that server computer to the storage device for association with the generic server computer name. If however the most suitable server computer is the same server computer as that identified in the last iteration of the process then there is no need to update the storage device and the writing means will not be activated.

Once any necessary update to the storage device 80 has been made the messaging means 170 will notify the copier 90 so that the copier updates the local memory 100 with the new list as stored in the storage device 80.

Hence when the client computer requests a machine address for the generic server computer name the conversion means 70 accesses the list in memory 100 and identifies a machine address just as it would if any other server computer name had been given. However in this instance the machine address actually relates to the server computer in the cluster which has been identified by the decision logic as the most suitable (eg. least heavily loaded). When this machine address is passed back to the client computer 20 via the output means 110, the client computer will proceed to automatically access the server which is most suitable.

By this approach it will be seen that a dynamic load levelling facility is provided which is completely transparent to the client program. As far as the program is concerned it is requesting a machine address as normal and is using one of the normal TCP/IP access methods to gain access to the server computer allocated to it.

In many of todays computing environments (eg Unix, AIX (Unix is a Trade Mark of Unix Systems Laboratories Inc)) an application is provided to perform the standard name resolution service (ie receipt of a computer name and conversion of that computer name into a full Internet address). This application is commonly known as a "nameserver" application, and is installed on one or more computers in the logical network. Every other computer in the network is told to communicate with a specified one of these 'nameserver' computers when it wishes to determine an Internet address for any other computer in the network. Hence a nameserver computer provides a resolution service to client computers by receiving from them a convenient name given to a particular computer (eg. abc.def.ghi.com), and converting it into a full Internet address (eg. 29.1.19.66). This Internet address is then used by the routing subsystem (TCP/IP) to allow a client user or application access to the physical computer (eg "abc" in this example).

In the above example of a computer name, "abc" is the physical machine, "def" is typically the site location, "ghi" the organisation, and "com" one of the Internet classes (three such classes are (com)mercial, (edu)cation, (mil)itary). Domains and sub-domains can also be added as part of this computer name. Basically the name takes a hierarchical form, with the finest resolution at the beginning and the coarsest resolution at the end; this type of naming structure will of course be well known to those skilled in the art.

All TCP/IP-based applications, including remote-login, remote-shell, telnet, ftp, and also client-server applications (such as database applications), are aware of the nameserver facility, and will automatically go to the designated nameserver computer to ask for resolution of a computer name into an Internet address before attempting to make a connection to another computer in the network.

If we consider Figure 1 again, the standard nameserver facility will include the following elements: the input means 30, the conversion means 70 with associated memory 100, the output means 110, the list stored in the storage device 80, and the copier 90.

The nameserver application is a "daemon" (background) process which runs on the data processing system; this data processing system may (but need not) be one of the server computers forming part of the cluster over which users are to be distributed. In Unix-type operating systems (eg. AIX by IBM Corporation, Ultrix by Digital Equipment Corporation, OSF/1 by the Open Software Foundation, and HP-UX by Hewlett Packard, etc) this daemon process is called "named" (name-daemon), and when it is initialised, it reads a special database file (named.data) stored on the storage device 80 to obtain details of the computer names about which it is expected to know (over which it has "authority"), and the corresponding Internet addresses ("dotted decimal", e.g. 29.1.19.66) for each computer name. Whilst the name daemon is operating, it can be forced to re-read the information from the named.data database file by the sending of an inter-process signal to the name daemon process telling it to update its internal tables 100 from the database file (named.data).

In the preferred embodiment of the present invention we provide a further facility which runs on the same computer as the nameserver application ("named"), and interfaces with it. A 'generic' computer name is introduced into the database file (named.data), which refers not to one specific computer, but to any one of a number of computers offering equivalent functionality. For example, the generic name might be "server.cluster.def.ghi.com"; a client program requesting a connection to 'server.cluster' is requesting connection to any one of the computers in the server cluster.

The further facility provided by the preferred embodiment will be referred to hereafter as the "User Load Leveller" (ULL) application. This application is responsible for deciding which server computer in the cluster is currently the least heavily loaded, according to some appropriate metric, and for conveying this information to the nameserver application. Then subsequent requests for resolution of the generic server computer name to an Internet address result in the nameserver application sending back to the client computer the Internet address of the server computer which has been deemed to be the most appropriate server computer for connection at that point in time.

The ULL application consists of the following elements from figure 1: the decision logic 120 with child processes 130, 140, 150; the writing means 160; and the messaging means 170. As described earlier with reference to Figure 1 the ULL application periodically (at a frequency which can varied (eg. tuned by a system administrator or dynamically adjusted)) polls the server computers in the cluster to determine how "busy" in some sense they are. The metric used may vary, depending on the type of work which is being handled by the cluster, but may for example include the number of login sessions, number of application instances running, number of idle cpu cycles since the last poll, etc. The metric can be altered to ensure that it is appropriate to a specific situation.

Based on the results of this polling, and taking into account the situation where a server computer in the cluster is too busy to respond to the status request within a certain number of seconds, the ULL application decides which machine is currently the least heavily loaded. The ULL application then modifies the database file (named.data) to associate the generic cluster machine name with the Internet address of this least heavily loaded machine, and sends the special inter-process signal via the messaging means 170 which tells the nameserver application to re-read its database file. The nameserver application will then, in response to a name resolution request from a client program, resolve the generic server computer name into the Internet address of the most appropriate server computer in the cluster for the client program to connect to.

The process carried out by the decision logic 120 of the preferred embodiment will now be described in more detail with reference to Figure 2. At step 200 the ULL application is initialised. A number of steps are carried out at initialisation. For example the application: checks for multiple copies of the ULL application in memory; cleans up from a previous run of the application (by freeing up system resources such as memory, locks and semaphores still held in the name of the previous instance of the ULL application); and locates the nameserver application (named) and its data file (named.data). The ULL application then parses its configuration file to read information defined by the system administrator, such as the metric strings, poll periods, identities of server computers in the cluster, etc. Further the ULL application generates a number of "child" processes - one per server computer - which are each responsible for polling the activity of one designated server.

Once the initialisation has been completed the process enters a main loop which executes until the ULL application is terminated. At steps 210, 220, 230 and 240 the child processes send a metric string (as defined by the system administrator) to each server computer in the cluster, await responses from those computers, and then wait for a trigger signal from the main ULL application.

Once the trigger signal has been sent by the main application the responses are sent by the child processes to the main application. The main application then collates the activity results received from the child processes (step 250), and based on predetermined test criteria identifies the most appropriate server computer (the "least busy" server computer) at step 260. At step 270 it is determined whether the server computer identified at step 260 differs from the current nominated server computer. If it does then the process advances to step 290, at which point the nameserver's data file (named.data) is modified. Further at step 300 a notification signal is sent to the nameserver application (named) to tell it to update its internal information from the data file.

The process then proceeds to step 280. If at step 270 it is determined that the server computer identified at step 260 is the same as the current nominated server computer then the process moves straight to step 280 without steps 290 and 300 being carried out. Writing to and reading from the data file are time consuming activities and so steps 290 and 300 should only be performed when necessary (ie when the "least busy" server computer changes).

At step 280 the process waits until the end of the "poll period". This period is the predetermined interval (as defined by the system administrator) between successive studies of the server computers by the ULL application. Once the poll period has expired the process loops back to steps 210-240 and the main loop is repeated.

Having discussed the preferred embodiment a few possible alterations will now be discussed. Firstly more than one generic server computer name can be added to the list in storage device 80 (the named.data file). Each generic name could be associated with a particular group of server computers, these groups being either completely separate or having a few server computers common to a plurality of the groups. Indeed one group may be a subset of another group. As an example consider Figure 3. A server cluster 410 comprises eight server computers 400. All eight server computers have access to a main body of data, but only four of them have access to some further (possibly more confidential) data.

In this situation two generic names could be generated, eg. "general.cluster" and "specific.cluster". Any one of the eight computers (enclosed by ring 430) can be associated with the former generic name, but only the four enclosed by ring 420 can be associated with the latter generic name, since only those four have access to the further (confidential) data.

The system administrator can then set up the metric string to be used when studying all eight server computers, or when studying only the four in ring 420; the metric string could be the same in both instances but need not be. If a client application needs access to the confidential information then it would request access to "specific.cluster", but if an application only needed access to the general information then it would request access to "general.cluster".

By this approach an application which only needs access to the general information will always be connected to the least busy server computer, whilst an application which needs access to the further (confidential) information will be given the machine address of the least busy server computer that can actually provide the necessary service; this may or may not be the least busy server computer in the network.

In preferred embodiments a further feature is provided to enable the decision logic to temporarily implement a "round-robin" metric instead of the above described 'studying' process. The round-robin principle will be familiar to those skilled in the art; basically when a client application requests access to a server computer it is assigned a particular server computer, and when the next request is received then that application is assigned the next server computer in the cluster, and so on. In this way the server computers are rotated so that each successive server access is made on a different server computer to the previous server access. Alternatively the server computers can be rotated at fixed time intervals rather than after each access request.

Although the round-robin technique does not have regard to the loading on any of the server computers, and so there is no determination of the least busy server computer, there are certain situations (eg. where there are lots of client applications which only take a short amount of database connection time) where a round-robin approach is acceptable. To implement the round robin approach the decision logic 120 would ask the writing means 160 to update the storage device 80 after each access request has been handled (or at fixed time intervals if the alternative approach is used), so that the generic name is always associated with successive server computers in the cluster in turn.

From the above description it will be clear that the system of the preferred embodiment has a number of advantages. Firstly the technique dynamically allocates new client users and applications to the server computer which is least heavily loaded at the time they make the connection, thus ensuring an even distribution of users and applications across all of the available server computers. The client computer only briefly contacts the data processing system of the preferred embodiment to resolve the generic computer name into a machine address. Completely standard access methods (eg. as provided by TCP/IP) are then used to make the connection, thus avoiding any proprietary protocols or any need to modify access methods or applications, and so providing fully transparent user load levelling.

Secondly the technique of the preferred embodiment does not involve any modification to the nameserver code - the User Load Leveller application interfaces with the standard code (eg. "named" as shipped with the unix/AIX operating system). It would be possible to provide similar functionality to that described here by producing a modified version of the nameserver code. However, avoiding this brings major advantages from both marketing and maintenance points of view.

Further the technique can be operated without requiring any modification to the server computers. They are accessed in a standard way after the generic server computer name has been used to provide the client computer with a machine address.

Another advantage is that the key parameters, such as the time interval between polls of the server computers in the cluster and the metric used to determine which server computer is least heavily loaded, can be altered and tuned by a local system administrator, allowing the system to be optimised for a particular situation.

The above described ULL application could be supplied as a separate tool to enhance the useability of parallel and distributed systems, or could be shipped with the nameserver application.

Claims

1. A data processing system for facilitating a connection of a program on a client computer to a server, the server consisting of a plurality of server computers with shared resources, the data processing system, the client computer, and the server computers residing in a network, the system comprising:

   input means for receiving a request from the client computer for a machine address of a server computer identified by a server computer name sent with the request, such a machine address enabling a connection to be made from the client computer to that server computer via the network;

   a storage device for storing a list identifying server computer names with machine addresses of the server computers;

   conversion means for using the list to convert the server computer name received by the input means into the machine address of the server computer;

   output means for sending the machine address from the conversion means to the client computer;

the system being characterised by:
decision logic for studying the server computers at predetermined intervals having regard to predetermined test criteria, in order to select one of the server computers; and
writing means for updating the list by associating the machine address for the server computer selected by the decision logic with a particular server computer name contained as a generic server computer name in the list;
whereby when a client computer specifies the generic server computer name, it receives the machine address of the server computer identified by the decision logic.

2. A system as claimed in Claim 1 further comprising:

a copier to copy the list from the storage device to a piece of memory accessible by the conversion means;

a messaging means, responsive to the updating of the list by the writing means, for sending a message to the copier requesting the copier to copy the updated list into the piece of local memory.

3. A system as claimed in Claim 1 or Claim 2, wherein the predetermined test criteria are such that the decision logic identifies the server computer having the least number of client programs logged on to it.

4. A system as claimed in any of claims 1 to 3, wherein the predetermined intervals are variable.

5. A system as claimed in any preceding claim, wherein the predetermined test criteria are set by a user of the system.

6. A system as claimed in any preceding claim, wherein the user can limit the number of server computers which the decision logic studies.

7. A system as claimed in any preceding claim wherein a plurality of generic names are used, each one having a number of server computers whose machine addresses are associated with that generic name, the decision logic employing different sets of predetermined test criteria for each generic name.

8. A system as claimed in Claim 7, wherein one or more of the server computers are associated with a plurality of the generic names.

9. A method of operating a data processing system to facilitate a connection of a program on a client computer to a server, the server consisting of a plurality of server computers with shared resources, the data processing system, the client computer, and the server computers residing in a network, the method comprising the steps of:
(a) receiving a request from the client computer for a machine address of a server computer identified by a server computer name sent with the request, such a machine address enabling a connection to be made from the client computer to that server computer via the network;
(b) storing a list identifying server computer names with machine addresses of the server computers in a storage device;
(c) converting, with reference to the list, the server computer name received at step (a) into the machine address of the server computer;
(d) sending the machine address identified at step (c) to the client computer;
the method being characterised by the steps of:
(e) employing decision logic to study the server computers at predetermined intervals having regard to predetermined test criteria, in order to select one of the server computers; and
(f) updating the list by associating the machine address for the server computer selected by the decision logic with a particular server computer name contained as a generic server computer name in the list;
whereby when a client computer specifies the generic server computer name at step (a), it receives the machine address of the server computer identified by the decision logic.

10. A method as claimed in Claim 9 further comprising the steps of:

copying the list from the storage device to a piece of memory accessible at the conversion step (c);

repeating, in response to the updating of the list at step (f), the copying step to ensure that the updated list is copied into the piece of local memory.

11. A method as as claimed in claim 9 or claim 10, wherein the predetermined intervals are set by a user of the system.

12. A method as claimed in any of claims 9 to 11, wherein the predetermined test criteria are set by a user of the system.

13. A method as claimed in any of claims 9 to 12, wherein the user can limit the number of server computers which the decision logic studies.

14. A method as claimed in any of claims 9 to 13, wherein a plurality of generic names are used, each one having a number of server computers whose machine addresses are associated with that generic name, the decision logic employing different sets of predetermined test criteria for each generic name.

15. A method as claimed in Claim 14, wherein one or more of the server computers are associated with a plurality of the generic names.

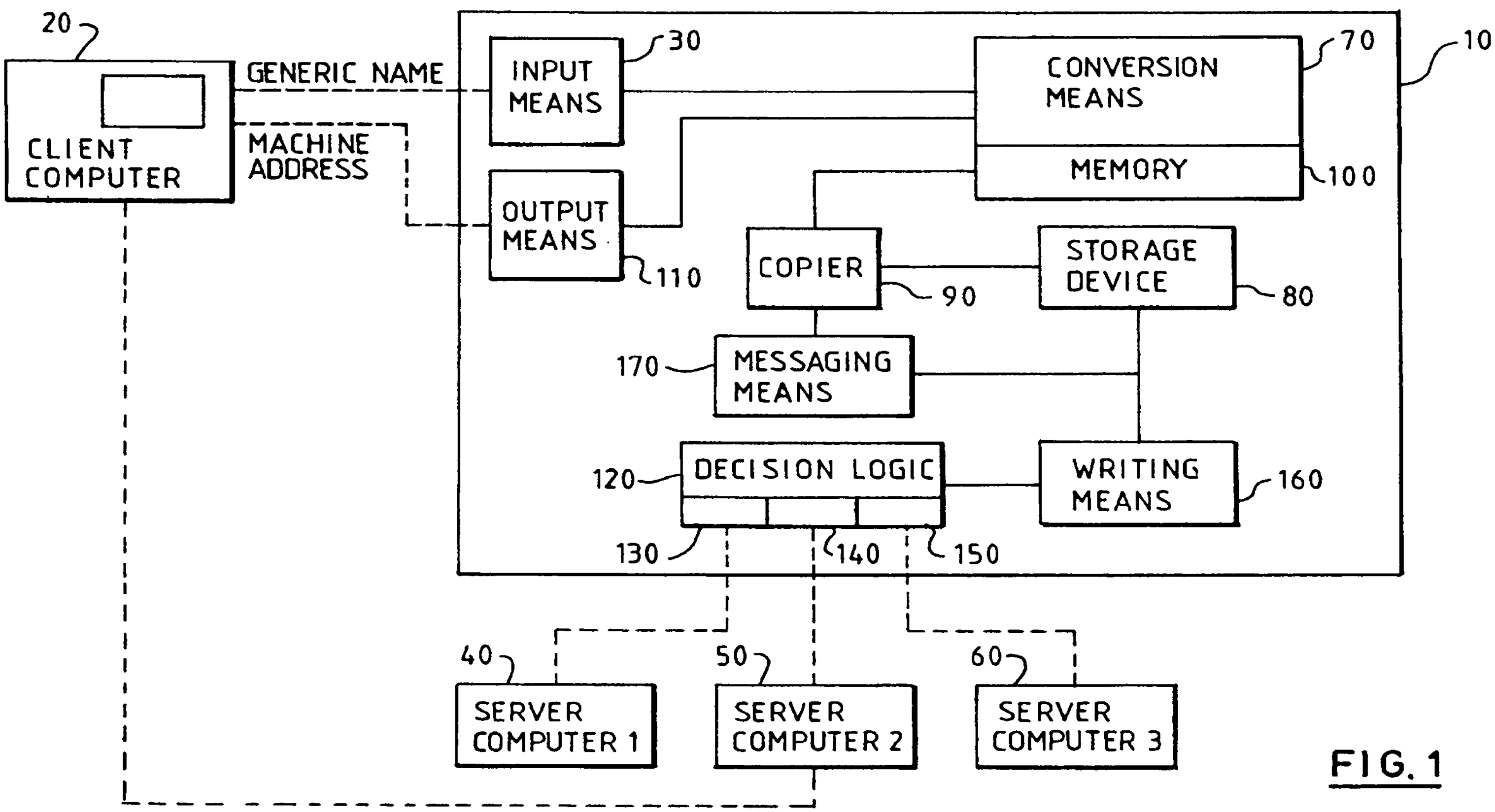
20
CLIENT COMPUTER
GENERIC NAME
MACHINE ADDRESS
INPUT MEANS
30
OUTPUT MEANS
110
CONVERSION MEANS
70
MEMORY
100
10
COPIER
90
STORAGE DEVICE
80
170
MESSAGING MEANS
120
DECISION LOGIC
WRITING MEANS
160
130
140
150
40
SERVER COMPUTER 1
50
SERVER COMPUTER 2
60
SERVER COMPUTER 3

FIG. 1

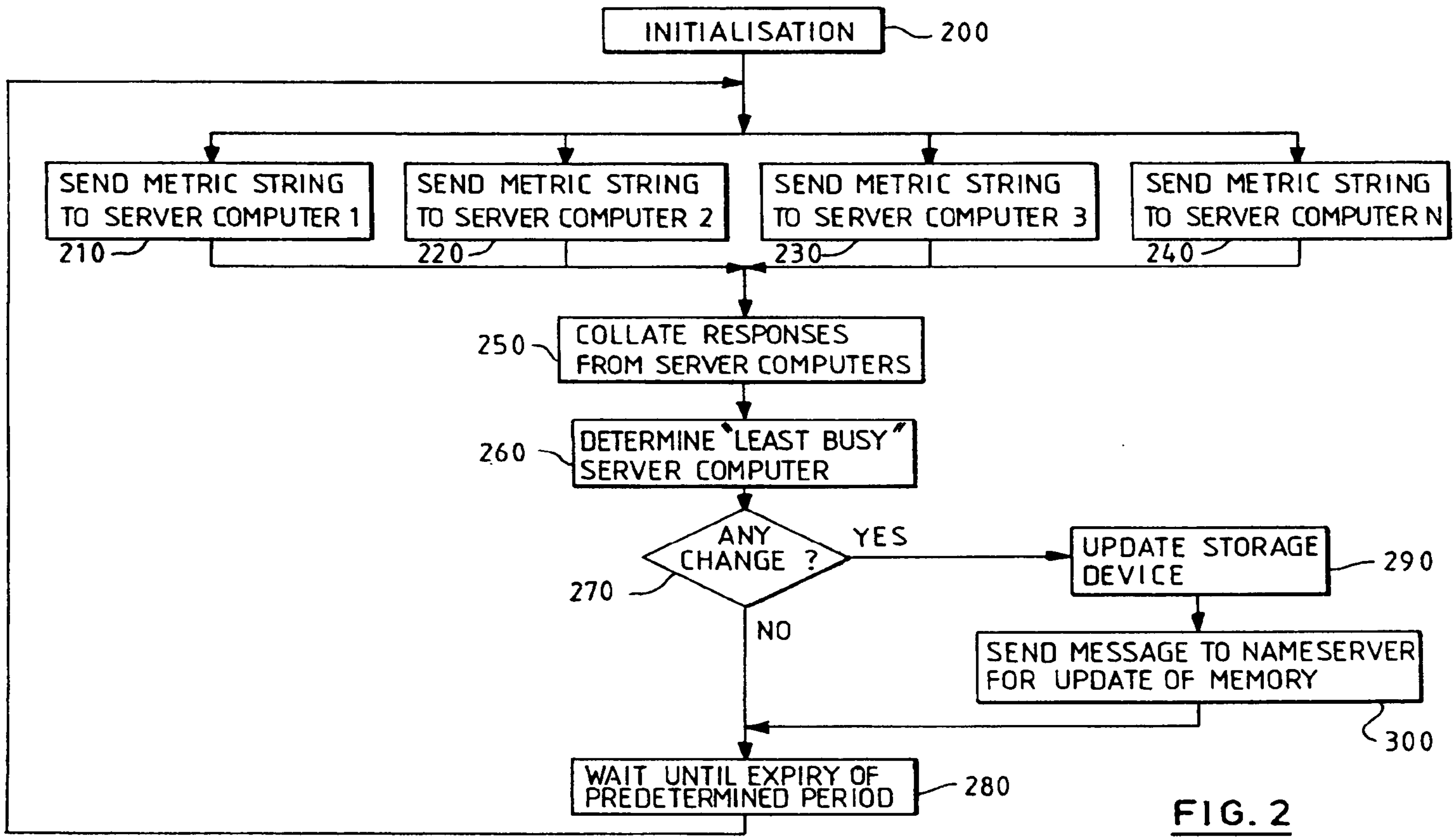
INITIALISATION
200
SEND METRIC STRING TO SERVER COMPUTER 1
210
SEND METRIC STRING TO SERVER COMPUTER 2
220
SEND METRIC STRING TO SERVER COMPUTER 3
230
SEND METRIC STRING TO SERVER COMPUTER N
240
COLLATE RESPONSES FROM SERVER COMPUTERS
250
DETERMINE "LEAST BUSY" SERVER COMPUTER
260
ANY CHANGE ?
270
YES
NO
UPDATE STORAGE DEVICE
290
SEND MESSAGE TO NAMESERVER FOR UPDATE OF MEMORY
300
WAIT UNTIL EXPIRY OF PREDETERMINED PERIOD
280

FIG. 2

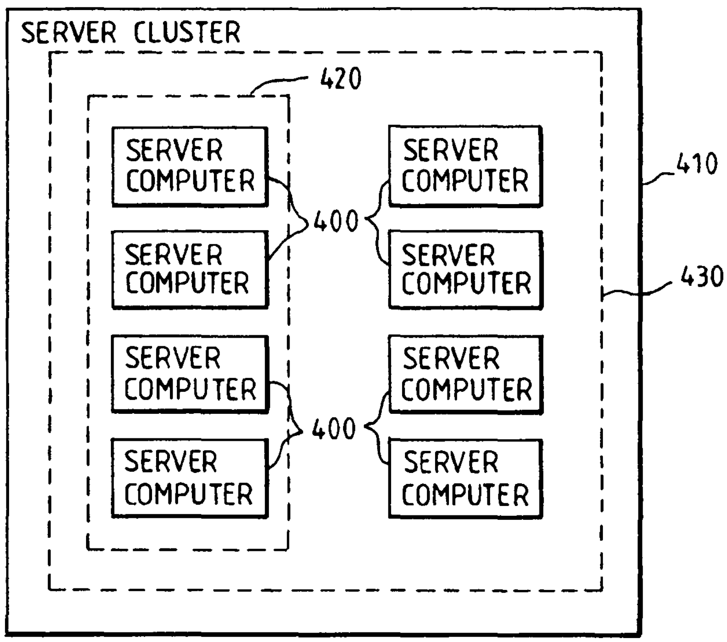
SERVER CLUSTER
420
SERVER COMPUTER
SERVER COMPUTER
SERVER COMPUTER
SERVER COMPUTER
SERVER COMPUTER
SERVER COMPUTER
SERVER COMPUTER
SERVER COMPUTER
400
400
410
430

FIG. 3

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 379 039 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
07.01.2004 Bulletin 2004/02

(51) Int Cl.^{7}: H04L 12/58, H04L 29/06

(21) Application number: 03022287.1

(22) Date of filing: 25.09.1996

(84) Designated Contracting States:
CH DE ES FI FR GB IE IT LI NL SE

(30) Priority: 25.09.1995 US 533115

(62) Document number(s) of the earlier application(s) in accordance with Art. 76 EPC:
96933928.2 / 0 852 868

(71) Applicant: Netspeak Corporation
Boca Raton, FL 33487 (US)

(72) Inventor: Hutton, Glenn W.
Miami, FL 33196 (US)

(74) Representative: Kindermann, Manfred
Patentanwalt,
Sperberweg 29
71032 Böblingen (DE)

Remarks:
This application was filed on 02 - 10 - 2003 as a divisional application to the application mentioned under INID code 62.

