124, 125, 126, 127, 128 and 129. The transport header 123 is the datagram header of the TLP that is encapsulating the ULP datagram. The ULP message type field 124 indicates whether it is a send or receive message, if it is a control message or a state message. The following table shows the different message types. The ULP message type field must be present in a ULP datagram.

Message Types	
1	Send
2	Receive
3	Send Control
4	Receive Control
5	Send State
6	Receive State

Send messages are always sent from a host to a group messaging server. Messages from a group server to the hosts are always receive messages. Send Control messages are messages from hosts to a group messaging server requesting a control function be performed. Receive Control messages are acknowledgments from a group messaging server to the hosts in response to a

prior Send Control messages. The Send and Receive State messages are special cases of the Send and Receive Control messages that allow hosts to read and write application specific state storage in the group messaging server. The specific control functions supported by the ULP will be explained later.

The destination ULP address 125 is required in ULP datagrams and specifies the primary destination of the ULP message. The address count field 126 is required in ULP send message types and is not present in ULP receive message types. When the address count field in a ULP send message is non-zero, it specifies the number of auxiliary destination addresses for the send message that follow the address count field. These auxiliary destination addresses are shown as items 127 and 128, but it is understood that there are as many auxiliary ULP destination addresses as specified by the address count field. Finally there is the payload 129.

The payload format for ULP datagrams is defined by items 116, 117, 118, 119, 120, 121 and 122. Item 116 is the message count and defines how many payload elements will be contained in the payload. A single payload element consists of a triplet of source ULP address, data length and data. Items 117, 118 and 119 comprise the first payload element of the payload. Item 117 is the ULP address of the source of the payload element, item 118 is the data length for the data in the payload element and item 119 is the actual data. Items 120, 121 and 122 comprise the last payload element in the payload. ULP send messages only support payloads with a single payload element, so the message count is required to be equal to one. ULP receive messages may have payloads with one or more payload elements.

ULP Address Space

The address space of the ULP is divided into three segments: unicast host addresses, implicit group addresses and logical group addresses. All source and destination addresses in ULP must be in this address space. The ULP address space is unique to a single group messaging server. Therefore each group messaging server has a unique ULP address space. Multiple group messaging servers may be connected to the network and hosts may communicate with multiple group messaging servers without confusion since each ULP datagram contains the header of the TLP. Different group messaging servers will have unique TLP addresses which can be used by the hosts to uniquely identify multiple ULP address spaces. The format for ULP addresses is shown in Figure 9 comprised of items 130, 131 and 132. The address format field 130 is a variable length field used to allow multiple address lengths to be supported. The address type field 131 indicates the type of ULP address: unicast host, implicit group or logical group. The encoding is as follows:

Address Type Encoding	
0 0	Unicast Host Address
0 1	Unicast Host Address
1 0	Implicit Group Address
1 1	Logical Group Address

The address format encoding determines the length of the address field and therefore the total length of the ULP address. This encoding is shown below. Note that when the address type specifies a unicast host address, the low bit of the address type field is concatenated to the address field to become the most significant bit of the address. This doubles the size of the address space for

unicast host addresses which is useful since there will generally be more hosts than group messaging servers.

Address Format Encoding	
0	29 Bit Address Field
1 0	4 Bit Address Field
1 1 0	11 Bit Address Field

ULP unicast host addresses are assigned to each host when it first connects to a group messaging server. When a host sends a message to other ULP address, the unicast ULP address of the host will appear as the source ULP address in the received payload element. Unicast ULP host addresses can also be used as destination addresses only as auxiliary addresses in a ULP send message. They are not allowed to be used to as the primary ULP destination address. This means that hosts cannot send ULP directly to one another, but always must send the messages to one another through a group messaging server.

Implicit group addresses are created by a group messaging server in response to a control message to the server requesting the creation of an implicit message group. The host requesting the creation of the implicit message group becomes a member of the message group when it is created. Other hosts can send inquiry control messages to the group messaging server to learn of its existence and then send a implicit group join message in order to join the group. The group messaging server maintains a list of ULP addresses of hosts that are members of the implicit message group. Implicit ULP group addresses are the only ULP addresses allowed to be the primary destination of a ULP send message. Implicit ULP addresses will never appear as ULP source addresses in a payload element.

Logical ULP addresses are used both to address logical message groups and for specifying set operations between the group members of the auxiliary ULP addresses in a ULP send message. Logical message groups are created and joined similarly to implicit message groups, however, logical ULP addresses may only be used as auxiliary ULP addresses in a ULP send message. Logical ULP addresses will also never appear as source ULP addresses in a payload element. The support of set operations between message groups as part of a ULP send message will be explained in a later section on ULP send messages.

Group Messaging Server Internal Functions

The internal components of the group messaging server are shown in Figure 10.

In the preferred embodiment, the group messaging server is a general purpose computer system with a network interface to connect it to a wide area network. Item 135 is the network interface for the group messaging server and includes not only the hardware connection to the network but the communications protocol stack used to implement the TLP on the server.

Item 136 is an overall control function for the group messaging server. This control function is responsible for all ULP messages that are sent or received by the GMS. Internal to this control function are several important storage and processing functions. Item 137 is an address map for all hosts currently connected to the GMS. This address map is a list of the ULP host address of each host connected to GMS and its corresponding TLP address. This enables the control function to construct the necessary TLP headers for sending ULP messages to the hosts connected to the GMS. Item 138 is a list of all of the currently active implicit ULP addresses currently recognized by the

GMS. Item 139 is an application specific state storage and processing function. Many interactive applications deployed over a network will be able to be implemented solely with host based processing. In these cases all data that needs to be sent between the hosts can be transported using the ULP. However, some applications will need maintain a centrally stored and maintained repository of application state information. This is useful when hosts may join or leave the application dynamically. When hosts join such an application, they will need a place from which they can obtain a snapshot of the current state of the application in order to be consistent with the other hosts that already where part of the application. To read and write this state storage area, the ULP supports send and receive state message types. Within these messages, there is the ability to access a state address space so that different portions of the state can be individually accessed. Application specific processing of state written into this state storage area can also be implemented.

Items 140 and 141 are two of multiple ULP server processes running on the GMS. These are software processes that are at the heart of the ULP. Each implicit ULP addresses recognized by the GMS has a one-to-one correspondence to a ULP server process and to a message group maintained by the process. Since all ULP send messages must have an implicit ULP address as the primary destination address of the message, every ULP send message is sent to and processed by a ULP server process. These processes are created by the GMS control function in response to ULP control messages to create new implicit ULP addresses. They are destroyed when the last host which is a member of its message group has left the message group. Internal to a ULP server process is a list, 142, of the ULP host addresses of the members of the message group, a set of message queues 143 for each host which is a member

of the message group and a message aggregation function 149 which is used to aggregate multiple messages to a single host into a single message.

Item 145 maintains a list of all of the logical ULP addresses and message groups in the GMS. Items 144 and 146 represent two of multiple logical ULP addresses. For each logical ULP address, there is a corresponding list, 147 and 148 of the host ULP addresses of the members of the logical message group. The logical message groups are not tied to specific ULP server processes, but are global with a GMS to all of the ULP server processes.

Control Functions

The control functions consist of connect, disconnect, create group, close group, join group, leave group, query groups, query group members, query group attributes. These control functions are implemented by a ULP send and receive control messages. The control functions are initiated by a host sending a ULP send control message to a GMS. These messages only allow a primary ULP destination address in the message and do no allow auxiliary addresses. The primary ULP address is interpreted as a control address space with a unique fixed address assigned to each of the control functions enumerated above. The contents of data in the payload supplies any arguments needed by the control function. Returned values from the control function are returned in a ULP receive control message that is addressed to the host that sent the original control message for which data is being returned. The detailed operation of these control functions is described below.

Connect

This control function allows a host to connect to a GMS. The destination ULP address in the message is a fixed address that indicates the connect function. The source ULP address and any data in the payload are ignored.

Upon receiving this message, the GMS control function, 136, creates a new host address and enters the host address in the host address map 136 along with the source TLP address from the TLP header of the message. Upon successful completion, the GMS control function responds with a receive control ULP message addressed to the host along with a function code in the data portion of the payload that indicates successful host connection. The destination ULP address in the message is the ULP address assigned to the host. The host saves this and uses it for any future messages to the GMS. If there is an error, the control function returns a message to the host with a function code in the data portion of the payload indicating failed host connection.

Disconnect

This function allows a host to disconnect from a GMS. The destination ULP address in the message is a fixed address that indicates the disconnect function. The source ULP address is used to remove the host from membership in any implicit or logical groups prior to disconnecting. Any data in the payload is ignored. The GMS control function also removes the entry for the host from the host address map. Upon successful completion, the GMS control function responds with a receive control ULP message addressed to the host along with a function code in the data portion of the payload that indicates successful host disconnection. The destination ULP address in the message is the ULP address assigned to the host. If there is an error, the control function returns a message to the host with a function code in the data portion of the payload indicating failed host disconnection.

Create implicit group

This function allows a host to create a new implicit message group and associated implicit ULP address and server process. The payload in the message may contain a single payload item whose data field holds attributes of the group. These attributes can be used to define any optional functions of the group. The destination ULP address in the message is a fixed address that indicates the create implicit group function. The GMS control function allocates a new implicit ULP address, adds it to the implicit ULP address list 138 and creates a new ULP server process 140. The host that sends this message is added to the membership list of the implicit group. This is done by adding the source ULP address in the message to the group membership list 142 in the ULP server process. Upon successful completion, the GMS control function responds with a receive control ULP message addressed to the host along with a function code in the data portion of the payload that indicates successful implicit group creation. The source ULP address in the payload is the ULP address assigned to the new implicit group. If there is an error, the control function returns a message to the host with a function code in the data portion of the payload indicating failed implicit group creation.

Create logical group

This function allows a host to create a new logical message group and associated logical ULP address. The payload in the message may contain a single payload item whose data field holds attributes of the group. These attributes can be used to define any optional functions of the group The destination ULP address in the message is a fixed address that indicates the create logical group function. The GMS control function allocates a new logical ULP address and adds it to the logical ULP address list 145. The host

that sends this message is added to the membership list of the logical group. This is done by adding the source ULP address in the message to the group membership list 147 for the new logical message group 144. Upon successful completion, the GMS control function responds with a receive control ULP message addressed to the host along with a function code in the data portion of the payload that indicates successful logical group creation. The source ULP address in the payload is the ULP address assigned to the new logical group. If there is an error, the control function returns a message to the host with a function code in the data portion of the payload indicating failed implicit group creation.

Join group

This function allows a host to join an existing logical or implicit message group. The destination ULP address in the message is a fixed address that indicates the join group function. The data portion of the payload contains the ULP address of the group that is to be joined. The GMS control function looks at this address and determines if it is an implicit or logical ULP address. If it is an implicit ULP address, the GMS control function finds the ULP server process selected by the address in the message payload and adds the source ULP host address from the message to the group membership list 142. If it is a logical ULP address, the GMS control function finds the logical ULP address 144 selected by the address in the message payload and adds the source ULP host address from the message to the group membership list 147. Upon successful completion, the GMS control function responds with a receive control ULP message addressed to the host along with a function code in the data portion of the payload that indicates successful group join. The source ULP address in the payload is the ULP address of the group that was joined. If

there is an error, the control function returns a message to the host with a function code in the data portion of the payload indicating failed implicit group creation.

Leave group

This function allows a host to leave an existing logical or implicit message group that it is a member of. The destination ULP address in the message is a fixed address that indicates the leave group function. The data portion of the payload contains the ULP address of the group that is to be left. The GMS control function looks at this address and determines if it is an implicit or logical ULP address. If it is an implicit ULP address, the GMS control function finds the ULP server process selected by the address in the message payload and removes from the group membership list 142 the source ULP host address from the message. If the host is the last member of the group, the ULP server process is terminated and the implicit ULP address is de-allocated. If it is a logical ULP address, the GMS control function finds the logical ULP address 144 selected by the address in the message payload and removes from the group membership list 147 the source ULP host address from the. If the host is the last member of the group, the ULP address is de-allocated. Upon successful completion, the GMS control function responds with a receive control ULP message addressed to the host along with a function code in the data portion of the payload that indicates successful group leave. If there is an error, the control function returns a message to the host with a function code in the data portion of the payload indicating failed implicit group creation.

Query groups

This function allows a host to get a list of all implicit and logical message groups currently active on a GMS. The destination ULP address in the

message is a fixed address that indicates the query groups function. Any data portion of the payload is ignored. Upon successful completion, the GMS control function responds with a receive control ULP message addressed to the host along with a payload with multiple payload elements. The first payload element contains a function code indicating successful query groups. The source ULP address in the first payload element is ignored. Each of the subsequent payload elements contain a ULP group address in the source address field of the payload element that is one of the active group addresses on the GMS. There is no data field in these subsequent payload elements. If there is an error, the control function returns a message to the host with a function code in the data portion of a payload with a single payload element indicating failed query groups.

Query group members

This function allows a host to get a list of all hosts that are members of a message group. The destination ULP address in the message is a fixed address that indicates the query group members function. The data portion of the payload carries the address of the message group for the query. Upon successful completion, the GMS control function responds with a receive control ULP message addressed to the host along with a payload with multiple payload elements. The first payload element contains a function code indicating successful query group members. The source ULP address in the first payload element is ignored. Each of the subsequent payload elements contain a ULP host address in the source address field of the payload element that is one of the active group addresses on the GMS. There is no data field in these subsequent payload elements. If there is an error, the control function

returns a message to the host with a function code in the data portion of a payload with a single payload element indicating failed query group members.

Query group attributes

This function allows a host to get a list of the attributes of a message group. The destination ULP address in the message is a fixed address that indicates the query group attributes function. The data portion of the payload carries the address of the message group for the query. Upon successful completion, the GMS control function responds with a receive control ULP message addressed to the host along with a payload with a two payload elements. The first payload element contains a function code indicating successful query group members. The second payload element contains the attributes of the message group. If there is an error, the control function returns a message to the host with a function code in the data portion of a payload with a single payload element indicating failed query group attributes.

Send Message Operation

In order to fully understand the operations of the send message function, a number of individual cases are worth considering.

Single implicit destination

The most simple case is a send message to a single implicit ULP address. In all send message datagrams, the destination ULP address 125 must be an implicit ULP address. In this case of a single implicit destination, this is the only destination address in the datagram. The auxiliary address count 126 is zero and there are no auxiliary destination addresses 127 or 128. The payload consists of a message count 116 of one, the ULP of the host sending the message in the source ULP address 117 and the data length 118 and data 119.

Send message datagrams may only have a single payload item so their message count field 116 must always be one.

The host sends the send message onto the network with a TLP header addressing the datagram to the GMS that is the selected target of the message. The GMS receives the message and the GMS control function 136 determines that it is a send message datagram and looks up the implicit destination address in its implicit ULP address list 138. If the address does not exist, an error message is returned to the sending host with a ULP receive message datagram. If the address is valid, the GMS control function removes the TLP header from the datagram and sends the ULP portion to the ULP server process corresponding to the destination implicit ULP address. Assume for discussion that this is the ULP server process 140. The ULP server process 140 will extract the single payload item from the message 117, 118 and 119 and place the payload item in each of the message queues 143. There will be one message queue for each member of the message group served by the ULP server process 140. The members of the group will have their host ULP addresses listed in the host address list 142. Each message queue in a ULP server process will fill with payload items that are targeted at particular destination hosts. The mechanisms by which payload items are removed from the queues and sent to the hosts will be described later.

Auxiliary unicast destination

In this case in addition to an implicit destination 125, there is also a single auxiliary address 127 in the datagram. The auxiliary address count 126 is one and the auxiliary destination addresses 127 is a unicast host ULP address. The payload consists of a message count 116 of one, the ULP of the host sending

the message in the source ULP address 117 and the data length 118 and data 119.

The host sends the send message onto the network with a TLP header addressing the datagram to the GMS that is the selected target of the message. The GMS receives the message and the GMS control function 136 determines that it is a send message datagram and looks up the implicit destination address in its implicit ULP address list 138 and the unicast host ULP auxiliary address in the host address map 137. If either of addresses does not exist, an error message is returned to the sending host with a ULP receive message datagram. If the addresses are valid, the GMS control function removes the TLP header from the datagram and sends the ULP portion to the ULP server process corresponding to the destination implicit ULP address. Assume for discussion that this is the ULP server process 140. The ULP server process extracts the auxiliary ULP address from the message and determines from the address that it is a unicast host ULP address. The server process then checks to see if this address is a member of the message group defined by the host address list 142. If it is not, no further action is taken and the payload item in the message is not placed in any of the message queues 143. If the host address is in the message group, the payload item in the message is placed in the single message queue corresponding to that host. The net effect is that the ULP server process has performed a set intersection operation on the members of the message group selected by the implicit ULP destination address and defined by the group membership list 142 with the members of the set of hosts defined by the auxiliary address. The payload item is them sent only to the hosts that are members of this set intersection.

Auxiliary logical destination

In this case in addition to an implicit destination 125, there is also a single auxiliary address 127 in the datagram. The auxiliary address count 126 is one and the auxiliary destination addresses 127 is a logical ULP address. The payload consists of a message count 116 of one, the ULP of the host sending the message in the source ULP address 117 and the data length 118 and data 119.

The host sends the send message onto the network with a TLP header addressing the datagram to the GMS that is the selected target of the message. The GMS receives the message and the GMS control function 136 determines that it is a send message datagram and looks up the implicit destination address in its implicit ULP address list 138 and the logical ULP auxiliary address in list of logical ULP addresses 145. If either of addresses does not exist, an error message is returned to the sending host with a ULP receive message datagram. If the addresses are valid, the GMS control function removes the TLP header from the datagram and sends the ULP portion to the ULP server process corresponding to the destination implicit ULP address. Assume for discussion that this is the ULP server process 140. The ULP server process extracts the auxiliary ULP address from the message and determines from the address that it is a logical ULP address. Assume for this example that this logical ULP address is the logical address 144. The server process fetches the group membership list 147 corresponding to the logical address and performs a set intersection operation with the group membership list 142 of the server process. If there are no members of this set intersection, no further action is taken and the payload item in the message is not placed in any of the message queues 143. If there are members of the set intersection operation, the payload

item in the message is placed in the queues corresponding to the hosts that are members of the set intersection.

Multiple auxiliary addresses with logical operations

In its most sophisticated form, a send message can perform set operations between the implicit message group of the ULP server process and multiple logical and unicast ULP addresses. This is done by placing multiple auxiliary destination ULP addresses in the message with logical operators imbedded in the address list. The address count 126 holds a count of the total auxiliary addresses in the address list 127 and 128. The auxiliary addresses are a mix of logical ULP addresses and unicast host ULP addresses. Two logical ULP addresses in the ULP address space are assigned the role of specifying set operations to be performed between the logical message groups and unicast host addresses in the message list. They are specially assigned addresses for the functions set intersection, set union. A third logical address is used to indicate set complement. The payload consists of a message count 116 of one, the ULP of the host sending the message in the source ULP address 117 and the data length 118 and data 119.

The host sends the send message onto the network with a TLP header addressing the datagram to the GMS that is the selected target of the message. The GMS receives the message and the GMS control function 136 determines that it is a send message datagram and looks up the implicit ULP message in the implicit ULP address list 138 and all of the addresses in the address list either in the host ULP address map 137 or in the logical ULP address list 145 as appropriate. If any of addresses does not exist, an error message is returned to the sending host with a ULP receive message datagram. If the addresses are valid, the GMS control function removes the TLP header from the datagram

and sends the ULP portion to the ULP server process corresponding to the destination implicit ULP address. Assume for discussion that this is the ULP server process 140. The ULP server process extracts the auxiliary ULP address list from the message and scans it from beginning to end. The scanning and processing of the set operators is done in post-fix fashion. This means that arguments are read followed by an operator that is then applied to the arguments. The result of the operator becomes the first argument of the next operation. Therefore at the start of scanning two addresses are read from the address list. The next address will be an operator that is applied to the arguments and the result of this operator is the first argument to be used by the next operator. From then on a single address is read from the address list followed by a logical ULP address which is operator on the two arguments consisting of the new argument and the results of the last operator. The logical address used to indicate set complement is not a set operator, by an argument qualifier since it can precede any address in the address list. The meaning of the set complement argument qualifier is relative to the group membership of implicit group address in the send message. If the set complement qualifier precedes a unicast host address which is not a member of the message group selected by the implicit ULP address in the send message, the effective argument is the set of all hosts that are members of the implicit message group. If the set complement qualifier precedes a unicast host address which is a member of the message group selected by the implicit ULP address in the send message, the effective argument is the set of all hosts that are members of the implicit message group except for the original unicast host address qualified by the complement function. If the set complement qualifier precedes a logical ULP address the effective argument is the set of all hosts that are members of

the implicit message group specified by the send message except hosts that are members of the logical message group preceded by the set complement modifier. Once the entire address list has been processed to a single result set of hosts, a set intersection operation is performed on this set and the set of members of the implicit message group 142 defined by the implicit address in the send message. If there are no members of this set intersection, no further action is taken and the payload item in the message is not placed in any of the message queues 143. If there are members of the set intersection operation, the payload item in the message is placed in the queues corresponding to the hosts that are members of the set intersection.

Message Delivery and Aggregation

Once messages are entered into the message queues in the ULP server processes, there are a variety of ways that they can ultimately be delivered to the targeted hosts. In the invention, the delivery method is set on a per-ULP server process basis by attributes that are provided at the time that an implicit ULP message group and server process are created. It is important during the description of these methods to keep in mind that the invention is intended to provide an efficient means for a group of hosts to send messages to each other at a rapid rate during the implementation of a networked interactive application. Also assumed in the following description is that the GMS performs echo suppression when a host sends a message to a group that it belongs to. This means that the host will not receive a copy of its own message to the group either as a single un-aggregated message or as a payload item in an aggregated message. This is controlled by a ULP server process attribute that can be changed to stop echo suppression, but echo suppression is the default.

Immediate Delivery

The most simple delivery method is to immediately deliver the payload items to their targeted hosts as soon as they are placed in the message queues. Each payload item in a message queue will contain a ULP source address, a data length and the data to be sent. To implement immediate delivery, the ULP server process will remove a payload item from a message queue for a particular host 143. The host address for this host will be obtained from the group membership list 142. The payload item and the destination host address will be sent to the GMS control function 136 where it will be used to create a ULP receive message sent to the destination host. The GMS control function 136 will use the destination ULP host address to look up the TLP address of the host from the host address map 137. This will be used to create a TLP header for the message 123. The ULP message type 124 will be ULP receive, the destination ULP address 125 will be the destination host, the address count will be 0 and there will be no auxiliary addresses. The payload in this case will have a message count 116 of 1 and the payload item comprised of fields 117, 118, and 119 will be the payload element taken from the message queue.

Immediate delivery is useful when the message rate between a group of hosts is low. Consider four hosts that are members of an implicit message group where each member of the group sends a message to every other member of the group at a fixed rate. With immediate delivery, each host will send three messages to the other members of the group and receive three messages from the other members of the group at the fixed rate. This is acceptable is the size of the group is small and the message rate is low. However, it is obvious that total message rate is the product of the underlying message rate and the total number of members of the group minus one. Clearly

this will result in unacceptably high message rates for large groups and highly interactive message rates. A group of 20 members that had an underlying message rate of 10 messages per second would yield a total message rate at each host of 190 messages sent and 190 messages received every second. This message rate will be unsupportable over a conventional dial-up connection to a conventional wide area network such as the ~~internet~~ Internet.

Aggregation

A key concept in the present invention is the aggregation of multiple messages in a message queue into a single ULP receive message to a host that contains multiple payload items in the payload. The ULP server process 140 removes payload items from a message queue 143 for a host and accumulates them in an aggregation buffer 149. The aggregation buffer has buffer areas for each host for which there is a message queue. These individual host areas within the aggregation buffer are called host aggregation buffers. The start and end of this aggregation period can be controlled in a number of ways that will be described in the next sections. At the end of the aggregation period, the each host aggregation buffer may hold multiple payload items. The host aggregation buffer will hold a message count of the payload items followed by the multiple payload items. The contents of a host aggregation buffer along with the ULP host address of the corresponding host are sent to the GMS control function 136 where it will be used to create a ULP receive message sent to the destination host. The GMS control function 136 will use the destination ULP host address to look up the TLP address of the host from the host address map 137. This will be used to create a TLP header for the message 123. The ULP message type 124 will be ULP receive, the destination ULP address 125 will be the destination host, the address count will be 0 and

there will be no auxiliary addresses. The payload in this case will have a message count 116 set by the message count value from the host aggregation buffer. The payload will contain all of the payload items from the host aggregation buffer.

The effect of aggregation will be to greatly reduce the total message rate received by the hosts. A single message to a host will be able to carry multiple payload items received from the other hosts during the aggregation period. This fits very well the interactive applications of this invention where groups of hosts will be sending messages to all the other hosts in the group at a periodic rate. Aggregation will be very effective in collecting together all of the messages from all of the other hosts into a single message for each member of the group. The reduces processing at each receiving host since a single message will be received rather than many separate messages. Aggregation will also reduce the total data rate to the hosts since aggregation eliminates the need for separate message headers for each payload item. The savings will be significant for small payload items since there will be only one message header comprising fields 123, 124 and 125 for multiple payload items. In cases where a group of hosts are sending messages to the group at a periodic rate, it is often the case in many interactive applications that the data being sent by each host to the group is very similar to the messages sent by the other hosts. This affords the opportunity within an aggregated payload of multiple payload items to apply a data compression method across the multiple data elements of the payload elements. A wide variety of known data compression methods will lend themselves to this application. The first data element in the first payload item can be sent in uncompressed form with each subsequent data element being compressed using some form of difference coding method. A variety of

known data compression methods use the concept of a predictor with differences from the predicted value being encoded. The first data element in an aggregated payload can be used as this predictor with the subsequent data elements coded using such a data compression method. These conventional data compression methods do not assume any knowledge of the internal structure or function of portions of a data element to compress. It is also possible to make use of application specific coding techniques that take advantage of such knowledge to potentially achieve much higher coding efficiency.

Server Isochronous

One method by which the aggregation time period can be defined is called Server Isochronous or SI. In this method, A ULP Server Process defines a uniform time base for defining the aggregation time period. This time base is defined by three parameters: the time period, the aggregation offset and the transmit offset. These parameters are set by the attributes provided in the create implicit group control function at the time the implicit group and the ULP server process are created. The time period is a fixed time interval during which the ULP server process will accumulate messages in the message queues, aggregate the messages in the queues and send the aggregated messages to the targeted hosts. The aggregation offset defines the point after the start of the time period after which arriving messages will be stored in the message queues for delivery in the next time period. Therefore, at the aggregation offset after the start of the time period, a snapshot will be taken of all of the messages in each message queue. New messages will continue to arrive and be entered into the queues after the aggregation offset. Only those messages in the queues before the aggregation offset point will be aggregated

into outbound messages. The resulting aggregated messages will then be sent to their targeted hosts at the point in time which is the transmit offset after the start of the time period. The result is that messages arrive continuously and are stored in the message queues. Once per time period the are aggregated into single messages to each host which is the target of messages and once per time period these aggregated messages are sent to the hosts.

Another embodiment of the SI method is to allow the ULP server process to dynamically vary the time period based on some criteria such as the received message rates, and/or received data rate. The ULP server could use a function to define the aggregation period based on the number of messages received per second or the total number of payload bytes received per second. One reasonable function would be to shorten the aggregation period as the rate or received messages or data rate of the received payloads increased. This would tend to keep the size of the outbound messages from growing too much as received messages and/or received data rate grew. Other possible functions could be used that varied the aggregation period based on received message rates, received payload data rates or other parameters available to the ULP server process.

Host Synchronous

The host synchronous or HS method of defining the aggregation time period allows the definition of a flexible time period that is controlled by the hosts. It is based on the concept of a turn which is a host sending a message to one or more members of the implicit message group which is operating is HS mode. Once every host in the message group has taken a turn, the aggregation period ends. A snapshot of the contents of the message queues is taken, the contents of each of the queues is aggregated and the aggregated messages are

sent to the hosts targeted by each message queue. A refinement to this technique qualifies which of the three ULP send message types to the group constitute a host turn: a send only to the implicit address of the group, a send to a unicast host address within the group or a send to a logical ULP address which shares members with the group. The attributes of the group not only will define HS aggregation, but one or more ULP send message types that will be considered a host turn. A further refinement sets the total number of turns that a host can take in a single aggregation time period. The default will be one turn, but multiple turns can be allowed. If a host attempts to take more turns than allowed, the messages are ignored.

This aggregation technique has the additional benefit of causing the hosts which are member of an HS implicit message group to have their processing functions synchronized when they are executing the same interactive application. Many networked interactive applications are based on a simple overall three step operational model: wait for messages from other hosts, process the messages and the local users inputs to update the local application, send messages to the other hosts. This basic application loop is repeated at a rate fast enough to provide an interactive experience such as 5 to 30 times per second. It is desirable to keep such applications synchronized so that the states of the applications is consistent on the different host machines. When such applications communicate using the HS model of the present invention their operations will become naturally synchronized. The HS ULP server process will wait until all of the members of the message group has completed their turns and sent a message to the group before sending the aggregated messages to the members of the group. This will cause the applications on the hosts to wait until they have received the aggregated messages. They will all then start

processing these messages along with the local user inputs. Even if they perform their processing at different speeds and send their next messages to the group at different times, the HS ULP server will wait until all have completed their processing and reported in with a message to the group. This will keep all of the host applications synchronized in that every host will be at the same application loop iteration as all of the others. This will keep the application state consistent on all of the hosts. Only network propagation delays from the GMS to the hosts and different processing speeds of the hosts will cause the start and completion of their processing to begin at different times. It is not a requirement in networked applications to keep all of the hosts precisely synchronized, only that that application state is consistent. The HS method provides a natural way to do this in the context of the present invention.

Preferred Embodiment

The detailed description of the invention has described a datagram implementation of the invention as the best way to explain the invention. The preferred embodiment of the invention is as follows.

In the preferred embodiment, the wide area network is the Internet and the TLP protocol is TCP/IP. The GMS is a general purpose computer system connected to the Internet and the hosts are personal computers connected to the Internet.

TCP/IP provides an number of advantages that provide for a more efficient applications interface on the hosts 151. TCP/IP supports the concept of source and destination port numbers in its header. The ULP can make use of the port numbers to identify source and destination ULP connections. Most ULP send messages will be from hosts to a implicit ULP group addresses and most ULP receive messages will be from the implicit ULP addresses to the ULP host

addresses. All of these and the ULP message type field can represented by source and destination port addresses within the TCP/IP header. This means that for most ULP messages, the ULP message encapsulated within the TCP/IP message need only contain the payload. There is the slight complication of the aggregated ULP receive messages sent from a ULP server process to a hosts. Here the destination port will be the host the source port will be for the implicit ULP group address and the payload will still contain the source host ULP addresses in each the payload items.

TCP/IP also supports header compression for low speed dial-up lines which is also important in this application. See RFC 1144. TCP/IP is a connection oriented protocol which provides reliable end-to-end transport. It handles re-transmission on errors and fragmentation and reassembly of data transparently to upper level protocols. Header compression allows much of the TCP/IP header to be omitted with each packet to be replaced by a small connection identifier. This connection ID will uniquely define a connection consisting of a source and destination IP address and source and destination TCP/IP port numbers.

At the interface to the application on the hosts, the preferred embodiment of the ULP is as a session layer protocol. In the preferred embodiment the application on a host opens a session with a ULP server process. This session is identified with a unique session ID on the host. The host application then sends data to the ULP host interface 151 tagged with this session ID. The session ID defines a host and implicit ULP pair including the TCP/IP TLP address of the GMS server that is running the particular ULP server process for the implicit ULP address. By binding the transport address of the GMS of a ULP server process to the session ID, we can transparently to the application

support multiple group messaging servers on the network and a single host can have multiple active sessions with different physical group messaging servers. This avoids any address space collision problems that could arise from the fact that the ULP address space is unique to each GMS.

Alternate Embodiments

One possible extension to the invention is to extend the ULP to support a common synchronized time base on the GMS and the hosts that are connected to it. This would be most interesting in context of the SI message aggregation mode. The SI time base on the GMS could be replicated on all of the hosts and all of the hosts and the GMS could lock these time bases together. There are known methods to synchronize time bases on multiple computer systems. One such method is called ~~NTP~~ Network Time Protocol (NTP).

Another extension to the invention is to define ULP server processes that perform specific application specific processing on the contents of the messages that are received. A variety of different application specific processing functions can be defined and implemented. A particular function would be selected by attributes provided in the create implicit group function. These functions could process the data in the message payloads and replace the data elements in the payloads with processed results. Separately, or in combination with processing the message payloads, the processing could store either raw message payload data in the application specific state storage area or could store processed results.

Clearly, the host system need not be personal computers, but could also be dedicated game consoles or television set top boxes or any other device with a programmable controller capable of implementing the ULP protocol.

The wide area network used to transport the ULP protocol need not be the Internet or based on IP. Other networks with some means for wide area packet or datagram transport are possible including ATM networks or a digital cable television network.

The invention now being fully described, it will be apparent to one of ordinary skill in the art that any changes and modifications can be made thereto without departing from the spirit or scope of the invention as set forth herein. Accordingly, the present invention is to be limited solely by the scope of the appended claims.

WHAT IS CLAIMED IS:

1. A method for providing group messages to a plurality of host computers connected over a unicast wide area communication network, comprising the steps of:

providing a group messaging server coupled to said network, said server communicating with said plurality of host computers using said unicast network and maintaining a list of message groups, each message group containing at least one host computer;

sending, by a first host computer belonging to a first message group, a message to said server via said unicast network, said message containing a payload portion and a portion for identifying said first message group; and

transmitting, by said server via said unicast network, said payload portion to selected host computers belonging to said first group.

2. The method of claim 1 wherein said selected host computers comprising all host computers belong to said first group except said first host computer.

3. The method of claim 1 wherein said message also contains a portion for identifying a second message group, said selected host computers being selected from a set operation of members in said first and said second message groups.

4. The method of claim 1 further comprising the step of creating, by a second host computer, said first message group by sending a first control message to said server via said unicast network.

5. The method of claim 4 further comprising the step of joining, by said first host computer, said first message group by sending via said unicast network a second control message to said server specifying said first message group.

6. The method of claim 1 wherein said network is Internet and said server communicates with said plurality of host computers using a session layer protocol

7. A method for providing group messages to a plurality of host computers connected over a unicast wide area communication network, comprising the steps of:

providing a group messaging server coupled to said network, said server communicating with said plurality of host computers using said unicast network and maintaining a list of message groups, each message group containing at least one host computer;

sending, by a plurality of host computers belonging to a first message group, messages to said server via said unicast network, said messages containing a payload portion and a portion for identifying said first message group;

aggregating, by said server in a time interval determined in accordance with a predefined criterion, said payload portions of said messages to create an aggregated payload;

forming an aggregated message using said aggregated payload; and

transmitting, by said server via said unicast network, said aggregated message to a recipient host computer belonging to said first message group.

8. The method of claim 7 wherein said time interval is a fixed period of time.

9. The method of claim 7 wherein said time interval corresponds to a time for said server to receive at least one message from each host computer belonging to said first message group.

10. The method of claim 7 further comprising the step of creating, by one of said plurality of host computers, said first message group by sending a first control message to said server via said unicast network.

11. The method of claim 10 further comprising the step of joining, by some of said plurality of host computers, said first message group by sending control messages via said unicast network to said server specifying said first message group.

12. The method of claim 7 wherein said network is Internet and said server communicates with said plurality of host computers using a session layer protocol

13. A method for providing group messages to a plurality of host computers connected over a unicast wide area communication network, comprising the steps of:

providing a group messaging server coupled to said network, said server communicating with said plurality of host computers using said unicast network and maintaining a list of message groups, each message group containing at least one host computer;

dynamically joining, by a first host computer, message groups on said list by sending a first control message to said server via said unicast network, said first control message specifying a message group desired to be joined by said first host computer; and

dynamically leaving, by said first host computer, message groups on said list by sending a second control message to said server via said unicast

network, said second control message specifying a message group said first host computer desires to leave.

14. The method of claim 13 wherein said first host computer belongs to a first message group, said method further comprising the steps of:

sending, by said first host computer, a message to said server via said unicast network, said message containing a payload portion and a portion for identifying said first message group; and

transmitting, by said server via said unicast network, said payload portion to selected host computers belonging to said first group.

15. The method of claim 14 wherein said selected host computers comprising all host computers belong to said first group except said first host computer.

16. The method of claim 14 wherein said message also contains a portion for identifying a second message group, said selected host computers being selected from a set operation of members in said first and said second message groups.

add a7

ABSTRACT

A method for deploying interactive applications over a network containing host computers and group messaging servers is disclosed. The method operates in a conventional unicast network architecture comprised of conventional network links and unicast gateways and routers. The hosts send messages containing destination group addresses by unicast to the group messaging servers. The group addresses select message groups maintained by the group messaging servers. For each message group, the group messaging servers also maintain a list of all of the hosts that are members of the particular group. In its most simple implementation, the method consists of the group server receiving a message from a host containing a destination group address. Using the group address, the group messaging server then selects a message group which lists all of the host members of the group which are the targets of messages to the group. The group messaging server then forwards the message to each of the target hosts. In an interactive application, many messages will be arriving at the group server close to one another in time. Rather than simply forward each message to its targeted hosts, the group messaging server aggregates the contents of each of messages received during a specified time period and then sends an aggregated message to the targeted hosts. The time period can be defined in a number of ways. This method reduces the message traffic between hosts in a networked interactive application and contributes to reducing the latency in the communications between the hosts.

Bib Data Sheet

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

SERIAL NUMBER	FILING DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
09/407,371	09/28/1999 RULE _	709	2758	1719.0050002

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MARC P. KWIATKOWSKI, LOS GATOS, CA ;

**** CONTINUING DATA ***************************

THIS APPLICATION IS A CON OF 08/896,797 07/18/1997 PAT 6,018,766
WHICH IS A CON OF 08/595,323 02/01/1996 PAT 5,822,523

**** FOREIGN APPLICATIONS *********************

IF REQUIRED, FOREIGN FILING LICENSE GRANTED
** 11/22/1999

Foreign Priority claimed	STATE OR COUNTRY	SHEETS DRAWING	TOTAL CLAIMS	INDEPENDENT CLAIMS
☐ yes ☐ no	CA	11	16	3
35 USC 119 (a-d) conditions met ☐ yes ☐ no ☐ Met after Allowance				
Verified and Acknowledged Examiner's Signature Initials				

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WASHINGTON, DC 200053934

TITLE

SERVER-GROUP MESSAGING SYSTEM FOR INTERACTIVE APPLICATIONS

FILING FEE RECEIVED		
1124	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

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NOTICE OF FILING / CLAIM FEE(S) DUE (CALCULATION SHEET)

APPLICATION NUMBER: 9/407371

Total Fee Calculation

	Fee Code Sm./Lg.	Total # Claims		Number Extra		Fee Sm. Entity	Fee Lg. Entity		Total
Basic Filing Fee	201/101						760	-	
Total Claims >20	203/103	16	-20 =		X			-	
Independent Claims >3	202/102	3	-3 =		X			-	
Mult. Dep Claim Present	204/104							-	
Surcharge	205/105						130	-	
English Translation	139								
TOTAL FEE CALCULATION									890

Fees due upon filing the application:

Total Filing Fees Due = $ 890

Less Filing Fees Submitted - $ Ø

BALANCE DUE = $ 890

P. M.

Office of Initial Patent Examination

FORM OIPE-RAM-01 (Rev. 12/97)

PATENT APPLICATION FEE DETERMINATION RECORD
Effective November 10, 1998

Application or Docket Number: 9/407,371

CLAIMS AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA
BASIC FEE		
TOTAL CLAIMS	16 minus 20=	*
INDEPENDENT CLAIMS	3 minus 3 =	*
MULTIPLE DEPENDENT CLAIM PRESENT		

SMALL ENTITY TYPE ☐ RATE	FEE	OR	OTHER THAN SMALL ENTITY RATE	FEE
	380.00	OR		760.00
X$ 9=		OR	X$18=	
X39=		OR	X78=	
+130=		OR	+260=	
TOTAL		OR	TOTAL	760

* If the difference in column 1 is less than zero, enter "0" in column 2

CLAIMS AS AMENDED - PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	* 19	Minus	** 20	=
Independent	* 6	Minus	*** 3	= 3
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				

SMALL ENTITY RATE	ADDITIONAL FEE	OR	OTHER THAN SMALL ENTITY RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X39=		OR	X78=	234
+130=		OR	+260=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	pd

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				

RATE	ADDITIONAL FEE	OR	RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X39=		OR	X78=	
+130=		OR	+260=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT C

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
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FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				

RATE	ADDITIONAL FEE	OR	RATE	ADDITIONAL FEE
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X39=		OR	X78=	
+130=		OR	+260=	
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* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."
***If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

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UNDER SECRETARY OF COMMERCE FOR
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Patent No. 6226686

Paper No. _____

NOTICE OF *EX PARTE* REEXAMINATION

Notice is hereby given that a request for *ex parte* reexamination of U.S. Patent No. 6226686 was filed on 9/28/99 under 35 U.S.C. 302 and 37 CFR 1.510(a).

The reexamination proceeding has been assigned Control No. 90/011036.

This Notice incorporates by reference into the patent file, all papers entered into the reexamination file.

Note: This Notice should be entered into the patent file and given a paper number.

ISSUE CLASSIFICATION	Class	Subclass
	709	245

[redacted]

PATENT NUMBER
6226686
6226686

U.S. UTILITY PATENT APPLICATION

O.I.P.E.	PATENT DATE
SCANNED QA	MAY 01 2001

SECTOR	CLASS	SUBCLASS	ART UNIT	EXAMINER
	709	245	2154	Maung

FILED WITH: ☐ DISK (CRF) ☐ FICHE
(Attached in pocket on right inside flap)

Part 1 of 2 Box

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PREPARED AND APPROVED FOR ISSUE

ISSUING CLASSIFICATION

ORIGINAL		CROSS REFERENCE(S)	
CLASS	SUBCLASS	CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)
709	245	709	218

INTERNATIONAL CLASSIFICATION

G06F 15/16

☐ Continued on Issue Slip Inside File Jacket

☐ TERMINAL DISCLAIMER	DRAWINGS			CLAIMS ALLOWED	
	Sheets Drwg.	Figs. Drwg.	Print Fig.	Total Claims	Print Claim for O.G.
	11	11	7	19	1

☐ a) The term of this patent subsequent to _____ (date) has been disclaimed.

(Assistant Examiner) (Date)

NOTICE OF ALLOWANCE MAILED

12-5-00

☐ b) The term of this patent shall not extend beyond the expiration date of U.S Patent. No. _____

(Primary Examiner) (Date)

ISSUE FEE

Amount Due	Date Paid
$1,240.00	3/2/01

☐ c) The terminal ____months of this patent have been disclaimed.

(Legal Instruments Examiner) (Date)

ISSUE BATCH NUMBER
V94

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(Rev. 10/97)

ISSUE FEE IN FILE

(LABEL AREA)

Formal Drawings (____ sht(s)) set____

(FACE)

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SEARCHED

Class	Sub.	Date	Exmr.
709	218	11/28/00	[illegible]
709	206		
709	230		
709	236		
709	206		
709	207		
709	231		
709	232		
370	389		
370	390		
709	204	11/28/00	+
709	245	"	"

INTERFERENCE SEARCHED

Class	Sub.	Date	Exmr.
709	218	12/7/00	[illegible]
709	245		+

SEARCH NOTES (INCLUDING SEARCH STRAT

	Date	
STN search	11/28/00	[illegible]
the results		
attached		

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ISSUE SLIP STAPLE AREA (for additional cross references)

POSITION	INITIALS	ID NO.	DATE
FEE DETERMINATION	MS	66621	10/6/
O.I.P.E. CLASSIFIER		49	10/8/99
FORMALITY REVIEW		69916	10/19/99

INDEX OF CLAIMS

✔ ..... Rejected
= ..... Allowed
— (Through numeral) Canceled
÷ ..... Restricted
N ..... Non-elected
I ..... Interference
A ..... Appeal
O ..... Objected

Claim Final	Claim Original	Date
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3	19	=
4	20	=
5	21	=
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If more than 150 claims or 10 actions staple additional sheet here

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#2

APPLICATION NUMBER	FILING/RECEIPT DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO./TITLE
09/407,371	09/28/99	ROTHSCHILD J	1719.0050002

0212/1021

STERNE KESSLER GOLDSTEIN & FOX PLLC
SUITE 600
1100 NEW YORK AVENUE NW
WASHINGTON DC 20005-3934

NOT ASSIGNED

DATE MAILED: 2756

10/21/99

NOTICE TO FILE MISSING PARTS OF APPLICATION
Filing Date Granted

An Application Number and Filing Date have been assigned to this application. The items indicated below, however, are missing. Applicant is given TWO MONTHS FROM THE DATE OF THIS NOTICE within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a). **If any of items 1 or 3 through 5 are indicated as missing, the SURCHARGE set forth in 37 CFR 1.16(e) of ☐ $65.00 for a small entity in compliance with 37 CFR 1.27, or ☑ $130.00 for a non-small entity, must also be timely submitted in reply to this NOTICE to avoid abandonment.**

If all required items on this form are filed within the period set above, the total amount owed by applicant as a ☐ small entity (statement filed) ☑ non-small entity is $ 890.00.

☑ 1. The statutory basic filing fee is:
☑ missing.
☐ insufficient.
Applicant must submit $ 760.00 to complete the basic filing fee and/or file a small entity statement claiming such status (37 CFR 1.27).

☐ 2. The following additional claims fees are due:
$_____ for _____ total claims over 20.
$_____ for _____ independent claims over 3.
$_____ for multiple dependent claim surcharge.
Applicant must either submit the additional claim fees or cancel additional claims for which fees are due.

☑ 3. The oath or declaration:
☑ is missing or unsigned.
☐ does not cover the newly submitted items.
An oath or declaration in compliance with 37 CFR 1. 63, including residence information and identifying the application by the above Application Number and Filing Date is required.

☐ 4. The signature(s) to the oath or declaration is/are by a person other than inventor or person qualified under 37 CFR 1.42, 1.43 or 1.47.
A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.

☐ 5. The signature of the following joint inventor(s) is missing from the oath or declaration:
_____
An oath or declaration in compliance with 37 CFR 1.63 listing the names of all inventors and signed by the omitted inventor(s), identifying this application by the above Application Number and Filing Date, is required.

☐ 6. **A $50.00 processing fee is required since your check was returned without payment (37 CFR 1.21(m)).**

☐ 7. Your filing receipt was mailed in error because your check was returned without payment.

☐ 8. The application was filed in a language other than English.
Applicant must file a verified English translation of the application, the $130.00 set forth in 37 CFR 1.17(k), unless previously submitted, and a statement that the translation is accurate (37 CFR 1.52(d)).

☐ 9. OTHER:_____

Direct the reply and any questions about this notice to "Attention: Box Missing Parts."

A copy of this notice MUST be returned with the reply.

D. Trelk

Customer Service Center
Initial Patent Examination Division (703) 308-1202

FORM **PTO-1533** (REV. 9/98)

U.S. GPO 1999 450-5875

PART 3 - OFFICE COPY

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

#13

APPLICATION NUMBER	FILING/RECEIPT DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO./TITLE
09/407,371	09/28/99	ROTHSCHILD J	1719.0050002

0212/1021

STERNE KESSLER GOLDSTEIN & FOX PLLC
SUITE 600
1100 NEW YORK AVENUE NW
WASHINGTON DC 20005-3934

OIPE NOV 18 1999 JC42 PATENT AND TRADEMARK OFFICE

NOT ASSIGNED
10726 pp
10/27/99 AGJ

DATE MAILED: 2756

10/21/99

NOTICE TO FILE MISSING PARTS OF APPLICATION
Filing Date Granted

An Application Number and Filing Date have been assigned to this application. The items indicated below, however, are missing. Applicant is given TWO MONTHS FROM THE DATE OF THIS NOTICE within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a). **If any of items 1 or 3 through 5 are indicated as missing, the SURCHARGE set forth in 37 CFR 1.16(e) of ☐ $65.00 for a small entity in compliance with 37 CFR 1.27, or ☑ $130.00 for a non-small entity, must also be timely submitted in reply to this NOTICE to avoid abandonment.**

If all required items on this form are filed within the period set above, the total amount owed by applicant as a ☐ small entity (statement filed) ☑ non-small entity is $ 890.00.

☑ 1. The statutory basic filing fee is:
☑ missing.
☐ insufficient.
Applicant must submit $ 760.00 to complete the basic filing fee and/or file a small entity statement claiming such status (37 CFR 1.27).

☐ 2. The following additional claims fees are due:
$_____ for _____ total claims over 20.
$_____ for _____ independent claims over 3.
$_____ for multiple dependent claim surcharge.
Applicant must either submit the additional claim fees or cancel additional claims for which fees are due.

Decl/filing fees Dec 21, 1999
State Bar May 21, 2000

☑ 3. The oath or declaration:
☑ is missing or unsigned.
☐ does not cover the newly submitted items.
An oath or declaration in compliance with 37 CFR 1. 63, including residence information and identifying the application by the above Application Number and Filing Date is required.

☐ 4. The signature(s) to the oath or declaration is/are by a person other than inventor or person qualified under 37 CFR 1.42, 1.43 or 1.47.
A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.

☐ 5. The signature of the following joint inventor(s) is missing from the oath or declaration:

_____

An oath or declaration in compliance with 37 CFR 1.63 listing the names of all inventors and signed by the omitted inventor(s), identifying this application by the above Application Number and Filing Date, is required.

☐ 6. **A $50.00 processing fee is required since your check was returned without payment (37 CFR 1.21(m)).**
☐ 7. Your filing receipt was mailed in error because your check was returned without payment.
☐ 8. The application was filed in a language other than English.
Applicant must file a verified English translation of the application, the $130.00 set forth in 37 CFR 1.17(k), unless previously submitted, and a statement that the translation is accurate (37 CFR 1.52(d)).
☐ 9. OTHER: _____

Direct the reply and any questions about this notice to "Attention: Box Missing Parts."

A copy of this notice MUST be returned with the reply.

Customer Service Center
Initial Patent Examination Division (703) 308-1202

11/19/1999 RTESEGATE 00000102 09407371
01 FC:105 130.00 CH
02 FC:101 760.00 CH

FORM **PTO-1533** (REV. 9/98) U.S. GPO 1999-450-5875

PART 2 - COPY TO BE RETURNED WITH RESPONSE

COPY

PATENT
Attorney Docket No. 16326.701

COMBINED DECLARATION AND POWER OF ATTORNEY
FOR UTILITY PATENT APPLICATION

As a below-named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

SERVER-GROUP MESSAGING SYSTEM FOR INTERACTIVE APPLICATIONS

the specification of which

__X__ is attached hereto.

____ was filed on _____ as Application Serial No. _____
and was amended on _____.
(If Applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a) which states in relevant part: "Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section....The duty to disclose all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §§ 1.97(b)-(d) and 1.98."

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate as indicated below and have also identified below any foreign application for patent or inventor's certificate on this invention having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed	
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No

Attorney Docket No. 16326.701

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulation, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Patented, Pending, Abandoned)
(Application Serial No.)	(Filing Date)	(Patented, Pending, Abandoned)

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith, and to file, prosecute and to transact all business in connection with international applications directed to said invention:

Stephen C. Durant	31,506
Michael Hetherington	32,357
Hark C. Chan	35,477
Charles D. Holland	35,196
Michael J. Murphy	37,404
Michael J. Panepucci	37,203

Address all correspondence to:

H. C. Chan
Wilson, Sonsini, Goodrich & Rosati
650 Page Mill Road
Palo Alto, CA 94304

Direct all telephone calls to H.C. Chan at (415) 493-9300.

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 Title 18, United States Code, §1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor: Daniel Joseph Samuel

Inventor's signature:

Date: 1/30/96

Citizenship: U.S.A.

Residence: 1248 Van Dyck Drive, Sunnyvale, CA 94087

Post Office Address: Same as above.

Full name of second joint inventor, if any: Marp Peter Kwiatkowski

Inventor's signature:

Date: 1/30/96

Citizenship: U.S.A.

Residence: 347 Massol Avenue, #108, Los Gatos, CA 95030

Post Office Address: Same as above.

Full name of third joint inventor, if any: Jeffrey Jackiel Rothschild

Inventor's signature:

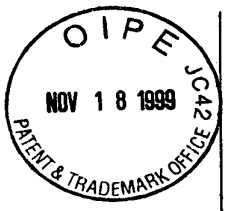
Date: 1/30/96

Citizenship: U.S.A.

Residence: 15560 Old Ranch Road, Los Gatos, CA 95030

Post Office Address: Same as above.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE



COPY

In re application of:
Rothschild *et al.*
Appl. No. 08/896,797
Filed: July 18, 1997
For: **Server-Group Messaging System for Interactive Applications**

Art Unit: 2315
Examiner: Maung, Z.
Atty. Docket: 1719.0050001

Revocation of Prior Power of Attorney and Appointment of New Attorneys of Record

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

The undersigned, having express authority to represent **Mpath Interactive, Inc.**, the assignee of the entire right, title, and interest in the above-captioned application, by assignment filed at the U.S. Patent and Trademark Office on **02/01/1996** and recorded at **reel 7861, frame 0413** (copy enclosed), hereby revokes all powers of attorney heretofore given in the above-captioned application and appoints as his attorneys Robert Greene Sterne, Registration No. 28,912; Edward J. Kessler, Registration No. 25,688; Jorge A. Goldstein, Registration No. 29,021; Samuel L. Fox, Registration No. 30,353; David K.S. Cornwell, Registration No. 31,944; Robert W. Esmond, Registration No. 32,893; Tracy-Gene G. Durkin, Registration No. 32,831; Michele A. Cimbala, Registration No. 33,851; Michael B. Ray, Registration No. 33,997; Robert E. Sokohl, Registration No. 36,013; and Eric K. Steffe, Registration No. 36,688, with full power of substitution, association, and revocation, to prosecute said application and to transact all business in the United States Patent and Trademark Office connected therewith.

The undersigned hereby grants said attorneys the power to insert on this Power of Attorney any further identification that may be necessary or desirable in order to comply with the rules of the U.S. Patent and Trademark Office.

Send all correspondence to:

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1100 New York Avenue, N.W.
Suite 600
Washington, D.C. 20005-3934.

Direct telephone calls to (202) 371-2600.

FOR: Mpath Interactive, Inc.

SIGNATURE: Brian A. Apgar

BY: Brian Apgar

TITLE: Executive Vice President of Development

DATE: 7/24/98

P:\USERS\SCULLER\17190050001rev.wpd
SKGF Rev. 1/27/98 dcw

COPY

Certificate Under 37 C.F.R. § 3.73(b)

Applicant(s): Jeffrey J. Rothschild *et al.*

Application No: 08/896,797 Filed: July 18th, 1997

For: Server-Group Messaging System for Interactive Applications

Mpath Interactive, a Corporation,
(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

certifies that it is an assignee of the patent application identified above by virtue of either:

A. [X] An Assignment from the inventor(s) of the patent application identified above. The assignment was recorded in the Patent and Trademark Office at Reel 7861, Frame 0413, or for which a copy thereof is attached.

[or]

B. [ ] A chain of title from the inventor(s) of the patent application identified above to the current assignee as shown below:

1. From: _____ To: _____
The document was recorded in the Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To: _____
The document was recorded in the Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

3. From: _____ To: _____
The document was recorded in the Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

[ ] Additional documents in the chain of title are listed on a supplemental sheet.

[X] Copies of assignments or other documents in the chain of title are attached.

The undersigned (whose title is supplied below) is empowered to act on behalf of the assignee.

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 are made with the knowledge that willful false statements, and the like so made, are punishable by fine or imprisonment, or both under Section 1001, Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: 7/24/98

Name: Brian Apgar

Title: Executive Vice President of Development

Signature: Brian A Apgar

P:\USERS\SCULLER\17190050001cert.wpd
SKGF Rev.1/26/98 dcw

Attorney Docket No. 16326.701

ASSIGNMENT

DO NOT FORWARD
TO ASSIGNMENT BRANCH
NOT FOR RECORDATION

WHEREAS, the undersigned,

Daniel Joseph Samuel
1248 Van Dyck Drive
Sunnyvale, CA 94087

Marc Peter Kwiatkowski
347 Massol Avenue, #108
Los Gatos, CA 95030-7234

and

Jeffrey Jackiel Rothschild
15560 Old Ranch Road
Los Gatos, CA 95030

hereinafter termed "Inventors", have invented certain new and useful improvements in

SERVER-GROUP MESSAGING SYSTEM FOR INTERACTIVE APPLICATIONS

as filed herewith; and

WHEREAS, Mpath Interactive Inc., a corporation of the State of California, having a place of business at 10455-A Bandley Drive, Cupertino, California, (hereinafter termed "Assignee"), is desirous of acquiring the entire right, title and interest in and to said application and the invention disclosed therein, and in and to all embodiments of the invention, heretofore conceived, made or discovered jointly or severally by said Inventors (all collectively hereinafter termed "said invention"), and in and to any and all patents, inventor's certificates and other forms of protection (hereinafter termed "patents") thereon granted in the United States and foreign countries.

NOW, THEREFORE, in consideration of good and valuable consideration acknowledged by said Inventors to have been received in full from said Assignee:

1. Said Inventors do hereby sell, assign, transfer and convey unto said Assignee the entire right, title and interest (a) in and to said application and said invention; (b) in and to all rights to apply for foreign patents on said invention pursuant to the International Convention for the Protection of Industrial Property or otherwise; (c) in and to any and all applications filed and any and all patents granted on said invention in the United States or any foreign country, including each and every application filed and each and every patent granted on any application which is a divisional, substitution, continuation, or continuation-in-part of any of said applications; and (d) in and to each and every reissue or extensions of any of said patents.

2. Said Inventors hereby jointly and severally covenant and agree to cooperate with said Assignee to enable said Assignee to enjoy to the fullest extent the right, title and interest herein conveyed in the United States and foreign countries. Such cooperation by said Inventors shall include prompt production of pertinent facts and documents, giving of testimony, execution of petitions, oaths, specifications, declarations or other papers, and other assistance all to the extent deemed necessary or desirable by said Assignee (a) for perfecting in said Assignee the right, title and interest herein conveyed; (b) for prosecuting any of said applications; (c) for filing and prosecuting substitute, divisional, continuing or additional applications covering said invention; (d) for filing and prosecuting applications for reissuance of any said patents; (e) for interference or other priority proceedings involving said invention; and (f) for legal proceedings involving said invention and any applications therefor and any patents granted thereon, including without limitation reissues and reexaminations, opposition proceedings, cancellation proceedings, priority contests, public use proceedings, infringement actions and court actions; provided, however, that the expense incurred by said Inventors in providing such cooperation shall be paid for by said Assignee.

3. The terms and covenants of this assignment shall inure to the benefit of said Assignee, its successors, assigns and other legal representatives, and shall be binding upon said Inventors, their respective heirs, legal representatives and assigns.

4. Said Inventors hereby jointly and severally warrant and represent that they have not entered and will not enter into any assignment, contract, or understanding in conflict herewith.

IN WITNESS WHEREOF, the said Inventors have executed and delivered this instrument to said Assignee as of the dates written below.

Daniel Joseph Samuel

1/30/96
Date

State of California)
)
County of Santa Clara)

On 1-30, 1996, before me, Tammy L. Williamson personally appeared Daniel Joseph Samuel,

☐ personally known to me or ☒ proved to me on the basis of satisfactory evidence, to be the person whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his authorized capacity, and that by his signature on the instrument the person or the entity upon behalf of which the person acted, executed the instrument.