(54) Point-to-point communication using e-mail to establish dynamic network addresses

(57) In a computer system having an audio transducer and a display device and being operatively coupled to other computers over a computer network (24), such as the Internet, means are included for establishing a point-to-point communication link between processes. The means provide for transmitting from a first processing unit (12) to the Internet an E-mail signal, including a first IP address assigned to the first processing unit, and for processing the E-mail signal through the Internet to deliver the E-mail signal to a second processing unit (22). Further means are provided for transmitting a second IP address to the first processing unit for establishing a point-to-point communication link between the first and second processing units through the Internet.

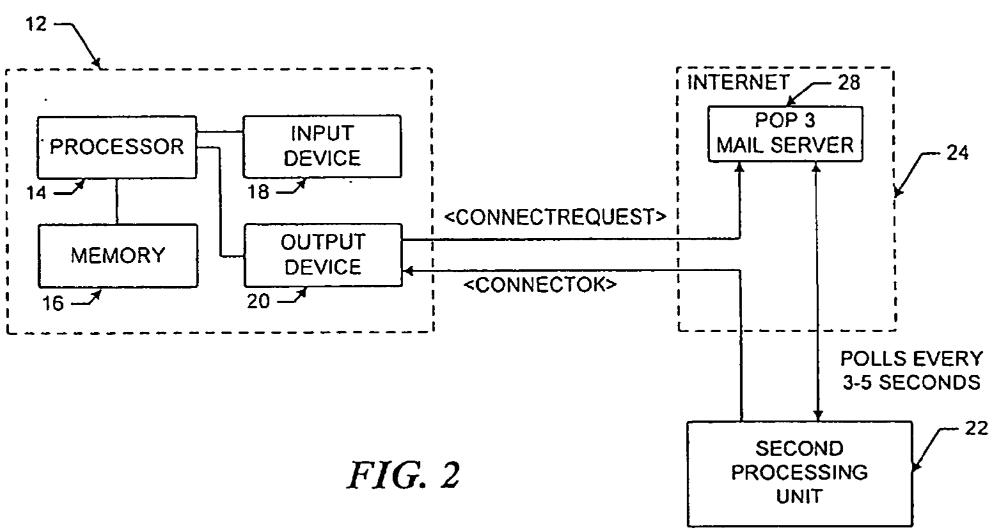

FIG. 2

EP 1 379 039 A2

Printed by Jouve, 75001 PARIS (FR)

Description

FIELD OF THE INVENTION

[0001] The present invention relates in general to data processing systems, and more specifically, to an apparatus, a method and a computer program product for facilitating audio communications over computer networks.

BACKGROUND OF THE INVENTION

[0002] The increased popularity of on-line services such as AMERICA ONLINE (TM), COMPUSERVE (R), and other services such as Internet gateways have spurred applications to provide multimedia contents, including video and voice clips, to online users. An example of an online voice clip application is VOICE E-MAIL FOR WINCIM and VOICE E-MAIL FOR AMERICA ONLINE (TM), available from Bonzi Software, as described in "Simple Utilities Send Voice E-Mail Online", MULTIMEDIA WORLD, VOL. 2, NO. 9, August 1995, p. 52. Using such Voice E-Mail software, a user may create an audio message to be sent to a predetermined E-mail address specified by the user.

[0003] Generally, devices interfacing with the Internet and other online services may communicate with each other upon establishing respective device addresses. One type of device address is the Internet Protocol (IP) address, which acts as a pointer to the device associated with the IP address. A typical device may have a Serial Line Internet Protocol or Point-to-Point Protocol (SLIP/PPP) account with a permanent IP address for receiving E-mail, voicemail, and the like over the Internet. E-mail and voicemail is generally intended to convey text, audio, etc., with any routing information such as an IP address and routing headers generally being considered an artifact of the communication, or even gibberish to the recipient.

[0004] Devices such as a host computer or server of a company may include multiple modems for connection of users to the Internet, with a temporary IP address allocated to each user. For example, the host computer may have a general IP address "XXX.XXX.XXX", and each user may be allocated a successive IP address of XXX.XXX.XXX.10, XXX.XXX.XXX.11, XXX.XXX.XXX.12, etc. Such temporary IP addresses may be reassigned or recycled to the users, for example, as each user is successively connected to an outside party. For example, a host computer of a company may support a maximum of 254 IP addresses which are pooled and shared between devices connected to the host computer.

[0005] Permanent IP addresses of users and devices accessing the Internet readily support point-to-point communications of voice and video signals over the Internet. For example, global real-time video conferencing has been implemented using dedicated IP addresses and mechanisms known as reflectors.

[0006] A technique for matching domain names to Internet Protocol addresses is described in the text entitled "Internetworking With TCP/IP", 2nd Edition, by Douglas E. Comer, November 1992, Prentice Hall, Englewood Cliffs, New Jersey, U.S.A. Comer describes a domain name system and cooperative systems of name servers for matching domain names to network addresses. Each name server is a server program that supplies mapping of domain names to IP addresses. The system described in Comer, however, is not designed for use with network nodes whose network names or name to address bindings change frequently.

[0007] International Publication WO 92/19054 discloses a network monitoring system including an address tracking module which uses passive monitoring of all packet communications over a local area network to maintain a name table of IP address mappings. The disclosed address tracking module is capable of monitoring only a small number of nodes on a local area network and is not suitable for use with a multitude of nodes over a wide area network.

[0008] Due to the dynamic nature of temporary IP addresses of some devices accessing the Internet, point-to-point communications in real-time of voice and video have been generally difficult to attain.

SUMMARY OF THE INVENTION

[0009] In a system for enabling point-to-point communications between a plurality of processing units over the Internet, means are provided for establishing a point-to-point communication link between a first processing unit and a second processing unit. The invention, as defined in the claims, comprises (a) means for transmitting from a first processing unit to the Internet an E-mail signal, including a first IP address assigned to the first processing unit, (b) means for processing the E-mail signal through the Internet to deliver the E-mail signal to a second processing unit and (c) means for transmitting a second IP address to the first processing unit for establishing a point-to-point communication link between the first and second processing units through the Internet.

[0010] The invention is in particular suitable for being used in connection with computer networks, such as the Internet, wherein the processing unit does not have a fixed or predetermined network protocol address. The invention thus provides for a protocol wherein a calling processing unit transmits by E-mail its dynamically assigned network protocol address, or IP address, directly to the called processing unit. The called processing unit then transmits its dynamically assigned IP address to the calling processing unit also via E-mail message.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The features of the invention will become more readily apparent and may be better understood by referring to the following detailed description of an illustrative embodiment of the present invention, taken in conjunction with the accompanying drawings, in which:

FIG. 1 illustrates, in block diagram format, a system for the disclosed point-to-point Internet protocol;
FIG. 2 illustrates, in block diagram format, the system using a secondary point-to-point Internet protocol;
FIG. 3 illustrates, in block diagram format, the system of FIGS. 1-2 with the point-to-point Internet protocol established;
FIG. 4 is another block diagram of the system of FIGS 1-2 with audio communications being conducted;
FIG. 5 illustrates a display screen for a processing unit;
FIG. 6 illustrates another display screen for a processing unit;
FIG. 7 illustrates a flowchart of the initiation of the point-to-point Internet protocols;
FIG. 8 illustrates a flowchart of the performance of the primary point-to-point Internet protocols; and
FIG. 9 illustrates a flowchart of the performance of the secondary point-to-point Internet protocol.

DETAILED DESCRIPTION

[0012] Referring now in specific detail to the drawings, with like reference numerals identifying similar or identical elements, as shown in FIG. 1, the present disclosure describes a point-to-point network protocol and system 10 for using such a protocol.

[0013] In an exemplary embodiment, the system 10 includes a first processing unit 12 for sending at least a voice signal from a first user to a second user. The first processing unit 12 includes a processor 14, a memory 16, an input device 18, and an output device 20. The output device 20 includes at least one modem capable of, for example, 14.4 kbaud communications and operatively connected via wired and/or wireless communication connections to the Internet or other computer networks such as an Intranet, i.e., a private computer network. One skilled in the art would understand that the input device 18 may be implemented at least in part by the modem of the output device 20 to allow input signals from the communication connections to be received. The second processing unit 22 may have a processor, memory, and input and output devices, including at least one modem and associated communication connections, as described above for the first processing unit 12. In an exemplary embodiment, each of the processing units 12, 22 may execute the WEBPHONE™ Internet telephony application available from NetSpeak Corporation, Boca Raton, FL, which is capable of performing the disclosed point-to-point Internet protocol and system 10, as described herein.

[0014] The first processing unit 12 and the second processing unit 22 are operatively connected to the Internet 24 by communication devices and software known in the art, such as an Internet Service Provider (ISP) or an Internet gateway. The processing units 12, 22 may be operatively interconnected through the Internet 24 to a connection server 26, and may also be operatively connected to a mail server 28 associated with the Internet 24.

[0015] The connection server 26 includes a processor 30, a timer 32 for generating time stamps, and a memory such as a database 34 for storing, for example, E-mail and Internet Protocol (IP) addresses of logged-in units. In an exemplary embodiment, the connection server 26 may be a SPARC 5 server or a SPARC 20 server, available from SUN MICROSYSTEMS, INC., Mountain View, CA, having a central processing unit (CPU) as processor 30, an operating system (OS) such as UNIX, for providing timing operations such as maintaining the timer 32, a hard drive or fixed drive, as well as dynamic random access memory (DRAM) for storing the database 34, and a keyboard and display and/or other input and output devices (not shown in FIG. 1). The database 34 may be an SQL database available from ORACLE or INFORMIX.

[0016] In an exemplary embodiment, the mail server 28 may be a Post Office Protocol (POP) Version 3 mail server including a processor, memory, and stored programs operating in a UNIX environment, or, alternatively, another OS, to process E-mail capabilities between processing units and devices over the Internet 24.

[0017] The first processing unit 12 may operate the disclosed point-to-point Internet protocol by a computer program described hereinbelow in conjunction with FIG. 6, which may be implemented from compiled and /or interpreted source code in the C++ programming language and which may be downloaded to the first processing unit 12 from an external computer. The operating computer program may be stored in the memory 16, which may include about 8 MB RAM and/or a hard or fixed drive having about 8 MB. Alternatively, the source code may be implemented in the first processing unit 12 as firmware, as an erasable read only memory (EPROM), etc. It is understood that one skilled in the art would be able to use programming languages other than C++ to implement the disclosed point-to-point network protocol and system 10.

[0018] The processor 14 receives input commands and data from a first user associated with the first processing unit 12 though the input device 18, which may be an input port connected by a wired, optical, or a wireless connection for electromagnetic transmissions, or alternatively may be transferable storage media, such as floppy disks, magnetic tapes, compact disks, or other storage media including the input data from the first user.

[0019] The input device 18 may include a user interface (not shown) having, for example, at least one button actuated by the user to input commands to select from a plurality of operating modes to operate the first processing unit 12. In alternative embodiments, the input device 18 may include a keyboard, a mouse, a touch screen, and/or a data reading device such as a disk drive for receiving the input data from input data files stored in storage media such as a floppy disk or, for example, an 8 mm storage tape. The input device 18 may alternatively include connections to other computer systems to receive the input commands and data therefrom.

[0020] The first processing unit 12 may include a visual interface for use in conjunction with the input device 18 and output device 20 similar to those screens illustrated in FIGS. 5-6, discussed below. It is also understood that alternative devices may be used to receive commands and data from the user, such as keyboards, mouse devices, and graphical user interfaces (GUI) such as WINDOWS™ 3.1 available form MICROSOFT Corporation, Redmond, WA., and other operating systems and GUIs, such as OS/2 and OS/2 WARP, available from IBM CORPORATION, Boca Raton, FL. Processing unit 12 may also include microphones and/or telephone handsets for receiving audio voice data and commands, speech or voice recognition devices, dual tone multifrequency (DTMF) based devices, and/or software known in the art to accept voice data and commands and to operate the first processing unit 12.

[0021] In addition, either of the first processing unit 12 and the second processing unit 22 may be implemented in a personal digital assistant (PDA) providing modem and E-mail capabilities and Internet access, with the PDA providing the input/output screens for mouse interactions or for touchscreen activation as shown, for example, in FIGS. 5-6, as a combination of the input device 18 and output device 20.

[0022] For clarity of explanation, the illustrative embodiment of the disclosed point-to-point Internet protocol and system 10 is presented as having individual functional blocks, which may include functional blocks labeled as "processor" and "processing unit". The functions represented by these blocks may be provided through the use of either shared or dedicated hardware, including, but not limited to, hardware capable of executing software. For example, the functions of each of the processors and processing units presented herein may be provided by a shared processor or by a plurality of individual processors. Moreover, the use of the functional blocks with accompanying labels herein is not to be construed to refer exclusively to hardware capable of executing software. Illustrative embodiments may include digital signal processor (DSP) hardware, such as the AT&T DSP16 or DSP32C, read-only memory (ROM) for storing software performing the operations discussed below, and random access memory (RAM) for storing DSP results. Very large scale integration (VLSI) hardware embodiments, as well as custom VLSI circuitry in combination with a general purpose DSP circuit, may also be provided. Any and all of these embodiments may be deemed to fail within the meaning of the labels for the functional blocks as used herein.

[0023] The processing units 12, 22 are capable of placing calls and connecting to other processing units connected to the Internet 24, for example, via dialup SLIP/PPP lines. In an exemplary embodiment, each processing unit assigns an unsigned long session number, for example, a 32- bit long sequence in a *.ini file for each call. Each call may be assigned a successive session number in sequence, which may be used by the respective processing unit to associate the call with one of the SLIP/PPP lines, to associate a <ConnectOK> response signal with a <Connect Request> signal, and to allow for multiplexing and demultiplexing of inbound and outbound conversations on conference lines, as explained hereinafter.

[0024] For callee (or called) processing units with fixed IP addresses, the caller (or calling) processing unit may open a "socket", i.e. a file handle or address indicating where data is to be sent, and transmit a <Call> command to establish communication with the callee utilizing, for example, datagram services such as Internet Standard network layering as well as transport layering, which may include a Transport Control Protocol (TCP) or a User Datagram Protocol (UDP) on top of the IP. Typically, a processing unit having a fixed IP address may maintain at least one open socket and a called processing unit waits for a <Call> command to assign the open socket to the incoming signal. If all lines are in use, the callee processing unit sends a BUSY signal or message to the callee processing unit. As shown in FIG. 1, the disclosed point-to-point Internet protocol and system 10 operate when a callee processing unit does not have a fixed or predetermined IP address. In the exemplary embodiment and without loss of generality, the first processing unit 12 is the caller processing unit and the second processing unit 22 is the called processing unit. When either of processing units 12, 22 logs on to the Internet via a dial-up connection, the respective unit is provided a dynamically allocated IP address by the a connection service provider.

[0025] Upon the first user initiating the point-to-point Internet protocol when the first user is logged on to the Internet 24, the first processing unit 12 automatically transmits its associated E-mail address and its dynamically allocated IP address to the connection server 26. The connection server 26 then stores these addresses in the database 34 and time stamps the stored addresses using timer 32. The first user operating the first processing unit 12 is thus established in the database 34 as an active on-line party available for communication using the disclosed point-to-point Internet protocol. Similarly, a second user operating the second processing unit 22, upon connection to the Internet 24 through the a connection service provider, is processed by the connection server 26 to be established in the database 34 as an active on-line party.

[0026] The connection server 26 may use the time stamps to update the status of each processing unit; for example, after 2 hours, so that the on-line status information stored in the database 34 is relatively current. Other predetermined time periods, such as a default value of 24 hours. may be configured by a systems operator.

[0027] The first user with the first processing unit 12 initiates a call using, for example, a Send command and/ or a command to speeddial an N^{TH} stored number, which may be labeled [SND] and [SPD] [N], respectively, by the input device 18 and/or the output device 20, such as shown in FIGS. 5-6. In response to either the Send or speeddial commands, the first processing unit 12 retrieves from memory 16 a stored E-mail address of the callee corresponding to the N^{TH} stored number. Alternatively, the first user may directly enter the E-mail address of the callee.

[0028] The first processing unit 12 then sends a query, including the E-mail address of the callee, to the connection server 26. The connection server 26 then searches the database 34 to determine whether the callee is logged-in by finding any stored information corresponding to the callee's E-mail address indicating that the callee is active and on-line. If the callee is active and on-line, the connection server 26 then performs the primary point-to-point Internet protocol; i.e. the IP address of the callee is retrieved from the database 34 and sent to the first processing unit 12. The first processing unit 12 may then directly establish the point-to-point Internet communications with the callee using the IP address of the callee.

[0029] If the callee is not on-line when the connection server 26 determines the callee's status, the connection server 26 sends an OFFLINE signal or message to the first processing unit 12. The first processing unit 12 may also display a message such as "Called Party Off-Line" to the first user.

[0030] When a user logs off or goes off-line from the Internet 24, the connection server 26 updates the status of the user in the database 34; for example, by removing the user's information, or by flagging the user as being off-line. The connection server 26 may be instructed to update the user's information in the database 34 by an off-line message, such as a data packet, sent automatically from the processing unit of the user prior to being disconnected from the connection server 26. Accordingly, an off-line user is effectively disabled from making and/or receiving point-to-point Internet communications.

[0031] As shown in FIGS. 2-4, the disclosed secondary point-to-point Internet protocol may be used as an alternative to the primary point-to-point Internet protocol described above, for example, if the connection server 26 is non-responsive, inoperative, and/or unable to perform the primary point-to-point Internet protocol, as a non-responsive condition. Alternatively, the disclosed secondary point-to-point Internet protocol may be used independent of the primary point-to-point Internet protocol. In the disclosed secondary point-to-point Internet protocol, the first processing unit 12 sends a <ConnectRequest> message via E-mail over the Internet 24 to the mail server 28. The E-mail including the <ConnectRequest> message may have, for example, the subject

[*wp#XXXXXXXX#nnn.nnn.nnn.#emailAddr]

where nnn.nnn.nnn.nnn. is the current (i.e. temporary or permanent) IP address of the first user, and XXXXXXXX is a session number, which may be unique and associated with the request of the first user to initiate point-to-point communication with the second user.

[0032] As described above, the first processing unit 12 may send the <ConnectRequest> message in response to an unsuccessful attempt to perform the primary point-to-point Internet protocol. Alternatively, the first processing unit 12 may send the <ConnectRequest> message in response to the first user initiating a SEND command or the like.

[0033] After the <ConnectRequest> message via E-mail is sent, the first processing unit 12 opens a socket and waits to detect a response from the second processing unit 22. A timeout timer, such as timer 32, may be set by the first processing unit 12, in a manner known in the art, to wait for a predetermined duration to receive a <ConnectOK> signal. The processor 14 of the first processing unit 12 may cause the output device 20 to output a Ring signal to the user, such as an audible ringing sound, about every 3 seconds. For example, the processor 14 may output a *.wav file, which may be labeled RING.WAV, which is processed by the output device 20 to output an audible ringing sound.

[0034] The mail server 28 then polls the second processing unit 22, for example, every 3-5 seconds, to deliver the E-mail. Generally, the second processing unit 22 checks the incoming lines, for example, at regular intervals to wait for and to detect incoming E-mail from the mail server 28 through the Internet 24.

[0035] Typically, for sending E-mail to users having associated processing units operatively connected to a host computer or server operating an Internet gateway, E-mail for a specific user may be sent over the Internet 24 and directed to the permanent IP address or the SLIP/PPP account designation of the host computer, which then assigns a temporary IP address to the processing unit of the specified user for properly routing the E-mail. The E-mail signal may include a name or other designation such as a user name which identifies the specific user regardless of the processing unit assigned to the user; that is, the host computer may track and store the specific device where a specific user is assigned or logged on, independent of the IP address system, and so the host computer may switch the E-mail signal to the device of the specific user. At that time, a temporary IP address may be generated or assigned to the specific user and device.

[0036] Upon detecting and/or receiving the incoming E-mail signal from the first processing unit 12, the second processing unit 22 may assign or may be assigned a temporary IP address. Therefore, the delivery of the E-mail through the Internet 24 provides the second processing unit 22 with a session number as well as IP addresses of both the first processing unit 12 and the second processing unit 22.

[0037] Point-to-point communication may then be established by the processing unit 22 processing the E-mail signal to extract the <ConnectRequest> message, including the IP address of the first processing unit 12 and the session number. The second processing unit 22 may then open a socket and generate a <ConnectOK> response signal, which includes the temporary IP address of the second processing unit 22 as well as the session number of the first processing unit.

[0038] The second processing unit 22 sends the <ConnectOK> signal directly over the Internet 24 to the IP address of the first processing unit 12 without processing by the mail server 28, and a timeout timer of the second processing unit 22 may be set to wait and detect a <Call> signal expected from the first processing unit 12.

[0039] Realtime point-to-point communication of audio signals over the Internet 24, as well as video and voicemail, may thus be established and supported without requiring permanent IP addresses to be assigned to either of the users or processing units 12, 22. For the duration of the realtime point-to-point link, the relative permanence of the current IP addresses of the processing units 12, 22 is sufficient, whether the current IP addresses were permanent (i.e. predetermined or preassigned) or temporary (i.e. assigned upon initiation of the point-to-point communication).

[0040] In the exemplary embodiment, a first user operating the first processing unit 12 is not required to be notified by the first processing unit 12 that an E-mail is being generated and sent to establish the point-to-point link with the second user at the second processing unit 22. Similarly, the second user is not required to be notified by the second processing unit 22 that an E-mail has been received and/or a temporary IP address is associated with the second processing unit 22. The processing units 12, 22 may perform the disclosed point-to-point Internet protocol automatically upon initiation of the point-to-point communication command by the first user without displaying the E-mail interactions to either user. Accordingly, the disclosed point-to-point Internet protocol may be transparent to the users. Alternatively, either of the first and second users may receive, for example, a brief message of "CONNECTION IN PROGRESS" or the like on a display of the respective output device of the processing units 12, 22.

[0041] After the initiation of either the primary or the secondary point-to-point Internet protocols described above in conjunction with FIGS. 1-2, the point-to-point communication link over the Internet 24 may be established as shown in FIGS. 3-4 in a manner known in the art. For example, referring to FIG. 3, upon receiving the <ConnectorOK> signal from the second processing unit 22, the first processing unit 12 extracts the IP address of the second processing unit 22 and the session number, and the session number sent from the second processing unit 22 is then checked with the session number originally sent from the first processing unit 12 in the <ConnectRequest> message as E-mail. If the session numbers sent and received by the processing unit 12 match, then the first processing unit 12 sends a <Call> signal directly over the Internet 24 to the second processing unit 22; i.e. using the IP address of the second processing unit 22 provided to the first processing unit 12 in the <ConnectOK> signal.

[0042] Upon receiving the <Call> signal, the second processing unit 22 may then begin a ring sequence, for example, by indicating or annunciating to the second user that an incoming call is being received. For example, the word "CALL" may be displayed on the output device of the second processing unit 22. The second user may then activate the second processing unit 22 to receive the incoming call.

[0043] Referring to FIG. 4, after the second processing unit 22 receives the incoming call, realtime audio and/or video conversations may be conducted in a manner known in the art between the first and second users through the Internet 24, for example, by compressed digital audio signals. Each of the processing units 12, 22 also display to each respective user the words "IN USE" to indicate that the point-to-point communication link is established and audio or video signals are being transmitted.

[0044] In addition, either user may terminate the point-to-point communication link by, for example, activating a termination command, such as by activating an [END] button or icon on a respective processing unit, causing the respective processing unit to send an <End> signal which causes both processing units to terminate the respective sockets, as well as to perform other cleanup commands and functions known in the art.

[0045] FIGS. 5-6 illustrate examples of display screens 36 which may be output by a respective output device of each processing unit 12, 22 of FIGS. 1-4 for providing the disclosed point-to-point Internet protocol and system 10. Such display screens may be displayed on a display of a personal computer (PC) or a PDA in a manner known in the art.