WITNESS my hand and official seal.

Tammy L. Williamson
Comm. [illegible]
NOTARY PUBLIC - CALIFORNIA
SANTA CLARA COUNTY
My Comm. Expires Feb. 5, 1996

(Notary Public)

Attorney Docket No. 16326.701

Marc Peter Kwiatkowski

1/30/96
Date

State of California)
County of Santa Clara)

On 1-30, 1996, before me, Tammy L. Williamson personally appeared Marc Peter Kwiatkowski,

☐ personally known to me or ☒ proved to me on the basis of satisfactory evidence, to be the person whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his authorized capacity, and that by his signature on the instrument the person or the entity upon behalf of which the person acted, executed the instrument.

WITNESS my hand and official seal.

Tammy L. Williamson
(Notary Public)

MGC1 Tammy L. Williamson Comm. #955083 NOTARY PUBLIC - CALIFORNIA SANTA CLARA COUNTY My Comm. Expires Feb. 5, 1996 MGC1

Jeffrey Jackiel Rothschild

1/30/96
Date

State of California)
County of Santa Clara)

On 1-30, 1996, before me, Tammy L. Williamson personally appeared Jeffrey Jackiel Rothschild,

☐ personally known to me or ☒ proved to me on the basis of satisfactory evidence, to be the person whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his authorized capacity, and that by his signature on the instrument the person or the entity upon behalf of which the person acted, executed the instrument.

WITNESS my hand and official seal.

Tammy L. Williamson
(Notary Public)

MGC1 Tammy L. Williamson Comm. #955083 NOTARY PUBLIC - CALIFORNIA SANTA CLARA COUNTY My Comm. Expires Feb. 5, 1996 MGC1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

ROTHSCHILD *et al.*

Appl. No. 09/407,371

Filed: September 28, 1999

For: **Server-Group Messaging System for Interactive Applications**

Art Unit: 2756

Examiner: To be assigned

Atty. Docket: 1719.0050002

Request for Corrected Official Filing Receipt

Assistant Commissioner for Patents
Washington, D.C. 20231

Attn: Application Processing Division
Customer Correction Branch

Sir:

Applicants hereby request that a corrected Official Filing Receipt be issued and sent to the undersigned representative. Specifically, the following correction to the Official Filing Receipt is requested:

1. In the "Continuing Data As Claimed by Applicant" section after 07/18/97 insert --Which is a CONTINUATION of 08/595,323, PAT 5,822,523--.

In support of the above request, a photocopy of the Official Filing Receipt is enclosed with the correction noted in red. It is requested that a corrected Official Filing Receipt be issued, and sent to the undersigned at the earliest possible time.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Raymond Millien
Attorney for Applicants
Registration No. 43,806

Date: 11/18/99

1100 New York Avenue, N.W.
Suite 600
Washington, D.C. 20005-3934
(202) 371-2600

0050002.cfr

PTO-103X
(Rev. 6-99)

FILING RECEIPT

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
ASSISTANT SECRETARY AND COMMISSIONER
OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NUMBER	FILING DATE	GRP ART UNIT	FIL FEE REC'D	ATTORNEY DOCKET NO.	DRWGS	TOT CL	IND CL
09/407,371	09/28/99	2756	$0.00	1719.0050002	1	16	3

STERNE KESSLER GOLDSTEIN & FOX PLLC
SUITE 600
1100 NEW YORK AVENUE NW
WASHINGTON DC 20005-3934

RECEIVED
DEC 13 1999
2700 MAIL ROOM

Receipt is acknowledged of this nonprovisional Patent Application. It will be considered in its order and you will be notified as to the results of the examination. Be sure to provide the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION when inquiring about this application. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please write to the Office of Initial Patent Examination's Customer Service Center. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts of Application" ("Missing Parts Notice") in this application, please submit any corrections to this Filing Receipt with your reply to the "Missing Parts Notice." When the PTO processes the reply to the "Missing Parts Notice," the PTO will generate another Filing Receipt incorporating the requested corrections (if appropriate).

Applicant(s) JEFFREY J. ROTHSCHILD; DANIEL J. SAMUEL; MARC P. KWIATKOWSKI.

CONTINUING DATA AS CLAIMED BY APPLICANT-
THIS APPLN IS A CON OF 08/896,797 07/18/97 Having
WHICH IS A CONTINUATION OF 08/595,323, PAT 5,822,523

TITLE
SERVER-GROUP MESSAGING SYSTEM FOR INTERACTIVE APPLICATIONS

PRELIMINARY CLASS: 709

RECEIVED
OCT 27 1999
STERNE, KESSLER, GOLDSTEIN & FOX PLLC

pp MBR RVM 10/27/99 105899-AGJ

DATA ENTRY BY: TUTT, TONDENICA TEAM: 01 DATE: 10/19/99

(See reverse for new important information)

2756

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
ATTORNEYS AT LAW
1100 NEW YORK AVENUE, N.W., SUITE 600
WASHINGTON, D.C. 20005-3934

(202) 371-2600
FACSIMILE: (202) 371-2540; (202) 371-6566

ROBERT GREENE STERNE
EDWARD J. KESSLER
JORGE A. GOLDSTEIN
SAMUEL L. FOX
DAVID K.S. CORNWELL
ROBERT W. ESMOND
TRACY-GENE G. DURKIN
MICHELE A. CIMBALA
MICHAEL B. RAY
ROBERT E. SOKOHL

ERIC K. STEFFE
MICHAEL Q. LEE
STEVEN R. LUDWIG
JOHN M. COVERT*
LINDA E. ALCORN
RAZ E. FLESHNER
ROBERT C. MILLONIG
MICHAEL V. MESSINGER
JUDITH U. KIM
TIMOTHY J. SHEA, JR.

DONALD R. MCPHAIL
PATRICK E. GARRETT
STEPHEN G. WHITESIDE
JEFFREY T. HELVEY*
HEIDI L. KRAUS
JEFFREY R. KURIN
RAYMOND MILLIEN
PATRICK D. O'BRIEN
LAWRENCE B. BUGAISKY
CRYSTAL D. SAYLES*

EDWARD W. YEE
ALBERT L. FERRO*
DONALD R. BANOWIT*
PETER A. JACKMAN
MOLLY A. MCCALL
TERESA U. MEDLER
JEFFREY S. WEAVER
KRISTIN K. VIDOVICH
ANDREW S. ROBERTS*
KENDRICK P. PATTERSON*

DONALD J. FEATHERSTONE**
KAREN R. MARKOWICZ**
GRANT E. REED**
SUZANNE E. ZISKA**
BRIAN J. DEL BUONO**
VINCENT L. CAPUANO**
ANDREW J. KAMAGE**
NANCY J. DEGEN**

ROBERT H. BENSON*
OF COUNSEL

*BAR OTHER THAN D.C.
**REGISTERED PATENT AGENTS

TC 2700 MAIL ROOM RECEIVED DEC 3 2700 TC 5

OIPE JC42 NOV 18 1999 PATENT & TRADEMARK OFFICE

November 18, 1999

WRITER'S DIRECT NUMBER:
(202) 789-5506
INTERNET ADDRESS:
RMILLIEN@SKGF.COM

Assistant Commissioner for Patents
Washington, D.C. 20231

Attn: Application Processing Division
Customer Correction Branch

Re: U.S. Utility Patent Application
Appl. No. 09/407,371; Filed: September 28, 1999
For: **Server-Group Messaging System for Interactive Applications**
Inventors: ROTHSCHILD *et al.*
Our Ref: 1719.0050002

Sir:

The following documents are forwarded herewith for appropriate action by the U.S. Patent and Trademark Office:

1. Request for Corrected Official Filing Receipt;

2. A copy of the Official Filing Receipt along with the correction indicated in red ink; and

3. Return postcard.

It is respectfully requested that the attached postcard be stamped with the date of filing of these documents, and that it be returned to our courier. In the event that extensions of time are necessary to prevent abandonment of this patent application, then such extensions of time are hereby petitioned.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036. A duplicate copy of this letter is enclosed.

Respectfully submitted,

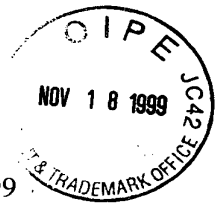
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Raymond Millien
Attorney for Applicants
Registration No. 43,806

0050002.pt3

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:
ROTHSCHILD *et al.*
Appl. No. 09/407,371
Filed: September 28, 1999
For: **Server-Group Messaging System for Interactive Applications**



Art Unit: 2756
Examiner: To be assigned
Atty. Docket: 1719.0050002

Preliminary Amendment

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination of the above-captioned application, Applicants submit the following Amendments and Remarks.

It is not believed that extensions of time or fees for net addition of claims are required beyond those that may otherwise be provided for in documents accompanying this paper. However, if additional extensions of time are necessary to prevent abandonment of this application,, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and any fees required therefor (including fees for net addition of claims) are hereby authorized to be charged to our Deposit Account No. 19-0036.

Kindly enter the following Amendments:

Amendments

In the Specification:

Please amend the specification as follows:

At Page 1, line 1, before Field of the Invention," insert --This application claims priority to U.S. Application No. 08/896,797, filed July 18, 1997, now allowed, which is a continuation of U.S. Application No. 08/595,323, filed February 1, 1996, now U.S. Patent No. 5,822,523.--

In the Claims:

Please cancel 2-16 without prejudice or disclaimer.

Remarks

Claims 2-16 have been canceled. Thus, claim 1 is presently pending in the application.

The specification has been amended to properly recite the lineage of the above-captioned application. No new matter has been added.

Prompt and favorable consideration of this Preliminary Amendment is respectfully requested.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Raymond Millien
Attorney for Applicants
Registration No. 43,806

Date: 11/18/99

1100 New York Avenue, N.W.
Suite 600
Washington, D.C. 20005-3934
(202) 371-2600

0050002.pam

PTO/SB/17 (6/99)
Approved for use through 09/30/2000. OMB 0651-0032
Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

FEE TRANSMITTAL
for FY 1999

Patent fees are subject to annual revision.
Small Entity payments must be supported by a small entity statement, otherwise large entity fees must be paid. See Forms PTO/SB/09-12.
See 37 C.F.R. §§ 1.27 and 1.28.

TOTAL AMOUNT OF PAYMENT	($) 890.00

Complete if Known	
Application Number	09/407,371
Filing Date	September 28, 1999
First Named Inventor	Jeffrey J. ROTHSCHILD
Examiner Name	To be assigned
Group / Art Unit	2756
Attorney Docket Number	1719.0050002

METHOD OF PAYMENT (check one)

1. ☐ The Commissioner is hereby authorized to charge indicated fees and credit any overpayment to:

Deposit Account Number	19-0036
Deposit Account Name	Sterne, Kessler, Goldstein & Fox P.L.L.C.

☐ Charge Any Additional Fee Required Under 37 CFR §§ 1.16 and 1.17

2. ☒ Payment Enclosed: ☒ Check No. 25956
☐ Money Order ☒ Other*
*Charge any deficiencies or credit any overpayments in the fees or fee calculations of Parts 1, 2 and 3 below to Deposit Account No. 19-0036.

FEE CALCULATION

1. BASIC FILING FEE

Large Fee Code	Entity Fee ($)	Small Fee Code	Entity Fee ($)	Fee Description	Fee Paid
101	760	201	380	Utility filing fee	760.00
106	310	206	155	Design filing fee	
107	480	207	240	Plant filing fee	
108	760	208	380	Reissue filing fee	
114	150	214	75	Provisional filing fee	

SUBTOTAL (1) ($) 760.00

2. EXTRA CLAIM FEES

		Extra		Fee from below		Fee Paid
Total Claims	1 - 20** =	0	X	0	=	0
Indep. Claims	1 - 3** =	0	X	0	=	0
Multiple Dependent					=	0

** or number previously paid, if greater; For Reissues, see below

Large Fee Code	Entity Fee ($)	Small Fee Code	Entity Fee ($)	Fee Description
103	18	203	9	Claims in excess of 20
102	78	202	39	Independent claims in excess of 3
104	260	204	130	Multiple dependant claim
108	78	209	39	**Reissue independent claims over original patent
110	18	210	9	**Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 0

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Fee Code	Entity Fee ($)	Small Fee Code	Entity Fee ($)	Fee Description	Fee Paid
105	130	205	65	Surcharge - late filing fee or oath	130.00
127	50	227	25	Surcharge - late provisional filing fee or cover sheet	
139	130	139	130	Non-English specification	
147	2,520	147	2,520	For filing a request for reexamination	
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	
113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action	
115	110	215	55	Extension for reply within first month	
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141	1,210	241	605	Petition to revive - unintentional	
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143	430	243	215	Design issue fee	
144	580	244	290	Plant issue fee	
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123	50	123	50	Petitions related to provisional applications	
126	240	126	240	Submission of Information Disclosure Stmt	
581	40	581	40	Recording each patent assignment per property (times number of properties)	
146	760	246	380	Filing a submission after final rejection (37 CFR 1.129(a))	
149	760	249	380	For each additional invention to be examined (37 CFR 1.129(b))	

Other fee (specify) :

Other fee (specify) :

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 130.00

SUBMITTED BY				Complete (if applicable)	
Typed or Printed Name	Raymond Millien			Reg. Number	43,806
Signature		Date	11/18/99	Deposit Acct. User ID	19-0036

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SKGF Rev. 7/28/99 mac

0050002.sb17

Section #3

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ROBERT H. BENSON*
OF COUNSEL

*BAR OTHER THAN D.C.
**REGISTERED PATENT AGENTS

November 18, 1999

WRITER'S DIRECT NUMBER:
(202) 789-5506
INTERNET ADDRESS:
RMILLIEN@SKGF.COM

Assistant Commissioner for Patents
Washington, D.C. 20231

Box Missing Parts

Re: U.S. Utility Patent Application
Appl. No. 09/407,371; Filed: September 28, 1999
For: **Server-Group Messaging System for Interactive Applications**
Inventors: ROTHSCHILD *et al.*
Our Ref: 1719.0050002

Sir:

In reply to the "Notice to File Missing Parts of Application--Filing Date Granted," dated October 21, 1999, Applicants submit the following documents for appropriate action by the U.S. Patent and Trademark Office:

1. Fee Transmittal (Form PTO/SB/17) (in duplicate);

2. Copy of the Notice to File Missing Parts;

3. A copy of the Combined Declaration and Power of Attorney for Utility Patent Application, executed by the inventors as filed in parent Application No. 08/896,797, filed: July 18, 1997;

4. A copy of the executed Revocation of Prior Power of Attorney and Appointment of New Attorneys of Record from Assignee;

5. A copy of the Assignee's 37 C.F.R. § 3.73(b) Statement with a copy of the recorded Assignment attached;

6. Preliminary Amendment;

7. Our Check No. 25956 for $890.00 to cover:

$760.00 Filing Fee for Patent Application (37 C.F.R. § 1.16)
$130.00 Surcharge for late filing of Declaration (37 C.F.R. § 1.16); and

8. Return postcard.

It is respectfully requested that the attached postcard be stamped with the date of filing of these documents, and that it be returned to our courier.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036. If extensions of time under 37 C.F.R. § 1.136 other than those otherwise provided for herewith are required to prevent abandonment of the present patent application, then such extensions of time are hereby petitioned, and any fees therefor are hereby authorized to be charged to our Deposit Account No. 19-0036. A duplicate copy of this letter is enclosed.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Raymond Millien
Attorney for Applicants
Registration No. 43,806

0050002.pt4

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: ROTHSCHILD *et al.*

Appl. No. 09/407,371

Filed: September 28, 1999

For: **Server-Group Messaging System for Interactive Applications**

Art Unit: 2756

Examiner: *To be assigned*

Atty. Docket: 1719.0050002

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination on the merits, please enter the following Preliminary Amendment in the above-identified patent application as follows.

It is not believed that extensions of time or fees for net addition of claims are required beyond those that may otherwise be provided for in documents accompanying this paper. However, if additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and any fees required therefor (including fees for net addition of claims) are hereby authorized to be charged to our Deposit Account No. 19-0036.

Amendments

In the Specification:

Please amend the specification as follows:

Page 1, line 1, before "FIELD OF THE INVENTION" insert

This application is a continuation of Serial No. 08/896,797, filed July 18, 1997, now U.S. Patent No. 6,018,766, which is a continuation of Serial No. 08/595,323, filed February 1, 1996, now U.S. Pat. No. 5,822,523.

Page 3, line 8, delete "time" and insert therefor --times--; and

Page 3, line 14, delete "example" and insert therefor --examples--.

Page 4, line 25, delete "PPP" and insert therefor --Point-to-Point Protocol (PPP)--.

Page 6, line 17, delete "does" and insert therefor --do--.

Page 17, line 14, delete "send" and insert therefor --sends--.

Page 19, line 24, after "game," insert -- the--.

Page 21, line 18, after "know" delete "the".

Page 24, line 15, delete "consists of" and insert therefor --involves--.

Page 25, line 1, delete "and" and insert therefor --an--; and

Page 25, line 22, after "necessary" insert --steps--.

Page 47, line 6, delete "internet" and insert therefor --Internet--.

Page 54, line 12, delete "NTP" and insert therefor --Network Time Protocol (NTP)--.

In the Claims:

Please cancel claims 1-16 without prejudice or disclaimer.

Please add the following new claims 17-35:

--17. A method for facilitating communications among a plurality of host computers over a network to implement a shared, interactive application, comprising the steps of:

(1) receiving a create message from one of the plurality of host computers, wherein said create message specifies a message group to be created;

(2) receiving join messages from a first subset of the plurality of host computers, wherein each of said join messages specifies said message group;

(3) receiving host messages from a second subset of said first subset of the plurality of host computers belonging to said message group, wherein each of said messages contains a payload portion and a portion that is used to identify said message group;

(4) aggregating said payload portions of said host messages received from said second subset of the plurality of host computers to create an aggregated payload;

(5) forming an aggregated message using said aggregated payload; and

(6) transmitting said aggregated message to said first subset of the plurality of host computers belonging to said message group;

wherein ~~whereby~~ said aggregated message keeps the shared, interactive application operating consistently on each of said first subset of the plurality of host computers.

18. The method of claim 17, wherein the network is at least a portion of the Internet.

3
~~19.~~ A method for facilitating communications among a plurality of host computers over a network to implement a shared, interactive application, comprising the steps of:

(1) receiving a create message from one of the plurality of host computers, wherein said create message specifies a message group to be created;

(2) receiving join messages from a first subset of the plurality of host computers, wherein each of said join messages specifies said message group;

(3) receiving host messages from a second subset of said first subset of the plurality of host computers belonging to said message group, wherein each of said messages contains a payload portion and a portion that is used to identify said message group;

(4) aggregating said payload portions of said host messages received from said second subset of the plurality of host computers to create an aggregated message;

(5) transmitting said aggregated message to said first subset of the plurality of host computers belonging to said message group;

Wherein
~~whereby~~ said aggregated message keeps the shared, interactive application operating consistently on each of said first subset of the plurality of host computers.

4 3
~~20.~~ The method of claim ~~19~~, wherein the network is at least a portion of the Internet.

5
~~21.~~ A method for facilitating communications among a plurality of host computers over a network to implement a shared, interactive application, comprising the steps of:

(1) receiving a host message from one of the plurality of host computers belonging to a message group, wherein said host message contains a payload portion and a portion that is used to identify said message group;

(2) forming a server message using said payload portion of said host message;

(3) transmitting said server message to each of the plurality of host computers belonging to said message group; and

(4) suppressing said server message such that said one of the plurality of host computers which originated said host message does not receive said server message;

Wherein
~~whereby~~ said server message keeps the shared, interactive application operating consistently on each of the plurality of host computers belonging to said message group.

60 A

22. The method of claim 21, wherein the network is at least a portion of the Internet.

23. A method for facilitating communications among a plurality of host computers over a network to implement a shared, interactive application, comprising the steps of:

(1) receiving messages from a subset of the plurality of host computers belonging to a message group, wherein each of said messages contains a payload portion and a portion that is used to identify said message group;

(2) aggregating said payload portions of said messages to create an aggregated payload; and

(3) transmitting said aggregated message to each of the plurality of host computers belonging to said message group;

~~whereby~~ wherein said aggregated message keeps the shared, interactive application operating consistently on each of the plurality of host computers belonging to said message group.

24. The method of claim 23, wherein the network is at least a portion of the Internet.

25. The method of claim 23, wherein step (3) is performed after pausing for a pre-determined time interval.

26. The method of claim 25, wherein said pre-determined time interval is equivalent to the amount of time for the group messaging server to receive at least one message from each of the plurality host computers belonging to said first message group.

27. The method of claim 25, wherein said pre-determined time interval is a function of the rate that said messages are received from said subset of the plurality of host computers belonging to said first message group.

12

28. A method for providing group messages to a plurality of host computers connected to a group messaging server over a unicast wide area communication network, comprising the steps of:

(1) communicating with the plurality of host computers using the unicast network and maintaining a list of message groups, each message group containing at least one host computer;

(2) receiving messages from a subset of the plurality of host computers, each host computer in said subset belonging to a first message group, wherein each of said messages contains a payload portion and a portion that is used to identify said first message group;

(3) aggregating said payload portions of said messages received from said subset of the plurality of host computers to create an aggregated payload;

(4) forming an aggregated message using said aggregated payload; and

(5) transmitting said aggregated message to a recipient host computer belonging to said first message group.

13 12

29. The method of claim 28, wherein the unicast wide area communication network is at least a portion of the Internet.

14 12

30. The method of claim 28, wherein the unicast wide area communication network is at least a portion of the Internet, and said group messaging server communicates with said plurality of host computers using a session layer protocol.

15 12

31. The method of claim 28, wherein step (3) is performed after pausing for a pre-determined time interval.

16 15

32. The method of claim 31, wherein said pre-determined time interval is equivalent to the amount of time for the group messaging server to receive at least one message from each of the plurality host computers belonging to said first message group.

17 ~~33~~. The method of claim 15 ~~31~~, wherein said pre-determined time interval is a function of the rate that said messages are received from said subset of the plurality of host computers belonging to said first message group.

18 ~~34~~. A method for facilitating communications among a plurality of host computers over a network to implement a shared, interactive application, comprising the steps of:

(1) receiving a host message from one of the plurality of host computers belonging to a message group, wherein said host message contains a payload portion and a portion that is used to identify said message group;

(2) forming a server message by using said payload portion of said host message; and

(3) transmitting said server message to each of the plurality of host computers belonging to said message group;

whereby said server message keeps the shared, interactive application operating consistently on each of the plurality of host computers belonging to said message group.

19 ~~35~~. The method of claim 18 ~~34~~, wherein the network is at least a portion of the Internet.--

Remarks

Upon entry of the foregoing amendment, claims 17-35 are pending in the application, with claims 17, 19, 21, 23, 28 and 34, being the independent claims. Claims 1-16 are sought to be canceled without prejudice to or disclaimer of the subject matter therein. New claims 17-35 are sought to be added. These changes are believed to introduce no new matter, and their entry is respectfully requested.

If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Michael Messinger Reg. No. 37,575 for

Raymond Millien
Attorney for Applicants
Registration No. 43,806

Date: 2/17/00

1100 New York Avenue, N.W.
Suite 600
Washington, D.C. 20005-3934
(202) 371-2600

MBR/RVM/vdb
P95-39.wpd

A

PTO/SB/17 (12/99)
Approved for use through 09/30/2000. OMB 0651-0032
Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

FEE TRANSMITTAL
for FY 2000

Patent fees are subject to annual revision.
Small Entity payments must be supported by a small entity statement, otherwise large entity fees must be paid. See Forms PTO/SB/09-12. See 37 C.F.R. §§ 1.27 and 1.28.

TOTAL AMOUNT OF PAYMENT	($)234.00

Complete if Known	
Application Number	09/407,371
Filing Date	September 28, 1999
First Named Inventor	Jeffrey J. Rothschild
Examiner Name	To be assigned
Group / Art Unit	2756
Attorney Docket Number	1719.0050002

METHOD OF PAYMENT (check one)

1. ☐ The Commissioner is hereby authorized to charge indicated fees and credit any overpayment to:

Deposit Account Number: 19-0036
Deposit Account Name: Sterne, Kessler, Goldstein & Fox P.L.L.C.

☐ Charge Any Additional Fee Required Under 37 CFR §§ 1.16 and 1.17

2. ☒ Payment Enclosed: ☒ Check ☐ Money Order ☒ Other*
*Charge any deficiencies or credit any overpayments in the fees or fee calculations of Parts 1, 2 and 3 below to Deposit Account No. 19-0036. Check # 26703

FEE CALCULATION

1. BASIC FILING FEE

Large Fee Code	Entity Fee ($)	Small Fee Code	Entity Fee ($)	Fee Description	Fee Paid
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107	480	207	240	Plant filing fee	
108	690	208	334	Reissue filing fee	
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SUBTOTAL (1) ($)

2. EXTRA CLAIM FEES

	Extra		Fee from below		Fee Paid
Total Claims 19 - 20** =	0	X	0.00	=	0.00
Indep. Claims 6 - 3** =	3	X	78.00	=	234.00
Multiple Dependent				=	0.00

** or number previously paid, if greater; For Reissues, see below

Large Fee Code	Entity Fee ($)	Small Fee Code	Entity Fee ($)	Fee Description
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104	260	204	130	Multiple dependent claim
108	78	209	39	**Reissue independent claims over original patent
110	18	210	9	**Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 234.00

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Fee Code	Entity Fee ($)	Small Fee Code	Entity Fee ($)	Fee Description	Fee Paid
105	130	205	65	Surcharge - late filing fee or oath	
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149	760	249	380	For each additional invention to be examined (37 CFR 1.129(b))	

Other fee (specify) :
Other fee (specify) :
*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 0.00

SUBMITTED BY				Complete (if applicable)	
Typed or Printed Name	Raymond Millien			Reg. Number	43,806
Signature	Michael Messinger Reg. No. 37,575	Date	2/17/00	Deposit Acct. User ID	19-0036

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SKGF Rev. 2/2/00 mac

0050002.sb17-2

2757

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**REGISTERED PATENT AGENTS

February 17, 2000

WRITER'S DIRECT NUMBER:
(202) 789-5506
INTERNET ADDRESS:
RMILLIEN@SKGF.COM

Assistant Commissioner for Patents
Washington, D.C. 20231

Re: U.S. Utility Patent Application
Appl. No. 09/407,371; Filed: September 28, 1999
For: **Server-Group Messaging System for Interactive Applications**
Inventors: ROTHSCHILD *et al.*
Our Ref: 1719.0050002

Sir:

Transmitted herewith for appropriate action are the following documents:

1. Fee Transmittal (Form PTO/SB/17) (in duplicate);

2. Preliminary Amendment;

3. Our Check No. 26703 for $234.00 to cover:

   $234.00 Excess independent claims over three (37 C.F.R. § 1.16); and

4. Return postcard.

It is respectfully requested that the attached postcard be stamped with the date of filing of these documents, and that it be returned to our courier.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036. If extensions of time under 37 C.F.R. § 1.136 other than those otherwise provided for herewith are required to prevent

abandonment of the present patent application, then such extensions of time are hereby petitioned, and any fees therefor are hereby authorized to be charged to our Deposit Account No. 19-0036. A duplicate copy of this letter is enclosed.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Reg. No. 37,575

Raymond Millien
Attorney for Applicants
Registration No. 43,806

0050002.pt5

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**REGISTERED PATENT AGENTS

May 22, 2000

WRITER'S DIRECT NUMBER:
(202) 789-5506
INTERNET ADDRESS:
RMILLIEN@SKGF.COM

Assistant Commissioner for Patents
Washington, D.C. 20231

Re: U.S. Utility Patent Application
Appl. No. 09/407,371; Filed: September 28, 1999
For: **Server-Group Messaging System for Interactive Applications**
Inventors: ROTHSCHILD *et al.*
Our Ref: 1719.0050002

Sir:

Transmitted herewith for appropriate action are the following documents:

1. Information Disclosure Statement;

2. Form PTO-1449, one (1) page, listing fifteen (15) documents;

3. One copy each of reference AL1 and AR1 as cited on Form PTO-1449; and

4. One (1) return postcard.

It is respectfully requested that the attached postcard be stamped with the date of filing of these documents, and that it be returned to our courier. In the event that extensions of time are necessary to prevent abandonment of this patent application, then such extensions of time are hereby petitioned.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036. A duplicate copy of this letter is enclosed.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Raymond Millien
Attorney for Applicants
Registration No. 43,806

0050002.pt6

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Rothschild *et al.*

Appl. No. 09/407,371

Filed: September 28, 1999

For: **Server-Group Messaging System for Interactive Applications**

Art Unit: 2758

Examiner: *To Be Assigned*

Atty. Docket: 1719.0050002

Information Disclosure Statement

Commissioner for Patents
Washington, D.C. 20231

Sir:

Listed on accompanying Form PTO-1449 are documents that may be considered material to the examination of this application, in compliance with the duty of disclosure requirements of 37 C.F.R. §§ 1.56, 1.97 and 1.98.

Applicants have listed publication dates on the attached PTO-1449 based on information presently available to the undersigned. However, the listed publication dates should not be construed as an admission that the information was actually published on the date indicated.

Applicants reserve the right to establish the patentability of the claimed invention over any of the information provided herewith, and/or to prove that this information may not be prior art, and/or to prove that this information may not be enabling for the teachings purportedly offered.

This statement should not be construed as a representation that a search has been made, or that information more material to the examination of the present patent application does not exist. The Examiner is specifically requested not to rely solely on the material submitted herewith. It is further understood that the Examiner will consider information that was cited or

submitted to the U.S. Patent and Trademark Office in a prior application relied on under 35 U.S.C. § 120. 1138 OG 37, 38 (May 19, 1992).

Applicants have checked the appropriate boxes below.

☒ 1. This Information Disclosure Statement is being filed before the mailing date of a first Office Action on the merits. No statement or fee is required.

☐ 2. This Information Disclosure Statement is being filed more than three months after the U.S. filing date AND after the mailing date of the first Office Action on the merits, but before the mailing date of a Final Rejection or Notice of Allowance.

- ☐ a. I hereby state that each item of information contained in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(1).
- ☐ b. I hereby state that no item of information in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to my knowledge after making reasonable inquiry, was known to any individual designated in 37 C.F.R. § 1.56(c) more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(2).
- ☐ c. Attached is our Check No. _____ in the amount of $ _____ in payment of the fee under 37 C.F.R. § 1.17(p).

☐ 3. This Information Disclosure Statement is being filed more than three months after the U.S. filing date and after the mailing date of a Final Rejection or Notice of Allowance, but before payment of the Issue Fee. A separate Petition to the Group Director, requesting consideration of this Information Disclosure Statement, is concurrently submitted herewith, along with our Check No. _____ in the amount of $ _____ in payment of the fee under 37 C.F.R. § 1.17(i).

- ☐ a. I hereby state that each item of information contained in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application not more than three months

prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(1).

☐ b. I hereby state that no item of information in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to my knowledge after making reasonable inquiry, was known to any individual designated in 37 C.F.R. § 1.56(c) more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(2).

☐ 4. The document(s) was/were cited in a search report by a foreign patent office in a counterpart foreign application. Submission of an English language version of the search report that indicates the degree of relevance found by the foreign office is provided in satisfaction of the requirement for a concise explanation of relevance. 1138 OG 37, 38.

☐ 5. A concise explanation of the relevance of the non-English language document(s) appears below:

☐ 6. The Examiner's attention is directed to co-pending U.S. Patent Application No. _____, filed _____, which is directed to related technical subject matter. 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.

☒ 7. A copy of documents AL1* and AR1 are enclosed. Copies of the remaining documents were cited by or submitted to the Patent Office in Application No. 08/896,797, filed July 18, 1997 (now U.S. Pat. No. 6,018,766), or 08/595,323, filed February 1, 1996 (now U.S. Pat. No. 5,822,523), which are relied upon for an earlier filing date under 35 U.S.C. § 120. Thus, copies of these documents are not attached. 37 C.F.R. § 1.98(d).

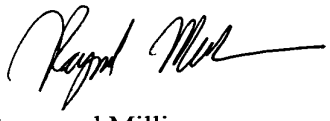
*The Examiner's attention is directed towards document AL1 (EP 0 647 149). It is believed that this document was cited in a prior application but was incorrectly listed as EP 0 647 142. Applicants hereby list the correct document number on the attached PTO-1449, and enclose a copy of the document for the convenience of the Examiner.

It is respectfully requested that the Examiner initial and return a copy of the enclosed PTO-1449, and indicate in the official file wrapper of this patent application that the documents have been considered.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036. A duplicate copy of this pleading is enclosed.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.



Raymond Millien
Attorney for Applicants
Registration No. 43,806

Date: 5/22/00

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*BAR OTHER THAN D.C.
**REGISTERED PATENT AGENTS

OIPE JC18
MAY 22 2000
PATENT & TRADEMARK OFFICE

May 22, 2000

WRITER'S DIRECT NUMBER:
(202) 789-5506
INTERNET ADDRESS:
RMILLIEN@SKGF.COM

Assistant Commissioner for Patents
Washington, D.C. 20231

Re: U.S. Utility Patent Application
Appl. No. 09/407,371; Filed: September 28, 1999
For: **Server-Group Messaging System for Interactive Applications**
Inventors: ROTHSCHILD *et al.*
Our Ref: 1719.0050002

Sir:

Transmitted herewith for appropriate action are the following documents:

1. Information Disclosure Statement;

2. Form PTO-1449, one (1) page, listing fifteen (15) documents;

3. One copy each of reference AL1 and AR1 as cited on Form PTO-1449; and

4. One (1) return postcard.

It is respectfully requested that the attached postcard be stamped with the date of filing of these documents, and that it be returned to our courier. In the event that extensions of time are necessary to prevent abandonment of this patent application, then such extensions of time are hereby petitioned.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036. A duplicate copy of this letter is enclosed.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Raymond Millien
Attorney for Applicants
Registration No. 43,806

0050002.pt6

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November 1, 2000

WRITER'S DIRECT NUMBER:
(202) 789-5506
INTERNET ADDRESS:
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Commissioner for Patents
Washington, D.C. 20231

Re: U.S. Utitlity Patent Application
Appl. No. 09/407,371; Filed: September 28, 1999
For: **Server-Group Messaging System for Interactive Applications**
Inventors: Rotshchild *et al.*
Our Ref: 1719.0050002

Sir:

Transmitted herewith for appropriate action are the following documents:

1. First Supplemental Information Disclosure Statement Under MPEP § 2001.06(c);

2. Form PTO-1449, thirteen (13) pages, listing ninety-seven (97) documents;

3. One copy each of the documents as cited on Form PTO-1449; and

4. One (1) return postcard.

It is respectfully requested that the attached postcard be stamped with the date of filing of these documents, and that it be returned to our courier. In the event that extensions of time are necessary to prevent abandonment of this patent application, then such extensions of time are hereby petitioned.

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Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Raymond Millien
Attorney for Applicants
Registration No. 43,806

Enclosures

0050002.pt7

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**REGISTERED PATENT AGENTS

November 1, 2000

WRITER'S DIRECT NUMBER:
(202) 789-5506
INTERNET ADDRESS:
RMILLIEN@SKGF.COM

Commissioner for Patents
Washington, D.C. 20231

Re: U.S. Utitlity Patent Application
Appl. No. 09/407,371; Filed: September 28, 1999
For: **Server-Group Messaging System for Interactive Applications**
Inventors: Rotshchild *et al.*
Our Ref: 1719.0050002

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Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Raymond Millien
Attorney for Applicants
Registration No. 43,806

Enclosures

0050002.pt7

#7

FORM PTO-1449 FIRST SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT	ATTY. DOCKET NO. 1719.0050002	APPLICATION NO. 09/407,371
	APPLICANT Rothschild *et al.*	
	FILING DATE September 28, 1999	GROUP 2758

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA1	4,572,509	02/1986	Sitrick	273	85	
	AB1	4,740,954	04/1988	Cotton *et al.*	370	60	
	AC1	4,807,224	02/1989	Naron *et al.*	370	94	
	AD1	4,984,235	01/1991	Hillis *et al.*	370	60	
	AE1	4,991,171	02/1991	Teraslinna *et al.*	370	94.1	
	AF1	4,998,199	03/1991	Tashiro *et al.*	364	410	
	AG1	5,083,800	01/1992	Lockton	273	439	
	AH1	5,089,813	02/1992	DeLuca *et al.*	340	825.44	
	AI1	5,117,420	05/1992	Hillis *et al.*	370	60	

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ1						Yes No
	AK1						Yes No
	AL1						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

	AM	1	Ahuja, S.R., *et al.*, "The Rapport Multimedia Conferencing System," *Conference on Office Information Systems* 1988, pp. 1-7.
	AN	1	Armstrong, S. *et al.*, "Multicast Transport Protocol," *Network Working Group Request For Comments: 1301*, 1992, 31 pages.
	AO	1	Berglund, E.J. and Cheriton, D.R. "Amaze: A Distributed Multi-Player Game Program using the Distributed V Kernel," *IEEE Proceedings of the Fourth Int'l Conf. on Distributed Systems*, 1984, pp. 248-253.
	AP	1	Braden, R. (ed.), "Requirements for Internet Hosts -- Communication Layers," *Network Working Group Request for Comments: 1122*, October 1989, 100 pages.
	AQ	1	Braden, R. (ed.), "Requirements for Internet Hosts -- Application and Support," *Network Working Group Request for Comments: 1123*, October 1989, 84 pages.

EXAMINER	ZARNI MAUNG	DATE CONSIDERED	11/30/00

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

P:\USERS\JASONG\1719\005-2(suppl).1449SKGF Rev. 1/95

FORM PTO-1449

FIRST SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

ATTY. DOCKET NO.	APPLICATION NO.
1719.0050002	09/407,371
APPLICANT: Rothschild *et al.*	
FILING DATE: September 28, 1999	GROUP: ~~2758~~ 2854

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA2	5,150,410	09/1992	Bertrand	380	28	
	AB2	5,257,113	10/1993	Chen *et al.*	358	426	
	AC2	5,287,530	02/1994	Davis *et al.*	370	94.1	
	AD2	5,289,460	02/1994	Drake, Jr. *et al.*	370	17	
	AE2	5,365,523	11/1994	Derby *et al.*	370	85.2	
	AF2	5,408,261	04/1995	Kamata *et al.*	348	15	
	AG2	5,430,727	07/1995	Callon	370	85.13	
	AH2	5,453,780	09/1995	Chen *et al.*	348	15	
	AI2	5,502,726	03/1996	Fischer	370	94.1	

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ2						Yes No
	AK2						Yes No
	AL2						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

	AM	2	Braden, R. *et al.*, "Integrated Services in the Internet Architecture: An Overview," *Network Working Group Request for Comments: 1633*, June 1994, 27 pages.
	AN	2	Braudes, R. and Zabele, S., "Requirements for Multicast Protocols," *Network Working Group Request for Comments: 1458*, May 1993, 16 pages.
	AO	2	Cameron, P. *et al.*," Transport Multiplexing Protocol (TMux)," *Network Working Group Request for Comments: 1692*, August 1994, 10 pages.
	AP	2	Cheriton, D.R. and Deering, S.E., "Host Groups: A Multicast Extension for Datagram Internetworks," *ACM/IEEE Proceedings of the Ninth Data Communications Symposium*, September 10-13, 1985, pp. 172-179.
	AQ	2	Chimiak, W., "A Comment on Packet Video Remote Conferencing and the Transport/Network Layers," *Network Working Group Request for Comments: 1453*, April 1993, 9 pages.

EXAMINER	ZARNI MAUNG	DATE CONSIDERED	1/30/00

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

P:\USERS\JASONG\1719\005-2(supp1).1449SKGF Rev. 1/95

3

FORM PTO-1449

FIRST SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

ATTY. DOCKET NO.	APPLICATION NO.
1719.0050002	09/407,371
APPLICANT: Rothschild *et al.*	
FILING DATE: September 28, 1999	GROUP: ~~2758~~ 2655

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA3	5,558,339	09/1996	Perlman	463	42	
	AB3	5,581,552	12/1996	Civanlar *et al.*	370	396	
	AC3	5,586,257	12/1996	Perlman	463	42	
	AD3	5,586,937	12/1996	Menashe	463		
	AE3	5,594,732	01/1997	Bell *et al.*	370	401	
	AF3	5,630,757	05/1997	Gagin *et al.*	463	43	
	AG3	5,634,011	05/1997	Auerbach *et al.*	395	200.15	
	AH3	5,685,775	11/1997	Bakoglu *et al.*	463	41	
	AI3	5,729,540	03/1998	Wegrzyn	370	336	

5,630,757FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ3						Yes No
	AK3						Yes No
	AL3						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

	AM	3	Crocker, D.H., "Standard For The Format Of ARPA Internet Text Messages," *IETF RFC # 822*, August ~~13~~, 1982, 43 pages.
	AN	3	Deering, S.E. and Cheriton, D.R., "Host Groups: A Multicast Extension to the Internet Protocol," *Network Working Group Request for Comments: 966*, December 1985, 23 pages.
	AO	3	Deering, S., "Host Extensions for IP Multicasting," *Network Working Group Request for Comments: 1054*, May 1988, 16 pages.
	AP	3	Deering, S., "Host Extensions for IP Multicasting," *Network Working Group Request for Comments: 1112*, August 1989, 14 pages.
	AQ	3	Handley, M.J., "The Car System: Multimedia in Support of Collaborative Design," *Computing and Control Division Colloquium on 'Multimedia and Professional Applications'*, February 3, 1993, pp. 8/1-8/5.

EXAMINER: ZARNI MAUNG DATE CONSIDERED: 11/8/00

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

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FORM PTO-1449

FIRST SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

ATTY. DOCKET NO.	APPLICATION NO.
1719.0050002	09/407,371
APPLICANT: Rothschild *et al.*	
FILING DATE: September 28, 1999	GROUP: ~~2758~~ 2154

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
ZN	AA4	5,740,170	04/1998	Andou *et al.*	370	390	
ZN	AB4	5,778,187	07/1998	Monteiro *et al.*	395	200.61	
ZN	AC4	5,805,830	09/1998	Reese *et al.*	395	200.65	
ZN	AD4	5,946,308	08/1999	Dobbins *et al.*	370	392	
ZN	AE4	5,956,485	09/1999	Perlman	395	200	
	AF4						
	AG4						
	AH4						
	AI4						

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ4						Yes No
	AK4						Yes No
	AL4						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

ZN	AM	4	Henckel, L., "Multipeer Transport Services for Multimedia Applications," *High Performance Networking, V: Proc. Of the IFIP TC6/WG6.4 Fifth International Conference on High Performance Networking*, June 27 - July 1, 1994, pp. 167-184.
ZN	AN	4	Kirsche, T. *et al.*, "Communication support for cooperative work," *Computer Communications*, Vol. 16, No. 9, September 1993, pp. 594-602.
ZN	AO	4	Lauwers, J.C. *et al.*, "Replicated Architectures for Shared Window Systems: A Critique," *Proc. of the ACM Conference on Office Information Systems*, 1990, pp. 249-260.
ZN	AP	4	Leung, Y-W. And Yum, T-S., "Optimum Connection Paths for a Class of Videoconferences," *Int'l. Conference on Comm. ICC 91*, Vol. 1 of 3, June 23-26, 1991, pp. 0859-0865.
ZN	AQ	4	Leung, Y-W. And Yum, T-S., "A Modular Multirate Video Distribution System-Design and Dimensioning," *IEEE/ACM Transactions on Networking*, Vol. 2, No. 6, December 1994, pp. 549-557.

EXAMINER	ZARNI MAUNG	DATE CONSIDERED	4/28/00

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

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FORM PTO-1449

FIRST SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

ATTY. DOCKET NO.	APPLICATION NO.
1719.0050002	09/407,371
APPLICANT: Rothschild *et al.*	
FILING DATE: September 28, 1999	GROUP: ~~2758~~ 2151

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA5						
	AB5						
	AC5						
	AD5						
	AE5						
	AF5						
	AG5						
	AH5						
	AI5						

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ5						Yes No
	AK5						Yes No
	AL5						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

	AM	5	Li, Y. and Andresen, S., "Multipoint Conferencing for Mobile Communications Network," *2nd Int'l. Conference on Universal Personal Communications*, October 12-15, 1993, pp. 212-216.
	AN	5	*Multipoint Control Units For Audiovisual Systems Using Digital Channels Up To 2 Mbit/s*, ITU Standard Draft H.231, 1993, pp. 11-22.
	AO	5	Ngoh, L., "Multicast Support for Group Communications," *Computer Networks and ISDN Systems*, 166-178, October 1991, pp. 166-178.
	AP	5	Postel, J.B., "Simple Mail Transfer Protocol," *Internet Engineering Task Force (IETF) Request for Comments (RFC) 821*, August 1982, 59 pages.
	AQ	5	Rajagopalan, B., "Membership protocols for distributed conference control," *Computer Communications*, Vol. 18, No. 10, October 1995, pp. 695-708.

EXAMINER	ZARNI MALING	DATE CONSIDERED	11/30/00

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

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FORM PTO-1449

FIRST SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

ATTY. DOCKET NO.	APPLICATION NO.
1719.0050002	09/407,371
APPLICANT: Rothschild *et al.*	
FILING DATE: September 28, 1999	GROUP: ~~2758~~ 2654

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA6						
	AB6						
	AC6						
	AD6						
	AE6						
	AF6						
	AG6						
	AH6						
	AI6						

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ6						Yes No
	AK6						Yes No
	AL6						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

	AM	6	Ramanathan, S. *et al.*, "Optimal Communication Architecture for Multimedia Conferencing in Distributed Systems," *The 12th Int'l Conference on Distributed Computing Systems*, June 9-12, 1992, pp. 46-53.
	AN	6	Rose, M.T. and Stefferud, E.A., "Proposed Standard for Message Encapsulation," *Network Working Group Request for Comments: 934*, January 1985, 9 pages.
	AO	6	Schaffer, U., "MPPS - A Multiparty Presentation Service," *Upper Layer Protocols, Architectures and Applications: Proc. Of the IFIP TC6/WG6.5 International Conference on Upper Layer Protocols, Architectures and Applications*, June 1-3, 1994, pp. 243-256.
	AP	6	Schooler, E.M., "The Impact of Scaling on a Multimedia Connection Architecture," *ACM Journal of Multimedia Systems*, Vol. 1, No. 1, 1993, pp. 1-10.
	AQ	6	Schulzrinne, H., "RTP: A Transport Protocol for Real-Time Applications," *IETF Internet Draft draft-ietf-avt-rtp-00.doc*, December 15, 1992, 23 pages.

EXAMINER: ZARNI MAUNG — DATE CONSIDERED: 11/3/00

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

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FORM PTO-1449

FIRST SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

ATTY. DOCKET NO.	APPLICATION NO.
1719.0050002	09/407,371
APPLICANT: Rothschild *et al.*	
FILING DATE: September 28, 1999	GROUP: ~~2758~~ 2199

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA7						
	AB7						
	AC7						
	AD7						
	AE7						
	AF7						
	AG7						
	AH7						
	AI7						

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ7						Yes No
	AK7						Yes No
	AL7						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

	AM	7	Schulzrinne, H. and Casner, S., "RTP: A Transport Protocol for Real-Time Applications," *IETF Internet Draft draft-ietf-avt-rtp-01.txt*, May 6, 1993, 16 pages.
	AN	7	Schulzrinne, H. and Casner, S., "RTP: A Transport Protocol for Real-Time Applications," *IETF Internet Draft draft-ietf-avt-rtp-02.txt*, July 30, 1993, 24 pages.
	AO	7	Schulzrinne, H. and Casner, S., "RTP: A Transport Protocol for Real-Time Applications," *IETF Internet Draft draft-ietf-avt-rtp-04.txt*, October 20, 1993, 33 pages.
	AP	7	Schulzrinne, H. *et al.*, "RTP: A Transport Protocol for Real-Time Applications," *Network Working Group Request for Comments Request for Comments: 1889*, January 1996, 61 pages.
	AQ	7	Singhal, S.K. and Cheriton, D.R., "Using a Position History-Based Protocol for Distributed Object Visualization," *Stanford University Technical Report No. CS-TR-94-1505*, 1994, 25 pages.

EXAMINER: ZARNI MAUNG — DATE CONSIDERED: 4/12/06

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

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FORM PTO-1449 FIRST SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT	ATTY. DOCKET NO. 1719.0050002	APPLICATION NO. 09/407,371
	APPLICANT Rothschild *et al.*	
	FILING DATE September 28, 1999	GROUP ~~2758~~ 2700

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA8						
	AB8						
	AC8						
	AD8						
	AE8						
	AF8						
	AG8						
	AH8						
	AI8						

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ8						Yes No
	AK8						Yes No
	AL8						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

	AM	8	"System for Establishing Communication Between Audiovisual Terminals Using Digital Channels Up To 2 Mbit/s," *Amended/New Draft Recommendation Of The H.240-Series Submitted To The Xth CCITT Plenary Assembly COM XV-R 94-E*, May 1992, 68 pages.
	AN	8	Thomas, E., "Listserv Distribute Protocol," *Network Working Group Request for Comments: 1429*, February, 1993, 7 pages.
	AO	8	Turletti, T., "H.261 software codec for videoconferencing over the Internet," *Rapports de Recherche No. 1834*, January 1993, pp. 1-18.
	AP	8	Vin, H.M. *et al.*, "Multimedia Conferencing in the Etherphone Environment," *Computer: Multimedia Information Systems*, October 1991, pp. 69-79.
	AQ	8	Vonderweidt, G. *et al.*, "A Multipoint Communication Service for Interactive Applications," *IEEE Transactions on Communications*, Vol. 39, No. 12, December 1991, pp. 1875-1885.

EXAMINER ZARNI MAUNG	DATE CONSIDERED 10/30/00

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

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FORM PTO-1449

FIRST SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

ATTY. DOCKET NO.	APPLICATION NO.
1719.0050002	09/407,371
APPLICANT: Rothschild *et al.*	
FILING DATE: September 28, 1999	GROUP: 2758

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA9						
	AB9						
	AC9						
	AD9						
	AE9						
	AF9						
	AG9						
	AH9						
	AI9						

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ9						Yes No
	AK9						Yes No
	AL9						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

	AM	9	Waitzman, D. *et al.*, "Distance Vector Multicast Routing Protocol," *Network Working Group Request for Comments: 1075*, November 1988, 20 pages.
	AN	9	Wancho, F., "Digest Message Format," *Network Working Group Request for Comments: 1153*, April 1990, 4 pages.
	AO	9	Waters, A.G., "Multicast Provision for High Speed Networks," *High Performance Networking, IV: Proc. Of the IFIP TC6/WG6.4 Fourth International Conference on High Performance Networking*, December 14-18, 1992, pp. 317-332.
	AP	9	Weiss, G. and Ziegler, C., "Packet Switched Voice Conferencing Across Interconnected Networks," *Proceedings 13th Conference on Local Computer Networks*, October 10-12, 1988, pp. 114-124.
	AQ	9	Weiss, G. and Ziegler, C., "A Comparative Analysis of Implementation Mechanisms for Packet Voice Conferencing," *IEEE INFOCOM '90 Proceedings Vol 1.*, 1990, pp. 1062-1070.

EXAMINER	ZARNI MAUNG	DATE CONSIDERED	11/30/00

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

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FORM PTO-1449

FIRST SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

ATTY. DOCKET NO.	APPLICATION NO.
1719.0050002	09/407,371
APPLICANT: Rothschild *et al.*	
FILING DATE: September 28, 1999	GROUP: ~~2758~~ 2654

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA10						
	AB10						
	AC10						
	AD10						
	AE10						
	AF10						
	AG10						
	AH10						
	AI10						

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ10						Yes No
	AK10						Yes No
	AL10						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

	AM	10	Willebeek-LeMair, M.H. and Shae, Z-Y., "Centralized versus Distributed Schemes for Videoconferencing," *Proceedings of the Fifth IEEE Computer Society Workshop on Future Trends of Distributed Computing Systems*, August 28-30, 1995, pp. 85-93.
	AN	10	Zarros, P.N., *et al.*, "Statistical Synchronization Among Participants in Real-Time Multimedia Conference," *IEEE INFOCOM Proceedings '94 Volume 1*, 1994, pp. 912-919.
	AO	10	Ziegler, C. *et al.*, "Implementation Mechanisms for Packet Switched Voice Conferencing," *IEEE Journal on Selected Areas in Communications*, Vol. 7, No. 5, June 1989, pp. 698-706.
	AP	10	Altenhofen, Michael *et al.*, "The BERKOM Multimedia Collaboration Service," *ACM Multimedia*, 1993, pp. 457-462.
	AQ	10	Arango, Mauricio *et al.*, "TOURING MACHINE: A Software Infrastructure to Support Multimedia Communications," *Communications of the ACM*, 1993, pp. 186-189.

EXAMINER	ZARNI MA-ONG	DATE CONSIDERED	11/26/00

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

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FORM PTO-1449 FIRST SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT	ATTY. DOCKET NO. 1719.0050002	APPLICATION NO. 09/407,371
	APPLICANT Rothschild *et al.*	
	FILING DATE September 28, 1999	GROUP ~~2758~~

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA11						
	AB11						
	AC11						
	AD11						
	AE11						
	AF11						
	AG11						
	AH11						
	AI11						

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ11						Yes No
	AK11						Yes No
	AL11						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

ZR	AM	11	Chang, Wan-teh *et al.*, "Call Processing And Signaling In A Desktop Multimedia Conferencing System," *Proc. Of GLOBECOM*, 1992, pp. 225-229.
ZR	AN	11	Deering, Stephen Edward, *Multicast Routing In A Datagram Internetwork*, Stanford University Dissertation, December 1991, pp. i-xiii and 1-137.
ZR	AO	11	Horton, Mark R., "UUCP Mail Interchange Format Standard," *Networking Working Group Request for Comments: 976*, February 1986, 10 pages.
ZR	AP	11	Kantor, Brian and Lapsley, Phil, "Network News Transfer Protocol: A Proposed Standard for the Stream-Based Transmission of News," *Networking Working Group Request for Comments: 977*, February 1986, 22 pages.
ZR	AQ	11	Leiner, B. (ed.), "Critical Issues in High Bandwidth Networking," *Networking Working Group Request for Comments: 1077*, November 1988, 37 pages.

EXAMINER	ZARNI MAUNG	DATE CONSIDERED	11/30/00

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

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FORM PTO-1449

FIRST SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

ATTY. DOCKET NO.	APPLICATION NO.
1719.0050002	09/407,371
APPLICANT: Rothschild *et al.*	
FILING DATE: September 28, 1999	GROUP: ~~2738~~ 2654

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA12						
	AB12						
	AC12						
	AD12						
	AE12						
	AF12						
	AG12						
	AH12						
	AI12						

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ12						Yes No
	AK12						Yes No
	AL12						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

ZR	AM	12	Nagle, John, "Congestion Control in IP/TCP Internetworks," *Networking Working Group Request for Comments: 896*, January 6, 1984, 8 pages.
ZR	AN	12	Ong, Lyndon Y. and Schwartz, Mischa, "Centralized and Distributed Control for Multimedia Conferencing," *Proceedings of ICC*, 1993, pp. 197-201.
ZR	AO	12	Romahn, Götz, "System Aspects Of Multipoint Videoconferencing," *GLOBECOM*, 1987, pp. 723-725.
ZR	AP	12	Schulzrinne *et al.*, "RTP: A Transport Protocol for Real-Time Applications," *IETF Internet Draft draft-ietf-avt-rtp-06.txt*, November 28, 1994, 93 pages.
ZR	AQ	12	Schulzrinne *et al.*, "RTP: A Transport Protocol for Real-Time Applications," *IETF Internet Draft draft-ietf-avt-rtp-new-08.txt*, July 14, 2000, 90 pages.

EXAMINER	DATE CONSIDERED
ZARNI MAUNG	6/20/00

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

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FORM PTO-1449

FIRST SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

ATTY. DOCKET NO.	APPLICATION NO.
1719.0050002	09/407,371
APPLICANT: Rothschild *et al.*	
FILING DATE: September 28, 1999	GROUP: ~~2758~~ 2154

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA13						
	AB13						
	AC13						
	AD13						
	AE13						
	AF13						
	AG13						
	AH13						
	AI13						

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ13						Yes No
	AK13						Yes No
	AL13						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

	AM	13	Zellweger, Polle T. *et al.*, "An Overview Of The Etherphone System And Its Applications," *2nd IEEE Conference on Computer Workstations*, March 7-10, 1988, pp. 160-168.
	AN	13	*Defendants' Initial Disclosure of Prior Art Under Civil Local Rule 16-7(D)-(E)*, 21 Pages, Entered April 4, 2000 in HearMe v. Lipstream Networks, Inc. *et al.*, United States District Court for the Northern District of California, Case No. C 99-04506 WHA.
	AO	13	*Defendants' Response Chart For United States Patent No. 5,822,523 Under Civil Local Rule 16-9(B)*, 26 Pages Plus Exhibits A-K, Dated July 5, 2000, Filed in HearMe v. Lipstream Networks, Inc. *et al.*, United States District Court for the Northern District of California- San Francisco Division, Case No. C 99-04506 WHA.
	AP	13	*Defendants' Response Chart For United States Patent No. 6,018,766 Under Civil Local Rule 16-9(B)*, 28 Pages Plus Exhibits A-J, Dated August 1, 2000, Filed in HearMe v. Lipstream Networks, Inc. *et al.*, United States District Court for the Northern District of California- San Francisco Division, Case No. C 99-04506 WHA.
	AQ	13	

EXAMINER	ZARNI MAUNG	DATE CONSIDERED	11/30/00

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

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#6

FORM PTO-1449 INFORMATION DISCLOSURE STATEMENT	ATTY. DOCKET NO. 1719.0050002	APPLICATION NO. 09/407,311
	APPLICANT Rothschild *et al.*	RECEIVED MAY 23 2000
	FILING DATE September 28, 1999	GROUP ~~2758~~ GROUP 2700

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA1	4,470,954	09/1984	Cotton *et al.*	370	60	
	AB1	5,079,767	01/1992	Perlman	370	94.3	
	AC1	5,150,464	09/1992	Sidhu *et al.*	395	200.01	
	AD1	5,245,608	09/1993	Deaton, Jr. *et al.*	370	94.1	
	AE1	5,309,433	05/1994	Cidon *et al.*	370	60	
	AF1	5,309,437	05/1994	Perlman *et al.*	370	85.13	
	AG1	5,329,619	07/1994	Page *et al.*	395	200.01	
	AH1	5,361,256	11/1994	Doeringer *et al.*	370	60	
	AI1	5,475,819	12/1995	Miller *et al.*	395	200.01	
	AJ1	5,517,494	05/1996	Green	370	60	
	AK1	5,740,231	04/1998	Cohn *et al.*	379	83	

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AL1	0 637 149	02/1995	EP	H04L	12/18	Yes No
	AM1	WO 95/10908	04/1995	PCT	H04L	12/18	Yes No
	AN1	WO 95/10911	04/1995	PCT	H04L	29/06	Yes No
	AO1						Yes No
	AP1						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

	AR	1	Oikarinen, J. and Reed, D., "Internet Relay Chat Protocol," Networking Group Request for Comments: 1459, May 1993, <http://www.tuug.org/~f/irc/text/rfc1459.txt>, 57 pages.
	AS	1	
	AT	1	

EXAMINER	ZARNI MAUNG	DATE CONSIDERED	11/30/00

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

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SKGF Rev. 1/95

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Rothschild *et al.*

Appl. No. 09/407,371

Filed: September 28, 1999

For: **Server-Group Messaging System for Interactive Applications**

Art Unit: 2758

Examiner: *To Be Assigned*

Atty. Docket: 1719.0050002

EXR. Note Part 2 (Box) For References

FIRST SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT UNDER MPEP § 2001.06(C)

Commissioner for Patents
Washington, D.C. 20231

Sir:

Listed on accompanying Form PTO-1449 are ninety-seven (97) documents that may be considered material to the examination of this application, in compliance with the duty of disclosure requirements of 37 C.F.R. §§ 1.56, 1.97 and 1.98.