[0046] As shown in FIG. 5, a first display screen 36 includes a status area 38 for indicating, for example, a called user by name and/or by IP address or telephone number; a current function such as C2; a current time; a current operating status such as "IN USE", and other control icons such as a down arrow icon 40 for scrolling down a list of parties on a current conference line. The operating status may include such annunciators as "IN USE," "IDLE," "BUSY," "NO ANSWER," "OFFLINE," "CALL," "DIALING," "MESSAGES," and "SPEEDDIAL."

[0047] Other areas of the display screen 36 may include activation areas or icons for actuating commands or entering data. For example, the display screen 36 may include a set of icons 42 arranged in columns and rows including digits 0-9 and commands such as END, SND, HLD, etc. For example, the END and SND commands may be initiated as described above, and the HLD icon 44 may be actuated to place a current line on hold. Such icons may also be configured to substantially simulate a telephone handset or a cellular telephone interface to facilitate ease of use, as well as to simulate function keys of a keyboard. For example, icons labeled L1-L4 may be mapped to function keys F1-F4 on standard PC keyboards, and icons C1-C3 may be mapped to perform as combinations of function keys, such as CTRL-F1, CTRL-F2, and CTRL-F3, respectively. In addition, the icons labeled L1-L4 and C1-C3 may include circular regions which may simulate light emitting diodes (LEDs) which indicate that the function or element represented by the respective icon is active or being performed.

[0048] Icons L1-L4 may represent each of 4 lines available to the caller, and icons C1-C3 may represent conference calls using at least one line to connect, for example, two or more parties in a conference call. The icons L1-L4 and C1-C3 may indicate the activity of each respective line or conference line. For example, as illustrated in FIG. 5, icons L1-L2 may have lightly shaded or colored circles, such as a green circle, indicating that each of lines 1 and 2 are in use, while icons L3-L4 may have darkly shaded or color circles, such as a red or black circle, indicating that each of lines 3 and 4 are not in use. Similarly, the lightly shaded circle of the icon labeled C2 indicates that the function corresponding to C2 is active, as additionally indicated in the status are 38, while darkly shaded circles of icons labeled C1 and C3 indicate that such corresponding functions are not active.

[0049] The icons 42 are used in conjunction with the status area 38. For example, using a mouse for input, a line that is in use, as indicated by the lightly colored circle of the icon, may be activated to indicate a party's name by clicking a right mouse button for 5 seconds until another mouse click is actuated or the [ESC] key or icon is actuated. Thus, the user may switch between multiple calls in progress on respective lines.

[0050] Using the icons as well as an input device such as a mouse, a user may enter the name or alias or IP address, if known, of a party to be called by either manually entering the name, by using the speeddial feature, or by double clicking on an entry in a directory stored in the memory, such as the memory 16 of the first processing unit 12, where the directory entries may be scrolled using the status area 38 and the down arrow icon 40.

[0051] Once a called party is listed in the status area 38 as being active on a line, the user may transfer the called party to another line or a conference line by clicking and dragging the status area 38, which is represented by a reduced icon 46. Dragging the reduced icon 46 to any one of line icons L1-L4 transfers the called party in use to the selected line, and dragging the reduced icon 46 to any one of conference line icons C1-C3 adds the called party to the selected conference call.

[0052] Other features may be supported, such as icons 48-52, where icon 48 corresponds to, for example, an ALT-X command to exit the communication facility of a processing unit, and icon 50 corresponds to, for example, an ALT-M command to minimize or maximize the display screen 36 by the output device of the processing unit. Icon 52 corresponds to an OPEN command, which may, for example, correspond to pressing the O key on a keyboard, to expand or contract the display screen 36 to represent the opening and closing of a cellular telephone. An "opened" configuration is shown in FIG. 5, and a "closed" configuration is shown in FIG. 6. In the "opened" configuration, additional features such as output volume (VOL) controls, input microphone (MIC) controls, waveform (WAV) sound controls, etc.

[0053] The use of display screens such as those shown in FIGS. 5-6 provided flexibility in implementing various features available to the user. It is to be understood that additional features such as those known in the art may be supported by the processing units 12, 22.

[0054] Alternatively, it is to be understood that one skilled in the art may implement the processing units 12, 22 to have the features of the display screens in FIGS. 5-6 in hardware; i.e. a wired telephone or wireless cellular telephone may include various keys, LEDs, liquid crystal displays (LCDs), and touchscreen actuators corresponding to the icons and features shown in FIGS. 5-6. In addition, a PC may have the keys of a keyboard and mouse mapped to the icons and features shown in FIGS. 5-6.

[0055] Referring to FIG. 7, the disclosed point-to-point Internet protocol and system 10 is illustrated. First processing unit 12 initiates the point-to-point Internet protocol in step 56 by sending a query from the first processing unit 12 to the connection server 26. If connection server 26 is operative to perform the point-to-point Internet protocol, in step 58, first processing unit 12 receives an on-line status signal from the connection server 26, such signal may include the IP address of the callee or a "Callee Off-Line" message. Next, first processing unit 12 performs the primary point-to-point Internet protocol in step 60, which may include receiving, at the first processing unit 12, the IP address of the callee if the callee is active and on-line. Alternatively, processing unit 60 may initiate and perform the secondary point-to-point Internet protocol in step 62, if the called party is not active and/or on-line.

[0056] Referring to FIG. 8, in conjunction with FIGS. 1 and 3-4, the disclosed point-to-point Internet protocol and system 10 is illustrated. Connection server 26 starts the point-to-point Internet protocol, in step 64, and timestamps and stores E-mail and IP addresses of logged-in users and processing units in the database 34 in step 66. Connection server 26 receives a query from a first processing unit 12 in step 68 to determine whether a second user or second processing unit 22 is logged-in to the Internet 24, with the second user being specified, for example, by an E-mail address. Connection server 26 retrieves the IP address of the specified user from the database 34 in step 70, if the specified user is logged-in to the Internet, and sends the retrieved IP address to the first processing unit 12 in step 72 to enable first processing unit 12 to establish point-to-point communications with the specified second user.

[0057] The disclosed secondary point-to-point Internet protocol operates as shown in FIG. 9. First processing unit 12 generates an E-mail signal, including a session number and a first IP address corresponding to a first processing unit in step 76. First processing unit 12 transmits the E-mail signal as a <ConnectRequest> signal to the Internet 24 in step 78. The E-mail signal is delivered through the Internet 24 using a mail server 28 to the second processing unit 22 in step 80. Second processing unit 22 extracts the session number and the first IP address from the E-mail signal in step 82 and transmits or sends the session number and a second IP address corresponding to the second processing unit 22, back to the first processing unit 12 through the Internet 24, in step 84. First processing unit 12 verifies the session number received from the second processing unit 22 in step 86, and establishes a point-to-point Internet communication link between the first processing unit 12 and second processing unit 22 using the first and second IP addresses in step 88.

[0058] While the disclosed point-to-point Internet protocols and system have been particularly shown and described with reference to the preferred embodiments, it is understood by those skilled in the art that various modifications in form and detail may be made therein without departing from the scope and spirit of the invention. Accordingly, modifications such as those suggested above, but not limited thereto, are to be considered within the scope of the invention.

Claims

1. A method for establishing point-to-point Internet communication between a plurality of processing units **characterized by** the steps:

   a) transmitting an E-mail signal, including a first IP address assigned to a first processing unit (12);
   b) processing the E-mail signal through the Internet to deliver the E-mail signal to a second processing unit (22); and
   c) transmitting a second IP address to the first processing unit for establishing a point-to-point communication link between the first and second processing units through the Internet.

2. The method of claim 1, further **characterized by**:

   a1) generating the E-mail signal from the first IP address corresponding to the first processing unit before the step (a) of transmitting the E-mail signal.

3. The method of claim 1, further **characterized by**:

   a1) generating the E-mail signal from a session number before the step (a) of transmitting the E-mail signal.

4. The method of claim 1, **characterized in that** the step of processing the E-mail signal further comprises the step of:

   b1) processing the E-mail signal using a mail server operatively connected to the second processing unit.

5. The method of claim 1, further **characterized by**:

   b1) generating a connection signal (CONNECTOK) including the second IP address at the second processing unit before the step (c) of transmitting the second IP address to the first processing unit, and

   wherein the step (c) of transmitting the second IP address includes the step of transmitting the connection signal from the second processing unit to the first processing unit.

6. A system for enabling point-to-point communications between a first and a second processing unit over the Internet, **characterized by**:

   a) means for transmitting from the first processing unit (12) to the Internet an E-mail signal, including a first IP address assigned to the first processing unit;
   b) means (28) for processing the E-mail signal through the Internet to deliver the E-mail signal to the second processing (22) unit; and
   c) means for transmitting a second IP address to the first processing unit for establishing a point-to-point communication link between the first and second processing units through the Internet.

7. The system of claim 6 comprising a server which is **characterized by**:

   a processor;
   a memory operatively coupled to the processor;
   a network interface logic operatively coupled to the processor and the memory and configured to connect the server to a computer network; and

mail processing logic responsive to an E-mail signal from the first processing unit and configured to provide the E-mail signal to the second processing unit, the E-mail signal comprising the network protocol address of the first processing unit.

8. The system of claim 6, further **characterized by**:

b1) means for generating a connection signal (CONNECTOK) including the second IP address in the second processing unit, and for transmitting the connection signal from the second processing unit to the first processing unit.

9. The system of claim 6, wherein the first processing unit comprises a processor for executing the point-to-point Internet protocol, **characterized by** means for generating an E-mail signal, including a first IP address, and by means for transmitting the E-mail signal through the Internet to the second processing unit for establishing a point-to-point communication link to the first processing unit.

10. The system of claim 9, **characterized in that** the processor is adapted to generate the E-mail signal from the first IP address corresponding to the first processing unit.

11. The apparatus of claim 9, **characterized in that** the processor is adapted to wait to detect a response from the second processing unit.

12. The system according to one of the claims 6-11, **characterized in that** the first IP address is dynamically assigned to the first processing unit.

13. The system according to one of the claims 6-12, comprising a mail server (28) for processing the E-mail signal through the Internet to deliver the E-mail to the second processing unit (22) for establishing a point-to-point communication link between the first and second processing unit through the Internet.

14. The system of claim 13, wherein the second processing unit comprises a processor adapted for receiving the E-mail signal from the mail server and for generating a connection signal (CONNECTOK) including a second IP address and for transmitting the connection signal to the first processing unit for establishing the point-to-point communication link to the first processing unit.

15. A computer program product for establishing point-to-point Internet communication between a plurality of processing units, the computer program product having a computer usable medium containing computer readable program code, comprising:

a) program code for transmitting an E-mail signal including a first IP address assigned to a first processing unit (12);
b) program code for processing the E-mail signal through the Internet to deliver the E-mail signal to a second processing unit (22);
c) program code for transmitting a second IP address to the first processing unit; and
d) program code for establishing in response to receiving the second IP address in the first processing unit a point-to-point communication link between the first and second processing units through the Internet.

16. The computer program product of claim 15, further **characterized by**:

b1) program code for generating a connection signal (CONNECTOK) including the second IP address at the second processing unit; and
c1) program code for transmitting the connection signal from the second processing unit to the first processing unit.

17. The computer program product of claim 15, further comprising in a memory (16) of the first processing unit:

program code for performing a point-to-point Internet protocol;
program code for generating an E-mail signal, including a first IP address; and
program code for use of a mail server (28) for processing the E-mail signal through the Internet to deliver the E-mail to the second processing unit for establishing a point-to-point communication link between the first and second processing unit.

18. The computer program product of claim 15, further comprising in a memory of the second processing unit:

second program code for performing a point-to-point Internet protocol; program code for receiving the E-mail signal from a mail server; and program code for generating a connection signal including a second IP address for establishing the point-to-point communication link to the first processing unit.

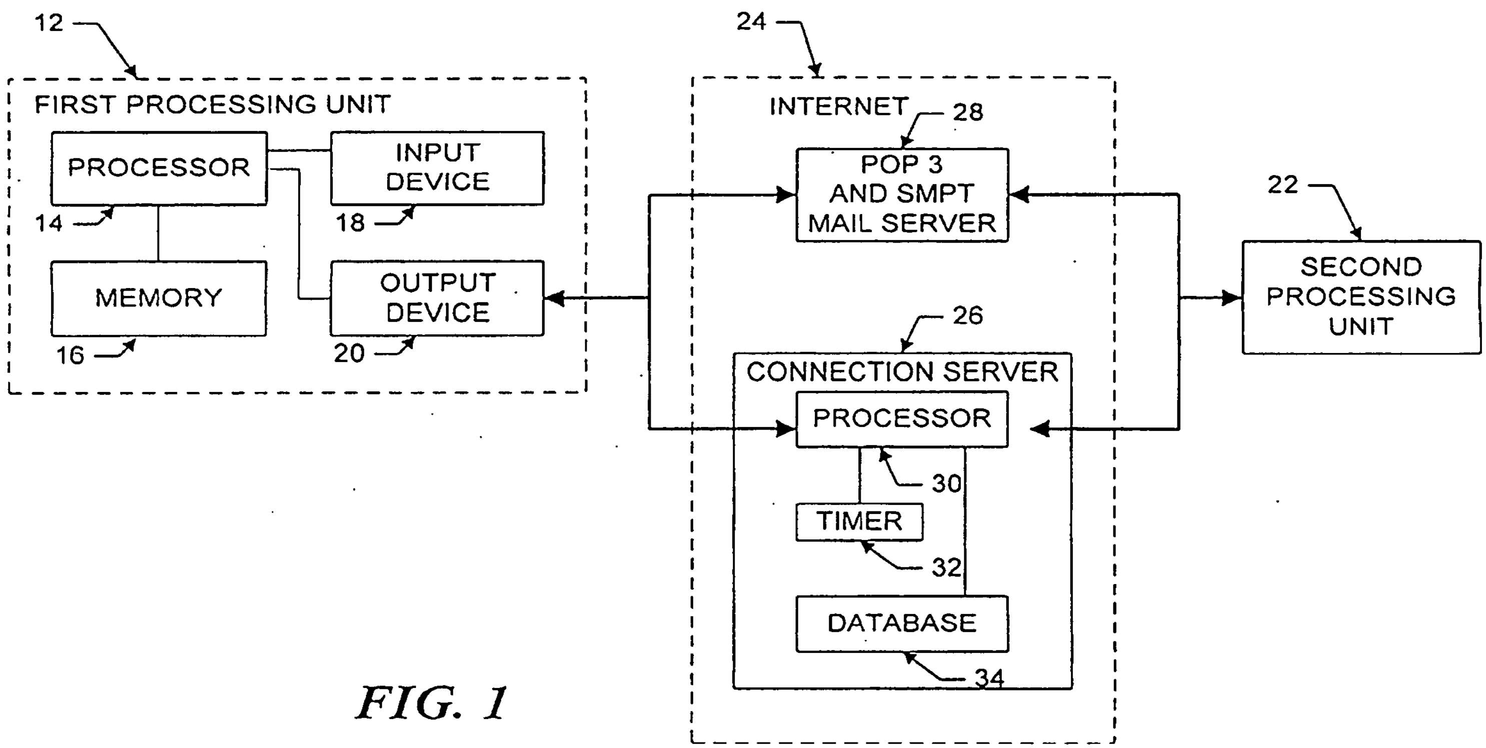
12
FIRST PROCESSING UNIT
PROCESSOR
INPUT DEVICE
14
18
MEMORY
OUTPUT DEVICE
16
20
24
INTERNET
28
POP 3 AND SMPT MAIL SERVER
26
CONNECTION SERVER
PROCESSOR
30
TIMER
32
DATABASE
34
22
SECOND PROCESSING UNIT

FIG. 1

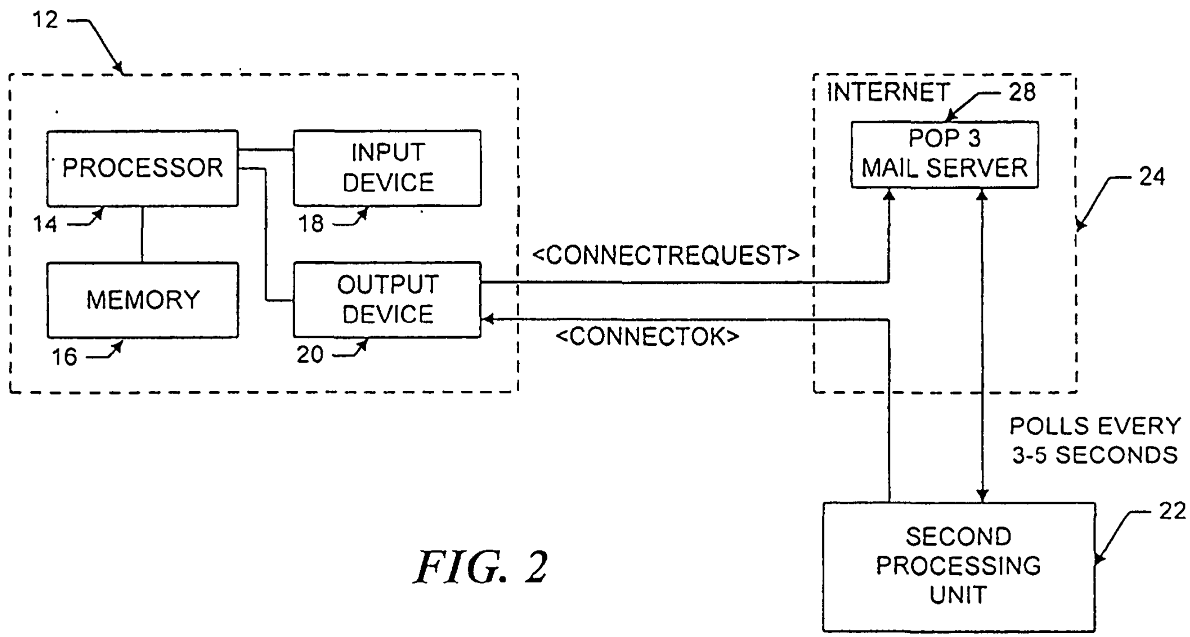
12
PROCESSOR
14
INPUT DEVICE
18
MEMORY
16
OUTPUT DEVICE
20
<CONNECTREQUEST>
<CONNECTOK>
INTERNET
28
POP 3 MAIL SERVER
24
POLLS EVERY 3-5 SECONDS
SECOND PROCESSING UNIT
22

FIG. 2

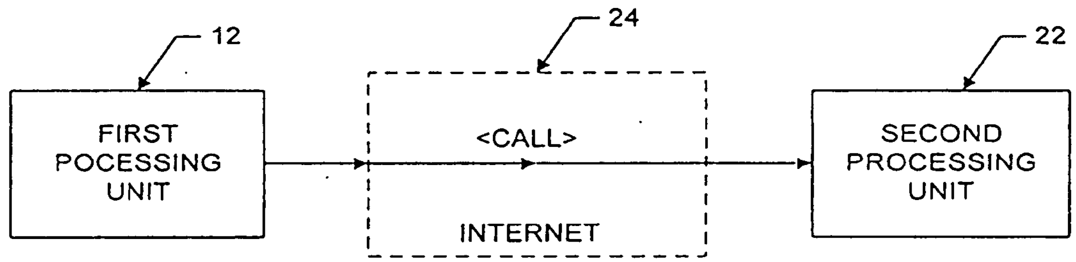
12
24
22
FIRST POCESSING UNIT
<CALL>
INTERNET
SECOND PROCESSING UNIT

FIG. 3

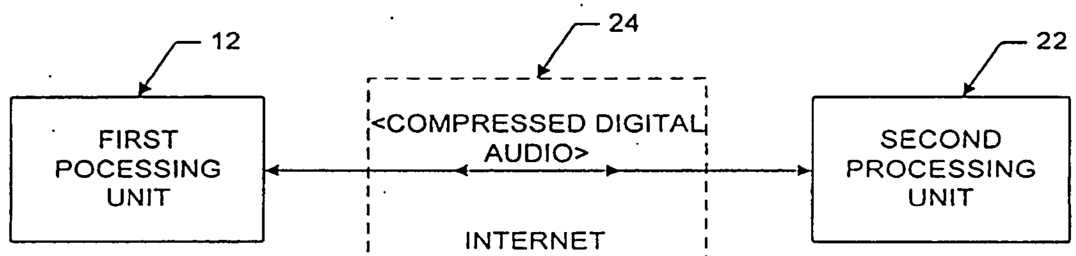
12
24
22
FIRST POCESSING UNIT
<COMPRESSED DIGITAL AUDIO>
INTERNET
SECOND PROCESSING UNIT

FIG. 4

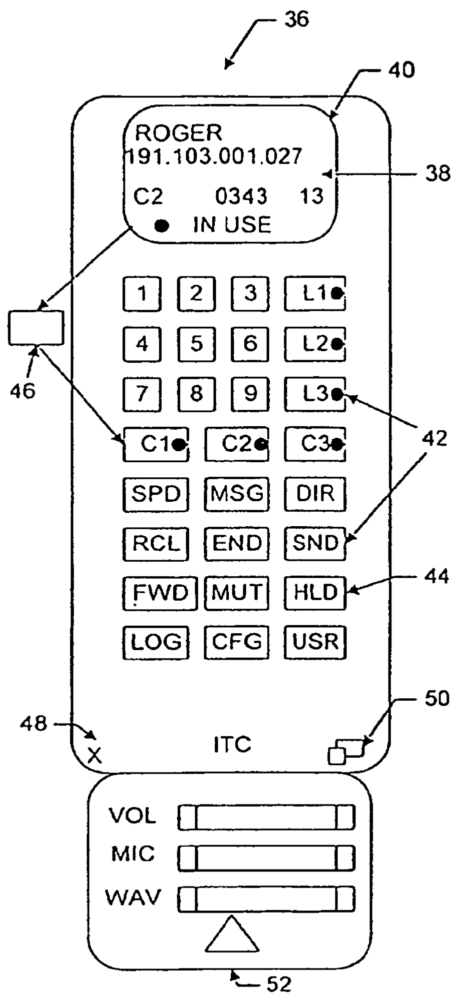
36
40
ROGER
191.103.001.027
38
C2 0343 13
IN USE
1 2 3 L1
4 5 6 L2
7 8 9 L3
46
C1 C2 C3
42
SPD MSG DIR
RCL END SND
FWD MUT HLD
44
LOG CFG USR
50
48
X
ITC
VOL
MIC
WAV
52

FIG. 5

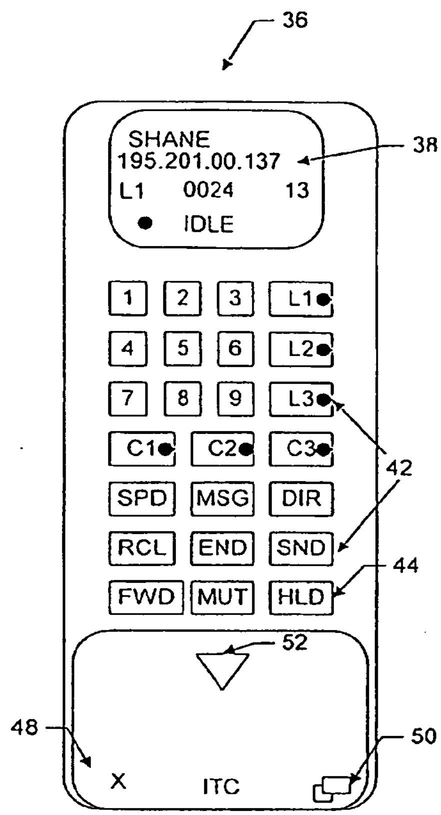
36
SHANE
195.201.00.137
38
L1 0024 13
IDLE
1 2 3 L1
4 5 6 L2
7 8 9 L3
C1 C2 C3
42
SPD MSG DIR
RCL END SND
44
FWD MUT HLD
52
48
50
X
ITC

FIG. 6

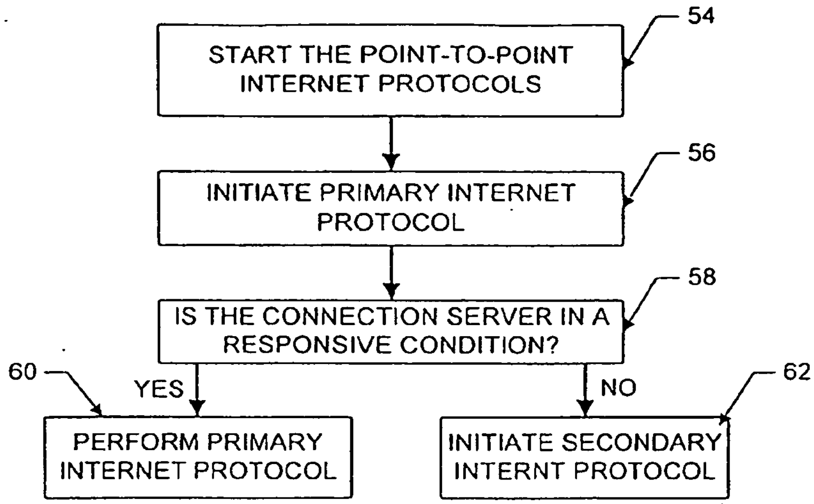
START THE POINT-TO-POINT INTERNET PROTOCOLS
54
INITIATE PRIMARY INTERNET PROTOCOL
56
IS THE CONNECTION SERVER IN A RESPONSIVE CONDITION?
58
YES
NO
60
PERFORM PRIMARY INTERNET PROTOCOL
62
INITIATE SECONDARY INTERNT PROTOCOL