The documents listed on the accompanying Form PTO-1449 were brought to the attention of the undersigned due to a litigation captioned HearMe v. Lipstream Networks, Inc., Case No. C-99-04506 (WHA), filed in the United States District Court for the Northern District of California on October 8, 1999. This suit involved U.S. Patents Nos. 5,822,523 and 6,018,766, to which the present application claims priority under 35 U.S.C. § 120. The suit was ultimately settled on August 30, 2000.

The defendants in the suit alleged invalidity and unenforceability of both U.S. Patent Nos. 5,822,523 and 6,018,766 based on the ninety-four (94) documents listed on the accompanying Form PTO-1449. These ninety-four documents were cited by the defendant in three "Response Charts" (Documents AN13, AO13 and AP13 listed on the accompanying Form PTO-1449) which are required by Local Rules 16-7 and 16-9 of the United States District Court for the

Northern District of California. Thus, due to the requirements of 37 C.F.R. §§ 1.56, 1.97 and 1.98, as well as MPEP § 2001.06(c) (7th ed., Rev. 1, Feb. 2000), the undersigned felt it best to cite all ninety-four documents, and the three Response Charts themselves, on the accompanying Form PTO-1449.

Applicants note that three documents listed in one of the defendant's Response Charts are drafts of the same Request for Comment (RFC) document and are no longer available from the Internet Engineering Task Force (IETF). The three documents are:

> Schulzrinne *et al.*, "RTP: A Transport Protocol for Real-Time Applications," *IETF Internet Draft draft-ietf-avt-rtp-03.txt*, December 1992;
> Schulzrinne *et al.*, "RTP: A Transport Protocol for Real-Time Applications," *IETF Internet Draft draft-ietf-avt-rtp-07.txt*, December 1992; and
> Schulzrinne *et al.*, "RTP: A Transport Protocol for Real-Time Applications," *IETF Internet Draft draft-ietf-avt-rtp-05.txt*, 1994.

They are unavailable because, according to IETF policy, older drafts of RFCs must be updated within six months or are deleted from their archives. See www.ietf.org/ID.html (IETF's "Internet Drafts" link), visited by the undersigned on September 5, 2000. Document AQ12 listed on the accompanying Form PTO-1449, dated July 14, 2000, however, is the most recent draft of these IETF RFCs that are no longer available.

Further, of the ninety-four documents cited in the three Response Charts, it is the undersigned's understanding that Documents AQ6, AM7-AP7, AP12 and AQ12 listed on the accompanying Form PTO-1449--all drafts of the same IETF RFC document--were the documents primarily relied upon by the defendants for their assertion of invalidity and unenforceability during the suit. See Molins PLC v. Textron, Inc., 48 F.3d 1172, 1182-83 (Fed. Cir. 1995) (discussion of inequitable conduct and "burying" references).

Applicants have listed publication dates on the attached PTO-1449 based on information presently available to the undersigned. However, the listed publication dates should not be construed as an admission that the information was actually published on the date indicated.

Applicants reserve the right to further establish the patentability of the claimed invention over any of the listed documents should they be applied as references, and/or to prove that some of these documents may not be prior art, and/or to prove that some of these documents may not be enabling for the teachings they purport to offer.

This statement should not be construed as a representation that a search has been made, or that information more material to the examination of the present patent application does not exist. The Examiner is specifically requested not to rely solely on the material submitted herewith. It is further understood that the Examiner will consider information that was cited or submitted to the U.S. Patent and Trademark Office in a prior application relied on under 35 U.S.C. § 120. 1138 OG 37, 38 (May 19, 1992).

It is respectfully requested that the Examiner initial and return a copy of the enclosed PTO-1449, and indicate in the official file wrapper of this patent application that the documents have been considered.

This Information Disclosure Statement is being filed before the mailing date of a first Office Action on the merits. No statement or fee is required. Nevertheless, the U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036. A duplicate copy of this pleading is enclosed.

Respectfully submitted,

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(FILE 'HOME' ENTERED AT 13:41:35 ON 29 NOV 2000)

FILE 'USPATFULL' ENTERED AT 13:41:42 ON 29 NOV 2000

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L1          16 S AGGREGAT? (4A) PAYLOAD#
L2        2591 S (GENERAT? OR CREAT?) (P) MESSAGE? (P) GROUP#
L3         258 S SUBSET? (P) HOST### (P) COMPUTER#
L4          17 S L3 AND L2
L5           1 S L4 AND L1
L6          32 S L4 OR L1

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L6 ANSWER 1 OF 32 USPATFULL
PI US 6154773 20001128
AB Entertainment content complementary to a musical recording is delivered to a user's computer by means of a computer network link. The user employs a browser to access the computer network. A plug-in for the browser is able to control an audio CD or other device for playing the musical recording. A script stored on the remote computer accessed over the network is downloaded. The script synchronizes the delivery of the complementary entertainment content with the play of the musical recording.

L6 ANSWER 2 OF 32 USPATFULL
PI US 6125111 20000926
AB An architecture for a modular communications system is disclosed. The modular communications system comprises at least one control module; a plurality of resource modules for receipt of external payload data provided to said system or for manipulation of the payload data; a plurality of resource module links, one link connecting each resource module to the control module and each resource module. The control module comprises a switch for switching payload data between the plurality of resource modules; and a bandwidth allocator comprising a bandwidth selector and a distributor each connected to the switch and to the resource module links. The bandwidth selector allows the selection of the bandwidth of payload data passed from any of the resource modules to the time switch. Similarly, the bandwidth distributor allows for the selection of the bandwidth of payload data switched through the switch and provided to any of the resource modules from the control module. Preferably, all the resource module links are electrically isolated from each other. The architecture provides for the modular assembly of a telecommunications offering varied capacities, redundancies and services.

L6 ANSWER 3 OF 32 USPATFULL
PI US 6115422 20000905
AB A method of implementing a time base change to a time-division multiplexec bitstream, for example an MPEG-2-compatible bitstream. The time base change is in response to a Time Base Change Flag. The bitstreams have video and audio packetized elementary streams, and each of these streams has a common time base. Each of the packetized elementary streams has a packet header, and packet data. The packet

headers of the packetized elementary streams each contain a Presentation Time Stamp/Decoding Time Stamp flag field, a Presentation Time Stamp field, and a Decoding Time Stamp field. A time base change is indicated by a change in the PCR. The first step in changing the Time Base is receiving a discontinuity in the bitstream. This is used to disable synchronization of the video and audio bitstreams, and to mark a data byte in the bitstream associated with the Time Base Change Flag. The time base change is carried out and an interrupt is issued when the marked data byte arrives for decoding. This interrupt re-enables synchronization of the audio and video bitstreams.

L6 ANSWER 4 OF 32 USPATFULL
PI US 6061549 20000509
AB A D-AMPS+ cellular communications air interface is presented wherein a packet data control channel and packet data traffic channel is supported in addition to the conventional digital control channel and digital traffic channel. In particular, the packet data control channel, packet data traffic channel and digital traffic channel support multiple modulation level operation (high versus low). Procedures are provided for intracell and intercell modulation transition of mobile station communications carried by a traffic channel. In particular, these procedures facilitate intracell and intercell modulation transition to a traffic channel using the same level of modulation, as well as intracell and intercell (fall-forward and fall-backward) modulation transition to a traffic channel using a different level of modulation.

L6 ANSWER 5 OF 32 USPATFULL
PI US 6023729 20000208
AB A method and apparatus related to grouping (or matching) network users and computers associated with multi-user applications is disclosed. Each user is associated with a client computer that is connected to a network. A match maker application resides on one or more server computer(s). The match maker application controls the process of collecting Clients into matched sets, called client groups, based upon a wide range of attributes of the users, their client computers, the server computers, software application titles, application instances and/or data communication links of the network, for example. Each time the match maker application creates a client group, it creates a group data set that represents the client group. Network match making information is presented to users in an understandable manner using icons, other graphical images or collections of icons and/or images, for example, displayed on a display screen. For example, a non-textual element of a graphical image can be varied to communicate group information about a client group to a user. A variety of non-textual elements can be used to communicate a variety of group information to a user.

L6 ANSWER 6 OF 32 USPATFULL
PI US 6018766 20000125
AB A method for deploying interactive applications over a network containing host computers and group messaging servers is disclosed. The method operates in a conventional unicast network architecture comprised of conventional network links and unicast gateways and routers. The hosts send messages containing destination group addresses by unicast to the group messaging servers. The group addresses select message groups maintained by the group messaging servers. For each message group, the group messaging servers also maintain a list of all of the hosts that are members of the particular group. In its most simple implementation, the method consists of the group server receiving a message from a host

containing a destination group address. Using the group address, the group messaging server then selects a message group which lists all of the host members of the group which are the targets of messages to the group. The group messaging server then forwards the message to each of the target hosts. In an interactive application, many messages will be arriving at the group server close to one another in time. Rather than simply forward each message to its targeted hosts, the group messaging server aggregates the contents of each of messages received during a specified time period and then sends an aggregated message to the targeted hosts. The time period can be defined in a number of ways. This method reduces the message traffic between hosts in a networked interactive application and contributes to reducing the latency in the communications between the hosts.

L6 ANSWER 7 OF 32 USPATFULL
PI US 5991286 19991123
AB A D-AMPS+ cellular communications air interface is presented wherein a packet data control channel and packet data traffic channel is supported in addition to the conventional digital control channel and digital traffic channel. In particular, the packet data control channel and packet data traffic channel support multiple modulation level operation (high versus low). Procedures are provided for mobile station selection, as well as re-selection, of either the high or low-level modulation for the packet channels. Procedures are further provided for facilitating a fall-forward to the high-level modulation packet data control channel, or a fall-backward to the low-level modulation packet data control channel with respect to both uplink and downlink packet data communications.

L6 ANSWER 8 OF 32 USPATFULL
PI US 5956401 19990921
WO 9604726 19960215
AB A communications path not using a deterministic signal frame structure is provided with performance monitoring by using known Alarm Indication Signal (AIS) type monitoring on the path but scrambling traffic signals in a scrambler to avoid them being mistaken for an AIS. At the receiving end of the path the received signals are monitored for the presence of an AIS, followed by a descrambler to unscramble the received signals before transmitting them to a receiving piece of CPE. An adverse state detector may also be provided, to avoid the scrambler scrambling traffic signals to that they look like an AIS.

L6 ANSWER 9 OF 32 USPATFULL
PI US 5924083 19990713
AB A distributed electronic trading system for displaying a real-time credit filtered view of at least one market in which financial instruments are traded in which the market view includes a predetermined number of orders currently available to a viewing trading entity based upon one or more credit limits entered by the viewing trading entities and/or other trading entities in the system includes a host for receiving and storing orders and credit information entered by a plurality of trading entities including the viewing trading entity, for transmitting the orders and predetermined display parameters, and for selectively transmitting the credit information; a plurality of intelligent nodes linked to the host; and a plurality of keystations respectively linked to one or more of the intelligent nodes. Each intelligent node includes a credit information storage unit for storing the selected credit information, an order book storage unit for storing the orders and display parameters, and a processor for generating

real-time credit filtered market view display information for each assigned trading entity. The real-time credit filtered market view display information includes the predetermined number of unilaterally and/or bilaterally credit filtered orders and corresponding available quantities. The displayed market view may consist of individual order prices and quantities, aggregated prices and quantities, and/or average prices at predetermined quantities chosen by the viewing trading entity.

L6 ANSWER 10 OF 32 USPATFULL
PI US 5878039 19990302
AB An interface device is provided which may be used to perform rate adaptation and time slot assignment, in either the transmit or receive directions, in a multiplexing unit for interfacing a high rate optical carrier line to a plurality of lower rate information carrier lines. The high rate optical carrier line may be a SONET or SDH carrier line. The interface device according to the present invention may be operationally configured to provide data rate adaptation and time slot assignment between an optical carrier line operating at an OC-12 rate with lower rate lines operating according to OC-3, OC-1, DS-3, or DS-1 protocols, or even virtual channels. A plurality of identical interface devices may be cascaded together and used to perform interface support for various channels operating at various rates, merely by manipulating the operational configuration of the individual interface devices in the cascade.

L6 ANSWER 11 OF 32 USPATFULL
PI US 5822523 19981013
AB A method for deploying interactive applications over a network containing host computers and group messaging servers is disclosed. The method operates in a conventional unicast network architecture comprised of conventional network links and unicast gateways and routers. The hosts send messages containing destination group addresses by unicast to the group messaging servers. The group addresses select message groups maintained by the group messaging servers. For each message group, the group messaging servers also maintain a list of all of the hosts that are members of the particular group. In its most simple implementation, the method consists of the group server receiving a message from a host containing a destination group address. Using the group address, the group messaging server then selects a message group which lists all of the host members of the group which are the targets of messages to the group. The group messaging server then forwards the message to each of the target hosts. In an interactive application, many messages will be arriving at the group server close to one another in time. Rather than simply forward each message to its targeted hosts, the group messaging server aggregates the contents of each of messages received during a specified time period and then sends an aggregated message to the targeted hosts. The time period can be defined in a number of ways. This method reduces the message traffic between hosts in a networked interactive application and contributes to reducing the latency in the communications between the hosts.

L6 ANSWER 12 OF 32 USPATFULL
PI US 5799151 19980825
AB An interactive trade network is described that integrates distributive messaging using a host computer and telecommunication networks, real-time interactive communications, a hierarchical knowledge matrix containing two familiar and comprehensive indices of classes of goods and classes of establishments and a legend of trade-related, cross-reference terms or parameters, a multiline programmable

application, an integrated application program interface, and integrated application programs. The Host System uses each Index Number of each of the indices as a topic board name. The apparatus creates a highly-selective media for either (a) messaging on mutually exclusive indexed topics of trade or (b) engaging in pubic or private real-time conferencing or electronic mail dedicated to any class of indexed economic activity. It enables progressive discussions on, and the retrieval of just the information needed under, discrete indexed topics on trade instantaneously. The interface typically facilitates access to one of thousands of topic boards upon input for, or interpreted to, three key strokes in the selector process. Users may review, broadcast, post or "chain" messages to one party or multiple parties, whether known or anonymous. Messages are cross-referenceable by geographic codes, time and other alpha-numeric descriptors.

L6 ANSWER 13 OF 32 USPATFULL
PI US 5737337 19980407
AB In an ADSL transmitter (62), data is flamed and split between a fast path and an interleave path by multiplexer (66). Data is forward error correction encoded in FEC encoder (70). Data on the interleave path is interleaved by interleaver (72) if an interleave depth (D) is >2. During interleaving, at least one additional read operation is performed, after a series of consecutive write and read operations. The additional read operation permits interleaving to continue without waiting for a next frame of data to arrive at the interleaver. An equal number of additional write operations compensates for the additional reads at a later point. Use of an interleaving memory can also be avoided by turning off or disabling the interleaver, while still permitting data to be sent along the interleave path. Transmit path controller (74) senses if D=1, and if so disables the interleaver and avoids the need for interleaver memory (64).

L6 ANSWER 14 OF 32 USPATFULL
PI US 5634011 19970527
AB A multinode, multicast communications network has a distributed control for the creation, administration and operational mode selection operative in each of the nodes of the network. Each node is provided with a Set Manager for controlling either creation of, administration or access to a set of users to whom a multicast is to be directed. The Set Manager maintains a record of the local membership of all users associated with the node in which the Set Manager resides. A given Set Manager for each designated set of users is assigned the task of being the Set Leader to maintain membership information about the entire set of users in the multicast group. One of the Set Managers in the communications network is designated to be the Registrar which maintains a list of all the Set Leaders in the network. The Registrar insures that there is one and only one Set Leader for each set of users, answers inquiries about the membership of the sets and directs inquiries to appropriate Set Leaders if necessary. All of the set creation, administration and control functions can therefore be carried out by any node of the system and provision is made to assume the function at a new node when failure or partition in the network occurs.

L6 ANSWER 15 OF 32 USPATFULL
PI US 5533005 19960702
AB Data is protected in a data transmission system operating on the synchronous digital hierarchy. The data is transmitted in multiplex form between ports in the system and protection is applied between ports at different or the same aggregate bit rates. This protection is achieved

by selecting between individual portions of the **payload** within the **aggregate** signals and each part of mutually protective portions has the same nominal traffic capacity. By duplexing an alternative signal path is created to ensure a continuity of traffic through the system in the event of a fault in one path.

L6 ANSWER 16 OF 32 USPATFULL
PI US 5469434 19951121
AB A time division multiplexer (TDM) is provided for multiplexing data from a plurality of channels. The TDM system generally comprises a high speed time division multiplexed digital data bus, a synchronizing bus, a plurality of channel cards coupled between the data channels and the data bus with each channel card having its own processor and memory, and a system communication manager (SCM) which is also coupled to the digital bus, and includes a (micro)processor. The processor of the SCM determines the frame for the system and initially forwards the frame information to each of the channel cards during predetermined time slots of the high speed data bus. The channel cards are synchronized by the SCM via the synchronization bus, and the channel cards use the synchronization information and the framing information in order to appropriately place data on and take data off of the high speed data bus without the use of an address bus. A system overhead frame (SOF) is also preferably multiplexed into timeslots of the high speed data bus. Thus, during operation, the high speed data bus multiplexes not only data from the channel cards, but system overhead information as well as framing information.

L6 ANSWER 17 OF 32 USPATFULL
PI US 5276899 19940104
AB A multiprocessor system intercouples the processors with an active logic network having a plurality of priority determining nodes. Messages applied concurrently to the network in groups are sorted, using the data content of the messages, to a single or common priority message which is distributed to all the processors with a predetermined total network delay time. Losing messages are again retried concurrently in groups at a later time. Message routing is determined by local acceptance or rejection of messages at the processors, based upon destination data in the messages. All messages occupy places in a coherent priority scheme and are transferred in contending groups with prioritization on the network. Using data, status, control and response messages, and different multiprocessor modes, the system is particularly suited for configuration in a relational data base machine having capability for maintaining an extended data base and handling complex queries.

L6 ANSWER 18 OF 32 USPATFULL
PI US 5271582 19931221
AB Multiple subsidiary small payloads are connected to standard mechanical and electrical interfaces provided by an expendable or recoverable modular mother satellite bus (MMSB) and launched into space as an assembly acting as a common carrier providing low unit launch costs for the attached subsidiary payloads and also providing a variety of electrical, pointing, and thermal control services for these payloads after reaching orbit. These services include but are not necessarily limited to controlled separation of free-flying satellites or re-entry vehicles, regulated electric power at a variety of voltages, telemetry, computer control, payload control via time delayed pre-programmed instructions, optional real-time payload control via direct radio communication or transmission through geostationary or other communication satellite links, time-driven or event-driven control

logic, mass data memory, encryption and decryption of data and commands, payload pointing, augmented heat rejection, and interconnection between subsidiary attached payloads through the data bus.

L6 ANSWER 19 OF 32 USPATFULL
PI US 5199672 19930406
AB The effect of orbit plane precession is used to place a plurality of satellites into one or more desired orbit planes. The satellites are distributed within each desired orbit plane in a selected configuration. The satellites are transported into orbit on one or more frame structures referred to as "pallets". When more than one pallet is used, they are placed on top of each other in a "stack". After the stack of the pallets has been launched into an initial, elliptical orbit, the pallets are separated sequentially from the stack at selected time intervals. Thrust is applied to transfer a first pallet from the initial orbit to a first, circular orbit, wherein the initial and first orbits are in planes that process at different predetermined initial and first rates, respectively. After waiting for a predetermined time while the initial orbit plane and the first orbit plane precess with respect to each other, thrust is applied to the next pallet to transfer it into a next, circular orbit in a next orbit plane, wherein the precession rate of the next orbit plane also is different from the initial precession rate of the initial orbit plane. The foregoing step is repeated until the satellites on the respective pallets have been sequentially deployed into the desired orbit planes. The satellites on each pallet are then separated from the pallet simultaneously, but at different rates to achieve separation among the satellites within each orbit.

L6 ANSWER 20 OF 32 USPATFULL
PI US 5143326 19920901
AB The invention is a rig useful in preventing relative movement between two hicles or other payloads suspended from a helicopter. The rig has two triangular plates which are in connection between the vehicles, the connection being loose before cables from the helicopter to the triangular plates are tensioned. When the helicopter rises, tension on the cables raises the triangular plates, thereby pivoting clevises which are engaged with the triangular plates and which are mounted on on the vehicles. The pivoting of the clevises draws the vehicles into tight abutment with abutment plates at the ends of the triangular plates so that the vehicles act as a single, more stable load. A cross member is connected both between the triangular plates and between the vehicles to inhibit relative lateral movement of the vehicles.

L6 ANSWER 21 OF 32 USPATFULL
PI US 5111384 19920505
AB A system for automating the dump analysis process includes a remotely located host computer system which, in response to requests from a local expert computer system, retrieves only relevant values from one or more physical memory dumps. The expert system reconstructs from these values the operating system control structures represented in the dump, and applies expert knowledge on these control structures to determine the symptom of the problem occurring on the computer system which stopped operating and generated the dump.

L6 ANSWER 22 OF 32 USPATFULL
PI US 5006978 19910409
AB A multiprocessor system intercouples the processors with an active logic network having a plurality of priority determining nodes. Messages applied concurrently to the network in groups are sorted, using the data

content of the messages, to a single or common priority message which is distributed to all the processors with a predetermined total network delay time. Losing messages are again retried concurrently in groups at a later time. Message routing is determined by local acceptance or rejection of messages at the processors, based upon destination data in the messages. All messages occupy places in a coherent priority scheme and are transferred in contending groups with prioritization on the network. Using data, status, control and response messages, and different multiprocessor modes, the system is particularly suited for configuration in a relational data base machine having capability for maintaining an extended data base and handling complex queries.

L6 ANSWER 23 OF 32 USPATFULL
PI US 4956772 19900911
AB A multiprocessor system intercouples the processors with an active logic network having a plurality of priority determining nodes. Messages applied concurrently to the network in groups are sorted, using the data content of the meassages, to a single or common priority message which is distributed to all the processors with a predetermined total network delay time. Losing messages are again retried concurrently in groups at a later time. Message routing is determined by local acceptance or rejection of messages at the processors, based upon destination data in the messages. All messages occupy places in a coherent priorty scheme and are transferred in contending groups with prioritization on the network. Using data, status, control and response messages, and different multiprocessor modes, the system is particularly suited for configuration in a relational data base machine having capability for maintaining an extended data base and handling complex queries.

L6 ANSWER 24 OF 32 USPATFULL
PI US 4945471 19900731
AB A multiprocessor system intercouples the processors wtih an active logic network having a plurality of priority determining nodes. Messages applied concurrently to the network in groups are sorted, using the data content of the messages, to a single or common priority message which is distributed to all the processors with a predetermined total network delay time. Losing messages are again retried concurrently in groups at a later time. Message routing is determined by local acceptance or rejection of messages at the processors, based upon destination data in the messages. All messages occupy places in a coherent priority scheme and are transferred in contending groups with prioritization on the network. Using data, status, control and response messages, and different multiprocessor modes, the system is particularly suited for configuration in a relational data base machine having capability for maintaining an extended data base and handling complex queries.

L6 ANSWER 25 OF 32 USPATFULL
PI US 4908612 19900313
AB A computer input-output device for permitting a user to control the operation of an application program on a host computer. The device includes a display divisible into a plurality of sections for displaying the names of the options then available to the user at any point in the operation of the application program. Selection keys associated with each section allow the user to select the option displayed in the corresponding section. In response to the selection, the input device sends a series of keystroke codes to the keyboard input port of the host computer to cause the application program to execute the selected option. The host computer keyboard is connected to the input-output device which intercepts keystroke codes generated by the keyboard and

transmits them to the computer only if the codes are designated as permissable ones. A set of programmable arrow keys controls the pointer functions of the application program on the host computer screen.

L6 ANSWER 26 OF 32 USPATFULL
PI US 4891600 19900102
AB A means for controllably accelerating a particle of matter having a selected dipole characteristic is shown. The means includes a means for generating an alternating electric field extending a first direction, which varies at a selected frequency and which has a predetermined magnitude which is less than the characteristic field ionization potential limit of a particle. A means for generating an alternating magnetic field is provided. The alternating magnetic field extends in a second direction at a predetermined angle to and crosses and intercepts the electric field to define a spatial force field region. The alternating magnetic field has a frequency which is substantially equal to and is at a predetermined phase angle relative to the alternating electric field and is at a flux density which, when multiplied times the selected frequency, is less than the characteristic field ionization limit of a particle. Means are provided for establishing a particle at a selected temperature below a particle thermal ionization level and for transporting a particle into the spatial force field region causing the dipole of a particle to be driven into cyclic motion at substantialy the selected frequency which accelerates a particle in a direction substantially normal to the directions of the electric field and said magnetic fields. A control means for establishing a predetermined spatial and time relationship between the electric field, magnetic field and dipole cyclic motion to control a particle acceleration is provided.

L6 ANSWER 27 OF 32 USPATFULL
PI US 4814979 19890321
AB A multiprocessor system intercouples the processors with an active logic network having a plurality of priority determining nodes. Messages applied concurrently to the network in groups are sorted, using the data content of the messages, to a single or common priority message which is distributed to all the processors with a predetermined total network delay time. Losing messages are again retried concurrently in groups at a later time. Message routing is determined by local acceptance or rejection of messages at the processors, based upon destination data in the messages. All messages occupy places in a coherent priority scheme and are transferred in contending groups with prioritization on the network. Using data, status, control and response messages, and different multiprocessor modes, the system is particularly suited for configuration in a relational data base machine having capability for maintaining an extended data base and handling complex queries.

L6 ANSWER 28 OF 32 USPATFULL
PI US 4663932 19870512
AB A dipolar force field propulsion system having a alternating electric field source for producing electromotive lines of force which extend in a first direction and which vary at a selected frequency and having an electric field strength of a predetermined magnitude, a source of an alternating magnetic field having magnetic lines of force which extend in a second direction which is at a predetermined angle to the first direction of the electromotive lines of force and which cross and intercept the electromotive line of force at a predetermined location defining a force field region and wherein the frequency of the alternating magnetic field substantially equal to the frequency of the alternating electric field and at a selected in phase angle therewith

and wherein the magnetic field has a flux density which when multiplied times the selected frequency is less than a known characteristic field ionization potential limit; a source of neutral particles of matter having a selected dipole characteristic and having a known characteristic field ionization potential limit which is greater than the magnitude of the electric field and wherein the dipoles of the particles of matter are capable of being driven into cyclic rotation at the selected frequency by the electric field to produce a reactive thrust, a vaporizing stage which vaporizes said particles of matter into a gaseous state at a selected temperature, and a transporting system for transporting the vaporized particles of matter into the force field defined by the crossing electromotive lines of force and the magnetic lines of force.

L6 ANSWER 29 OF 32 USPATFULL
PI US 4649533 19870310
AB The information retrieval method and apparatus includes a group of geographically widely-distributed terminals, which accept a remotely located host computer. Each terminal includes a memory for storing a plurality of items of call origination information. A call original circuit transmits individual ones of the items of call origination information via a communication path to the switching system for causing it to extend the path to the host computer. Logic circuits transfer a first one of the items of call origination information indicative of the geographically shortest communication path, to the call origination circuit in an attempt to extend a communication path, of the geographically shortest length, to the host computer. If the attempt proves unsuccessful, the logic circuit sends automatically a second one of the items of call origination information, indicative of the next shortest communication path length.

L6 ANSWER 30 OF 32 USPATFULL
PI US 4543630 19850924
AB A multiprocessor system intercouples the processors with an active logic network having a plurality of priority determining nodes. Messages applied concurrently to the network in groups are sorted, using the data content of the messages, to a single or common priority message which is distributed to all the processors with a predetermined total network delay time. Losing messages are again retried concurrently in groups at a later time. Message routing is determined by local acceptance or rejection of messages at the processors, based upon destination data in the messages. All messages occupy places in a coherent priority scheme and are transferred in contending groups with prioritization on the network. Using data, status, control and response messages, and different multiprocessor modes, the system is particularly suited for configuration in a relational data base machine having capability for maintaining an extended data base and handling complex queries.

L6 ANSWER 31 OF 32 USPATFULL
PI US 4445171 19840424
AB A multiprocessor system intercouples processors with an active logic network having a plurality of priority determining nodes. Messages are applied concurrently to the network in groups from the processors and are sorted, using the data content of the messages to determine priority, to select a single or common priority message which is distributed to all the processors with a predetermined total network delay time. Losing messages are again retried concurrently in groups at a later time. Message routing is determined by local acceptance or rejection of messages at the processors, based upon destination data in

the messages. All messages occupy places in a coherent priority scheme and are transferred in contending groups with prioritization on the network. Using data, status, control and response messages, and different multiprocessor modes, the system is particularly suited for configuration in a relational data base machine having capability for maintaining an extended data base and handling complex queries.

L6 ANSWER 32 OF 32 USPATFULL

PI US 4412285 19831025

AB A system using a sorting network to intercouple multiple processors so as to distribute priority messages to all processors is characterized by semaphore means accessible to both the local processors and the global resource via the network. Transaction numbers identifying tasks are employed in the messages, and interfaces at each processor are locally controlled to establish transaction number related indications of the current status of each task being undertaken at the associated processor. A single query to all processors via the network elicits a prioritized response that denotes the global status as to that task. The transaction numbers also are used as global commands and local controls for the flow of messages. A destination selection system based on words in the messages is used as the basis for local acceptance or rejection of messages. This arrangement together with the transaction number system provides great flexibility as to intercommunication and control.

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SECOND SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
ZM	AA1	5,297,143	03/1994	Fridrich *et al.*	370	85.3	
ZM	AB1	5,418,912	05/1995	Christenson	395	200	
ZM	AC1	5,481,735	01/1996	Mortensen *et al.*	395	200.1	
ZM	AD1	5,590,281	12/1996	Stevens	395	200.01	
ZM	AE1	5,674,127	10/1997	Horstmann *et al.*	463	42	
ZM	AF1	5,761,436	06/1998	Nielsen	395	200.75	
ZM	AG1	5,784,568	06/1998	Needham	395	200.64	
ZM	AH1	5,812,552	09/1998	Arora *et al.*	370	401	
ZM	AI1	5,930,259	07/1999	Katsube *et al.*	370	409	

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
ZM	AJ1	WO 93/15572	08/1993	PCT	H04J	3/26	Yes / No
	AK1						Yes / No
	AL1						Yes / No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

ZM	AM	1	Addeo, E.J. *et al.*, "A Multi-Media Multi-Point Communication Services Capability for Broadband Networks," 1987, pp. 423-428.
ZM	AN	1	Addeo, E.J. *et al.*, "Personal Multi-Media Multi-Point Communication Services for Broadband Networks," 1988, pp. 53-57.
ZM	AO	1	Aguilar, Lorenzo, "Datagram Routing for Internet Multicasting," 1984, pp. 58-63.
ZM	AP	1	Aguilar, L. *et al.*, "Architecture for a Multimedia Teleconferencing System," 1986, pp. 126-136.
ZM	AQ	1	Aras, C. *et al.*, "Real-Time Communication in Packet-Switched Networks," 1994, pp. 122-139.

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ATTY. DOCKET NO.	APPLICATION NO.
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Rothschild *et al.*	
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U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA2						
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EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ2						Yes No
	AK2						Yes No
	AL2						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

	AM	2	Baguette, Yves and Danthine, André, "Comparison of TP4, TCP and XTP- Part 1: Connection Management Mechanisms (*)," Vol. 3-N 5, Sept-Oct. 1992, pp. 1-12.
	AN	2	Baker, Rusti *et al.*, "Multimedia Processing Model for a Distributed Multimedia I/O System*," *Network and Operating System Support for Digital Audio and Video*, 1992, pp. 164-175.
	AO	2	Bettati, R. *et al.*, "Connection Establishment for Multi-Party Real-Time Communication," *Network and Operating Systems Support for Digital Audio and Video*, 1995, pp. 240-250.
	AP	2	Bharath-Kumar, Kadaba and Jaffe, Jeffrey M., "Routing to Multiple Destinations in Computer Networks," 1983, pp. 343-351.
	AQ	2	Birchler, Barbara D. *et al.*, "Toward a general Theory of Unicast-Based Multicast Communication*," ~~pp.~~ 237-251.

EXAMINER	ZARNI MAUNG	DATE CONSIDERED	12/1/00

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA3						
	AB3						
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	AI3						

5,630,757FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ3						Yes No
	AK3						Yes No
	AL3						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

	AM	3	Birman, K.P. and Joseph, T.A., "On Communication Support for Fault Tolerant Process Groups," *Network Working Group Request for Comments: 992*, November 1986, pp. 1-16.
	AN	3	Braden, Robert *et al.*, "The Design of the RSVP Protocol," RSVP Project: Final Report, May 27, 1993-June 30, 1995, pp. 1-21.
	AO	3	Brown, E.F. *et al.*, "A Continuous Presence Video Conferencing System," 1978, pp. 34.1.1-34.1.4.
	AP	3	Brown, T. *et al.*, "Packet Video for Heterogeneous Networks Using CU-SEEME," *Proceedings ICIP-96*, September 16-19, 1996, pp. 9-12.
	AQ	3	Bubenik *et al.*, "Multipoint Connection Management in High Speed Networks," 1991, pp. 59-68.

EXAMINER	DATE CONSIDERED
ZARNI MAUNG	12/1/00

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA4						
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	AI4						

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ4						Yes No
	AK4						Yes No
	AL4						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

	AM	4	Casner, Stephen *et al.*, "N-Way Conferencing with Packet Video," *The Third International Workshop on Packet Video*, March 22-23, 1990, pp. 1-6.
	AN	4	Chia, L.T. *et al.*, "An Experimental Integrated Workstation for Teleconferencing," *Integrating Telecommunications and Information Technology on the Desktop*, March 1994, pp. 1-5.
	AO	4	Clark, David D. *et al.*, "Supporting Real-Time Applications in an Integrated Services Packet Network: Architecture and Mechanism," 1992, pp. 14-26.
	AP	4	Clark, William J., "Multipoint Multimedia Conferencing," *IEEE Communications Magazine*, May 1992, pp. 44-50.
	AQ	4	Cohen, David M. and Heyman, Daniel P., "Performance Modeling of Video Teleconferencing in ATM Networks," *IEEE Transactions on Circuits and Systems for Video Technology*, Vol. 3, No. 6, December 1993, pp. 408-420.

EXAMINER ZARNI MAUNG	DATE CONSIDERED 12/11/00

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EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA5						
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FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ5						Yes No
	AK5						Yes No
	AL5						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

ZM	AM	5	Crowcroft, J. *et al.* "Multimedia TeleConferencing over International Packet Switched Networks. RN/90/XX," *IEEE Conference on Communications Software: Communications for Distributed Applications & Systems*, April 18-19, 1991, pp. 23-33.
ZM	AN	5	Deering, Stephen *et al.*, "An Architecture for Wide-Area Multicast Routing," 1994, pp. 126-135.
ZM	AO	5	Deering, Stephen E., "Multicast Routing in Internetworks and Extended LANs," *SIGCOMM '88 Symposium Communications Architectures & Protocols*, August 16-19, 1988, pp. 55-64.
ZM	AP	5	Deering, Stephen E. and Cheriton, David R., "Multicast Routing in Datagram Internetworks and Extended LANs," *ACM Transactions on Computer Systems*, May 1990, Vol. 8, No. 2, pp. 85-110.
ZM	AQ	5	Dewan, Prasun *and Choudhary, Rajiv.* "A High-Level and Flexible Framework for Implementing Multiuser User Interfaces," *ACM Transactions on Information Systems*, October 1992, Vol. 10, No. 4, pp. 345-380.

EXAMINER	DATE CONSIDERED
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ATTY. DOCKET NO.	APPLICATION NO.
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EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA6						
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FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ6						Yes No
	AK6						Yes No
	AL6						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

	AM	6	Draoli, M. *et al.*, "Video Conferencing on a LAN/MAN Interconnected System: QoS Evaluation," *Proceedings of the Fourth International Conference on Computer Communications and Networks*, September 20-23, 1995, pp. 170-177.
	AN	6	Draoli, M. *et al.*, "Videoconferencing on a LAN/MAN Architecture: Service Evaluation and System Dimensioning," *Communications Technology Proceedings*, 1996, Vol. 2, pp. 630-633.
	AO	6	Ensor, J. Robert *et al.*, "The Rapport Multimedia Conferencing System- A Software Overview," *2nd IEEE Conference on Computer Workstations*, March 7-10, 1988, pp. 52-58.
	AP	6	Ferrari, Domenico *et al.*, "Network support for multimedia A discussion of the Tenet Approach," *Computer Networks and ISDN Systems*, 1994, pp. 1267-1280.
	AQ	6	Fliesser, R.J. *et al.*, "Design of a Multicast ATM Packet Switch," *1993 Canadian Conference on Electrical and Computer Engineering*, Vol. 1, pp. 779-783.

EXAMINER	ZARNI MAUNG	DATE CONSIDERED	12/11/00

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA7						
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FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ7						Yes No
	AK7						Yes No
	AL7						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

	AM	7	Han, Jefferson and Smith, Brian, "CU-SeeMe VR Immersive Desktop Teleconferencing," *ACM Multimedia*, 1996, 9 pages.
	AN	7	Harju, Jarmo *et al.*, "Quality and Performance of a Desktop Video Conferencing System in the Network of Interconnected LANs," *Proceedings of the 19th Conference on Local Networks*, 1994, pp. 365-371.
	AO	7	Heinrichs, Bernd and Jakobs, Kai, "OSI Communication Services Supporting CSCW Applications," *SIGDOC '93*, 1993, pp. 107-115.
	AP	7	Herzog, Shai *et al.*, "Sharing 'Cost' of Multicast Trees: An Axiomatic Analysis," *ACM SIGCOMM '95 Conference*, August 1995, pp. 1-15.
	AQ	7	Hopper, Andy, "Pandora-an experimental system for multimedia applications," *Operating Systems Review*, April 1990, Vol. 24, Number 2, pp. 19-34.

EXAMINER	ZARNI MAUNG	DATE CONSIDERED	12/1/00

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FORM PTO-1449 SECOND SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT	ATTY. DOCKET NO. 1719.0050002	APPLICATION NO. 09/407,371
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U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA8						
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EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ8						Yes No
	AK8						Yes No
	AL8						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

	AM	8	Huang, Jau-Hsiung *et al.*, "Design and Implementation of Multimedia Conference System on Broadcast Networks*," *18th Conference on Local Computer Networks*, 1993, pp. 337-341.
	AN	8	Jia, Weija, "Implementation of a Reliable Multicast Protocol," *Software- Practices & Experiences*, July 1997, pp. 813-849.
	AO	8	Koerner, Eckhart, "Group Management for a Multimedia Collaboration Service," *Presented at EUNICE '96 Summer School on Telecommunications Services*, September 23-27, 1996, pp. 1-11.
	AP	8	Kohlert, Doug *et al.*, "Implementing a Graphical Multi-user Interface Toolkit," *Software-Practice and Experience*, September 1993, Vol. 23, No. 9, pp. 981-999.
	AQ	8	Larsen, A.B. and Brown, E.F., "'Continuous Presence' Video Conferencing at 1.5-6Mb/sec," pp. 391-398.

EXAMINER ZARNI MAUNG	DATE CONSIDERED 12/1/00

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EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA9						
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FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ9						Yes No
	AK9						Yes No
	AL9						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

	AM	9	Lauwers, J. Chris and Lantz, Keith A., "Collaboration Awareness in Support of Collaboration Transparency: Requirements for the Next of Shared Window Systems," *CHI '90 Proceedings*, April 1990, pp. 303-311.
	AN	9	Leung, Wu-hon F. *et al.*, "A Software Architecture for Workstations Supporting Mulitmedia Conferencing in Packet Switching Networks," *IEEE Journal on Selected Areas in Communications*, April 1990, Vol. 8, No. 1, pp. 380-390.
	AO	9	Li, L. *et al.*, "Real-time Synchronization Control in Multimedia Distributed Systems," pp. 294-305.
	AP	9	Li, S. *et al.*, "VC collaborator: a mechanism for video conferencing support*," *Proceedings of SPIE*. October 1995, pp. 89-99.
	AQ	9	Mathy, L. and Bonaventure, O., "The ACCOPI Multimedia Transport Service over ATM," *Proceedings of 2ndCOST237 Workshop on Teleservices and Multimedia Communication*, November 20-22, 1995, pp. 159-175.

EXAMINER ZARNI MAUNG	DATE CONSIDERED 02/11/00

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EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA10						
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FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ10						Yes No
	AK10						Yes No
	AL10						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

ZM	AM	10	Mathy, L. *et al.*, "A Group Communication Framework," *Broadband Islands '94: Connecting with the End-user*, 1994, pp. 167-178.
ZM	AN	10	Mathy, L. *et al.*, "Towards an Integrated Solution for Multimedia Communications," *Rev. AIM*, 1996, pp. 3-10.
ZM	AO	10	Mathy, L . and Bonaventure, O., "QoS Negotiation for Multicast Communications," *Multimedia Transport and Teleservices Lecture Notes in Computer Science*, 1994, pp. 199-218.
ZM	AP	10	McCanne, S. and Vetterli, M., "Joint Source/Channel Coding for Multicast Packet Video," *Proceedings of the International Conference on Image Processing*, October 23-26, 1995, pp. 25-28.
ZM	AQ	10	Mitzel, Danny J. *et al.*, "An Architectural Comparison of ST-II and RSVP," 10 pages.

EXAMINER	ZARNI MAUNG	DATE CONSIDERED	12/1/00

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EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA11						
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FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ11						Yes No
	AK11						Yes No
	AL11						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

	AM	11	Mitzel, Danny J. and Shenker, Scott, "Asymptotic Resource Consumption in Multicast Reservation Styles," *ACM SIGCOMM '94 Conference*, August 1994, pp. 1-8.
	AN	11	Moy, J., "Multicast Extensions to OSPF," *Network Working Group Request for Comments: 1584*, March 1994, 83 pages.
	AO	11	Nguyen, Mai-Huong *et al.*, "MCMP: A Transport/Session Level Distributed Protocol for Desktop Conference Setup," September 1996, Vol 14, No. 7, pp. 1404-1421.
	AP	11	Nichols, Kathleen M., "Network Performance of Packet Video on a Local Area Network," *IPCCC '92*, April1-3, 1992, pp. 0659-0666.
	AQ	11	Nicolaou, Cosmos, "An Architecture for Real-Time Multimedia Communication Systems," *IEEE Journal on Selected Area Communications*, April 1990, Vol. 8, No. 1, pp. 391-400.

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA12						
	AB12						
	AC12						
	AD12						
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FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ12						Yes No
	AK12						Yes No
	AL12						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

	AM	12	Parsa, M. *et al.*, "Scalable Internet Multicast Routing," *4th International Conference on Computer Communications and Networks*, September 20-23, 1995, pp. 162-166.
	AN	12	Partridge, C., "A Proposed Flow Specification," *Network Working Group Request for Comments: 1363*, September 1992, 17 pages.
	AO	12	Pasquale, Joseph C. *et al.*, "The Multimedia Multicast Channel," *Internetworking Research and Experience*, 1994, Vol. 5, pp. 151-162.
	AP	12	Pasquale, Joseph C. *et al.*, "The multimedia multicasting problem," *Multimedia Systems*, 1998, pp. 43-59.
	AQ	12	Rangan, P. Venkat, "Communication Architectures and Algorithms for Media Mixing in Multimedia Conferences," *IEEE/ACM Transactions on Networking*, 1993, pp. 20-30.

EXAMINER	ZARNI MAUNG	DATE CONSIDERED	12/1/00

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

P:\USERS\JASONG\1719\005-2(supp2)_1449.wpdSKGF Rev. 1/95

FORM PTO-1449

SECOND SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

ATTY. DOCKET NO.	APPLICATION NO.
1719.0050002	09/407,371
APPLICANT	
Rothschild *et al.*	
FILING DATE	GROUP
September 28, 1999	2758

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NOV 30 2000
TECH CENTER 2700
2154

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA13						
	AB13						
	AC13						
	AD13						
	AE13						
	AF13						
	AG13						
	AH13						
	AI13						

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ13						Yes No
	AK13						Yes No
	AL13						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

ZM	AM	13	Reibman, Amy R. and Berger, Arthur W., "Traffic Descriptors for VBR Video Teleconferencing Over ATM Networks," *IEEE/ACM Transactions on Networking*, June 1995, Vol. 3, No. 3, pp. 329-339.
ZM	AN	13	Robinson, John *et al.*, "A Multimedia Interactive Conferencing Application for Personal Workstations," *IEEE Transactions on Communications*, November 1991, pp. 1698-1708.
ZM	AO	13	Robinson, John A., "Communications services architecture for CSCW," *Computer Communications*, May 1994, Vol. 17, No. 5, pp. 339-347.
ZM	AP	13	Sabri, Shaker and Prasada, Birendra, "Video Conferencing Systems," *Proceedings of the IEEE*, April 1985, Vol. 73, No. 4, pp. 671-688.
ZM	AQ	13	Sakata, Shiro, "Multimedia and Multi-party Desktop Conference System (MERMAID) as Groupware Platform," *IEEE Region 10's Ninth Annual International Conference Proceedings*, August 1994, pp. 739-743.

EXAMINER	ZARNI MAUNG	DATE CONSIDERED	12/11/00

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

P:\USERS\JASONG\1719\005-2(supp2)_1449.wpdSKGF Rev. 1/95

FORM PTO-1449

SECOND SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

ATTY. DOCKET NO.	APPLICATION NO.
1719.0050002	09/407,371
APPLICANT: Rothschild *et al.*	
FILING DATE: September 28, 1999	GROUP: 2700

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA14						
	AB14						
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	AH14						
	AI14						

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ14						Yes No
	AK14						Yes No
	AL14						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

	AM	14	Sasse, M.-A. *et al.*, "Workstation-based multimedia conferencing: Experiences from the MICE project," *Integrating Telecommunications and Information Technology on the Desktop*, 1994, pp. 1-6.
	AN	14	Schmandt, Chris and McKenna, Michael A., "An Audio and Telephone Server for Multi-media Workstations," *2nd IEEE Conference on Computer Workstations*, march 7-10, 1988, pp. 150-159.
	AO	14	Schooler, Eve M. and Casner, Stephen L., "An Architecture for Multimedia Connection Management," Reprinted from the *Proceedings IEEE 4th Comsoc International Workshop on Multimedia Communications*, April 1992, pp. 271-274.
	AP	14	Schooler, Eve M., "Case Study: Multimedia Conference Control in a Packet-Switched Teleconferencing System," Reprinted from the *Journal of Internetworking: Research and Experience*, June 1993, Vol. 4, No. 2, pp. 99-120.
	AQ	14	Schooler, Eve M., *A Distributed Architecture for Multimedia Conference Control*, ISI Research Report No. ISI/RR-91-289, November 19991, pp. 1-18.

EXAMINER	ZARNI MAUNG	DATE CONSIDERED	12/1/00

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

P:\USERS\JASONG\1719\005-2(supp2)_1449.wpdSKGF Rev. 1/95

FORM PTO-1449 SECOND SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT	ATTY. DOCKET NO. 1719.0050002	APPLICATION NO. 09/407,374
	APPLICANT Rothschild *et al.*	RECEIVED NOV 30 2004
	FILING DATE September 28, 1999	GROUP ~~2781~~ CENTER 2700

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA15						
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	AI15						

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ15						Yes No
	AK15						Yes No
	AL15						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

	AM	15	Schooler, Eve M. *et al.*, "Multimedia Conferencing: Has it come of age?" Reprinted from the *Proceedings 24th Hawaii International Conference on System Sciences*, January 1991, Vol. 3, pp. 707-716.
	AN	15	Soman, Sadhna and Singh, Suresh, "An Experimental study of Video Conferencing over the Internet," *IEEE Globecom '94*, 1994, pp. 720-724.
	AO	15	Strigini, Lorenso *et al.*, "Multicast Services on High-Speed Interconnected LANs," *High Speed Local Area Networks*, 1987, pp. 173-176.
	AP	15	Tanigawa, Hiroya *et al.*, "Personal Multimedia-Multipoint Teleconference System, 1991, pp. 1127-1134.
	AQ	15	Tassiulas, Leandros and Ephremides, Anthony, "Dynamic Server Allocation to Parallel Queues with Randomly Varying Connectivity," *IEEE Transactions on Information Theory*, March 1993, Vol. 39, No. 2, pp. 466-478.

EXAMINER	ZARNI MAUNG	DATE CONSIDERED	12/1/00

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

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FORM PTO-1449

SECOND SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

ATTY. DOCKET NO.	APPLICATION NO.
1719.0050002	09/407,371
APPLICANT: Rothschild *et al.*	
FILING DATE: September 28, 1999	GROUP: ~~2758~~ 2154

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA16						
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	AI16						

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ16						Yes No
	AK16						Yes No
	AL16						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

	AM	16	Tillman, Matthew A. and Yen, David, "SNA and OSI: Three Strategies for Interconnection," *Communications of the ACM*, February 1990, Vol. 33, No. 2, pp. 214-224.
	AN	16	Turletti, Thierry and Huitema, Christian, "Videoconferencing on the Internet," *IEEE/ACM Transactions on Networking*, 1996, pp. 340-351.
	AO	16	Topolcic, C. (ed.), "Experimental Internet Stream Protocol, version 2 (ST-II)," *Network Working Group Request for Comments: 1190*, October 1990, 127 pages.
	AP	16	Venkatesh, D. and Little, T.D.C., "Investigation of Web Server Access as a Basis for Designing Video-on-Demand Systems," *Proceedings of the International Society for Optical Engineering*, October 23-24, 1995, Vol. 2617, pp. 2-11.
	AQ	16	Watabe, K. *et al.*, "A Distributed Multiparty Desktop Conferencing System and its Architecture," 1990, pp. 386-393.

EXAMINER: ZARNI MAUNG — DATE CONSIDERED: 12/1/00

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

P:\USERS\JASONG\1719\005-2(supp2)_1449.wpdSKGF Rev. 1/95

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FORM PTO-1449

SECOND SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

ATTY. DOCKET NO.	APPLICATION NO.
1719.0050002	09/407,371
APPLICANT: Rothschild *et al.*	
FILING DATE: September 28, 1999	GROUP: 2758

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA17						
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FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ17						Yes No
	AK17						Yes No
	AL17						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

ZR	AM	17	*What Is RTP?* (visited Januar 4, 2000) <http://raddist.rad.com/networks/1996/iphone/rtp.htm>, 5 pages.
ZR	AN	17	Wilde, Erik and Plattner, Bernhard, "Transport-Independent Group and Session Management for Group Communications Platforms," *ETT*, July-August 1997, Vol. 8, No. 4, pp. 409-421.
ZR	AO	17	Willebeek-LeMair, M.H. and Shae, Z.-Y., "Centralized versus Distributed Schemes for Videoconferencing," *Proceedings of the Fifth IEEE Computer Society Workshop on Future Trends of Distributed Computing System*, August 28-30, 1995, pp. 85-93.
ZR	AP	17	Woodside, Murray C, and Franks, R. Greg, "Alternative Software Architectures for Parallel Protocol Execution with Synchronous IPC," *IEEE/ACM Transactions on Networking*, April 1993, Vol. 1, No. 2, pp. 178-186.
ZR	AQ	17	Xylomenos, George and Polyzos, C., "IP Multicast for Mobile Hosts," *IEEE Communications Magazine*, January 1997, pp. 54-58.

EXAMINER	ZARNI MAUNG	DATE CONSIDERED	12/1/00

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

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FORM PTO-1449

SECOND SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

ATTY. DOCKET NO.	APPLICATION NO.
1719.0050002	09/407,371
APPLICANT: Rothschild *et al.*	
FILING DATE: September 28, 1999	GROUP: ~~2600~~ 2154

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U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA18						
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	AH18						
	AI18						

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ18						Yes No
	AK18						Yes No
	AL18						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

LM	AM	18	Xylomenos, George and Polyzos, G.C., "IP multicast group management for point-to-point local distribution," *Computer Communications*, 1998, pp. 1645-1654.
LM	AN	18	Yeung, K.H. and Yum, T.S., "Selective Broadcast Data Distribution Systems," *Proceedings of the 15th International Conference on Distributed Computing Systems*, May 30-June 2, 1995, pp. 317-324.
LM	AO	18	Yum, Tak-Shing *et al.*, "Video Bandwidth Allocation for Multimedia Teleconferences," *IEEE Transactions on Communications*, February/March/April 1995, Vol. 43, Nos. 2/3/4, pp. 457-465.
LM	AP	18	Zarros, Panagiotis N. *et al.*, "Interparticipant Synchronization in Real-Time Multimedia Conferencing Using Feedback," *IEEE/ACM Transactions on Networking*, April 1996, Vol. 4, No. 2, pp. 173-180.
LM	AQ	18	Zarros, Panagiotis N. *et al.*, "Statistical Synchronization Among Participants in Real-Time Multimedia Conference," *Proceedings of the IEEE Symposium on Computers and Communications*, June 27-29, 1995, pp. 30-36.

EXAMINER	ZARNI MAUNG	DATE CONSIDERED	12/1/00

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

P:\USERS\JASONG\1719\005-2(supp2)_1449.wpdSKGF Rev. 1/95

37

FORM PTO-1449

SECOND SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

ATTY. DOCKET NO.	APPLICATION NO.
1719.0050002	09/401,371
APPLICANT	
Rothschild *et al.*	
FILING DATE	GROUP
September 28, 1999	2154

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NOV 30 2000
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U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB-CLASS	FILING DATE
	AA19						
	AB19						
	AC19						
	AD19						
	AE19						
	AF19						
	AG19						
	AH19						
	AI19						

FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB-CLASS	TRANSLATION
	AJ19						Yes No
	AK19						Yes No
	AL19						Yes No

OTHER (Including Author, Title, Date, Pertinent Pages, etc.)

ZR	AM	19	Zhang, Lixia *et al.*, "RSVP: A New Resource ReSerVation Protocol," Accepted By IEEE Network Magazine, (date unknown), 22 pages.
	AN	19	
	AO	19	
	AP	19	
	AQ	19	

EXAMINER	ZARNI MAUNG	DATE CONSIDERED	12/1/00

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

P:\USERS\JASONG\1719\005-2(supp2)_1449.wpdSKGF Rev. 1/95

#8

RECEIVED BY 11/30/00
NOV 30 2000
TECH CENTER 2700

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:
Rothschild *et al.*

Appl. No. 09/407,371

Filed: September 28, 1999

For: **Server-Group Messaging System for Interactive Applications**

Art Unit: 2758

Examiner: *To Be Assigned*

Atty. Docket: 1719.0050002

SECOND SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT UNDER MPEP § 2001.06(C)

Commissioner for Patents
Washington, D.C. 20231

Sir:

Listed on accompanying Form PTO-1449 are one-hundred and one (101) documents that may be considered material to the examination of this application, in compliance with the duty of disclosure requirements of 37 C.F.R. §§ 1.56, 1.97 and 1.98.

This "Second Supplemental Information Disclosure Statement under MPEP § 2001.06(c)" is a follow-up to the "First Supplemental Information Disclosure Statement under MPEP § 2001.06(c)" filed by the Applicants on November 1, 2000. That is, the documents listed on the accompanying Form PTO-1449 were also brought to the attention of the undersigned as a result of a litigation captioned HearMe v. Lipstream Networks, Inc., Case No. C-99-04506 (WHA), filed in the United States District Court for the Northern District of California on October 8, 1999. This suit involved U.S. Patents Nos. 5,822,523 and 6,018,766, to which the present application claims priority under 35 U.S.C. § 120. The suit was ultimately settled on August 30, 2000. In any event, due to the requirements of 37 C.F.R. §§ 1.56, 1.97 and 1.98, as well as MPEP § 2001.06(c) (7th ed., Rev. 1, Feb. 2000), the undersigned felt it best to cite these xx documents on the accompanying Form PTO-1449.

Applicants have listed publication dates on the attached PTO-1449 based on information presently available to the undersigned. However, the listed publication dates should not be construed as an admission that the information was actually published on the date indicated.

Applicants reserve the right to further establish the patentability of the claimed invention over any of the listed documents should they be applied as references, and/or to prove that some of these documents may not be prior art, and/or to prove that some of these documents may not be enabling for the teachings they purport to offer.

This statement should not be construed as a representation that a search has been made, or that information more material to the examination of the present patent application does not exist. The Examiner is specifically requested not to rely solely on the material submitted herewith. It is further understood that the Examiner will consider information that was cited or submitted to the U.S. Patent and Trademark Office in a prior application relied on under 35 U.S.C. § 120. 1138 OG 37, 38 (May 19, 1992).

It is respectfully requested that the Examiner initial and return a copy of the enclosed PTO-1449, and indicate in the official file wrapper of this patent application that the documents have been considered.

This Information Disclosure Statement is being filed before the mailing date of a first Office Action on the merits. No statement or fee is required. Nevertheless, the U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036. A duplicate copy of this pleading is enclosed.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Raymond Millien
Attorney for Applicants
Registration No. 43,806

Date: 11/30/00

1100 New York Avenue, N.W.
Suite 600
Washington, D.C. 20005-3934
(202) 371-2600

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UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

NOTICE OF ALLOWANCE AND ISSUE FEE DUE

TM31/1205
STERNE KESSLER GOLDSTEIN & FOX PLLC
SUITE 600
1100 NEW YORK AVENUE NW
WASHINGTON DC 20005-3934

APPLICATION NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT	DATE MAILED
09/407,371	09/28/99	019	MAUNG, Z 2154	12/05/00
First Named Applicant	ROTHSCHILD,		35 USC 154(b) term ext. = 0 Days.	

TITLE OF INVENTION: SERVER-GROUP MESSAGING SYSTEM FOR INTERACTIVE APPLICATIONS

ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
0 1719.0050002	709-245.000	V94	UTILITY	NO	$1240.00	03/05/01

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED.

THE ISSUE FEE MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED.

HOW TO RESPOND TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.
If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is changed, pay twice the amount of the FEE DUE shown above and notify the Patent and Trademark Office of the change in status, or
B. If the status is the same, pay the FEE DUE shown above.

If the SMALL ENTITY is shown as NO:

A. Pay FEE DUE shown above, or

B. File verified statement of Small Entity Status before, or with, payment of 1/2 the FEE DUE shown above.

II. Part B-Issue Fee Transmittal should be completed and returned to the Patent and Trademark Office (PTO) with your ISSUE FEE. Even if the ISSUE FEE has already been paid by charge to deposit account, Part B Issue Fee Transmittal should be completed and returned. If you are charging the ISSUE FEE to your deposit account, section "4b" of Part B-Issue Fee Transmittal should be completed and an extra copy of the form should be submitted.

III. All communications regarding this application must give application number and batch number.
Please direct all communications prior to issuance to Box ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PATENT AND TRADEMARK OFFICE COPY

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/407,371	09/28/99	ROTHSCHILD J	1719.0050002

TM31/1205

STERNE KESSLER GOLDSTEIN & FOX PLLC
SUITE 600
1100 NEW YORK AVENUE NW
WASHINGTON DC 20005-3934

EXAMINER	
MAUNG, Z	

ART UNIT	PAPER NUMBER
2154	9

DATE MAILED: 12/05/00

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

Commissioner of Patents and Trademarks

Notice of Allowability

Application No.	Applicant(s)
09/407,371	Rothschild et al.
Examiner	**Group Art Unit**
Zarni Maung	2154

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance and Issue Fee Due or other appropriate communication will be mailed in due course.