FIG. 7

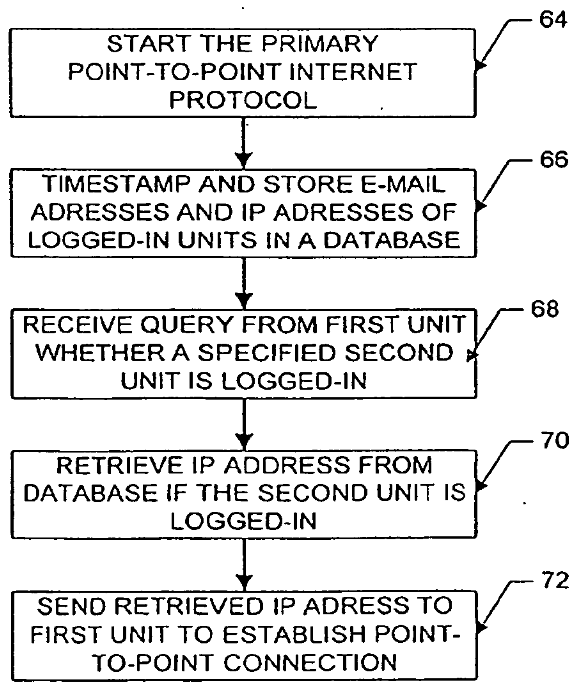
START THE PRIMARY POINT-TO-POINT INTERNET PROTOCOL
64
TIMESTAMP AND STORE E-MAIL ADRESSES AND IP ADRESSES OF LOGGED-IN UNITS IN A DATABASE
66
RECEIVE QUERY FROM FIRST UNIT WHETHER A SPECIFIED SECOND UNIT IS LOGGED-IN
68
RETRIEVE IP ADDRESS FROM DATABASE IF THE SECOND UNIT IS LOGGED-IN
70
SEND RETRIEVED IP ADRESS TO FIRST UNIT TO ESTABLISH POINT-TO-POINT CONNECTION
72

FIG. 8

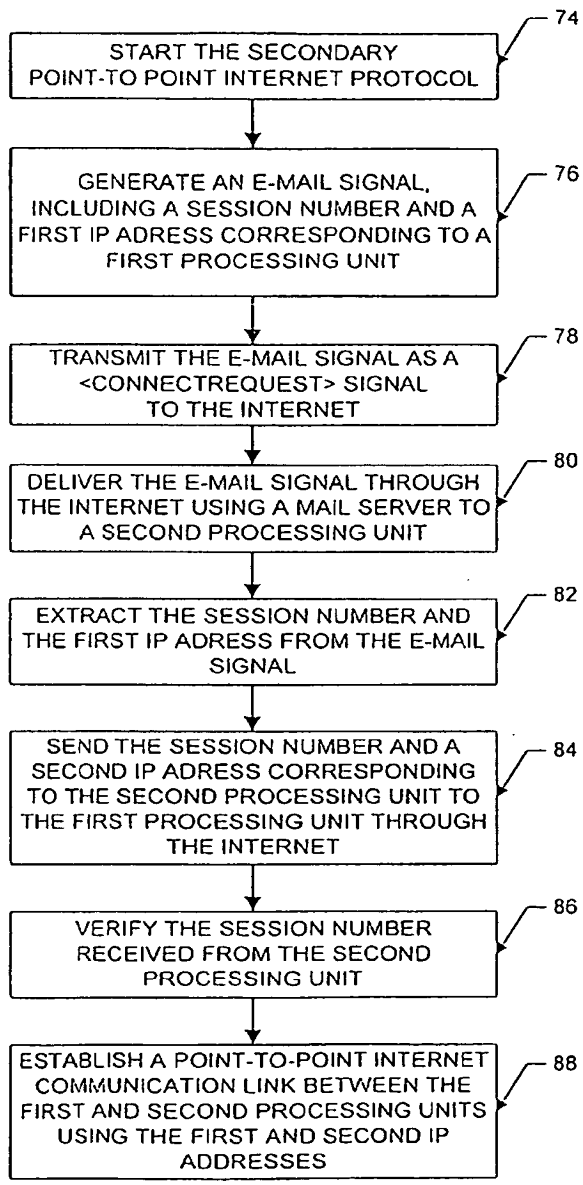
74
START THE SECONDARY POINT-TO POINT INTERNET PROTOCOL
76
GENERATE AN E-MAIL SIGNAL, INCLUDING A SESSION NUMBER AND A FIRST IP ADRESS CORRESPONDING TO A FIRST PROCESSING UNIT
78
TRANSMIT THE E-MAIL SIGNAL AS A <CONNECTREQUEST> SIGNAL TO THE INTERNET
80
DELIVER THE E-MAIL SIGNAL THROUGH THE INTERNET USING A MAIL SERVER TO A SECOND PROCESSING UNIT
82
EXTRACT THE SESSION NUMBER AND THE FIRST IP ADRESS FROM THE E-MAIL SIGNAL
84
SEND THE SESSION NUMBER AND A SECOND IP ADRESS CORRESPONDING TO THE SECOND PROCESSING UNIT TO THE FIRST PROCESSING UNIT THROUGH THE INTERNET
86
VERIFY THE SESSION NUMBER RECEIVED FROM THE SECOND PROCESSING UNIT
88
ESTABLISH A POINT-TO-POINT INTERNET COMMUNICATION LINK BETWEEN THE FIRST AND SECOND PROCESSING UNITS USING THE FIRST AND SECOND IP ADDRESSES

FIG. 9

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 379 039 A3

(12) EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
10.03.2004 Bulletin 2004/11

(43) Date of publication A2:
07.01.2004 Bulletin 2004/02

(21) Application number: 03022287.1

(22) Date of filing: 25.09.1996

(51) Int Cl.7: **H04L 12/58**, H04L 29/06, H04L 29/12

(84) Designated Contracting States:
CH DE ES FI FR GB IE IT LI NL SE

(30) Priority: 25.09.1995 US 533115

(62) Document number(s) of the earlier application(s) in accordance with Art. 76 EPC:
96933928.2 / 0 852 868

(71) Applicant: Netspeak Corporation
Boca Raton, FL 33487 (US)

(72) Inventor: Hutton, Glenn W.
Miami, FL 33196 (US)

(74) Representative: Kindermann, Manfred
Patentanwalt,
Sperberweg 29
71032 Böblingen (DE)

(54) **Point-to-point communication using e-mail to establish dynamic network addresses**

(57) In a computer system having an audio transducer and a display device and being operatively coupled to other computers over a computer network (24), such as the Internet, means are included for establishing a point-to-point communication link between processes. The means provide for transmitting from a first processing unit (12) to the Internet an E-mail signal, including a first IP address assigned to the first processing unit, and for processing the E-mail signal through the Internet to deliver the E-mail signal to a second processing unit (22). Further means are provided for transmitting a second IP address to the first processing unit for establishing a point-to-point communication link between the first and second processing units through the Internet.

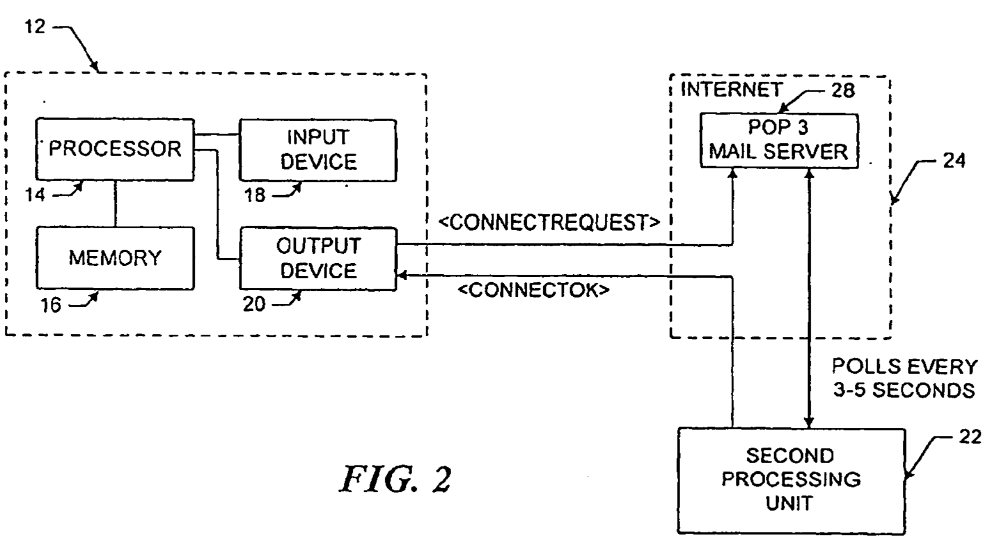

FIG. 2

EP 1 379 039 A3

Printed by Jouve, 75001 PARIS (FR)

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 02 2287

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	EP 0 581 722 A (YEDA RES & DEV) 2 February 1994 (1994-02-02) * page 2, line 3 - page 3, line 58 * * page 5, line 33 - page 6, line 13 * * page 7, line 10 - line 17 * * page 8, line 19 - line 24 * ---	1-18	H04L12/58 H04L29/06 H04L29/12
A	US 5 440 547 A (ESAKI HIROSHI ET AL) 8 August 1995 (1995-08-08) * column 1, line 9 - column 4, line 48 * * column 15, line 67 - column 17, line 6 * ---	1-18	
A	GB 2 283 645 A (DIGITAL EQUIPMENT INT) 10 May 1995 (1995-05-10) * page 1, line 3 - page 3, line 22 * * page 5, line 22 - line 26 * * page 6, line 4 - page 7, line 28 * * page 11, line 17 - page 12, line 21 * ---	1,6,15	
A	US 5 287 103 A (KASPRZYK MARLON Z ET AL) 15 February 1994 (1994-02-15) * the whole document * ---	1,6,15	TECHNICAL FIELDS SEARCHED (Int.Cl.7)
A	US 5 410 754 A (FAVREAU KEITH ET AL) 25 April 1995 (1995-04-25) * column 1, line 6 - column 3, line 41 * * column 15, line 13 - line 16 * -----	1,6,15	H04L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12 January 2004	Vaskimo, K

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 03 02 2287

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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12-01-2004

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 379 050 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
07.01.2004 Bulletin 2004/02

(51) Int Cl.[7]: **H04L 29/06**, H04L 12/58

(21) Application number: **03022288.9**

(22) Date of filing: **25.09.1996**

(84) Designated Contracting States:
CH DE ES FI FR GB IE IT LI NL SE

(30) Priority: **25.09.1995 US 533115**

(62) Document number(s) of the earlier application(s) in accordance with Art. 76 EPC:
96933928.2 / 0 852 868

(71) Applicant: **Netspeak Corporation**
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(72) Inventor: **Hutton, Glenn W.**
Miami, FL 33196 (US)

(74) Representative: **Kindermann, Manfred**
Patentanwalt,
Sperberweg 29
71032 Böblingen (DE)

Remarks:
This application was filed on 02 - 10 - 2003 as a divisional application to the application mentioned under INID code 62.

(54) **Server mediated point-to-point communication over a computer network**

(57) In a computer system (12) having an audio transducer and a display device and being operatively coupled to other computers (22) and a server (26) over a computer network (24), means are described for establishing a point-to-point communication link between computer systems. The means provide for transmitting from a first process to the server a query as to whether a second process is connected to the computer network and for receiving a network protocol address of the second process from the server when the second process is connected to the computer network. In response to the received network protocol of the second process a point-to-point communication link is established between the first process and the second process over the computer network.

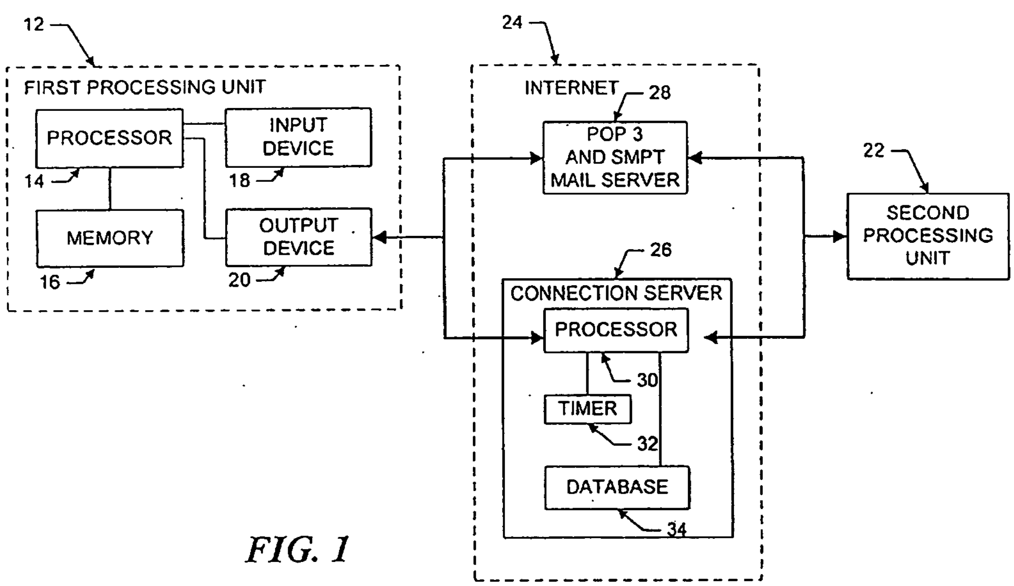

FIG. 1

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Description

FIELD OF THE INVENTION

[0001] The present invention relates in general to data processing systems, and more specifically, to an apparatus, a method and a computer program product for facilitating audio communications over computer networks.

BACKGROUND OF THE INVENTION

[0002] The increased popularity of on-line services such as AMERICA ONLINE (TM), COMPUSERVE (R), and other services such as Internet gateways have spurred applications to provide multimedia contents, including video and voice clips, to online users. An example of an online voice clip application is VOICE E-MAIL FOR WINCIM and VOICE E-MAIL FOR AMERICA ONLINE (TM), available from Bonzi Software, as described in "Simple Utilities Send Voice E-Mail Online", MULTIMEDIA WORLD, VOL. 2, NO. 9, August 1995, p. 52. Using such Voice E-Mail software, a user may create an audio message to be sent to a predetermined E-mail address specified by the user.

[0003] Generally, devices interfacing with the Internet and other online services may communicate with each other upon establishing respective device addresses. One type of device address is the Internet Protocol (IP) address, which acts as a pointer to the device associated with the IP address. A typical device may have a Serial Line Internet Protocol or Point-to-Point Protocol (SLIP/PPP) account with a permanent IP address for receiving E-mail, voicemail, and the like over the Internet. E-mail and voicemail is generally intended to convey text, audio, etc., with any routing information such as an IP address and routing headers generally being considered an artifact of the communication, or even gibberish to the recipient.

[0004] Devices such as a host computer or server of a company may include multiple modems for connection of users to the Internet, with a temporary IP address allocated to each user. For example, the host computer may have a general IP address "XXX.XXX.XXX", and each user may be allocated a successive IP address of XXX.XXX.XXX.10, XXX.XXX.XXX.11, XXX.XXX.XXX.12, etc. Such temporary IP addresses may be reassigned or recycled to the users, for example, as each user is successively connected to an outside party. For example, a host computer of a company may support a maximum of 254 IP addresses which are pooled and shared between devices connected to the host computer.

[0005] Permanent IP addresses of users and devices accessing the Internet readily support point-to-point communications of voice and video signals over the Internet. For example, global real-time video conferencing has been implemented using dedicated IP addresses and mechanisms known as reflectors.

[0006] A technique for matching domain names to Internet Protocol addresses is described in the text entitled "Internetworking With TCP/IP", 2nd Edition, by Douglas E. Comer, November 1992, Prentice Hall, Englewood Cliffs, New Jersey, U.S.A. Comer describes a domain name system and cooperative systems of name servers for matching domain names to network addresses. Each name server is a server program that supplies mapping of domain names to IP addresses. The system described in Comer, however, is not designed for use with network nodes whose network names or name to address bindings change frequently.

[0007] International Publication WO 92/19054 discloses a network monitoring system including an address tracking module which uses passive monitoring of all packet communications over a local area network to maintain a name table of IP address mappings. The disclosed address tracking module is capable of monitoring only a small number of nodes on a local area network and is not suitable for use with a multitude of nodes over a wide area network.

[0008] Due to the dynamic nature of temporary IP addresses of some devices accessing the Internet, point-to-point communications in realtime of voice and video have been generally difficult to attain.

SUMMARY OF THE INVENTION

[0009] In a computer system having an audio transducer and a display device and being operatively coupled to other computers and a server over a computer network, means are provided for establishing a point-to-point communication link between the computer system and a second computer system over the computer network. The invention, as defined in the claims, comprises (a) means for transmitting from the first process to a server a query as to whether a second process is connected to the computer network; (b) means for receiving a network protocol address of the second process from the server when the second process is connected to the computer network, and (c) means, responsive to the network protocol of the second process, for establishing a point-to-point communication link between the first process and the second process over the computer network.

[0010] The invention is in particular suitable for being used in connection with computer networks, such as the Internet, wherein the processing unit does not have a fixed or predetermined network protocol address. The invention thus provides for a protocol by which the processing units report their dynamically assigned network protocol address to a server once they are logging on the computer network. The server maintains and retrieves such information upon request from a calling processing unit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The features of the invention will become more readily apparent and may be better understood by referring to the following detailed description of an illustrative embodiment of the present invention, taken in conjunction with the accompanying drawings, in which:

FIG. 1 illustrates, in block diagram format, a system for the disclosed point-to-point Internet protocol;
FIG. 2 illustrates, in block diagram format, the system using a secondary point-to-point Internet protocol;
FIG. 3 illustrates, in block diagram format, the system of FIGS. 1-2 with the point-to-point Internet protocol established;
FIG. 4 is another block diagram of the system of FIGS 1-2 with audio communications being conducted;
FIG. 5 illustrates a display screen for a processing unit;
FIG. 6 illustrates another display screen for a processing unit;
FIG. 7 illustrates a flowchart of the initiation of the point-to-point Internet protocols;
FIG. 8 illustrates a flowchart of the performance of the primary point-to-point Internet protocols; and
FIG. 9 illustrates a flowchart of the performance of the secondary point-to-point Internet protocol.

DETAILED DESCRIPTION

[0012] Referring now in specific detail to the drawings, with like reference numerals identifying similar or identical elements, as shown in FIG. 1, the present disclosure describes a point-to-point network protocol and system 10 for using such a protocol.

[0013] In an exemplary embodiment, the system 10 includes a first processing unit 12 for sending at least a voice signal from a first user to a second user. The first processing unit 12 includes a processor 14, a memory 16, an input device 18, and an output device 20. The output device 20 includes at least one modem capable of, for example, 14.4 kbaud communications and operatively connected via wired and/or wireless communication connections to the Internet or other computer networks such as an Intranet, i.e., a private computer network. One skilled in the art would understand that the input device 18 may be implemented at least in part by the modem of the output device 20 to allow input signals from the communication connections to be received. The second processing unit 22 may have a processor, memory, and input and output devices, including at least one modem and associated communication connections, as described above for the first processing unit 12. In an exemplary embodiment, each of the processing units 12, 22 may execute the WEBPHONE™ Internet telephony application available from NetSpeak Corporation, Boca Raton, FL, which is capable of performing the disclosed point-to-point Internet protocol and system 10, as described herein.

[0014] The first processing unit 12 and the second processing unit 22 are operatively connected to the Internet 24 by communication devices and software known in the art, such as an Internet Service Provider (ISP) or an Internet gateway. The processing units 12, 22 may be operatively interconnected through the Internet 24 to a connection server 26, and may also be operatively connected to a mail server 28 associated with the Internet 24.

[0015] The connection server 26 includes a processor 30, a timer 32 for generating time stamps, and a memory such as a database 34 for storing, for example, E-mail and Internet Protocol (IP) addresses of logged-in units. In an exemplary embodiment, the connection server 26 may be a SPARC 5 server or a SPARC 20 server, available from SUN MICROSYSTEMS, INC., Mountain View, CA, having a central processing unit (CPU) as processor 30, an operating system (OS) such as UNIX, for providing timing operations such as maintaining the timer 32, a hard drive or fixed drive, as well as dynamic random access memory (DRAM) for storing the database 34, and a keyboard and display and/or other input and output devices (not shown in FIG. 1). The database 34 may be an SQL database available from ORACLE or INFORMIX.

[0016] In an exemplary embodiment, the mail server 28 may be a Post Office Protocol (POP) Version 3 mail server including a processor, memory, and stored programs operating in a UNIX environment, or, alternatively, another OS, to process E-mail capabilities between processing units and devices over the Internet 24.

[0017] The first processing unit 12 may operate the disclosed point-to-point Internet protocol by a computer program described hereinbelow in conjunction with FIG. 6, which may be implemented from compiled and /or interpreted source code in the C++ programming language and which may be downloaded to the first processing unit 12 from an external computer. The operating computer program may be stored in the memory 16, which may include about 8 MB RAM and/or a hard or fixed drive having about 8 MB. Alternatively, the source code may be implemented in the first processing unit 12 as firmware, as an erasable read only memory (EPROM), etc. It is understood that one skilled in the art would be able to use programming languages other than C++ to implement the disclosed point-to-point network protocol and system 10.

[0018] The processor 14 receives input commands and data from a first user associated with the first processing unit 12 though the input device 18, which may be an input port connected by a wired, optical, or a wireless connection for electromagnetic transmissions, or alternatively may be transferable storage media, such as floppy disks, magnetic tapes, compact disks, or other storage media including the input data from the first user.

[0019] The input device 18 may include a user interface (not shown) having, for example, at least one button actuated by the user to input commands to select from a plurality of operating modes to operate the first processing unit 12. In alternative embodiments, the input device 18 may include a keyboard, a mouse, a touch screen, and/or a data reading device such as a disk drive for receiving the input data from input data files stored in storage media such as a floppy disk or, for example, an 8 mm storage tape. The input device 18 may alternatively include connections to other computer systems to receive the input commands and data therefrom.

[0020] The first processing unit 12 may include a visual interface for use in conjunction with the input device 18 and output device 20 similar to those screens illustrated in FIGS. 5-6, discussed below. It is also understood that alternative devices may be used to receive commands and data from the user, such as keyboards, mouse devices, and graphical user interfaces (GUI) such as WINDOWS™ 3.1 available form MICROSOFT Corporation, Redmond, WA., and other operating systems and GUIs, such as OS/2 and OS/2 WARP, available from IBM CORPORATION, Boca Raton, FL. Processing unit 12 may also include microphones and/or telephone handsets for receiving audio voice data and commands, speech or voice recognition devices, dual tone multifrequency (DTMF) based devices, and/or software known in the art to accept voice data and commands and to operate the first processing unit 12.

[0021] In addition, either of the first processing unit 12 and the second processing unit 22 may be implemented in a personal digital assistant (PDA) providing modem and E-mail capabilities and Internet access, with the PDA providing the input/output screens for mouse interactions or for touchscreen activation as shown, for example, in FIGS. 5-6, as a combination of the input device 18 and output device 20.

[0022] For clarity of explanation, the illustrative embodiment of the disclosed point-to-point Internet protocol and system 10 is presented as having individual functional blocks, which may include functional blocks labeled as "processor" and "processing unit". The functions represented by these blocks may be provided through the use of either shared or dedicated hardware, including, but not limited to, hardware capable of executing software. For example, the functions of each of the processors and processing units presented herein may be provided by a shared processor or by a plurality of individual processors. Moreover, the use of the functional blocks with accompanying labels herein is not to be construed to refer exclusively to hardware capable of executing software. Illustrative embodiments may include digital signal processor (DSP) hardware, such as the AT&T DSP16 or DSP32C, read-only memory (ROM) for storing software performing the operations discussed below, and random access memory (RAM) for storing DSP results. Very large scale integration (VLSI) hardware embodiments, as well as custom VLSI circuitry in combination with a general purpose DSP circuit, may also be provided. Any and all of these embodiments may be deemed to fail within the meaning of the labels for the functional blocks as used herein.