☒ This communication is responsive to 2/17/2000

☒ The allowed claim(s) is/are 17-35

☐ The drawings filed on _____ are acceptable.

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) _____ .

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

A SHORTENED STATUTORY PERIOD FOR RESPONSE to comply with the requirements noted below is set to EXPIRE **THREE MONTHS** FROM THE "DATE MAILED" of this Office action. Failure to timely comply will result in ABANDONMENT of this application. Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

☐ Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL APPLICATION, PTO-152, which discloses that the oath or declaration is deficient. A SUBSTITUTE OATH OR DECLARATION IS REQUIRED.

☒ Applicant MUST submit NEW FORMAL DRAWINGS

☐ because the originally filed drawings were declared by applicant to be informal.

☒ including changes required by the Notice of Draftsperson's Patent Drawing Review, PTO-948, attached hereto or to Paper No. _____ .

☐ including changes required by the proposed drawing correction filed on _____ , which has been approved by the examiner.

☐ including changes required by the attached Examiner's Amendment/Comment.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the reverse side of the drawings. The drawings should be filed as a separate paper with a transmittal lettter addressed to the Official Draftsperson.

☐ Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Any response to this letter should include, in the upper right hand corner, the APPLICATION NUMBER (SERIES CODE/SERIAL NUMBER). If applicant has received a Notice of Allowance and Issue Fee Due, the ISSUE BATCH NUMBER and DATE of the NOTICE OF ALLOWANCE should also be included.

Attachment(s)

☐ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

☒ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

☐ Interview Summary, PTO-413

☒ Examiner's Amendment/Comment

☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material

☒ Examiner's Statement of Reasons for Allowance

ZARNI MAUNG
PRIMARY EXAMINER
ART UNIT 2154

Serial Number: 09/407,371

Art Unit: 2154

1. An Examiner's Amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 C.F.R. § 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the Issue Fee.

2. Authorization for this Examiner's Amendment was given in a telephone interview with Mr. Raymond Millien (Registration No. 43,806) on December 1, 2000.

3. In the claims,

Please amend the claims as follows:

Claim 17, line 15, please delete the word "whereby" and insert -- wherein--;

Claim 19, line 14, please delete the word "whereby" and insert -- wherein --;

Claim 21, line 11, please delete the word "whereby" and insert -- wherein --;

Claim 23, line 10, please delete the word "whereby" and insert -- wherein --;

Claim 34, line 6, after the words "forming a server message", please insert the word --- by --;

Claim 34, line 6, after the words "said payload portion of said host message;and ", Please insert --- aggregating said payload portion with the payload portion of a second host message received from another of the plurality of host computers belonging to said message group ---.

Claim 10, line 13, after the words "basic commands", please insert --- , and wherein the generating is performed by an intelligent device of the plurality of devices in the network ----;

Claim 18, line 13, after the words "basic commands", please insert --- , and wherein the generating is performed by an intelligent device of the plurality of devices in the network ----;

Claim 23, line 12, after the words "basic commands", please insert --- , and wherein the generating is performed by an intelligent device of the plurality of devices in the network ----;

4. The following is an examiner's Statement of Reasons for Allowance:

The present claims are allowable over the applied art of record for the following reasons:

None of the prior art of record teaches or suggests the method for facilitating communications among a plurality of host computers over a network, wherein said method comprises the steps of receiving a create message from said host computers, receiving jopin messgaes from a first subset of said computers, receiving host messages from a second subset of said first subset of computers belonging to said message group, wherein each of said messages contains a payload portion and a portion that is used to identify said message group, aggregating said payload portions portions of said messages received from said second subset of computers, forming an aggregated message using said aggregated payload, and transmitting said aggregated message to said first set of

computer as set forth in the claims and the specification.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Zarni Maung whose telephone number is (703) 308-6687. The examiner can normally be reached on Monday-Friday from 9:30 to 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng An, can be reached on (703) 305-9678. The fax phone number for this Group is (703) 308-9052.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 305-9600.

ZARNI MAUNG
PRIMARY EXAMINER

Form PTO 948 (Rev. 8-98) U.S. DEPARTMENT OF COMMERCE - Patent and Trademark Office Application No. 09/407,371

NOTICE OF DRAFTSPERSON'S PATENT DRAWING REVIEW

The drawing(s) filed (insert date) 9/28/99 rd

A. ☐ approved by the Draftsperson under 37 CFR 1.84 or 1.152.

B. ☒ objected to by the Draftsperson under 37 CFR 1.84 or 1.152 for the reasons indicated below. The Examiner will require submission of new, corrected drawings when necessary. Corrected drawing must be sumitted according to the instructions on the back of this notice.

1. DRAWINGS. 37 CFR 1.84(a): Acceptable categories of drawings:
   Black ink. Color.
   ___ Color drawings are not acceptable until petiton is granted. Fig(s) ___
   ___ Pencil and non-black ink not permitted. Fig(s) ___

2. PHOTOGRAPHS. 37 CFR 1.84 (b)
   ___ 1 full-tone set is required. Fig(s) ___
   ___ Photographs not properly mounted (must use brystol board or photographic double-weight paper). Fig(s) ___
   ___ Poor quality (half-tone). Fig(s) ___

3. TYPE OF PAPER. 37 CFR 1.84(e)
   ___ Paper not flexible, strong, white, and durable. Fig(s) ___
   ___ Erasures, alterations, overwritings, interlineations, folds, copy machine marks not accepted. Fig(s) ___
   ___ Mylar, velum paper is not acceptable (too thin). Fig(s) ___

4. SIZE OF PAPER. 37 CFR 1.84(f): Acceptable sizes:
   ___ 21.0 cm by 29.7 cm (DIN size A4)
   ___ 21.6 cm by 27.9 cm (8 1/2 x 11 inches)
   ___ All drawing sheets not the same size. Sheet(s) ___
   ___ Drawings sheets not an acceptable size. Fig(s) ___

5. MARGINS. 37 CFR 1.84(g): Acceptable margins:
   Top 2.5 cm Left 2.5cm Right 1.5 cm Bottom 1.0 cm
   SIZE: A4 Size
   Top 2.5 cm Left 2.5 cm Right 1.5 cm Bottom 1.0 cm
   SIZE: 8 1/2 x 11
   Margins not acceptable. Fig(s) 1-2, 5-7, 9, 18
   ___ Top (T) X Left (L)
   ___ Right (R) ___ Bottom (B)

6. VIEWS. 37 CFR 1.84(h)
   REMINDER: Specification may require revision to correspond to drawing changes.
   Partial views. 37 CFR 1.84(h)(2)
   ___ Brackets needed to show figure as one entity. Fig(s) ___
   ___ Views not labeled separately or properly. Fig(s) ___
   ___ Enlarged view not labeled separetely or properly. Fig(s) ___

7. SECTIONAL VIEWS. 37 CFR 1.84 (h)(3)
   ___ Hatching not indicated for sectional portions of an object. Fig(s) ___
   ___ Sectional designation should be noted with Arabic or Roman numbers. Fig(s) ___

8. ARRANGEMENT OF VIEWS. 37 CFR 1.84(i)
   ___ Words do not appear on a horizontal, left-to-right fashion when page is either upright or turned so that the top becomes the right side, except for graphs. Fig(s) ___

9. SCALE. 37 CFR 1.84(k)
   ___ Scale not large enough to show mechanism without crowding when drawing is reduced in size to two-thirds in reproduction. Fig(s) ___

10. CHARACTER OF LINES, NUMBERS, & LETTERS. 37 CFR 1.84(i)
    ___ Lines, numbers & letters not uniformly thick and well defined, clean, durable, and black (poor line quality). Fig(s) ___

11. SHADING. 37 CFR 1.84(m)
    ___ Solid black areas pale. Fig(s) ___
    ___ Solid black shading not permitted. Fig(s) ___
    ___ Shade lines, pale, rough and blurred. Fig(s) ___

12. NUMBERS, LETTERS, & REFERENCE CHARACTERS. 37 CFR 1.84(p)
    ___ Numbers and reference characters not plain and legible. Fig(s) ___
    ___ Figure legends are poor. Fig(s) ___
    ___ Numbers and reference characters not oriented in the same direction as the view. 37 CFR 1.84(p)(1). Fig(s) ___
    ___ English alphabet not used. 37 CFR 1.84(p)(2)
    Figs ___
    X Numbers, letters and reference characters must be at least .32 cm (1/8 inch) in height. 37 CFR 1.84(p)(3) Fig(s) 9-11

13. LEAD LINES. 37 CFR 1.84(q)
    ___ Lead lines cross each other. Fig(s) ___
    ___ Lead lines missing. Fig(s) ___

14. NUMBERING OF SHEETS OF DRAWINGS. 37 CFR 1.84(t)
    ___ Sheets not numbered consecutively, and in Arabic numerals beginning with number 1. Sheet(s) ___

15. NUMBERING OF VIEWS. 37 CFR 1.84(u)
    ___ Views not numbered consecutively, and in Arabic numerals, beginning with number 1. Fig(s) ___

16. CORRECTIONS. 37 CFR 1.84(w)
    ___ Corrections not made from prior PTO-948 dated ___

17. DESIGN DRAWINGS. 37 CFR 1.152
    ___ Surface shading shown not appropriate. Fig(s) ___
    ___ Solid black shading not used for color contrast. Fig(s) ___

COMMENTS

- DESCRIPTIVE MATTERS OBS. FIG. 1-11. (UNDER FIG. LEGENDS)

REVIEWER AD DATE 1/3/00 TELEPHONE NO. ___

ATTACHMENT TO PAPER NO. #9

[redacted]

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/407,371	09/28/99	ROTHSCHILD J	1719.0050002

TM01/1208
STERNE KESSLER GOLDSTEIN & FOX PLLC
SUITE 600
1100 NEW YORK AVENUE NW
WASHINGTON DC 20005-3934

EXAMINER	
MAUNG, Z	
ART UNIT	**PAPER NUMBER**
2154	10

DATE MAILED: 12/08/00

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

Commissioner of Patents and Trademarks

PTO-90C (Rev. 2/95)
*U.S. GPO: 2000-473-000/44602

1- File Copy

Interview Summary

Application No.	Applicant(s)
09/407,371	Rothschild et al.
Examiner	**Group Art Unit**
Zarni Maung	2154

All participants (applicant, applicant's representative, PTO personnel):

(1) *Zarni Maung* (3) _____

(2) *Mr. Raymond Millien (Registration No. 43,806)* (4) _____

Date of Interview *Dec 7, 2000*

Type: [X] Telephonic [ ] Personal (copy is given to [ ] applicant [ ] applicant's representative).

Exhibit shown or demonstration conducted: [ ] Yes [X] No. If yes, brief description:

Agreement [X] was reached. [ ] was not reached.

Claim(s) discussed: *10, 18, and 23*

Identification of prior art discussed:
None

Description of the general nature of what was agreed to if an agreement was reached, or any other comments:
The examiner informed to the applicant's attorney that there are typographical errors on the page 3 of the examiner's amendment paper 9, mailed on 12/5/2000. The examiner informed to the applicant's attorney to disregard the amendment to claim 10, line 13, claim 18, line 13 and claim 23, line 12 which appeared on page 3 of the examiner's amendment.

(A fuller description, if necessary, and a copy of the amendments, if available, which the examiner agreed would render the claims allowable must be attached. Also, where no copy of the amendents which would render the claims allowable is available, a summary thereof must be attached.)

1. [ ] It is not necessary for applicant to provide a separate record of the substance of the interview.

Unless the paragraph above has been checked to indicate to the contrary, A FORMAL WRITTEN RESPONSE TO THE LAST OFFICE ACTION IS NOT WAIVED AND MUST INCLUDE THE SUBSTANCE OF THE INTERVIEW. (See MPEP Section 713.04). If a response to the last Office action has already been filed, APPLICANT IS GIVEN ONE MONTH FROM THIS INTERVIEW DATE TO FILE A STATEMENT OF THE SUBSTANCE OF THE INTERVIEW.

2. [ ] Since the Examiner's interview summary above (including any attachments) reflects a complete response to each of the objections, rejections and requirements that may be present in the last Office action, and since the claims are now allowable, this completed form is considered to fulfill the response requirements of the last Office action. Applicant is not relieved from providing a separate record of the interview unless box 1 above is also checked.

Zarni Maung

ZARNI MAUNG
PRIMARY EXAMINER
ART UNIT 2154

Examiner Note: You must sign and stamp this form unless it is an attachment to a signed Office action.

HM

PART B—ISSUE FEE TRANSMITTAL

Complete and mail this form, together with applicable fees, to: **Box ISSUE FEE**
Assistant Commissioner for Patents
Washington, D.C. 20231

MAILING INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE. Blocks 1 through 4 should be completed where appropriate. All further correspondence including the Issue Fee Receipt, the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Legibly mark-up with any corrections or use Block 1)

TM31/1200

STERNE KESSLER GOLDSTEIN & FOX PLLC
SUITE 600
1100 NEW YORK AVENUE NW
WASHINGTON DC 20005-3934

OIPE
MAR 02 2001
PATENT & TRADEMARK OFFICE

Note: The certificate of mailing below can only be used for domestic mailings of the Issue Fee Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing.

Certificate of Mailing

I hereby certify that this Issue Fee Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Box Issue Fee address above on the date indicated below.

(Depositor's name)

(Signature)

(Date)

APPLICATION NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT	DATE MAILED
09/407,371	09/28/99	019	MAUNG, Z 2154	12/05/00

First Named Applicant: ROTHSCHILD, 35 USC 154(b) term ext. = 0 Days.

TITLE OF INVENTION: SERVER-GROUP MESSAGING SYSTEM FOR INTERACTIVE APPLICATIONS

ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
0 1719.0050002	709-245.000	V94	UTILITY	NO	$1240.00	03/05/01

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363). Use of PTO form(s) and Customer Number are recommended, but not required.

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47) attached.

2. For printing on the patent front page, list (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Sterne, Kessler,
2 Goldstein, & Fox PLLC
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)
PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. Inclusion of assignee data is only appropriate when an assignment has been previously submitted to the PTO or is being submitted under separate cover. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: HearMe

(B) RESIDENCE: (CITY & STATE OR COUNTRY): Mountain View, CA

Please check the appropriate assignee category indicated below (will not be printed on the patent)
☐ Individual ☒ Corporation or other private group entity ☐ government

4a. The following fees are enclosed (make check payable to Commissioner of Patents and Trademarks): Check # 30545
☒ Issue Fee
☒ Advance Order - # of Copies ten (10)

4b. The following fees or deficiency in these fees should be charged to:
DEPOSIT ACCOUNT NUMBER 19-0036
(ENCLOSE AN EXTRA COPY OF THIS FORM)
☒ Issue Fee
☒ Advance Order - # of Copies ten (10)

The COMMISSIONER OF PATENTS AND TRADEMARKS is requested to apply the Issue Fee to the application identified above.

(Authorized Signature) Raymond Millien, Reg.# 43,806 (Date) 3/2/01

NOTE: The Issue Fee will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the Patent and Trademark Office.

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending on the needs of the individual case. Any comments on the amount of time required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, D.C. 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND FEES AND THIS FORM TO: Box Issue Fee, Assistant Commissioner for Patents, Washington D.C. 20231

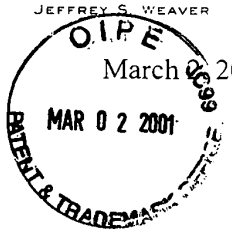
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

03/05/2001 JTRLINE2 00000065 09407371
01 FC:142 1240.00 OP
02 FC:551 30.00 OP

TRANSMIT THIS FORM WITH FEE

DUPLICATE

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
ATTORNEYS AT LAW
1100 NEW YORK AVENUE, N.W. • WASHINGTON, D.C. 20005-3934
PHONE: (202) 371-2600 • FACSIMILE: (202) 371-2540 • www.skgf.com



March 2, 2001

WRITER'S DIRECT NUMBER:
(202) 789-5506
INTERNET ADDRESS:
RMILLIEN@SKGF.COM

Attn. Box Issue Fee
Batch No. V94

Commissioner for Patents
Washington, D.C. 20231

Re: U.S. Allowed Utility Patent Application
Appl. No. 09/407,371; Filed: September 28, 1999
For: **Server-Group Messaging System for Interactive Applications**
Inventors: Rothschild *et al.*
Our Ref: 1719.0050002

Sir:

In response to the **Notice of Allowance and Issue Fee Due** dated **December 5, 2000**, the following documents are forwarded for appropriate action by the U.S. Patent and Trademark Office:

1. Issue Fee Transmittal (Form PTOL-85B);

2. Fee Transmittal (Form PTO/SB/17) (in duplicate);

3. Letter to the Draftsman;

4. Eleven (11) sheets of formal drawings, approval of which is respectfully requested;

5. Return postcard; and

6. Our Check No. 30545 for $ 1,270.00 to cover:

$1,240.00 Issue Fee; and
$ 30.00 Advance copies of patent.

It is respectfully requested that the attached postcard be stamped with the date of filing of these documents, and that it be returned to our courier.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036. If extensions of time under 37 C.F.R. § 1.136 other than those otherwise provided for herewith are required to prevent abandonment of the present patent application, then such extensions of time are hereby petitioned, and any fees therefor are hereby authorized to be charged to our Deposit Account No. 19-0036. A duplicate copy of this letter is enclosed.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Raymond Millien
Attorney for Applicants
Registration No. 43,806

Enclosures

P:\USERS\VBLADES\Raymond Millien\1719\0050002.pt9
SKGF Rev 5/30/00 mac

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	Confirmation No.
Rothschild *et al.*	Art Unit: 2154
Appl. No. 09/407,371	Examiner: MAUNG, Z.
Filed: September 28, 1999	Atty. Docket: 1719.0050002
For: **Server-Group Messaging System for Interactive Applications**	**Batch No. V94**

Letter to PTO Draftsman: Submission of Formal Drawings

Commissioner for Patents
Washington, D.C. 20231

Sir:

Submitted herewith are Eleven (11) sheets of formal drawings with Figures 1-11, corresponding to the informal drawings submitted with the above-captioned application. Identification of the drawings is provided in accordance with 37 C.F.R. § 1.84(c). Acknowledgment of the receipt, approval, and entry of these formal drawing) into this application is respectfully requested.

It is not believed that an extension of time is required, other than any already provided herewith. However, if an extension of time is needed to prevent abandonment of the application, then such extension of time is hereby petitioned. The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036. A duplicate copy of this Letter is enclosed.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Raymond Millien
Attorney for Applicants
Registration No. 43,806

Date: 3/2/01

1100 New York Avenue, N.W.
Suite 600
Washington, D.C. 20005-3934
(202) 371-2600

P:\USERS\VBLADES\Raymond Millien\1719\0050002.ltd SKGF Rev 1/26/01 mac

Appl. No. 09/407,371; Group Art Unit: 2154
Dkt. No. 1719.0050002; Batch No.: V94
Inventor(s): Rothschild *et al.*; Tel: 202/371-2600
Title: Server-Group Messaging System for Interactive Applications

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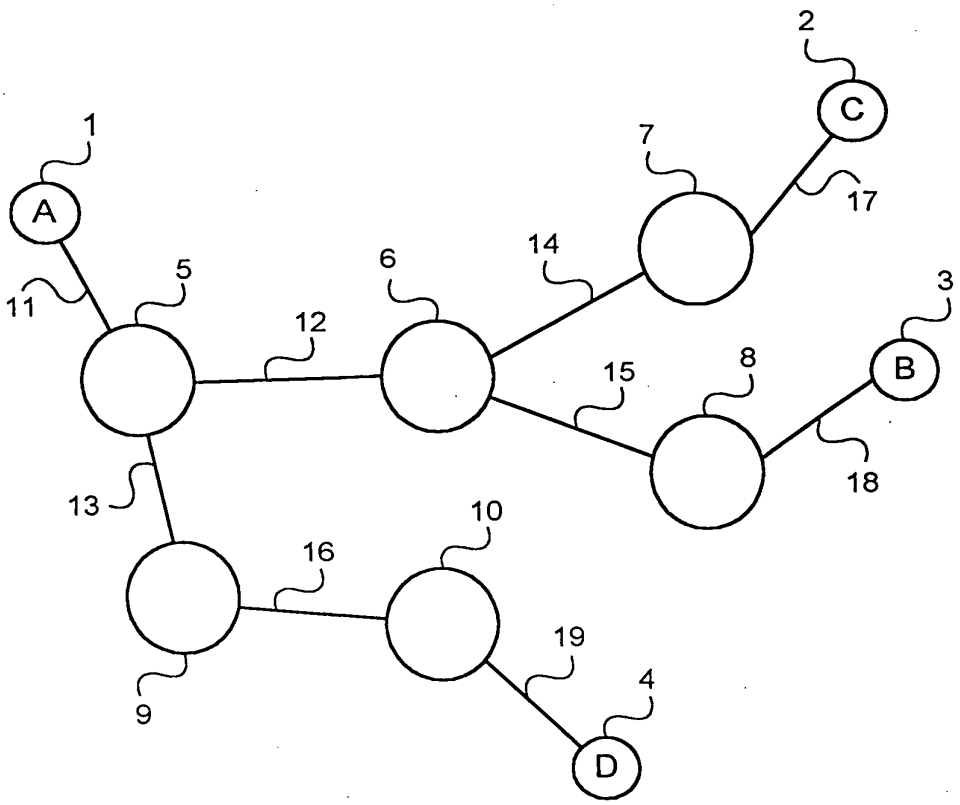


Figure 1
Prior Art

Appl. No. 09/407,371; Group Art Unit: 2154
Dkt. No. 1719.0050002; Batch No.: V94
Inventor(s): Rothschild *et al.*; Tel: 202/371-2600
Title: Server-Group Messaging System for Interactive Applications

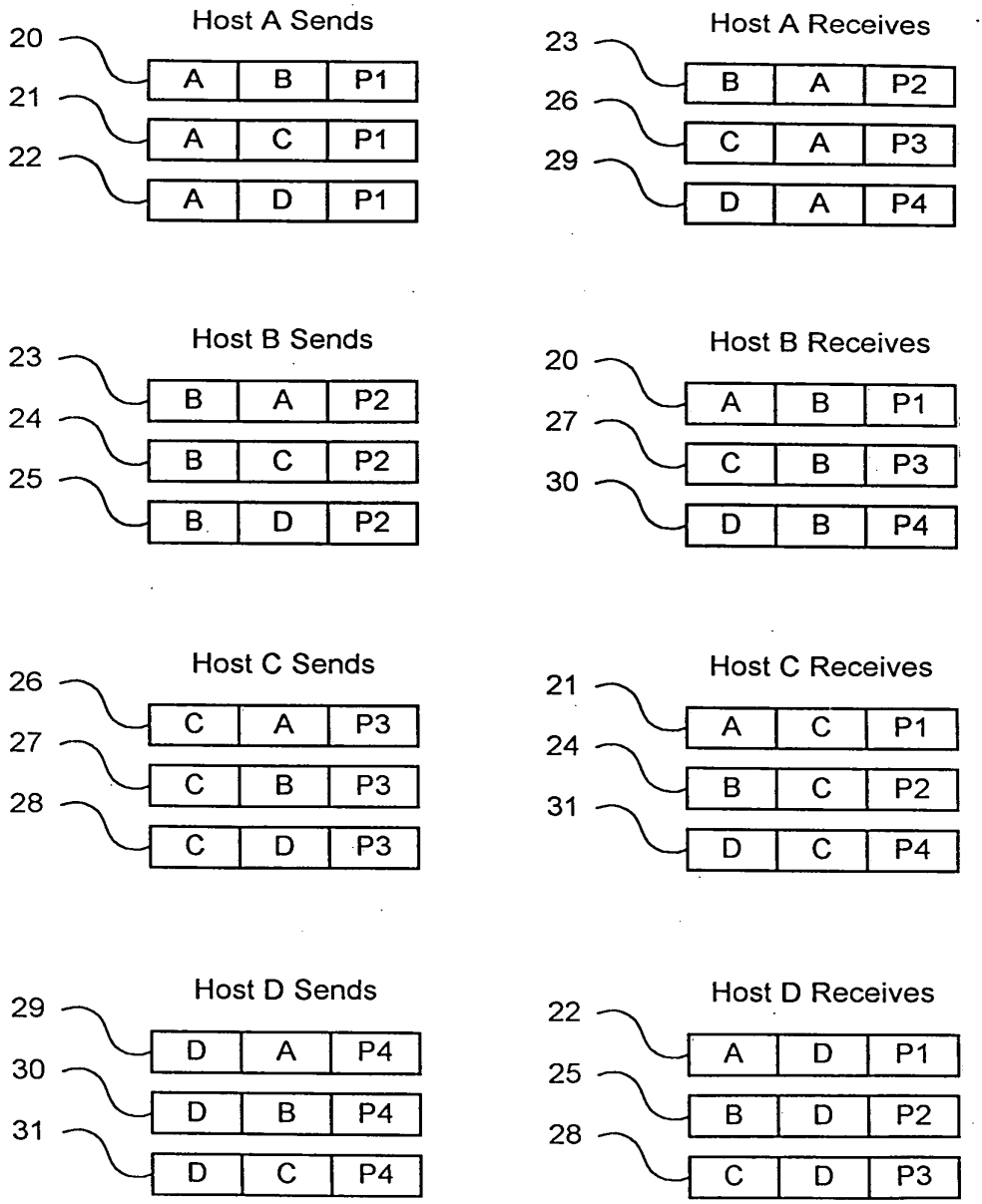


Figure 2
Prior Art

Appl. No. 09/407,371; Group Art Unit: 2154
Dkt. No. 1719.0050002; Batch No.: V94
Inventor(s): Rothschild *et al.*; Tel: 202/371-2600
Title: Server-Group Messaging System for Interactive Applications

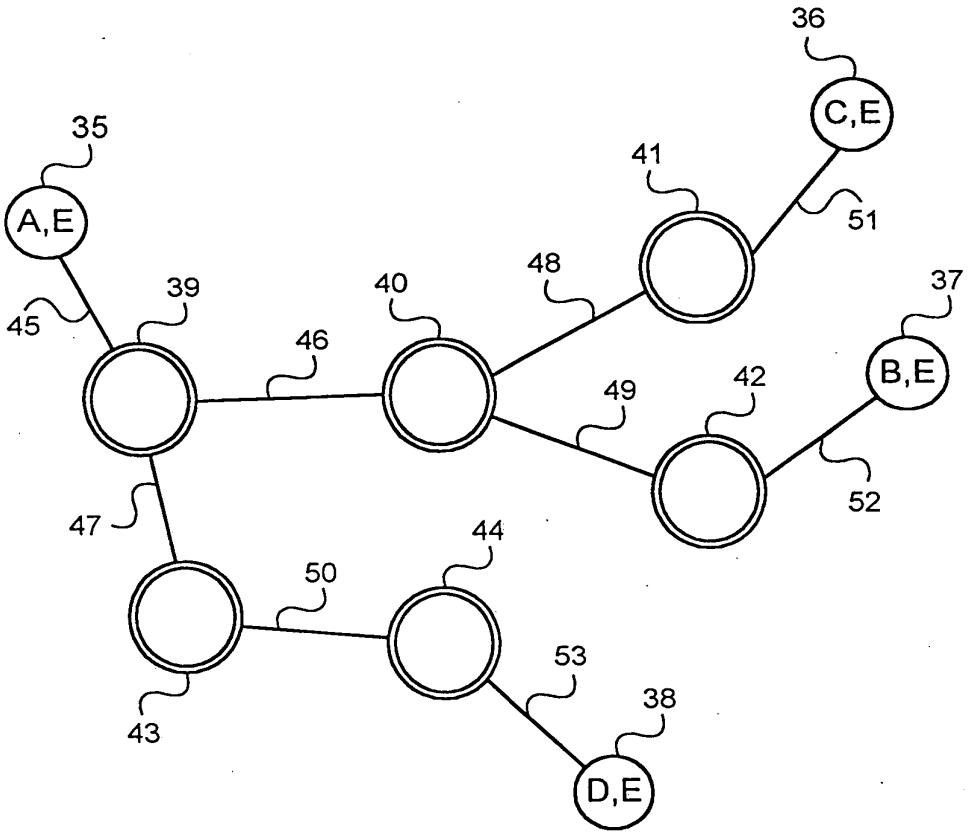


Figure 3
Prior Art

Appl. No. 09/407,371; Group Art Unit: 2154
Dkt. No. 1719.0050002; Batch No.: V94
Inventor(s): Rothschild *et al.*; Tel: 202/371-2600
Title: Server-Group Messaging System for Interactive Applications