[0023] The processing units 12, 22 are capable of placing calls and connecting to other processing units connected to the Internet 24, for example, via dialup SLIP/PPP lines. In an exemplary embodiment, each processing unit assigns an unsigned long session number, for example, a 32- bit long sequence in a *.ini file for each call. Each call may be assigned a successive session number in sequence, which may be used by the respective processing unit to associate the call with one of the SLIP/PPP lines, to associate a <ConnectOK> response signal with a <Connect Request> signal, and to allow for multiplexing and demultiplexing of inbound and outbound conversations on conference lines, as explained hereinafter.

[0024] For callee (or called) processing units with fixed IP addresses, the caller (or calling) processing unit may open a "socket", i.e. a file handle or address indicating where data is to be sent, and transmit a <Call> command to establish communication with the callee utilizing, for example, datagram services such as Internet Standard network layering as well as transport layering, which may include a Transport Control Protocol (TCP) or a User Datagram Protocol (UDP) on top of the IP. Typically, a processing unit having a fixed IP address may maintain at least one open socket and a called processing unit waits for a <Call> command to assign the open socket to the incoming signal. If all lines are in use, the callee processing unit sends a BUSY signal or message to the callee processing unit. As shown in FIG. 1, the disclosed point-to-point Internet protocol and system 10 operate when a callee processing unit does not have a fixed or predetermined IP address. In the exemplary embodiment and without loss of generality, the first processing unit 12 is the caller processing unit and the second processing unit 22 is the called processing unit. When either of processing units 12, 22 logs on to the Internet via a dial-up connection, the respective unit is provided a dynamically allocated IP address by the a connection service provider.

[0025] Upon the first user initiating the point-to-point Internet protocol when the first user is logged on to the Internet 24, the first processing unit 12 automatically transmits its associated E-mail address and its dynamically allocated IP address to the connection server 26. The connection server 26 then stores these addresses in the database 34 and time stamps the stored addresses using timer 32. The first user operating the first processing unit 12 is thus established in the database 34 as an active on-line party available for communication using the disclosed point-to-point Internet protocol. Similarly, a second user operating the second processing unit 22, upon connection to the Internet 24 through the a connection service provider, is processed by the connection server 26 to be established in the database 34 as an active on-line party.

[0026] The connection server 26 may use the time stamps to update the status of each processing unit; for example, after 2 hours. so that the on-line status information stored in the database 34 is relatively current. Other predetermined time periods. such as a default value of 24 hours. may be configured by a systems operator.

[0027] The first user with the first processing unit 12 initiates a call using, for example, a Send command and/or a command to speeddial an N^{TH} stored number, which may be labeled [SND] and [SPD] [N], respectively, by the input device 18 and/or the output device 20, such as shown in FIGS. 5-6. In response to either the Send or speeddial commands, the first processing unit 12 retrieves from memory 16 a stored E-mail address of the callee corresponding to the N^{TH} stored number. Alternatively, the first user may directly enter the E-mail address of the callee.

[0028] The first processing unit 12 then sends a query, including the E-mail address of the callee, to the connection server 26. The connection server 26 then searches the database 34 to determine whether the callee is logged-in by finding any stored information corresponding to the callee's E-mail address indicating that the callee is active and on-line. If the callee is active and on-line, the connection server 26 then performs the primary point-to-point Internet protocol; i.e. the IP address of the callee is retrieved from the database 34 and sent to the first processing unit 12. The first processing unit 12 may then directly establish the point-to-point Internet communications with the callee using the IP address of the callee.

[0029] If the callee is not on-line when the connection server 26 determines the callee's status, the connection server 26 sends an OFFLINE signal or message to the first processing unit 12. The first processing unit 12 may also display a message such as "Called Party Off-Line" to the first user.

[0030] When a user logs off or goes off-line from the Internet 24, the connection server 26 updates the status of the user in the database 34; for example, by removing the user's information, or by flagging the user as being off-line. The connection server 26 may be instructed to update the user's information in the database 34 by an off-line message, such as a data packet, sent automatically from the processing unit of the user prior to being disconnected from the connection server 26. Accordingly, an off-line user is effectively disabled from making and/or receiving point-to-point Internet communications.

[0031] As shown in FIGS. 2-4, the disclosed secondary point-to-point Internet protocol may be used as an alternative to the primary point-to-point Internet protocol described above, for example, if the connection server 26 is non-responsive, inoperative, and/or unable to perform the primary point-to-point Internet protocol, as a non-responsive condition. Alternatively, the disclosed secondary point-to-point Internet protocol may be used independent of the primary point-to-point Internet protocol. In the disclosed secondary point-to-point Internet protocol, the first processing unit 12 sends a <ConnectRequest> message via E-mail over the Internet 24 to the mail server 28. The E-mail including the <ConnectRequest> message may have, for example, the subject

[*wp#XXXXXXXX#nnn.nnn.nnn.#emailAddr]

where nnn.nnn.nnn.nnn. is the current (i.e. temporary or permanent) IP address of the first user, and XXXXXXXX is a session number, which may be unique and associated with the request of the first user to initiate point-to-point communication with the second user.

[0032] As described above, the first processing unit 12 may send the <ConnectRequest> message in response to an unsuccessful attempt to perform the primary point-to-point Internet protocol. Alternatively, the first processing unit 12 may send the <ConnectRequest> message in response to the first user initiating a SEND command or the like.

[0033] After the <ConnectRequest> message via E-mail is sent, the first processing unit 12 opens a socket and waits to detect a response from the second processing unit 22. A timeout timer, such as timer 32, may be set by the first processing unit 12, in a manner known in the art, to wait for a predetermined duration to receive a <ConnectOK> signal. The processor 14 of the first processing unit 12 may cause the output device 20 to output a Ring signal to the user, such as an audible ringing sound, about every 3 seconds . For example, the processor 14 may output a *.wav file, which may be labeled RING.WAV, which is processed by the output device 20 to output an audible ringing sound.

[0034] The mail server 28 then polls the second processing unit 22, for example, every 3-5 seconds, to deliver the E-mail. Generally, the second processing unit 22 checks the incoming lines, for example, at regular intervals to wait for and to detect incoming E-mail from the mail server 28 through the Internet 24.

[0035] Typically, for sending E-mail to users having associated processing units operatively connected to a host computer or server operating an Internet gateway, E-mail for a specific user may be sent over the Internet 24 and directed to the permanent IP address or the SLIP/PPP account designation of the host computer, which then assigns a temporary IP address to the processing unit of the specified user for properly routing the E-mail. The E-mail signal may include a name or other designation such as a user name which identifies the specific user regardless of the processing unit assigned to the user; that is, the host computer may track and store the specific device where a specific user is assigned or logged on, independent of the IP address system, and so the host computer may switch the E-mail signal to the device of the specific user. At that time, a temporary IP address may be generated or assigned to the specific user and device.

[0036] Upon detecting and/or receiving the incoming E-mail signal from the first processing unit 12, the second processing unit 22 may assign or may be assigned a temporary IP address. Therefore, the delivery of the E-mail through the Internet 24 provides the second processing unit 22 with a session number as well as IP addresses of both the first processing unit 12 and the second processing unit 22.

[0037] Point-to-point communication may then be established by the processing unit 22 processing the E-mail signal to extract the <ConnectRequest> message, including the IP address of the first processing unit 12 and the session number. The second processing unit 22 may then open a socket and generate a <ConnectOK> response signal, which includes the temporary IP address of the second processing unit 22 as well as the session number of the first processing unit.

[0038] The second processing unit 22 sends the <ConnectOK> signal directly over the Internet 24 to the IP address of the first processing unit 12 without processing by the mail server 28, and a timeout timer of the second processing unit 22 may be set to wait and detect a <Call> signal expected from the first processing unit 12.

[0039] Realtime point-to-point communication of audio signals over the Internet 24, as well as video and voicemail, may thus be established and supported without requiring permanent IP addresses to be assigned to either of the users or processing units 12, 22. For the duration of the realtime point-to-point link, the relative permanence of the current IP addresses of the processing units 12, 22 is sufficient, whether the current IP addresses were permanent (i.e. predetermined or preassigned) or temporary (i.e. assigned upon initiation of the point-to-point communication).

[0040] In the exemplary embodiment, a first user operating the first processing unit 12 is not required to be notified by the first processing unit 12 that an E-mail is being generated and sent to establish the point-to-point link with the second user at the second processing unit 22. Similarly, the second user is not required to be notified by the second processing unit 22 that an E-mail has been received and/or a temporary IP address is associated with the second processing unit 22. The processing units 12, 22 may perform the disclosed point-to-point Internet protocol automatically upon initiation of the point-to-point communication command by the first user without displaying the E-mail interactions to either user. Accordingly, the disclosed point-to-point Internet protocol may be transparent to the users. Alternatively, either of the first and second users may receive, for example, a brief message of "CONNECTION IN PROGRESS" or the like on a display of the respective output device of the processing units 12, 22.

[0041] After the initiation of either the primary or the secondary point-to-point Internet protocols described above in conjunction with FIGS. 1-2, the point-to-point communication link over the Internet 24 may be established as shown in FIGS. 3-4 in a manner known in the art. For example, referring to FIG. 3, upon receiving the <ConnectorOK> signal from the second processing unit 22, the first processing unit 12 extracts the IP address of the second processing unit 22 and the session number, and the session number sent from the second processing unit 22 is then checked with the session number originally sent from the first processing unit 12 in the <ConnectRequest> message as E-mail. If the session numbers sent and received by the processing unit 12 match, then the first processing unit 12 sends a <Call> signal directly over the Internet 24 to the second processing unit 22; i.e. using the IP address of the second processing unit 22 provided to the first processing unit 12 in the <ConnectOK> signal.

[0042] Upon receiving the <Call> signal, the second processing unit 22 may then begin a ring sequence, for example, by indicating or annunciating to the second user that an incoming call is being received. For example, the word "CALL" may be displayed on the output device of the second processing unit 22. The second user may then activate the second processing unit 22 to receive the incoming call.

[0043] Referring to FIG. 4, after the second processing unit 22 receives the incoming call, realtime audio and/or video conversations may be conducted in a manner known in the art between the first and second users through the Internet 24, for example, by compressed digital audio signals. Each of the processing units 12, 22 also display to each respective user the words "IN USE" to indicate that the point-to-point communication link is established and audio or video signals are being transmitted.

[0044] In addition, either user may terminate the point-to-point communication link by, for example, activating a termination command, such as by activating an [END] button or icon on a respective processing unit, causing the respective processing unit to send an <End> signal which causes both processing units to terminate the respective sockets, as well as to perform other cleanup commands and functions known in the art.

[0045] FIGS. 5-6 illustrate examples of display screens 36 which may be output by a respective output device of each processing unit 12, 22 of FIGS. 1-4 for providing the disclosed point-to-point Internet protocol and system 10. Such display screens may be displayed on a display of a personal computer (PC) or a PDA in a manner known in the art.

[0046] As shown in FIG. 5, a first display screen 36 includes a status area 38 for indicating, for example, a called user by name and/or by IP address or telephone number; a current function such as C2; a current time; a current operating status such as "IN USE", and other control icons such as a down arrow icon 40 for scrolling down a list of parties on a current conference line. The operating status may include such annunciators as "IN USE," "IDLE," "BUSY," "NO ANSWER," "OFFLINE," "CALL," "DIALING," "MESSAGES," and "SPEEDDIAL."

[0047] Other areas of the display screen 36 may include activation areas or icons for actuating commands or entering data. For example, the display screen 36 may include a set of icons 42 arranged in columns and rows including digits 0-9 and commands such as END, SND, HLD, etc. For example, the END and SND commands may be initiated as described above, and the HLD icon 44 may be actuated to place a current line on hold. Such icons may also be configured to substantially simulate a telephone handset or a cellular telephone interface to facilitate ease of use, as well as to simulate function keys of a keyboard. For example, icons labeled L1-L4 may be mapped to function keys F1-F4 on standard PC keyboards, and icons C1-C3 may be mapped to perform as combinations of function keys, such as CTRL-F1, CTRL-F2, and CTRL-F3, respectively. In addition, the icons labeled L1-L4 and C1-C3 may include circular regions which may simulate light emitting diodes (LEDs) which indicate that the function or element represented by the respective icon is active or being performed.

[0048] Icons L1-L4 may represent each of 4 lines available to the caller, and icons C1-C3 may represent conference calls using at least one line to connect, for example, two or more parties in a conference call. The icons L1-L4 and C1-C3 may indicate the activity of each respective line or conference line. For example, as illustrated in FIG. 5, icons L1-L2 may have lightly shaded or colored circles, such as a green circle, indicating that each of lines 1 and 2 are in use, while icons L3-L4 may have darkly shaded or color circles, such as a red or black circle, indicating that each of lines 3 and 4 are not in use. Similarly, the lightly shaded circle of the icon labeled C2 indicates that the function corresponding to C2 is active, as additionally indicated in the status are 38, while darkly shaded circles of icons labeled C1 and C3 indicate that such corresponding functions are not active.

[0049] The icons 42 are used in conjunction with the status area 38. For example, using a mouse for input, a line that is in use, as indicated by the lightly colored circle of the icon, may be activated to indicate a party's name by clicking a right mouse button for 5 seconds until another mouse click is actuated or the [ESC] key or icon is actuated. Thus, the user may switch between multiple calls in progress on respective lines.

[0050] Using the icons as well as an input device such as a mouse, a user may enter the name or alias or IP address, if known, of a party to be called by either manually entering the name, by using the speeddial feature, or by double clicking on an entry in a directory stored in the memory, such as the memory 16 of the first processing unit 12, where the directory entries may be scrolled using the status area 38 and the down arrow icon 40.

[0051] Once a called party is listed in the status area 38 as being active on a line, the user may transfer the called party to another line or a conference line by clicking and dragging the status area 38, which is represented by a reduced icon 46. Dragging the reduced icon 46 to any one of line icons L1-L4 transfers the called party in use to the selected line, and dragging the reduced icon 46 to any one of conference line icons C1-C3 adds the called party to the selected conference call.

[0052] Other features may be supported, such as icons 48-52, where icon 48 corresponds to, for example, an ALT-X command to exit the communication facility of a processing unit, and icon 50 corresponds to, for example, an ALT-M command to minimize or maximize the display screen 36 by the output device of the processing unit. Icon 52 corresponds to an OPEN command, which may, for example, correspond to pressing the O key on a keyboard, to expand or contract the display screen 36 to represent the opening and closing of a cellular telephone. An "opened" configuration is shown in FIG. 5, and a "closed" configuration is shown in FIG. 6. In the "opened" configuration, additional features such as output volume (VOL) controls, input microphone (MIC) controls, waveform (WAV) sound controls, etc.

[0053] The use of display screens such as those shown in FIGS. 5-6 provided flexibility in implementing various features available to the user. It is to be understood that additional features such as those known in the art may be supported by the processing units 12, 22.

[0054] Alternatively, it is to be understood that one skilled in the art may implement the processing units 12, 22 to have the features of the display screens in FIGS. 5-6 in hardware; i.e. a wired telephone or wireless cellular telephone may include various keys, LEDs, liquid crystal displays (LCDs), and touchscreen actuators corresponding to the icons and features shown in FIGS. 5-6. In addition, a PC may have the keys of a keyboard and mouse mapped to the icons and features shown in FIGS. 5-6.

[0055] Referring to FIG. 7, the disclosed point-to-point Internet protocol and system 10 is illustrated. First processing unit 12 initiates the point-to-point Internet protocol in step 56 by sending a query from the first processing unit 12 to the connection server 26. If connection server 26 is operative to perform the point-to-point Internet protocol, in step 58, first processing unit 12 receives an on-line status signal from the connection server 26, such signal may include the IP address of the callee or a "Callee Off-Line" message. Next, first processing unit 12 performs the primary point-to-point Internet protocol in step 60, which may include receiving, at the first processing unit 12, the IP address of the callee if the callee is active and on-line. Alternatively, processing unit 60 may initiate and perform the secondary point-to-point Internet protocol in step 62, if the called party is not active and/or on-line.

[0056] Referring to FIG. 8, in conjunction with FIGS. 1 and 3-4, the disclosed point-to-point Internet protocol and system 10 is illustrated. Connection server 26 starts the point-to-point Internet protocol, in step 64, and timestamps and stores E-mail and IP addresses of logged-in users and processing units in the database 34 in step 66. Connection server 26 receives a query from a first processing unit 12 in step 68 to determine whether a second user or second processing unit 22 is logged-in to the Internet 24, with the second user being specified, for example, by an E-mail address. Connection server 26 retrieves the IP address of the specified user from the database 34 in step 70, if the specified user is logged-in to the Internet, and sends the retrieved IP address to the first processing unit 12 in step 72 to enable first processing unit 12 to establish point-to-point communications with the specified second user.

[0057] The disclosed secondary point-to-point Internet protocol operates as shown in FIG. 9. First processing unit 12 generates an E-mail signal, including a session number and a first IP address corresponding to a first processing unit in step 76. First processing unit 12 transmits the E-mail signal as a <ConnectRequest> signal to the Internet 24 in step 78. The E-mail signal is delivered through the Internet 24 using a mail server 28 to the second processing unit 22 in step 80. Second processing unit 22 extracts the session number and the first IP address from the E-mail signal in step 82 and transmits or sends the session number and a second IP address corresponding to the second processing unit 22, back to the first processing unit 12 through the Internet 24, in step 84. First processing unit 12 verifies the session number received from the second processing unit 22 in step 86, and establishes a point-to-point Internet communication link between the first processing unit 12 and second processing unit 22 using the first and second IP addresses in step 88.

[0058] While the disclosed point-to-point Internet protocols and system have been particularly shown and described with reference to the preferred embodiments, it is understood by those skilled in the art that various modifications in form and detail may be made therein without departing from the scope and spirit of the invention. Accordingly, modifications such as those suggested above, but not limited thereto, are to be considered within the scope of the invention.

Claims

1. In a computer system (12) having a display (36) and audio transducer, the computer system coupled to other computer systems and a server (26) over a computer network (24), an apparatus for establishing a point-to-point communication link comprising:

    a. means for transmitting, from the computer system (12) to the server (26) a query as to whether a second computer system (22) is connected to the computer network (24);
    b. means for receiving a network protocol address of the of the second computer from the server when the second computer system is connected to the computer network; and
    c. means, responsive to the network protocol address of the second computer system, for establishing a point-to-point communication link between the first computer system and the second computer system over the computer network.

2. The apparatus of claim 1 further comprising:

    d. means for receiving audio data and transmitting the audio data to the second computer over the established point-to-point communication link.

3. The apparatus claim 1, wherein the network protocol addresses comprise Internet Protocol Addresses (IP addresses).

4. The apparatus claim 1 wherein the query transmitted to the server includes an E-mail address of the second computer system (22).

5. The apparatus claim 1, further comprising:

    f. means for transmitting an E-mail signal containing a network protocol address from the computer system (12) to a second computer system over the computer network (24) when the server (26) indicates that the second computer system is not connected to the computer network;
    g. means for receiving a second network protocol address from the second computer system over the computer network; and
    h. means, responsive to the second network protocol address, for establishing a point-to-point communication link between the first computer system (12) and the second computer system (22) over the computer network.

6. A method of operating a processing unit (12) for establishing a point-to-point communication between the processing unit (12) and a second one of a plurality of other processing units (22) over a computer network (24) including a server (26), each of said processing units having a display and an audio transducer, the method comprising the steps of:

    a. transmitting from the processing unit (12) to the server a query as to whether the second processing (22) unit is connected to the computer network (24);
    b. receiving a network protocol address of the second processing unit from the server when the second processing unit is connected to the computer network; and
    c. establishing in response to the network pro-

tocol address of the second processing unit a point-to-point communication link between the first processing unit and the second processing unit over the computer network.

7. The method of claim 6 further comprising the step:

d. receiving audio data and transmitting the audio data to the second processing unit over the established point-to-point communication link.

8. The method of claim 6, wherein the network protocol addresses comprise Internet Protocol Addresses (IP addresses).

9. The method of claim 6 wherein the query transmitted to the server includes the E-mail address of the second computer system (22).

10. The method of claim 4, further comprising the steps of:

e. transmitting an E-mail signal containing a network protocol address from the first processing unit to the second processing unit over the computer network when the server indicates that the second computer system is not connected to the computer network;
f. receiving a second network protocol address from the second processing unit over the computer network; and
g. establishing in response to the second network protocol address a point-to-point communication link between the first processing unit and the second processing unit over the computer network.

11. A computer program product for use in a processing unit (12) having a memory (16), a display (36) and an audio transducer, to establish a point-to-point communication between the processing unit (12) and a second one of a plurality of other processing units (22) over a computer network (24) including a server (26), the computer program product having a computer usable medium containing computer readable program code, comprising:

a. program code for transmitting from the processing unit to the server a query as to whether the second processing unit is connected to the computer network;
b. program code for receiving a network protocol address of the second processing unit from the server when the second processing unit is connected to the computer network; and
c. program code for establishing in response to the network protocol address of the second processing unit a point-to-point communication link between the first processing unit and the second processing unit over the computer network.

12. The program product of claim 11 further comprising:

d. program code for receiving audio data and transmitting the audio data to the second processing unit over the established point-to-point communication link.

13. The program product of claim 11, wherein the network protocol addresses comprise Internet Protocol Addresses (IP addresses).

14. The program product of claim 11, wherein the query transmitted to the server includes the E-mail address of the second processing unit (22).

15. The program product of claim 11, further comprising:

e. program code for transmitting an E-mail signal containing a network protocol address from the first processing unit to the second processing unit over the computer network when the server indicates that the second computer system is not connected to the computer network;
f. program code for receiving a second network protocol address from the second processing unit over the computer network; and
g. program code for establishing in response to the second network protocol address a point-to-point communication link between the first processing unit and the second processing unit over the computer network.

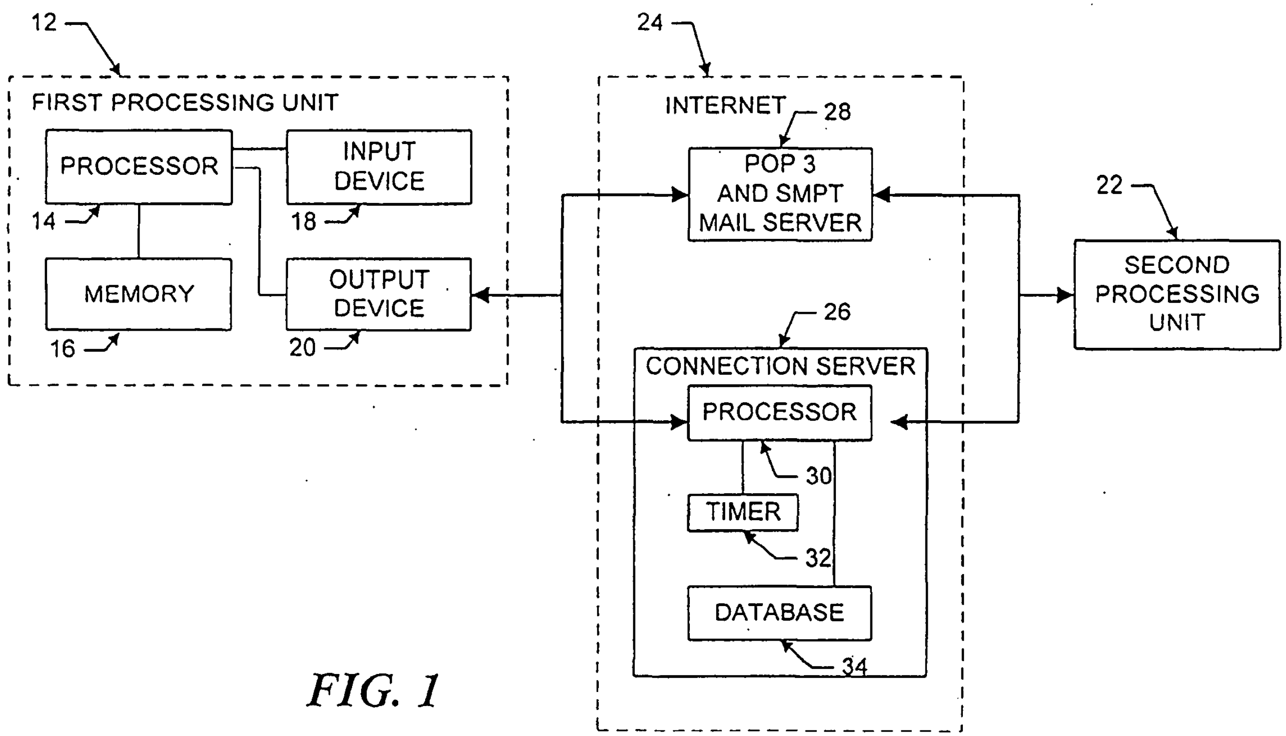
12
FIRST PROCESSING UNIT
PROCESSOR
INPUT DEVICE
14
18
MEMORY
OUTPUT DEVICE
16
20
24
INTERNET
28
POP 3 AND SMPT MAIL SERVER
26
CONNECTION SERVER
PROCESSOR
30
TIMER
32
DATABASE
34
22
SECOND PROCESSING UNIT

FIG. 1

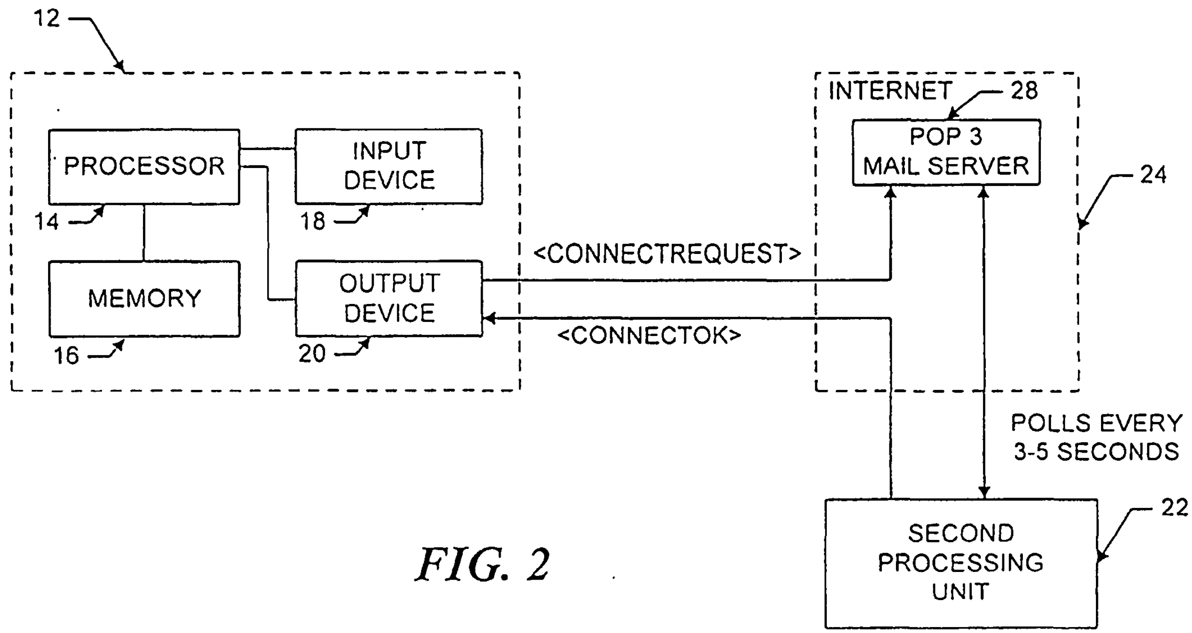
12
PROCESSOR
INPUT DEVICE
MEMORY
OUTPUT DEVICE
14
18
16
20
INTERNET
28
POP 3 MAIL SERVER
24
<CONNECTREQUEST>
<CONNECTOK>
POLLS EVERY 3-5 SECONDS
SECOND PROCESSING UNIT
22

FIG. 2

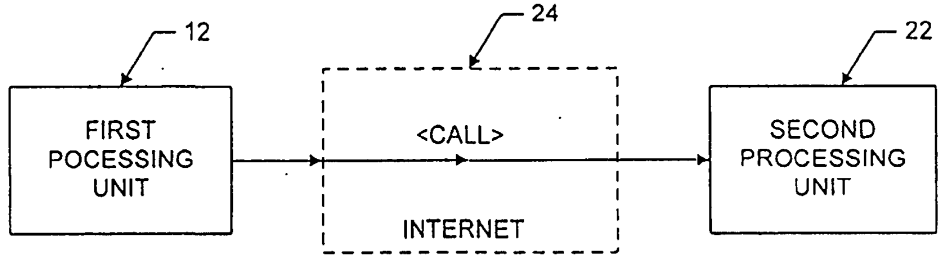
12
24
22
FIRST POCESSING UNIT
<CALL>
INTERNET
SECOND PROCESSING UNIT

FIG. 3

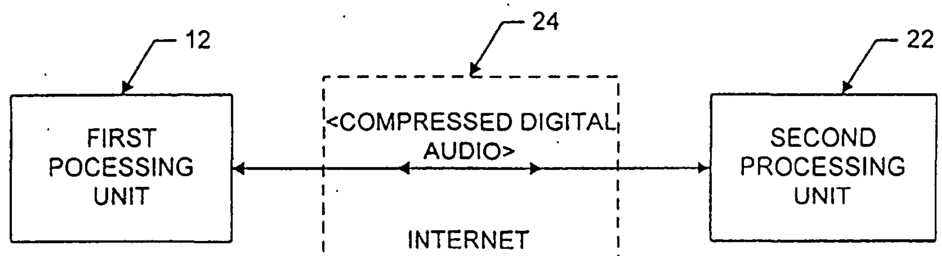
12
24
22
FIRST POCESSING UNIT
<COMPRESSED DIGITAL AUDIO>
INTERNET
SECOND PROCESSING UNIT

FIG. 4

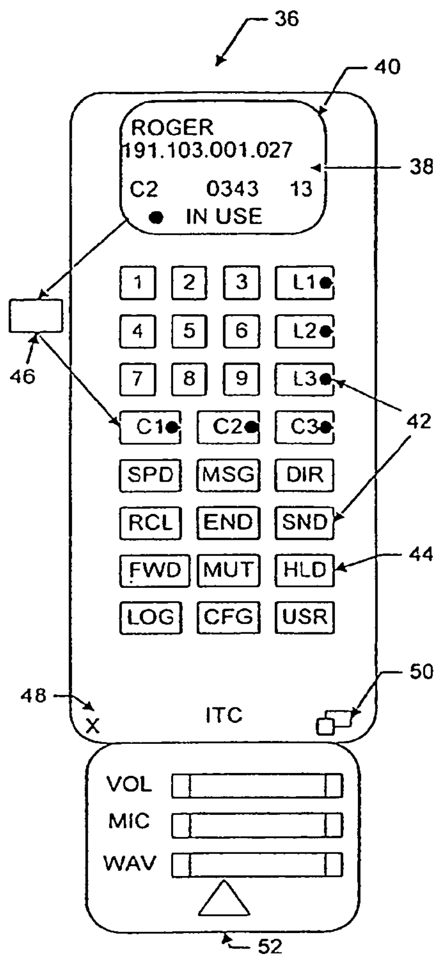
36
40
ROGER
191.103.001.027
C2 0343 13
IN USE
38
1 2 3 L1
4 5 6 L2
7 8 9 L3
46
C1 C2 C3
42
SPD MSG DIR
RCL END SND
FWD MUT HLD
44
LOG CFG USR
48
X
ITC
50
VOL
MIC
WAV
52

FIG. 5

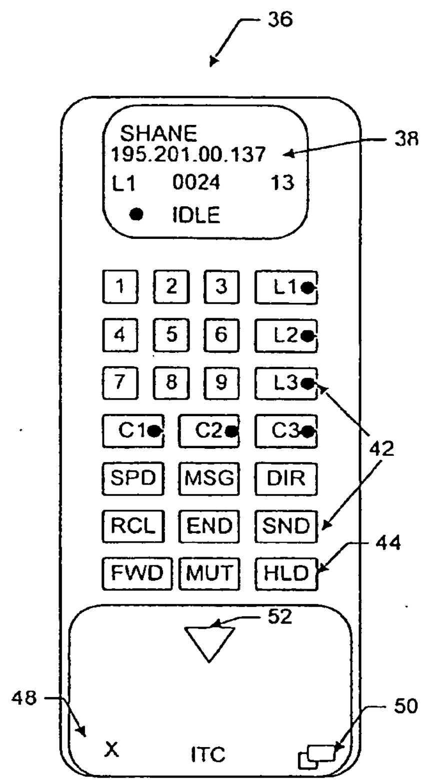
36
SHANE
195.201.00.137
L1 0024 13
IDLE
38
1 2 3 L1
4 5 6 L2
7 8 9 L3
C1 C2 C3
42
SPD MSG DIR
RCL END SND
FWD MUT HLD
44
52
48
X
ITC
50

FIG. 6

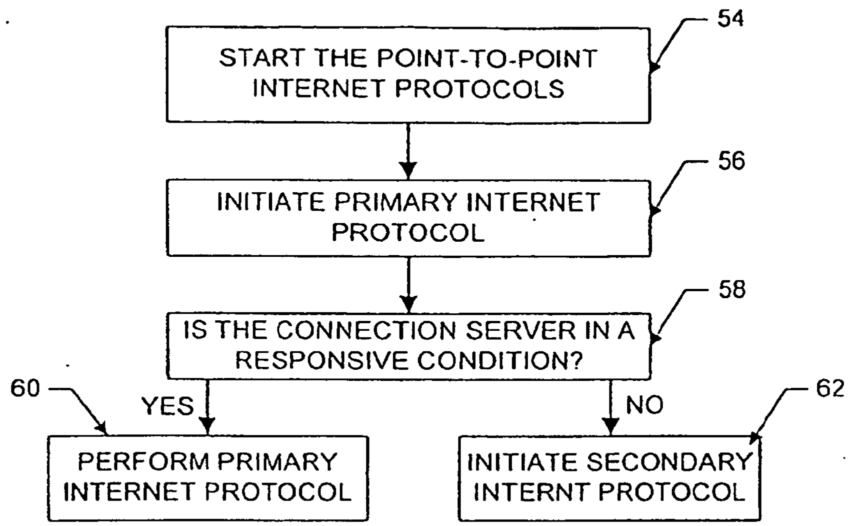
54
START THE POINT-TO-POINT INTERNET PROTOCOLS
56
INITIATE PRIMARY INTERNET PROTOCOL
58
IS THE CONNECTION SERVER IN A RESPONSIVE CONDITION?
60
YES
NO
62
PERFORM PRIMARY INTERNET PROTOCOL
INITIATE SECONDARY INTERNT PROTOCOL

FIG. 7

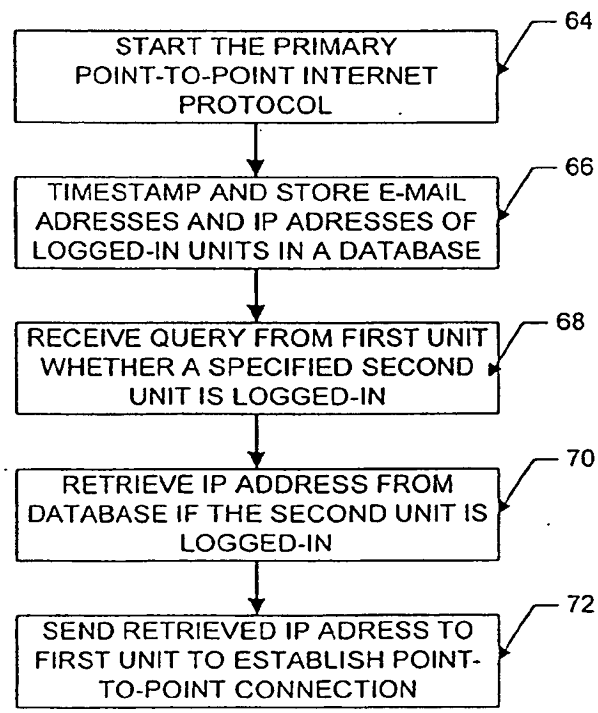
64
START THE PRIMARY POINT-TO-POINT INTERNET PROTOCOL
66
TIMESTAMP AND STORE E-MAIL ADRESSES AND IP ADRESSES OF LOGGED-IN UNITS IN A DATABASE
68
RECEIVE QUERY FROM FIRST UNIT WHETHER A SPECIFIED SECOND UNIT IS LOGGED-IN
70
RETRIEVE IP ADDRESS FROM DATABASE IF THE SECOND UNIT IS LOGGED-IN
72
SEND RETRIEVED IP ADRESS TO FIRST UNIT TO ESTABLISH POINT-TO-POINT CONNECTION

FIG. 8

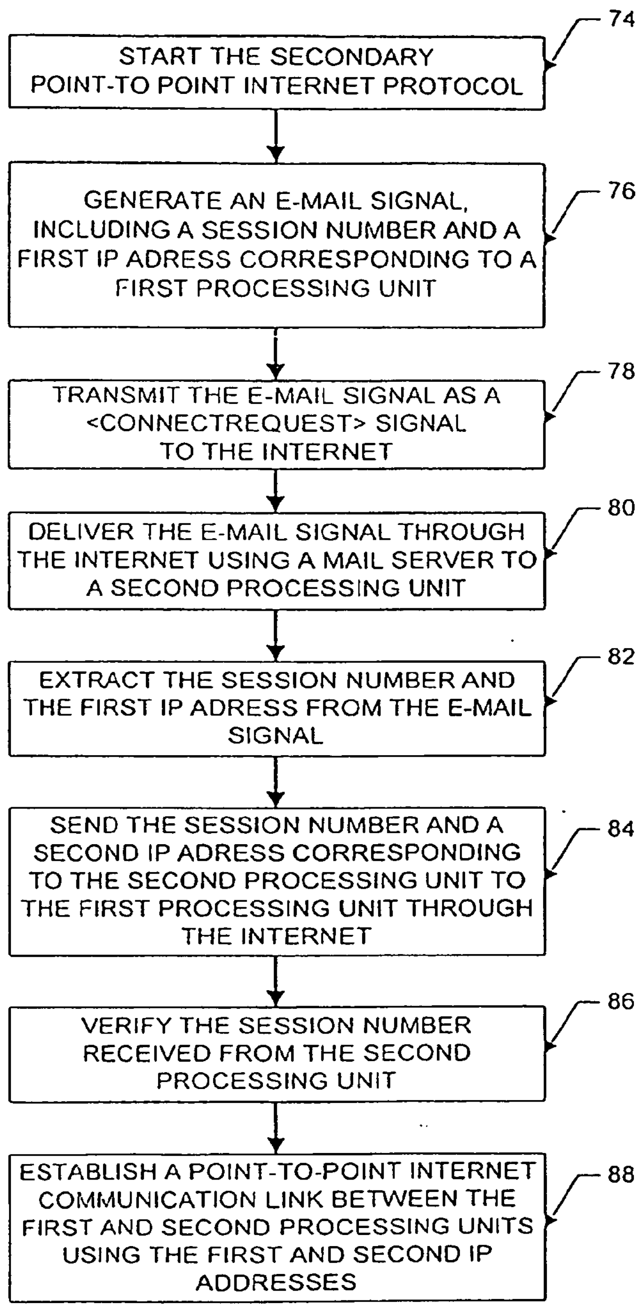
74
START THE SECONDARY POINT-TO POINT INTERNET PROTOCOL
76
GENERATE AN E-MAIL SIGNAL, INCLUDING A SESSION NUMBER AND A FIRST IP ADRESS CORRESPONDING TO A FIRST PROCESSING UNIT
78
TRANSMIT THE E-MAIL SIGNAL AS A <CONNECTREQUEST> SIGNAL TO THE INTERNET
80
DELIVER THE E-MAIL SIGNAL THROUGH THE INTERNET USING A MAIL SERVER TO A SECOND PROCESSING UNIT
82
EXTRACT THE SESSION NUMBER AND THE FIRST IP ADRESS FROM THE E-MAIL SIGNAL
84
SEND THE SESSION NUMBER AND A SECOND IP ADRESS CORRESPONDING TO THE SECOND PROCESSING UNIT TO THE FIRST PROCESSING UNIT THROUGH THE INTERNET
86
VERIFY THE SESSION NUMBER RECEIVED FROM THE SECOND PROCESSING UNIT
88
ESTABLISH A POINT-TO-POINT INTERNET COMMUNICATION LINK BETWEEN THE FIRST AND SECOND PROCESSING UNITS USING THE FIRST AND SECOND IP ADDRESSES

FIG. 9

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 379 050 A3

(12) EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
10.03.2004 Bulletin 2004/11

(43) Date of publication A2:
07.01.2004 Bulletin 2004/02

(21) Application number: 03022288.9

(22) Date of filing: 25.09.1996

(51) Int Cl.7: H04L 29/06, H04L 12/58

(84) Designated Contracting States:
CH DE ES FI FR GB IE IT LI NL SE

(30) Priority: 25.09.1995 US 533115

(62) Document number(s) of the earlier application(s) in accordance with Art. 76 EPC:
96933928.2 / 0 852 868

(71) Applicant: Netspeak Corporation
Boca Raton, FL 33487 (US)

(72) Inventor: Hutton, Glenn W.
Miami, FL 33196 (US)

(74) Representative: Kindermann, Manfred
Patentanwalt,
Sperberweg 29
71032 Böblingen (DE)

(54) Server mediated point-to-point communication over a computer network

(57) In a computer system (12) having an audio transducer and a display device and being operatively coupled to other computers (22) and a server (26) over a computer network (24), means are described for establishing a point-to-point communication link between computer systems. The means provide for transmitting from a first process to the server a query as to whether a second process is connected to the computer network and for receiving a network protocol address of the second process from the server when the second process is connected to the computer network. In response to the received network protocol of the second process a point-to-point communication link is established between the first process and the second process over the computer network.

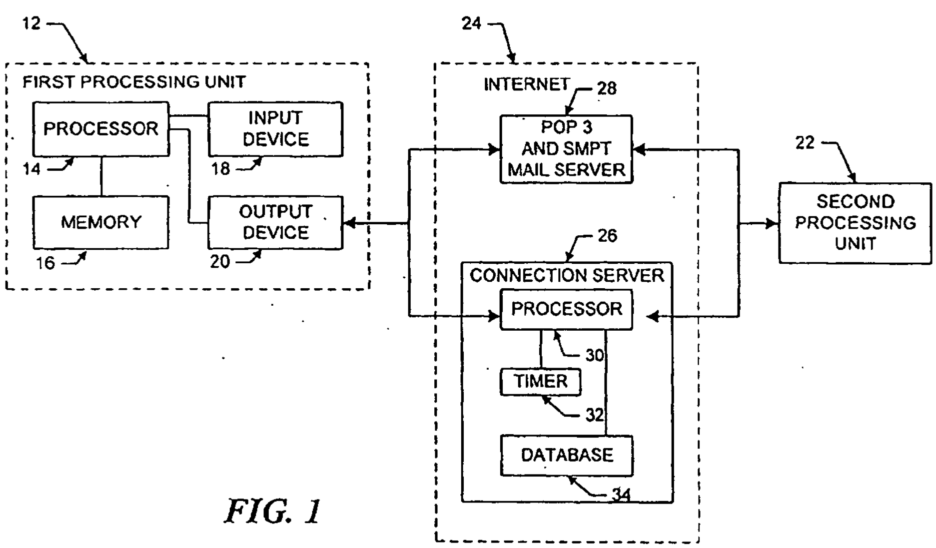

FIG. 1

EP 1 379 050 A3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 02 2288

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 5 440 547 A (ESAKI HIROSHI ET AL) 8 August 1995 (1995-08-08) * column 1, line 9 - column 4, line 43 * * column 16, line 9 - column 17, line 6 * ---	1-15	H04L29/06 H04L12/58
Y	GB 2 283 645 A (DIGITAL EQUIPMENT INT) 10 May 1995 (1995-05-10) * page 2, line 26 - page 3, line 2 * * page 11, line 17 - line 23 * ---	1-15	
Y	WO 94 22087 A (3COM CORP) 29 September 1994 (1994-09-29) * page 1, line 2 - page 6, line 8 * * page 12, line 17 - page 13, line 30 * * page 14, line 6 - line 10 * * page 15, line 12 - page 16, line 7 * * page 17, line 17 - line 22 * ---	1-15	
A	US 5 315 705 A (IWAMI NAOKO ET AL) 24 May 1994 (1994-05-24) * abstract * * column 1, line 44 - line 62 * ---	1,6,11	TECHNICAL FIELDS SEARCHED (Int.Cl.7)
A	US 5 287 103 A (KASPRZYK MARLON Z ET AL) 15 February 1994 (1994-02-15) * column 4, line 18 - column 6, line 60 * ---	1,6,11	H04L
A	EP 0 648 038 A (IBM) 12 April 1995 (1995-04-12) * column 7, line 33 - line 52 * ---	1,6,11	
A	EP 0 518 596 A (DIGITAL EQUIPMENT CORP) 16 December 1992 (1992-12-16) * column 1, line 31 - line 36 * * column 3, line 12 - line 30 * --- -/--	1,6,11	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20 January 2004	Vaskimo, K

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons
& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 02 2288

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	EP 0 597 691 A (IBM) 18 May 1994 (1994-05-18) * page 6, line 10 - line 27 * ---		
A	EP 0 632 672 A (IBM) 4 January 1995 (1995-01-04) * column 4, line 17 - line 24 * * column 6, line 24 - line 37 * * figure 1 * -----		

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20 January 2004	Vaskimo, K

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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O : non-written disclosure
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T : theory or principle underlying the invention
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D : document cited in the application
L : document cited for other reasons
& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 03 02 2288

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20-01-2004

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

(12) UK Patent Application (19) GB (11) 2 283 645 (13) A

(43) Date of A Publication 10.05.1995

(21) Application No 9322910.2

(22) Date of Filing 06.11.1993

(51) INT CL[6]
H04L 12/46 12/66

(52) UK CL (Edition N)
H4P PPA

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(58) Field of Search
UK CL (Edition M) H4P PPA PPG
INT CL[5] H04L 12/46 12/66
Online databases:WPI,INSPEC

(71) Applicant(s)
Digital Equipment International Limited

(Incorporated in Switzerland)

1 Grand Places, 1700 Fribourg, Switzerland

(72) Inventor(s)
Stewart F Bryant
Ian Michael Charles Shand

(74) Agent and/or Address for Service
Eric Potter Clarkson
St Mary's Court, St Mary's Gate, NOTTINGHAM, NG1 1LE, United Kingdom

(54) **Digital communication systems**

(57) A digital communication system comprising a network of routers R1-R3 linked together by links LK12-LK23 and having LANs LAN1-LAN7 coupled to them, and using IP (Internet Protocol), under which each LAN has a subnet address, and each host on a LAN has the subnet address as the high-order part of its own address. In IP, each router contains a set of interface/LAN tables each listing the low-order address portions of the addresses of the hosts attached to the LAN plus the MAC (medium access control) identifiers of those hosts, and a set of link tables listing the subnet addresses of the LANs reachable through those links. In the present system, both the interface tables and the link tables contain the full host addresses of all hosts reachable through those interfaces and links, and the routers also contain means for polling the interfaces for unknown hosts. Each router also contain an ARP (address resolution protocol) unit (30, Fig. 2) for detecting ARP requests from a source for a destination having the same subnet address as the source but not on the same interface, and returning a proxy ARP response giving the router's identification. A host can thereby be moved to a LAN whose address does not match that of the host.