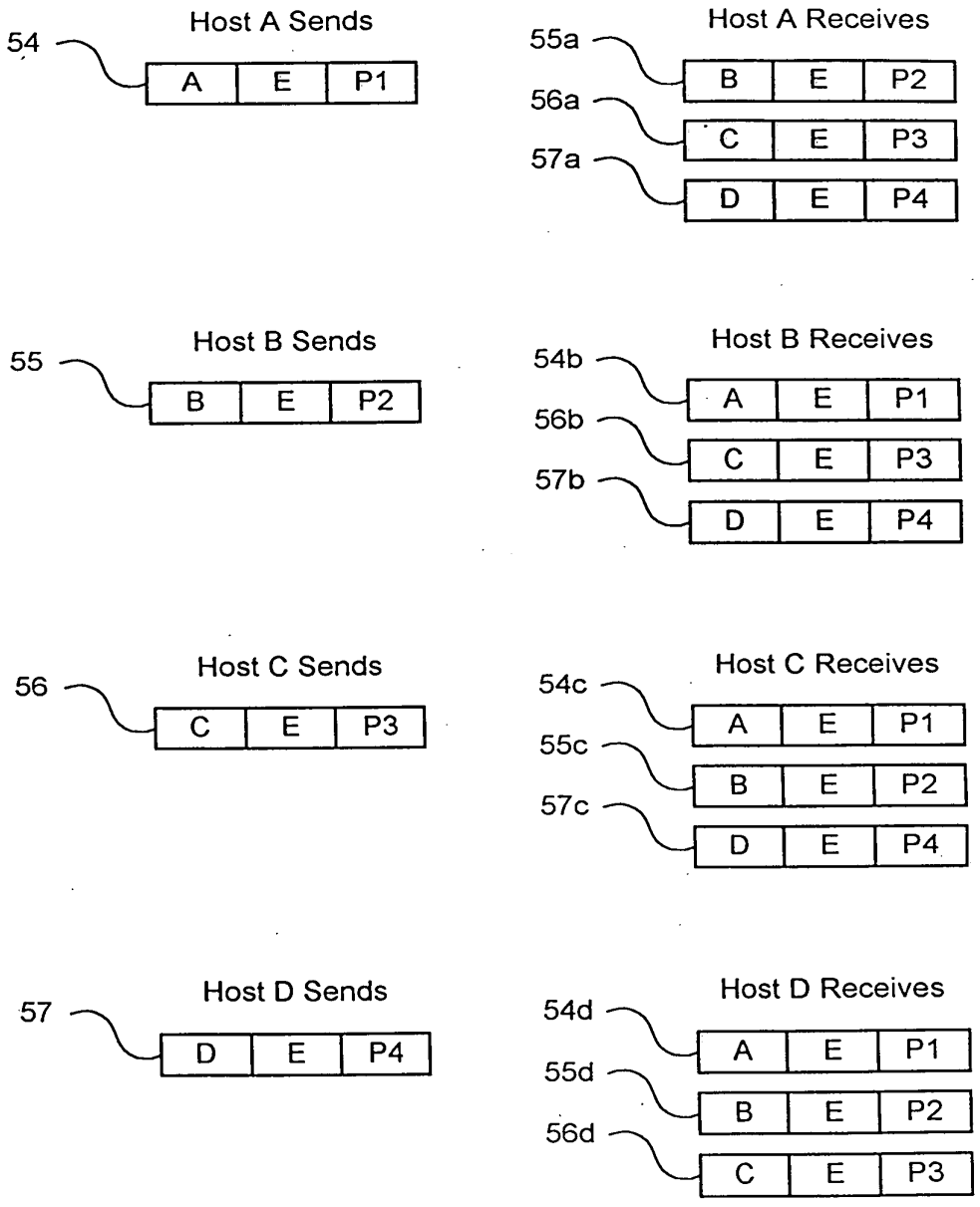


Figure 4
Prior Art

Appl. No. 09/407,371; Group Art Unit: 2154
Att. No. 1719.0050002; Batch No.: V94
Inventor(s): Rothschild *et al.*; Tel: 202/371-2600
Title: Server-Group Messaging System for Interactive Applications

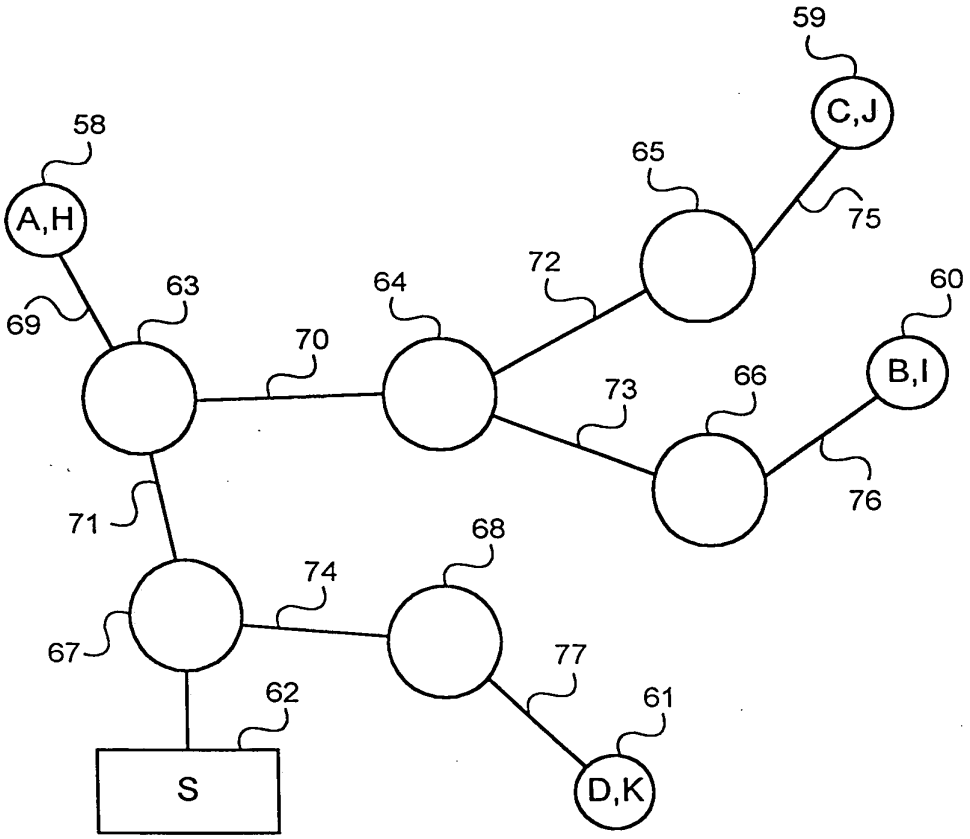


Figure 5

Appl. No. 09/407,371; Group Art Unit: 2154
Dkt. No. 1719.0050002; Batch No.: V94
Inventor(s): Rothschild *et al.*; Tel: 202/371-2600
Title: Server-Group Messaging System for Interactive Applications

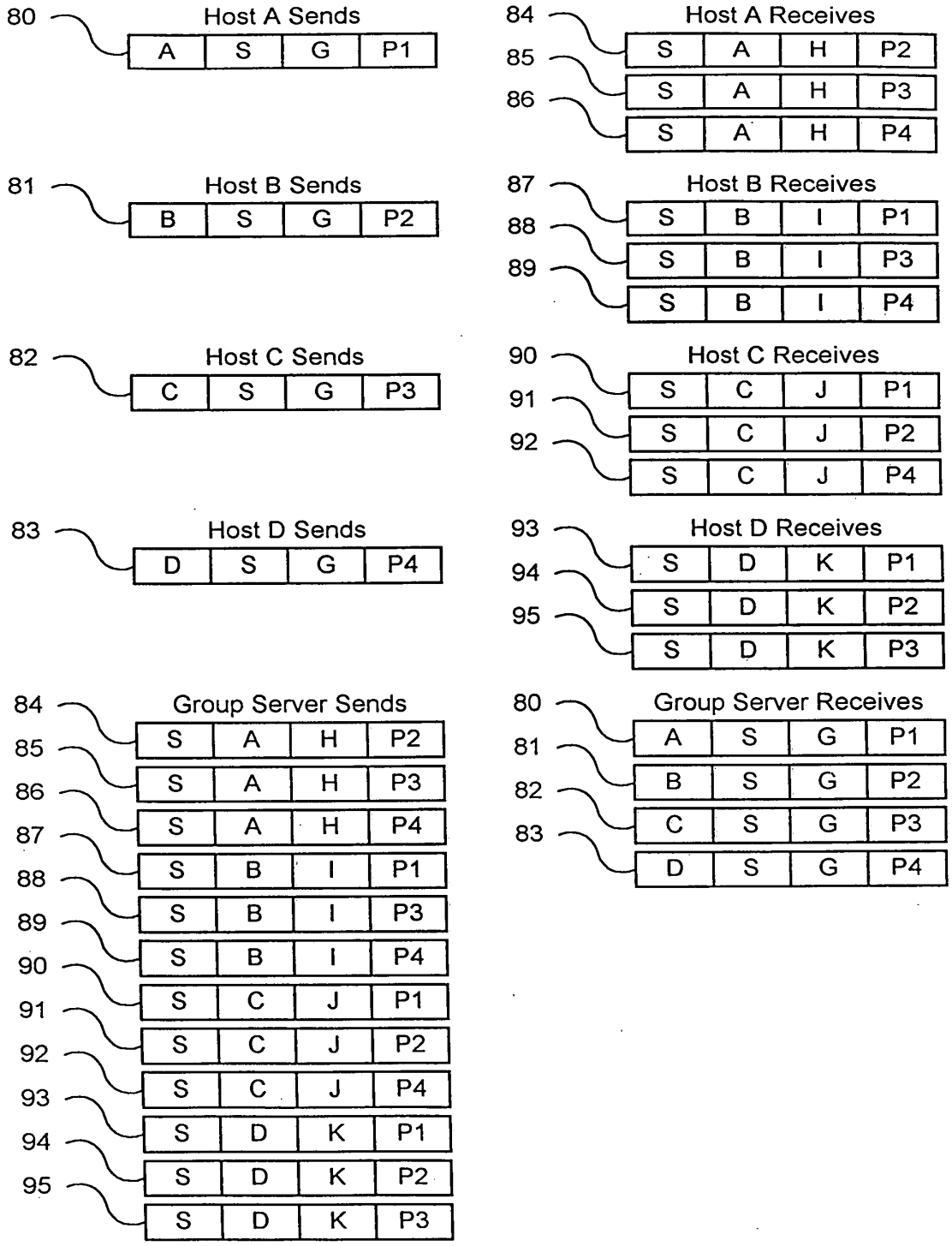


Figure 6

Appl. No. 09/407,371; Group Art Unit: 2154
Dkt. No. 1719.0050002; Batch No.: V94
Inventor(s): Rothschild *et al.*; Tel: 202/371-2600
Title: Server-Group Messaging System for Interactive Applications

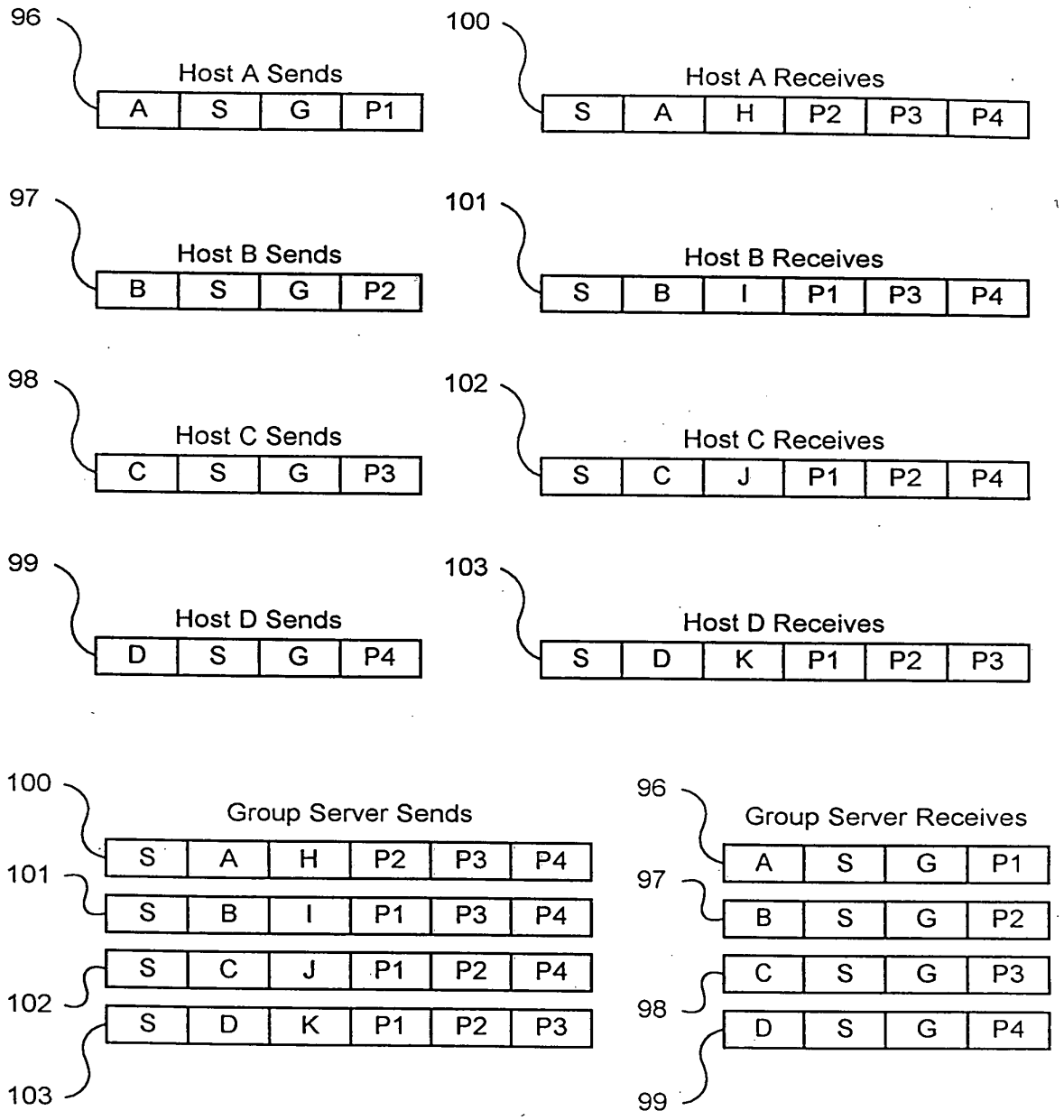


Figure 7

Appl. No. 09/407,371; Group Art Unit: 2154
Dkt. No. 1719.0050002; Batch No.: V94
Inventor(s): Rothschild *et al.*; Tel: 202/371-2600
Title: Server-Group Messaging System for Interactive Applications

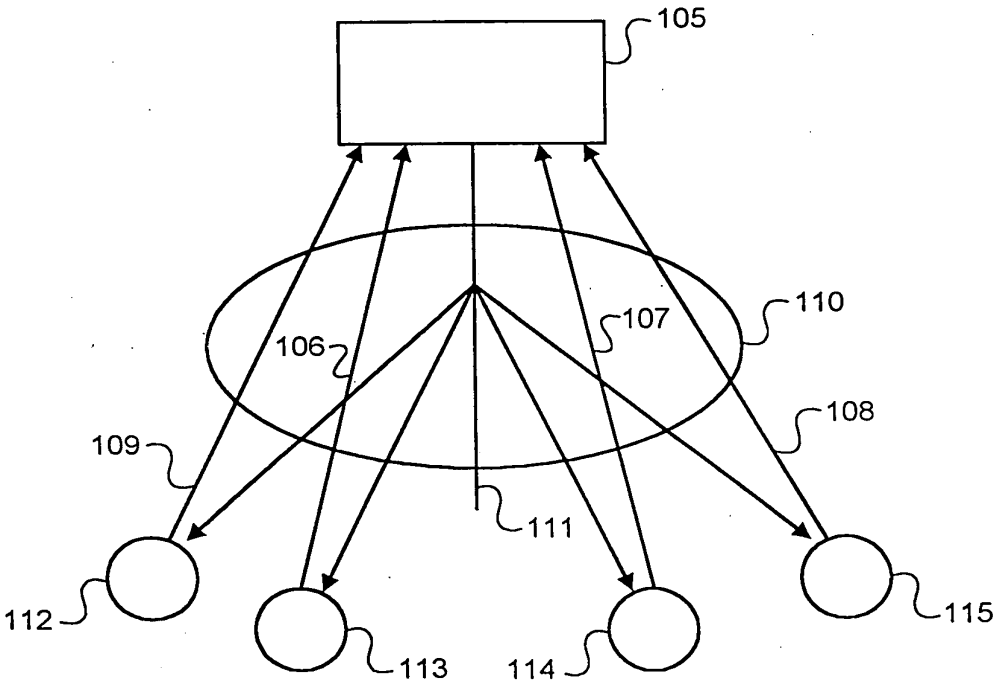


Figure 8
Prior Art

Appl. No. 09/407,371; Group Art Unit: 2154
Dkt. No. 1719.0050002; Batch No.: V94
Inventor(s): Rothschild *et al.*; Tel: 202/371-2600
Title: Server-Group Messaging System for Interactive Applications

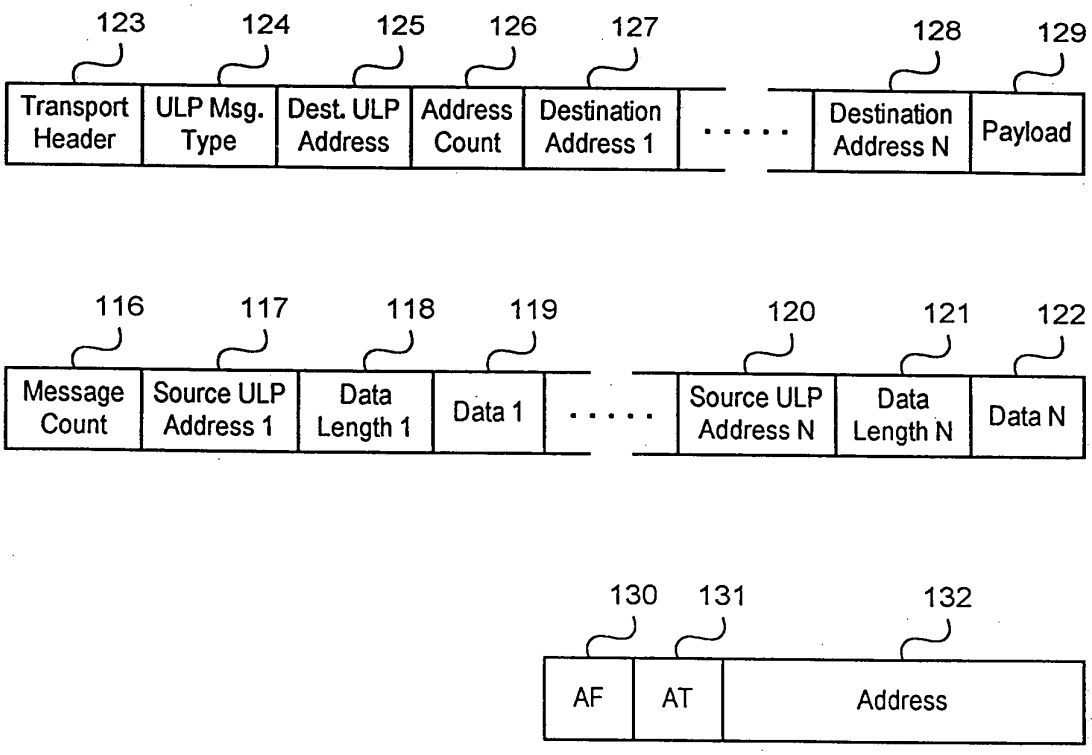


Figure 9

Appl. No. 09/407,371; Group Art Unit:-2154
Dkt. No. 1719.0050002; Batch No.: V94
Inventor(s): Rothschild *et al.*; Tel: 202/371-2600
Title: Server-Group Messaging System for Interactive Applications

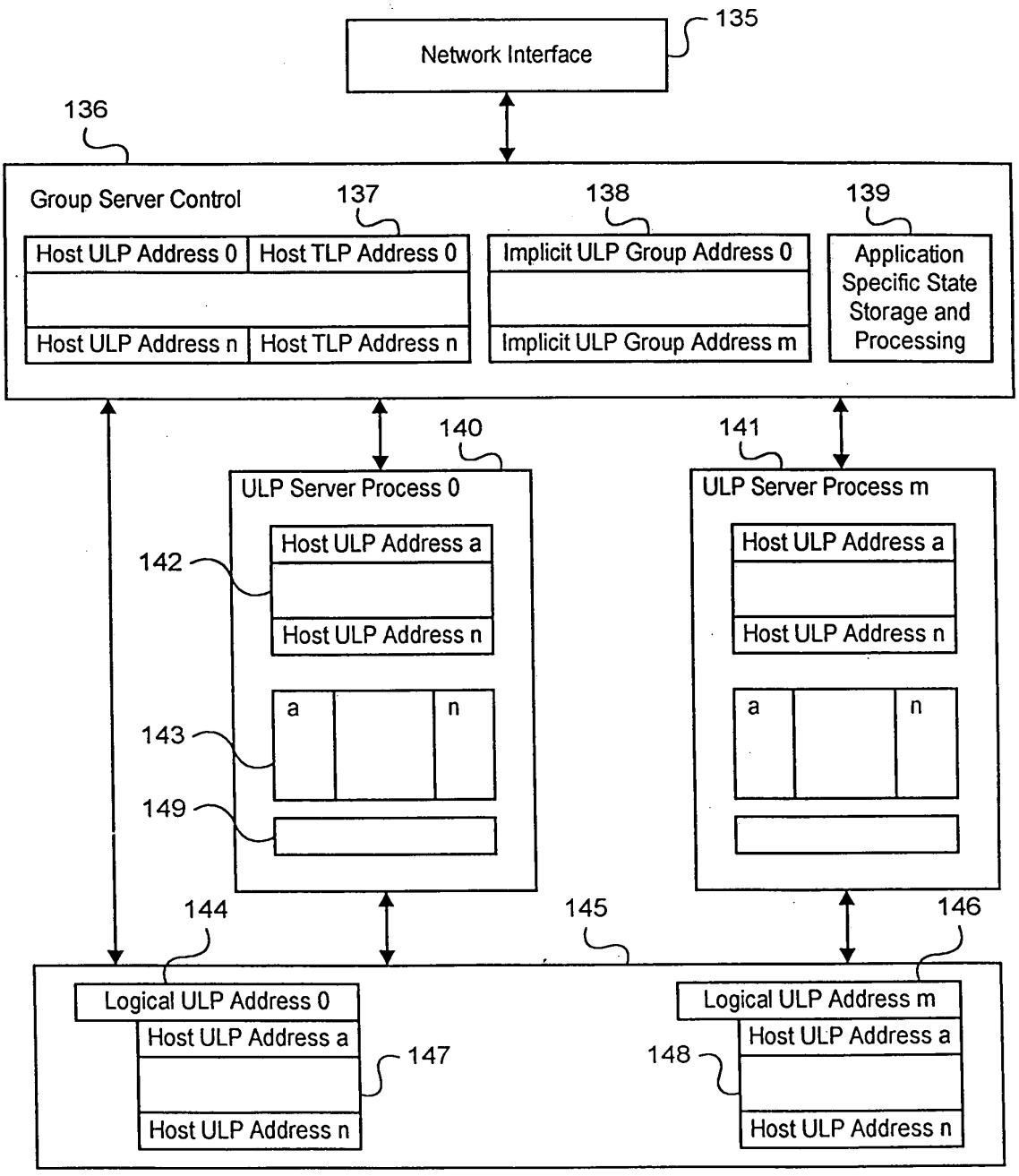


Figure 10

Appl. No. 09/407,371; Group Art Unit: 2154
Dkt. No. 1719.0050002; Batch No.: V94
Inventor(s): Rothschild *et al.*; Tel: 202/371-2600
Title: Server-Group Messaging System for Interactive Applications

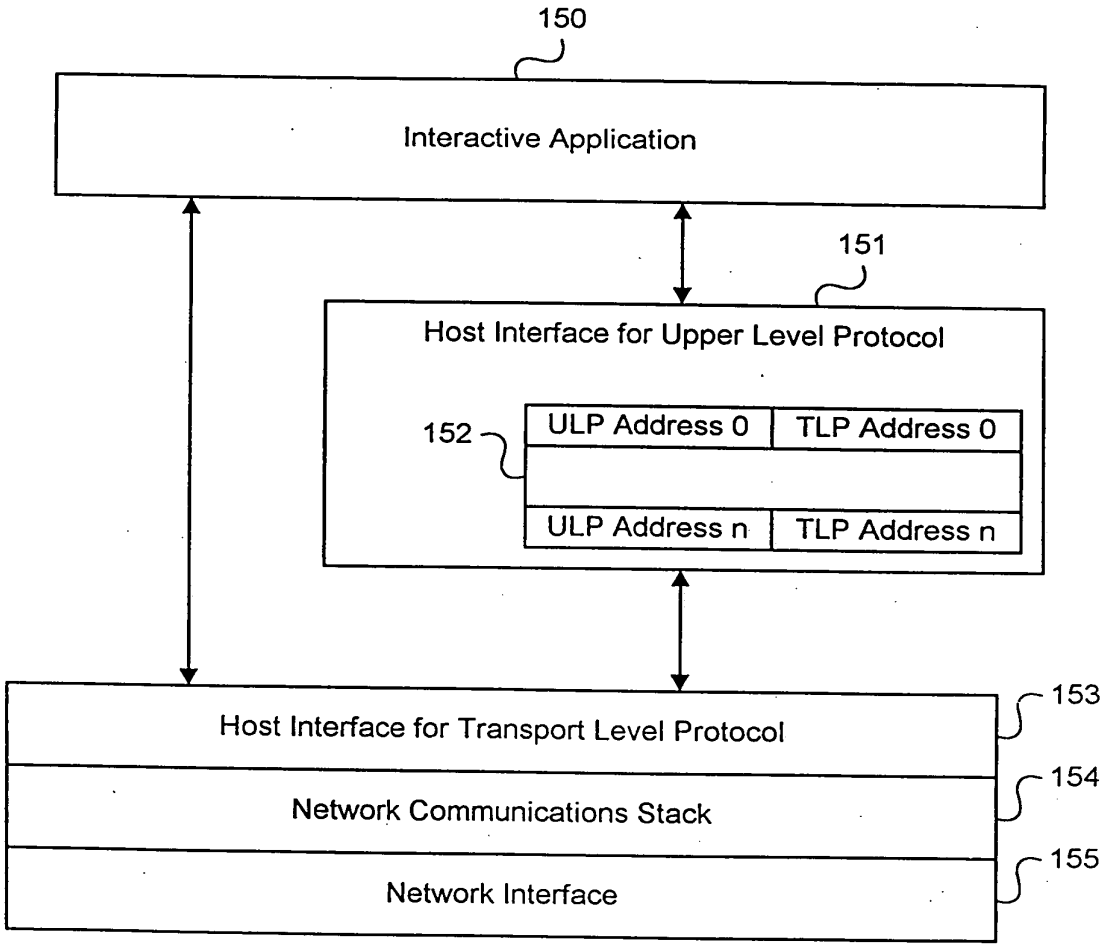
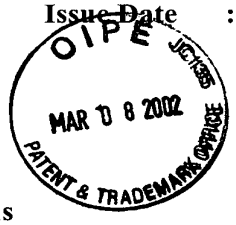


Figure 11

Attorney Docket No.: PT-005.02

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	**Rothschild *et al.***	**Patent No.**	:	**6,226,686**
Serial No.	:	**09/407,371**	**Issue Date**	:	**May 1, 2001**
Filed	:	**September 28, 1999**			
Title	:	**Server-Group Messaging System for Interactive Applications**			



REVOCATION AND POWER OF ATTORNEY

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

As an officer of Paltalk Holdings, Inc., owner of the entire right, title and interest in, to and under the invention described and claimed in the above-identified patent, I hereby revoke all previous powers of attorney and appoint the following attorneys, with full power of substitution and revocation, to transact all business in the Patent and Trademark Office connected therewith Daniel A. Devito (32,125), Edward V. Filardi (25,757), David W. Hansen (38,910), Constance S. Huttner (35,903), Ronald S. Laurie (25,431), Robert B. Smith (28,538), Robert B. Beyers (46,552), Meir Y. Blonder (40,517), Ian R. Blum (42,336), John L. Dauer, Jr. (39,953), Jose Esteves (41,011), Michael D. Fabiano (44,675), Stacey J. Farmer (42,526), Di Jiang-Schuerger (44,806), Frederick D. Kim (38,513), Thomas R. Lane (42,718), Daniel J. Lin (47,750), Douglas R. Nemec (41,219), Guy Perry (46,194), Constance F. Ramos (47,883), Andrew F. Strobert (35,375), Todd J. Tiberi (37,455), Joseph Yang (41,387), and Matthew B. Zisk (45,257), all of Skadden, Arps, Slate, Meagher & Flom LLP, whose address is Four Times Square, New York, NY 10036.

Please direct all future correspondence to Skadden, Arps, Slate, Meagher & Flom LLP, Four Times Square, New York, NY 10036, and direct all phone calls to Skadden, Arps et al. at (212) 735-3000.

Respectfully submitted,

Date: February ___, 2002

By: _____ 2/4/01

Name: ROBERT LEE (print name)

Title: PRESIDENT (print title)

Attorney Docket No.: PT-005.02 DSP

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	**Rothschild *et al.***	**Patent No.**	:	**6,226,686**
Serial No.	:	**09/407,371**	**Issue Date**	:	**May 1, 2001**
Filed	:	**September 28, 1999**			
Title	:	**Server-Group Messaging System for Interactive Applications**			

CERTIFICATE OF MAILING

I hereby certify that this paper and all enclosures referred to therein are being deposited with the United States Postal Service as First Class Mail, with sufficient postage in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231 on Feb. 15, 2002.

Name of Person Mailing: Josephine Hardy

Signature of Person Mailing

TRANSMITTAL OF REVOCATION AND POWER OF ATTORNEY

Assistant Commissioner for Patents
Washington, D.C. 20231

26137

Sir:

Enclosed please find a Revocation and Power of Attorney in the above-identified patent which revokes all previous powers of attorney and appoints the attorneys at Skadden, Arps, Slate, Meagher & Flom LLP to conduct all business in the Patent and Trademark Office connected therewith.

Accordingly, all correspondence should be addressed to Skadden, Arps, Slate, Meagher & Flom LLP, Four Times Square, New York, NY 10036, telephone number (212) 735-3000.

Respectfully submitted,

Date: **February 15, 2002**

By: _____

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Enclosure

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
09/407,371	09/28/1999	JEFFREY J. ROTHSCHILD	1719.0050002

CONFIRMATION NO. 2659

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PATENT DEPARTMENT
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6226686 6226686

Date Mailed: 03/26/2002

NOTICE REGARDING POWER OF ATTORNEY

This is in response to the Power of Attorney filed 03/22/2002.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

DAVID O LIPSCOMB
OPR (703) 308-7127

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