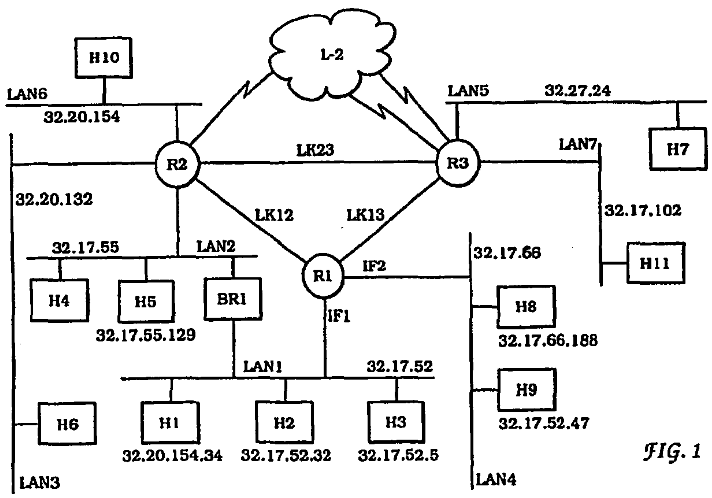


FIG. 1

GB 2 283 645 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

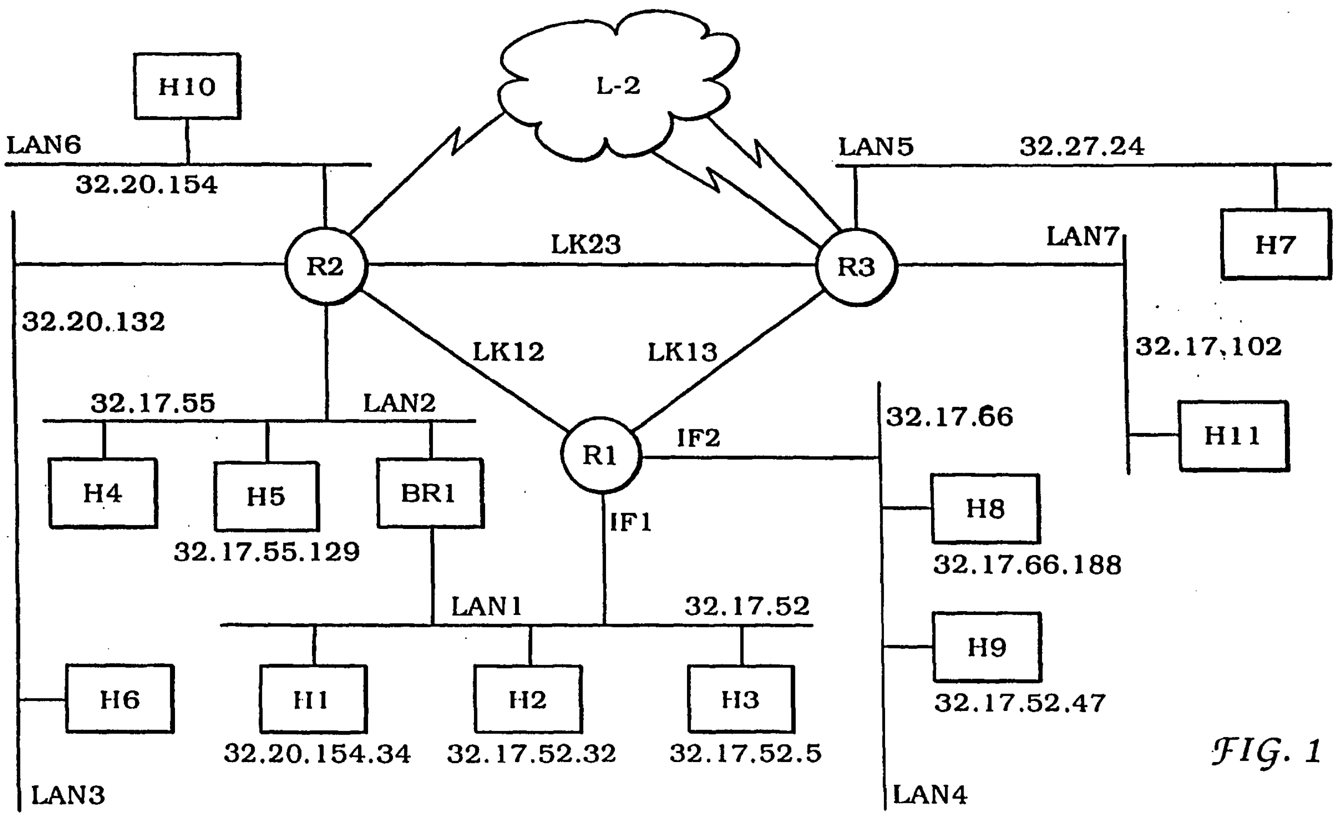
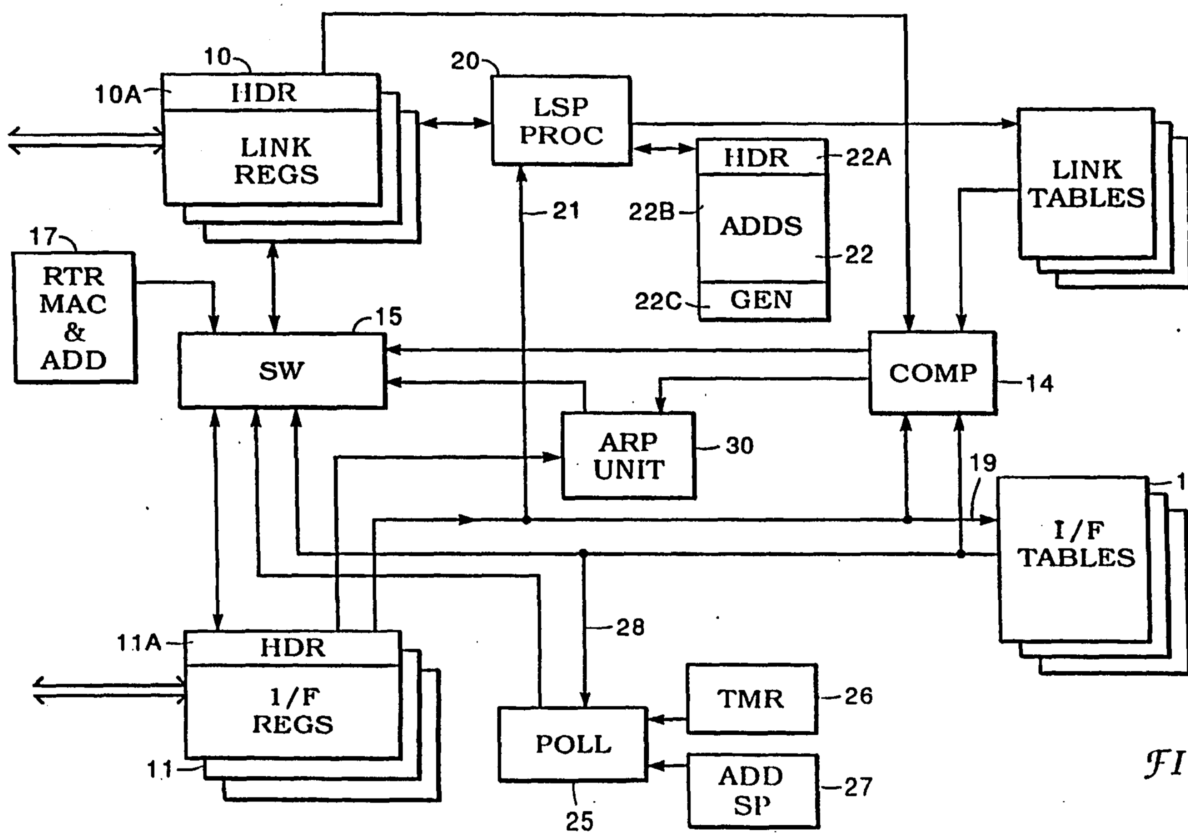

H10
LAN6
32.20.154
L-2
LAN5
32.27.24
H7
R2
LK23
R3
LAN7
32.20.132
LK12
LK13
32.17.102
32.17.55
LAN2
32.17.66
R1
IF2
H11
H4
H5
BR1
H8
IF1
32.17.55.129
32.17.66.188
LAN1
32.17.52
H9
H6
H1
H2
H3
32.17.52.47
32.20.154.34
32.17.52.32
32.17.52.5
LAN3
LAN4

FIG. 1

1/2

2/2



10
10A
HDR
LINK
REGS
20
LSP
PROC
HDR
22A
22B
ADDS
22
22C
GEN
21
LINK
TABLES
12
17
RTR
MAC
&
ADD
15
SW
COMP
14
ARP
UNIT
30
19
13
I/F
TABLES
28
11A
HDR
1/F
REGS
11
TMR
26
POLL
ADD
SP
27
25

FIG. 2

Digital Communication Systems

The present invention relates to digital communication systems, and more particularly to the addressing of units therein.

Digital communication systems: general

There is a considerable variety of digital communication systems. We are primarily concerned here with systems which interconnect a considerable number of essentially independent units (typically devices such as personal computers and work-stations), and are typically geographically extensive. Depending on the particular type of system, the units which it interconnects are termed end units, end-systems, or hosts.

As a very general matter, there are two extreme forms of system: a pure switching system and a pure broadcast-type system. In a pure switching system, the connections between the hosts are all individual, passing through a network of switching nodes. In a pure broadcast-type system, all end-units are connected to all other end-units by means of a common message medium.

It is clear that both these extreme types of system have major disadvantages. A pure switching system requires a highly complicated network of switching nodes, while there are obvious capacity limits on a pure broadcast-type system. A hybrid style of system has therefore become well established, in which there are local broadcast-type subsystems which are connected to each other by means of a switching system. (In a sense, this constitutes a hierarchy, but the term "hierarchy", and the associated term "levels", are normally used to describe the organization of the more complicated and elaborate forms of switching network.)

A simple and common form of local broadcast-type subsystem is the LAN (local area network). A LAN consists essentially of a common message medium to which a number of hosts are connected. When a host wants to send a message, it monitors the LAN to determine whether any other host is currently using the LAN. If not, then the host sends its message. Every host permanently monitors the LAN, watching to see whether any of the messages on the LAN are directed to itself. (There are various mechanisms for dealing with collisions, where two hosts try to transmit substantially simultaneously.)

There are various specific forms and various modifications of LANs, and there are other similar broadcast (common medium) systems. We shall use the term LAN loosely to cover all such systems, regardless of the details of the manufacturer or protocol.

As noted above, a number of LANs may be coupled together or interconnected by means of a switching network. The switching network in general consists of a number of nodes or switching devices, which we shall term "routers". (Alternative terms are "intermediate systems" and "gateways".) The connection from a router to a LAN is termed an interface; the connection from a router to another router is termed a link.

Obviously, there must be a suitable addressing system. Each host must have an address, and the communication system must somehow deliver messages from any host to any other host.

<u>IP systems</u>

We will consider primarily the types of system known as IP (Internet Protocol) systems from now on, because that is the main type of system for which the present invention is applicable. However, the principles of the present invention are not limited to IP systems, but are also applicable to other systems having similar characteristics, such as Appletalk.

Identifiers and addresses

Hosts generally have unique identifiers which are physically defined by their manufacturers, eg. by hard-wiring or burning in, often termed MAC (medium access control) identifiers. A MAC identifier is normally globally unique; it will typically include a portion distinguishing the manufacturer from all other manufacturers and a serial number distinguishing it from all other machines made by that manufacturer.

It is however preferred to assign each machine a logical address, which can be chosen to facilitate the finding of connection paths in the system. (If desired, a single physical machine can be given more than one logical address, in which case it will behave as more than one logical host.) The MAC identifier is more usually termed a MAC address, but we will use the term "identifier" for MAC addresses to avoid confusion with logical addresses.

In the IP system, the logical address (IP address) is a 32-bit number, which is conventionally divided into 4 bytes or octets which are then written in decimal form (eg. 1.5.21.178). These logical addresses are normally assigned manually.

A major feature of the IP system is that all hosts attached to a LAN have a common high-order part (which is typically the top 3 bytes) of their addresses; this high-order part thus forms the address of the LAN. Thus the host with address 1.5.21.178 will be attached to a LAN with address 1.5.21, and all the other devices attached to that LAN will have addresses with the same high-order part, eg. 1.5.21.17, 1.5.21.8, etc. Each LAN forms a subnet; the address of the LAN is normally termed a subnet address.

If only part of an address is significant, then the significant part is indicated by a mask associated with the address (and of the same length as the address). Thus for the above LAN, the mask will be 255.255.255.0, because only the top 3 bytes of the address are significant. (In theory, the mask can be used to define non-contiguous bits, but in practice this rarely happens.)

The IP system as so far described therefore consists of a network of routers with LANs attached to the routers. A host on a LAN can send messages to other hosts on the same LAN directly over the LAN. To send a message to a host on a different LAN, the host must send the message to the router attached to the LAN. The network of routers then has the responsibility for passing the message to the router attached to the destination LAN. That router then puts the message on that LAN, and the destination host receives it.

System elaborations

There are certain elaborations of this basic system which are worth noting.

First, there is a special address used for broadcasting. In effect, every device has two addresses; its own normal address and the special broadcast address. A message with the broadcast address is received and accepted by every device. Messages with the broadcast address are normally confined to a single LAN; the routers do not attempt to pass such messages through the router network. (There are in fact various special addresses, to allow multicasting (to a group, but not all, of the hosts), and a second broadcast address, but this is not relevant for present purposes.)

Second, a LAN can be connected to more than one router. This may be the most convenient way to connect two parts of the system, with the LAN forming the only connection between the two routers. More often, however, the two routers are both in the same router network, so that they provide two alternative paths to the LAN (from some other LAN). This redundancy allows the system to maintain communication with the LAN even if one of the routers connected to the LAN fails; also, it may allow the message flow rate to or from the LAN to be increased above the limit attainable with one router.

Third, two LANs can be coupled together by means of a bridge in known manner. A bridge is, in effect, a relay device which repeats any message on either of the LANs onto the other LAN. Thus LANs can be connected together into an extended LAN network in manner well known in the art. (We shall use the simple term "LAN" to include extended LANs.)

Fourth, a LAN (which may be a single or extended LAN) can have more than one logical address; the router to which it is attached will treat the single physical port or interface to which that LAN is attached as two separate logical interfaces. Any message put onto such a LAN at any point is physically transmitted to all hosts on it. (In fact, a bridge may have some form of filtering built into it, but this is not relevant for present purposes.) Logically, however, the LAN consists of two or more distinct subnets with different subnet addresses.

IP message flow protocol on LANs

In the IP system, message routing through the router network is determined by the IP addresses, but message routing over LANs is determined by the MAC identifiers. Mechanisms are therefore required to convert IP addresses to MAC identifiers when messages pass over LANs.

There are three main cases to consider for a source host sending a message to a destination host: the destination host may be on the same subnet as the source host, it may be on a different LAN, or it may be on the same LAN but a different subnet.

In the first case, the source sends out an ARP (address resolution protocol) request message with the logical (IP) address of the destination. That ARP request is received by the destination, which sends back an ARP response message to the source. (The ARP request is a broadcast message which is received by all the hosts on the subnet, but only the destination host responds; all the other hosts recognize that the destination address in the ARP request does not match their own address, and they therefore discard the message.) The destination host includes its MAC identifier in its ARP response. The source then sends the actual data message to the destination using the destination's MAC identifier.

This involves a large message overhead, since the passing of each data message is preceded by an ARP request and ARP response. The various units of the system therefore store tables of IP (logical) addresses and MAC identifiers, so that most data messages can be sent out with the MAC identifiers without having to be preceded by ARP requests and responses.

In the second case, the message has to be passed through the router network. In general, each host knows of the existence of at least one router on its LAN. (This may be achieved by routers advertising their presence to their hosts by means of broadcast messages.) The source therefore sends the message to a router (using the router's MAC identifier). The router network forwards the message to a router attached to the LAN including the destination host. That router then sends an ARP request to the destination host, which returns an ARP response. The router then sends the data message to the destination host, using the host's MAC identifier. (If the router does not get an ARP response, the packet is discarded or sent back to the source with an error status.)

The third case is where the source and destination hosts are on the same LAN but different subnets. The first message is passed in the same way as for the second case; the router accepts the message and then transmits it again on the same LAN. The router also returns a redirect message to the source, informing the source of the MAC address of the destination. The source stores this information, and can then send any further messages direct to the destination over the LAN common to the source and destination.

More specifically, each host maintains a connection table which lists the IP addresses and corresponding MAC identifiers of other hosts with which it has recently been in communication (without passing through a router - ie. in the first and third cases above). If a host wants to send a message, the destination is initially identified by its IP address. The host checks its table for the IP address, and if it is in the table, it extracts the associated MAC identifier from the table and sends the data message directly to that MAC identifier. If the IP address is not in the table, then the host has to send an ARP request to obtain a MAC identifier for the data message to be sent to. It enters the MAC identifier and associated IP address in the table for future use.

Similarly, each router has a set of interface tables, one for each interface. Each table lists the logical subnet addresses for that interface and, for each subnet address, lists the hosts with that subnet address, by logical address and MAC identifier. Obviously, the router will only know of the hosts which have sent out ARP requests. Each table in the router also has the identifier of its physical interface associated with it.

The various tables normally incorporates a time-out mechanism, so that entries which have not been used for some considerable time are deleted. This minimizes the chance of a unit trying to send a message to a unit which has disappeared from the system.

Router network organization

As noted above, if a message has to pass through the router network, that network has the responsibility for passing the message to the router attached to the destination LAN. This means that the routers have to pass routing (addressing) information between themselves so that when a router on a LAN receives a message (from a host on that LAN) for another LAN, it will know how to forward the message through the router network (and similarly, the router to which the message is forwarded will in turn know which router to forward the message to, and so on throughout the router network). This routing information is passed between the routers by means of routing control messages.

We are assuming here that a subnet address consists of the top 3 bytes of a 32-bit IP address (as determined by the associated mask), and that all hosts on that subnet have the subnet address as the high-order part of their own addresses. (The routing control messages will also generally contain other information, eg. about the cost and capacity of the paths between routers.) The routers therefore only have to deal with subnet addresses.

We are primarily concerned with the type of network in which every router is in communication, directly or indirectly, with all other routers on essentially the same basis. This is a single-level (level 1) system, and the number of routers will generally be fairly modest for such a system. Various types of routing control mechanisms are known for achieving this; for convenience, we shall assume that the routing control messages are link state packets (LSPs), and that the router network passes the LSPs around so that each router maintains a set of link tables, one for each link to other routers, with each subnet address being held in the table for a link which points to a router which is in some sense nearer to the actual location of that subnet.

Further details of the mechanisms which the router network uses to pass messages (either data messages passing between hosts, or router network control messages) through itself are not relevant for present purposes.

Router network elaborations

This basic mechanism for establishing and maintaining the topology of the router network is subject to possible elaborations.

As noted above, some of the links in the router network may pass through LANs. This does not affect the operation of the system, though of course any messages in the router network which pass through such links have to be encapsulated by the LAN messaging mechanism for their passage over those links.

The routers can operate algorithms for combining (condensing) subnet addresses. Thus if a router has several LANs attached to it with the same top 2 bytes in their addresses (eg. subnet addresses 1.5.21, 1.5.34, 1.5.26, etc), and these LANs are the only ones in the system with these top 2 bytes, that router can identify all those LANs by the single address of just the top 2 bytes (1.5). (As noted above, a mask will define the address as consisting of only 2 bytes.)

This mechanism allows the router network to be hierarchical. In each local (level 1) region of the network, the routers will have full information about all the LANs attached to that region, but will have only summary (condensed) information about the subnet addresses of other local regions. The mechanisms used for passing messages between different level 1 regions of the router network form a second level, level 2, of the network.

The condition for combining subnet addresses in a router in a level 1 area can in fact be relaxed slightly. If there is a odd subnet with say 1.5.102 as its address attached to some other router, the router to which all other subnets with 1.5 as the top 2 bytes in their addresses are connected can advertise itself as the router for address 1.5, provided that it forwards any messages it receives for subnet 1.5.102 on to the other router having the 1.5.102 subnet attached to it.

The problem

In the IP system, the address of a host includes the address of its LAN (as a subnet address). A host is therefore "tied" to its LAN. It can be moved to a physically different place on its LAN; all physical locations on a LAN are logically identical. However, it cannot be moved to another LAN. If it is so moved, it will be inaccessible; although it will be physically attached to the new LAN, no other host will be able to reach it.

In some situations, this restriction on moving hosts is not significant; in others, it provides a useful security feature.

However, in a large company or other organization, there may be a number of different LANs which are connected in an IP system, and for a variety of reasons, such as changes of organization, it may be desirable or even necessary to physically move a host in such a way that it has to be removed from its LAN and attached to another LAN.

This causes a problem. To move a host from one LAN to another, the host's address has to be changed to match the address of the new LAN. Since addresses are manually assigned, it is possible to make this change. Making the change may not in itself be particularly difficult. However, that will in effect turn the host into a new host. None of the other hosts which have been in communication with it will know its new address, and communication will have to be re-established from scratch with all these other hosts. This can be highly inconvenient.

One potential solution to this difficulty is to couple the different LANs together to form an extended LAN, as discussed above. However, this increases the complexity of system management, and involves difficulties arising from the complexity and proprietary nature of multipath bridging. The message density on the extended LAN is also increased, eg. by the increased multicast traffic, and this may limit the extent to which this solution is feasible.

Another potential solution utilizes a directory service. IP systems often have a directory service, which is essentially a table correlating host "names" with their IP addresses. This allows a source host to identify a destination host by means of the destination host's name; but before a source host can actually communicate with a destination host, the source has to obtain the destination's IP address from the directory service by sending the destination's name to the directory service, which returns the associated IP address.

If a host is moved, it can be given a new IP address consistent with its new location, and the directory service can be updated to associate the new IP address with the host's name (which is unchanged). If a source host wants to communicate with the host which has moved, the source host will find that messages directed to the old destination IP address will fail to reach their destination. It can then use the directory service to obtain the destination's IP address, as if it were trying to establish communication with the destination for the first time, and will thereby acquire the destination's new IP address.

This solution requires manual updating of the directory service, which is likely to involve considerable time delays during which the migrated host is inaccessible. It also requires the organization to have a management structure capable of dealing with the changes involved in an acceptably simple and effective manner.

A third potential solution is to provide re-addressing. This involves giving the migrated host a new IP address, consistent with its new LAN, and recording its old and new addresses in the router for its original LAN. A message sent to the host using its old address will reach its old router; that router will replace the old address by the new address and forward the message to the new router. However, this has various disadvantages. For example, message paths through the router network are considerably extended; also, the number of host addresses used in the system is increased each time a host migrates, and the need for the migrating host to be given an address consistent with its new LAN may be inconvenient. Also, the return path for messages between the two hosts is different to the outward path, which can cause difficulties.

The broad object of the present invention is therefore to provide an improved technique whereby a host in an IP or similar system can be moved from one subnet to another without having to have its address changed.

There are some important constraints implied in this formulation of the problem. Any solution must be compatible with existing IP systems; any modifications to only some of the routers and/or hosts in an existing IP system to provide the required technique must not interfere with the operation of the remaining routers and/or hosts. Further, IP-type systems are of course very well established, and include huge numbers of existing hosts. It is therefore desirable, if possible, for the solution to involve modifications to only routers, so that existing hosts can be moved without having to be modified.

As just noted, IP-type systems are very well established, and many such systems are extremely large, both in the numbers of hosts and geographically. The ideal solution in an abstract sense would permit a host to be moved from any location on the system to any other location. However, a solution which allowed only a limited degree of mobility of hosts around the system would be of great practical value, even though it would theoretically be only a partial solution.

The solution

The present invention provides a solution which comprises a combination of several features, all involving modifications of the details of the manner in which the routers operate.

According to the present invention there is provided a digital communication system comprising a network of routers linked together by links and having interfaces with local area networks (LANs) coupled to them, and operating under a protocol under which each LAN has a subnet address, and each host on a LAN has the subnet address as the high-order part of its own address, each router containing a set of interface/LAN tables listing the low-order address portions of the addresses of the hosts attached to the LAN plus the MAC (medium access control) identifiers of those hosts, and a set of link tables listing the subnet addresses of the LANs reachable through those links, wherein: both the interface tables and the link tables in the routers contain the full addresses of all hosts reachable through those interfaces and links; the routers contain means for detecting ARP (address resolution protocol) requests from a source host for a destination host having the same subnet address as the source host but not on the same interface, and returning a proxy ARP response giving the router's identification; and the routers contain polling means for polling the interfaces for unknown hosts.

Since the present system does not require any changes to the hosts, the address space of the system is unchanged. However, the present system in effect decouples the host addresses from the subnet addresses and hence from the geographical LAN locations. This allows considerably greater freedom in assigning addresses to hosts within the system address space.

In the standard system as described above, we have taken the top 3 bytes of the 32-bit address space as being used for subnet addresses, and the bottom byte as being used for different host addresses on the subnet. In fact, the division between the subnet address and the host addresses on the subnet can be defined more flexibly, by the use of suitable masks. However, the number of possible host addresses on a subnet must obviously be a power of 2, and the actual number of hosts on the subnet is likely to fall well short of the maximum.

Thus in the standard system, there are likely to be many spare addresses, which cannot be used (or can only be used by hosts added to the subnet with which those unused addresses are associated). In the present system, these spare addresses can be used much more freely, since they can be assigned to hosts regardless of which subnets (and hence LANs) those hosts are to be attached to.

<u>Router network organization</u>

A major feature of router operation is that the present modified routers use full host addresses for level 1 routing.

In the standard IP system, the routers use abbreviated addresses - the subnet addresses of the LANs - for level 1 routing; in effect, the routers operate an address compression algorithm which compresses the addresses of all the hosts on a subnet into a single subnet address. In the present system, the router operation is modified so that this address compression is no longer performed.

The result is that in a router network using the present modified routers, each router will hold effectively the same routing information as before, albeit in an expanded form. The operation of the router network is therefore effectively unchanged in principle (as far as the routing of messages through the router network is concerned). However, the amount of LSP traffic is increased, the amount of processing required for routing is increased, and the routers have to have a greater storage capacity.

If the level 1 network forms part of a larger system coupled to other level 1 networks through a level 2 organization, the level 2 organization is unaffected. Compressed or summary addresses are used unchanged for level 2 routing. The migration of hosts is restricted to within their own level 1 systems; it is not possible for a host to migrate from one level 1 system to another. As mentioned above, this restriction is rarely significant.

The present routers are largely compatible with standard routers, so that a network can consist of a mixture of standard and compatible routers. For present purposes, it is convenient to regard the resulting network as a network of modified routers to which standard routers have been added.

In a standard router network, the routing information consists of subnet addresses, which are distributed by the LSPs and stored by the routers. A subnet address has the form of a full address plus a mask, with the mask defining which part of the full address forms the subnet address; the rest of the address is ignored. The ignored part of the address is in fact, of course, a host address (on the subnet defined by the mask).

In a mixed system, the modified routers will send LSPs with full addresses in the same format, ie. address plus mask pairs, and any standard router receiving such an LSP will automatically store this address in the usual way. As far as such a standard router is concerned, there is no difference between subnet and full (host) addresses; the distinction arises solely from the contents of the masks associated with the various addresses. In a mixed system, therefore, the presence of standard routers will not affect the performance of the subsystem of modified routers (provided, of course, that the standard routers have sufficient storage capacity). The migration of hosts in such a mixed system is of course limited to the subsystem of modified routers.

As noted above, in the present system the amount of address information which has to be propagated through the router system is considerably increased. It may therefore be desirable to introduce a new LSP option type or format, to reduce the size and/or number of LSPs.

In the standard system, routing information is exchanged between the routers in the form of information units termed "options", of which there can be various formats or types. To reduce the number of LSP messages, a number of options are typically assembled into a single LSP. The standard option type can be taken as consisting of a header, an address section, and a general information section. The header contains an identifier which defines the LSP option type and length; the address section will consist of the address plus mask pair; and the general information section will contain associated routing information such as cost and distance.

The new LSP option type has the same general format, but the address section contains a set of host addresses without masks. Thus a considerable number of addresses can be sent as a single option of the new type, instead of needing a separate option (of the old type) in the LSP for each address. The length of this new LSP option will be considerably less than the total length of the separate LSP options of the old type, because there will be only one header and general information section, and each address will consist of a pure address with no accompanying mask.

The number of addresses in the new LSP option type may be included explicitly in the header, or may be calculated from the total length of the option by subtracting the header and general information lengths and dividing by the address length. Different addresses cannot, of course, have different associated routing information, because the addresses all share the common general information in the final section of the option. The routers will normally assemble the addresses of hosts on a common LAN when constructing an LSP option of the new type; those addresses will then all have the same characteristics and can share the same general information.

The new LSP option type can be used in a mixed system, as standard routers forward all LSP options (including those of the new type); the full host address information will thus be maintained throughout the subsystem of modified routers. However, the standard routers will not update themselves with the contents of LSP options of the new type. The modified routers must therefore also send out LSP options of the old type, so that the routing information in the standard routers is maintained. Also, if the standard routers split the subsystem of modified routers into disconnected parts, hosts cannot migrate between those parts because the standard routers connecting those parts will maintain only subnet addresses, not full host addresses.

LAN addressing by routers

For the router network to be able to route messages correctly, each router must know the whereabouts of all the hosts. This knowledge is distributed amongst the different routers using LSPs. However, before the a router can distribute information about the location of a host, it must become aware of the existence of the host.

In the standard system, each router is aware of the subnets attached to it (this knowledge may, for example, be entered manually). A router need not be explicitly aware of the existence of the hosts attached to the LAN. If a message for a host on the LAN is received, the router can send out an ARP request, and the ARP response confirms the existence of the host on the LAN. (If there is no ARP response, then it is assumed that the host does not exist.)

As discussed above, in the standard system the router in fact maintains an interface table for the various hosts on the LAN, so that it can forward future messages to them without having to obtain their MAC identifiers by ARP requests. The interface table is built up partly from ARP requests sent out by the router, and partly by ARP requests sent out from the hosts.

A standard router preferably maintains this table actively, by polling the hosts at suitable intervals. The poll message is simply an ARP request to the host. An ARP response confirms the existence of the host; if there is no ARP response, the host no longer exists.

In the present system, the modified router maintains its interface tables in broadly the same way as do standard routers. The present router, however, necessarily constructs its interface tables entirely automatically, whereas in a standard router the subnet addresses may be entered manually.

The present routers listen promiscuously for ARP requests from hosts (for a reason discussed later), and may listen similarly to other messages. This listening helps the routers to maintain their interface tables. The routers will therefore automatically learn of the existence of hosts which are involved in message transmission. However, it is possible that when a host is moved from one router to another, some other host may want to send a message to it before it has itself tried to send any messages. (In the standard IP system, hosts do not advertise themselves; the identity between the subnet address and the top part of the host address means that the location of a host is inherent in the system.)

Another way in which the routers can automatically discover the existence of hosts is for the hosts to announce their existence when they are first turned on, with the routers listening for such messages. However, this requires the hosts to issue suitable identification messages when first turned on; this may require modification of some hosts, and some types of host may not be modifiable.

Some mechanism must therefore be provided for the router network to discover the existence of silent hosts. Since changes cannot be imposed on the hosts themselves, the standard routers must therefore be modified, in the present system, so that they can discover the existence of such silent hosts. There are two ways in which this can be done, which may be termed active and passive. (It may be noted that in standard routers, the subnet addresses may be passed round automatically but will normally be set manually. In the present system, the subnet addresses are not of such importance, and the modified routers must determine all host addresses automatically.)

With the active technique, the routers actively search for hosts. Each router has to be modified to perform polling. For this, the routers in the level area are informed (eg. manually) of the address space of the hosts in that area. Each router then polls each of its interfaces in turn; that is, for each interface in turn it sends out a series of ARP requests, working through the host address space address by address. It will therefore elicit responses from all hosts attached to it.

This polling is of course distinct from the polling, mentioned above, which standard routers perform. The standard router polling is not through the host address space, but through the actual addresses of hosts which are already recorded in the routers' tables, to confirm their existence.

Provided that the host address space is manageably small, this is the preferred mechanism. This polling automatically takes care of the normal maintenance of the interface tables. Since the router network can only route messages to hosts which it knows about, it is important to confirm the disappearance of a host, eg. by a suitable number of retries. A discovery time of say 500 s (comparable to the ARP time-out), and a polling rate of 7 polls per second will accommodate an address space of 4000 hosts, which is much larger than most practical LANs.

The polling message density can be reduced if a router does not poll for addresses which it knows to be attached to other of its interfaces, or to other routers. However, a router needs to poll for hosts which are attached to it to confirm their existence, just as with a standard router; also, polling for hosts which are listed in its tables as being attached to other routers accelerates their discovery if they are moved.

Instead of polling by ARP requests, a router could poll by sending a suitable broadcast message, asking the hosts to report their existence. However, this has two disadvantages. One is that it requires the hosts to return suitable identification messages in response to the broadcast enquiry; this may require modification of some hosts, and some types of host may not be modifiable. The other is that the response messages from the hosts will temporarily produce a very high message density, which may for example overwhelm the router.

With the preferred mechanism of ARP polling, the polling intensity can be reduced by partitioning the host address space so that certain segments of it will only contain hosts which will announce their presence when first turned on. It will then not be necessary to poll through those address space segments.

A possible refinement of ARP polling is that if a router discovers that a host has disappeared, that host address can be distributed to all routers, with all routers then sending out ARP requests at higher than normal polling frequency for that host for some convenient period of time. (The router which has lost the host should be included in this, because the host may be migrating to another of its interfaces.) This will result in rapid detection of the migrating host if it is reconnected into the network.

With the passive technique for routers to discover the existence of silent hosts, they only search for a host when there is a message for that host. If the router network receives a message for a host which it (the router network) does not recognize, then the message is passed around the routers, and each router polls each of its interfaces with an ARP request.

This requires a more complex router network organization, to ensure that the message is distributed to all routers, but it may reduce the amount of polling, as the occurrence of messages to silent hosts will usually be relatively uncommon. The message may be distributed rapidly to all routers, with all the routers then polling their LANs; this may impose a significant transient load on the system. Alternatively, each router in turn may poll its interfaces for the destination host, and forward the message on to the next router only if it fails to find the destination host on any of its interfaces; this may result in a large delay.

Host to host communication

In the standard system, there are 4 mechanisms for a source host to send a message to a destination host. First, if the destination has the same subnet address as the source, if the source does not know the destination's MAC identifier it will send an ARP request to the destination; otherwise (second), it sends the message direct to the destination using the MAC identifier. Third, if the destination is on a different subnet, the source sends the message to a router. Fourth, if the destination is on a different subnet but the same extended LAN as the source, the source can send direct to the destination's MAC identifier as a result of a redirect message from a router.

The present system must maintain all these modes of message transmission as far as the hosts are concerned; in particular, it must cope with all possible combinations of source and destination subnet addresses and LAN locations. The source and destination may be on the same or different LANs, and may have the same or different subnet addresses.

If the source and destination are on the same LAN and have the same subnet address, then if the source knows the destination's MAC identifier it will send the message direct to the destination using the MAC identifier. Otherwise, the source will send an ARP request to the destination and, because the two are on the same LAN, it will get an ARP response and then send the message using the MAC identifier returned in the ARP response. This is the same as in the standard system.

If the source and destination are on different LANs and have different subnet addresses, the source will send the message to a router, which will forward it to the router to which the destination is attached. This is broadly similar to the standard system (though the router uses the more detailed routing information of the present system).

If the source and destination are on the same LAN but have different subnet addresses, the source will send the message to a router; this will return a redirect message to the source, which will then send the message direct to the destination using the destination's MAC address. This is broadly similar to the standard system (though again the router uses the more detailed routing information of the present system).

If the source and destination are on different LANs but have the same subnet address, then the source will send an ARP request to the destination, expecting to receive an ARP response with the destination's MAC identifier. The router on the source LAN must listen for such ARP requests and return ARP responses (this is the promiscuous listening for ARP requests mentioned above). On hearing an ARP request on an interface, the router must check its link tables and its interface tables for its other interfaces for the destination. If the destination is in those tables, it is in fact on a different LAN from the source. However, the source is expecting an ARP response. The router must therefore return a proxy ARP response - ie, it must return an ARP response on behalf of the destination. This proxy ARP response will of course contain the router's MAC identifier. The source will then send the message to the router, which must then forward it through the router network.

Specific Embodiment

A communication system embodying the invention will now be described, by way of example, with reference to the drawings, in which:

Fig. 1 is a general block diagram of the system; and

Fig. 2 is a highly simplified block diagram of a modified router (ie. the present router).

Fig. 1 shows a communication system with various typical features. The system consists of a level 1 network of 3 routers R1-R3 coupled by links LK12, LK23, and LK13 (the digits indicating the routers which each link couples together). This level 1 network forms part of a level 2 system (the rest of which is shown merely as a cloud L-2), and is coupled to the rest of the level 2 network by links shown as zig-zag lines.

Router R1 has 2 physical LAN interfaces, with LAN1 (with subnet address 32.17.52) and LAN4 (with subnet address 32.17.66) coupled to them; router R2 has 3 LAN interfaces, with LAN2 (with subnet address 32.17.55), LAN3 (with subnet address 32.20.132), and LAN6 (with subnet address 32.20.154) connected to them; and router R3 has 2 LAN interfaces, with LAN5 (with subnet address 32.27.24) and LAN7 (with subnet address 32.17.102) connected to them. LAN1 and LAN2 are connected together in known manner through a bridge BR1, forming a single extended LAN with two subnet addresses.

Hosts H1-H11 are coupled to the various LANs as shown. Each host has an address consisting of 4 bytes. In the standard system, each host's address will be the address of its LAN plus a final byte added to the end of the subnet address, as shown for hosts H2 (address 32.17.52.32), H3 (address 32.17.52.5), H5 (address 32.17.55.129), and H8 (address 32.17.66.188).

Each host maintains a connection table for its connections. Host H2, for example, will maintain the following table:

Host H2, connection table

Router connection:
R1-MAC

Host list:

32.17.52.5 (H3)	H3-MAC
32.17.55.129 (H5)	H5-MAC
...	

This table has two parts, a router connection and a host list. The router connection part is a single entry, the MAC of router R1, which the host uses for sending messages to hosts which are not on its own extended LAN. The second part lists the hosts which H2 has recently sent messages to, together with the MAC identifiers which it uses to send messages to those hosts. Communication with H3 is direct, over LAN1, so messages to that host are sent to that host's MAC identifier. Communication with H8 is via the router network, so messages to that host are sent to router R1, using that router's MAC identifier. Communication with H5 is also direct; H2 has learnt H5's MAC identifier as the result of a redirect message from router R1 or R2 at some time in the past.

The host maintains this table as a cache with time-out, so that entries which have not been used for more than a certain time are deleted. New entries are added as communication with new hosts is desired, by using the ARP requests as discussed above.

Each router maintains interface and link tables. Router R1, for example, would maintain the following interface tables if it were a standard router.

<u>Router R1 (standard form), interface tables</u>

IF1 (interface)
    32.17.52 (subnet address)
        5   H3-MAC
        32   H2-MAC
        ...
    32.17.55 (subnet address)
        129 H5-MAC
        ...

IF2 (interface)
    32.17.66 (subnet address)
        188 H8-MAC
        ...

Each interface table is divided into a separate section for each logical subnet address of the (possibly extended) LAN attached to that interface. Each section records the subnet address and then lists the hosts on the LAN with that subnet address. Each host entry consists of the host's address and its MAC identifier. The host's address is recorded as only the final byte, since the first 3 bytes of the address are the address of its subnet. The first interface table has two sections because the two LANs LAN1 and LAN2, with different subnet addresses, are both connected to that physical interface (via the bridge BR1 in the case of LAN2).

The routers also maintain link tables for their links to other routers. In the standard system, each router passes the addresses of the LANs to which it is coupled to the other routers in the level 1 network, and those other routers hold that information in their link tables. Thus if router R1 were standard, it would maintain two link tables as follows.

<u>Router R1 (standard form), link tables</u>

LK12:

32.20.154 (LAN6)
32.20.132 (LAN3)
...

LK13:

32.27.24 (LAN5)
32.17.102 (LAN7)
...

The entries in each table are the addresses of the LANs which can be reached through the associated link. If link LK13 did not exist, then the link table LK12 would contain the addresses 32.27.24 and 32.17.102 (as well as 32.17.154 and 32.20.132), because the message route for those addresses would then be via router R2.

Each subnet address in the link tables can be regarded as a compressed version of the set of host addresses on that LAN. This can be represented more fully by writing the subnet addresses as 32.17.154.xx, etc, where the final byte is masked off by a mask.

For the coupling to the rest of the level 2 system, the routers provide further compressed addresses over the zig-zag links to region L-2. In this case, the level 2 addresses will be simply the single value 32.0001xxxx.xx.xx (where the second byte is written in binary). Similarly, the routers R2 and R3 will maintain level 2 connection tables (with further compressed entries) for addresses in the L-2 region. Also, router R1 will maintain these region L-2 addresses (preferably in the same compressed form) in its link tables LK12 and LK13, so that messages from hosts on its LANs to the L-2 region can be correctly routed. (This is why the tables LK12 and LK13 are shown as having further entries beyond the 2 shown explicitly for each.)

In the present system, the routers are modified from the standard form to maintain the level 1 connection information within the interface and link tables in uncompressed form. Thus the interface table for interface IF1 for router R1 will contain:

Router R1 (modified form), interface table IF1

IF1:

32.17.52.5	H3-MAC
32.17.52.32	H2-MAC
32.17.55.129	H5-MAC
32.20.154.34	H1-MAC
...	

Switching, for convenience, to router R3 to discuss the link tables, this would contain the following link table for link LK13 in the standard form:

Router R3 (standard form), link table LK13

LK13:

32.17.52	(LAN1)
32.17.55	(LAN2)
32.17.66	(LAN4)
...	

For the modified form of router R3, this link table will contain all the entries for router R1's interface tables, in the same form as in those interface tables, instead of just the compressed or subnet addresses. Thus router R3 will contain the following link table for link LK13 in the modified form:

<u>Router R3 (modified form), link table LK13</u>

LK13:

32.17.52.5	H3-MAC
32.17.52.32	H2-MAC
32.17.55.129	H5-MAC
32.17.66.188	H8-MAC
...	

The connection information relating to connections to the level 2 area L-2 is unchanged from the standard form.

With the host addresses discussed up to now, the operation of the system with the present (modified) routers is substantially unchanged from the operation with standard routers. Suppose, however, that host H1 was originally on LAN6 (address 32.20.154), and was given the address 32.20.154.34 while it was on that LAN. Suppose also that it is desirable to transfer that host to LAN1 as shown.

In the standard system, it would not be possible for any messages to reach H1, because its address does not match LAN1's address. For H1 to be logically connected to the system, either its address would have to be changed to match that of LAN1 (so that it would effectively be a new host), or LAN1 and LAN6 would have to be coupled together by a bridge (so that H1 could still be reached by router R2), or some form of address conversion would have to be provided.

In the present system, however, messages can reach H1. This is because all the routers' tables (ie. both link and interface tables) contain the individual addresses of all hosts (of the level 1 area) in full; they do not now contain the subnet addresses as such.

Thus router R1 will contain the address 32.20.154.34 in its interface table for interface IF1, so that it can forward a message for H1 reaching it from another router (or from another of its interfaces). Similarly, the link tables of R2 and R3 will contain the address 32.20.154.34 in full, so that any message for H1 reaching either of those routers can be forwarded to router R1 (assuming that for some reason, messages are not passed to it from router R2 through the extended LAN network of the 2 LANs LAN2 and LAN1).

In the standard system, router R2 would contain the address 32.20.154 of LAN6 in one of its interface tables, and would capture all messages to any host with that as the first 3 bytes of its address. In the present system, however, router R2 contains only the addresses of the individual hosts attached to it, not the subnet address as such. It will therefore not capture any messages to host H1, ie. to address 32.20.154.34, and will therefore not interfere with the correct routing of messages to that host.

Fig. 1 also shows a second host, host H9, which has migrated, in this case from LAN1 to LAN4. Router R1's interface table for interface IF2 contains the address (32.17.52.47) of this host, and routers R2 and R3 contain this address in their link tables LK12 and LK13, so that messages to this host from LANs attached to R2 and R3 will reach it as desired.

There is however a complication if a host such as H2 on H9's original or "home" subnet wants to send a message to it. H2 finds that its own subnet address is the same as H9's subnet address, and therefore sends an ARP request to H9 on LAN1 (hosts' behaviour is unchanged from in the standard system).

As discussed above, the present routers listen to all ARP requests from hosts on their interfaces, to detect ARP requests for migrated hosts. When a router detects an ARP request, it checks the address of the destination host against the contents of its tables (both the interface tables and the link tables). If the destination host is on the same interface as the source host, the router ignores the ARP request (the destination host will respond to the ARP request with an ARP response and message transmission will proceed normally). But if the destination is not on the same interface as the source, the router responds with a proxy ARP response which includes its own MAC identifier. The source will then send the message to the router, and the router then forwards the message to the actual location of the destination.

Thus router R1 will detect the ARP request from host H2 for host H9, find that host H9 is not on interface IF1, and return a proxy ARP response to H2. H2 will then send the message to the router, which will pass it to interface IF2 so that it reaches H9.

If host H2 has previously been in communication with host H9 over their original common LAN, H2 will of course still have H9's MAC address in its connection table, and will continue to use that MAC address when trying to send messages to H9; and when H9 migrates, H2 will find that H9 has apparently disappeared. H2 will thereupon flush its connection table (or at least the entry for H9), and attempt to re-open communication with H9 by sending an ARP request. Router R1 will return a proxy ARP response to this, as just discussed, and communication with H9 will therefore be re-established.

Fig. 2 shows the general logical organization of the preferred form of modified (present) router, which we may take as router R1.

There is a plurality of link registers 10, one per link, for receiving messages (including LSPs) coming in over links from other routers and for holding messages to be transmitted over those links. There is a plurality of interface registers 11, one per interface, for receiving messages coming in over the router's interfaces and for holding messages to be transmitted over those interfaces. There is a plurality of link table stores 12, one per link, for storing the link tables discussed above. There is a plurality of interface table stores 13, one per interface, for storing the interface tables discussed above. The link and interface registers 10 and 11 are coupled to switching circuitry 15.

Each of the link registers 10 and interface registers 11 has a header section 10A, 11A respectively for containing header information including, for example, the source and destination addresses and (in the case of messages in the interface registers) MAC identifiers. When a message is received in one of these registers, its destination address is compared by a comparator 14 with the addresses in the link and interface tables and moved from its initial register to the appropriate register for output, ie. from a link register to another link register, from a link register to an interface register, or from an interface register to an interface register. In addition, if the message is moved into an interface register, the MAC identifier of the destination is copied over line 16 from the interface table into the header section of the interface register.

(In practice, the messages may be stored in a common memory, with pointers being used to identify different memory areas as the different registers, and the movement of a message from one register to another being achieved by changing the pointers. Also, the headers may be processed separately from the bodies of the messages.)

The interface registers 11 are also coupled to an ARP unit 30. All ARP requests on the LANs attached to the interfaces are received by the router, ie. are written into the interface registers 11. When an ARP request is so received, comparator 14 compares the host destination address in its header with the host addresses in the link tables 12 and the interface tables 13.

If the destination is not in the interface table for the interface on which the ARP request was received, ie. is in some other interface table, or in a link table, then the comparator 14 sends a signal to the ARP unit 30, which then converts the ARP request in the interface register to a proxy ARP response. This ARP response includes the router's address and MAC identifier, which are stored in a router address and MAC identifier store 17 and are copied into the header into of the interface register for return to the host as the ARP response.

If the destination is in the interface table for the interface on which the ARP request was received, then the router makes no response. However, for all ARP requests which it receives, the router checks whether the source is listed in the interface table for the interface on which the ARP request was received. If it is not, then it updates its tables by adding the source's address to the appropriate interface table and deleting it from any other tables which it is in. In addition, the host's address (ie. the full address) is passed (over line 21) to an LSP processor 20.

A polling unit 25 is also coupled, through the switching circuitry 15, to the header sections 11A of the interface registers 11. The polling unit 25 performs two functions, under the control of a timer 26 to which it is coupled.

First, the polling unit is coupled to the interface tables 13, and selects each entry in the interface tables in turn for verification. For this, the address of each end-station in turn is copied into the appropriate one of the interface registers 11 and sent out as an ARP request. The MAC identifier in the response is passed back to the interface table and compared therein with the stored MAC identifier, to verify the entry. If verification fails (after a suitable number of retries), the table entry is deleted and the address of the deleted host is passed to the LSP processor 20.

Second, the polling unit is also coupled to an address space store 27, which is set to contain the address space of the (level 1) system. Under control of the timer 26, the polling unit 25 works sequentially through all addresses of the address space. Addresses which are already in the interface tables are filtered out. The remaining addresses are passed, in sequence, to each of the interface registers for sending out an ARP request, to see whether a host with that address exists. If it does, then the address and MAC identifier in the ARP response are passed to the appropriate interface table and to the LSP processor 20.

Turning now to the LSP processor 20, this receives the addresses of hosts newly discovered by the router and of hosts which disappear from the router's interfaces. It constructs LSP options containing these addresses, assembles them into LSPs, and passes them to the set of link registers 10 for transmission to other routers. This processor 20 also processes LSP options received by the link registers 10 from other routers, updating the entries in the corresponding link table 12 by adding and/or deleting entries appropriately. The LSP processor 20 is coupled to an LSP option memory 22 in which LSP options of the new type discussed above are constructed; this memory comprises a header section 22A, an address section 22B for the addresses of the LSP, and a general information section 22C. This memory is used to assemble LSP options of the new type which are to be sent out by the router, and to store incoming new type options received from other routers ready for analysis and transfer of their contents into the link tables 12.

In the system shown in Fig. 1, each router is coupled to every other router. In general, however, this will not always be so. LSP options must therefore be forwarded throughout the level 1 area. The LSP processor is responsible for this; it causes an incoming LSP option to be copied to all other link registers 10 for forwarding (as parts of LSPs) to other routers. Various techniques can be used to prevent the unlimited circulation and multiplication of LSP information.

Claims

1. A digital communication system comprising a network of routers linked together by links and having interfaces with local area networks (LANs) coupled to them, and operating under a protocol under which each LAN has a subnet address, and each host on a LAN has the subnet address as the high-order part of its own address, each router containing a set of interface/LAN tables listing the low-order address portions of the addresses of the hosts attached to the LAN plus the MAC (medium access control) identifiers of those hosts, and a set of link tables listing the subnet addresses of the LANs reachable through those links, wherein:

both the interface tables and the link tables in the routers contain the full addresses of all hosts reachable through those interfaces and links;

the routers contain means for detecting ARP (address resolution protocol) requests from a source host for a destination host having the same subnet address as the source host but not on the same interface, and returning a proxy ARP response giving the router's identification; and

the routers contain means for interrogating the interfaces for unknown hosts.

2. A digital communication system according to claim 1 wherein the means for interrogating the interfaces comprises polling means.

3. A digital communication system according to claim 2 wherein the polling means include timing means causing the polling means to perform polling for unknown hosts.

4. A digital communication system according to claim 3 wherein each router contains an address space store settable to contain the address space of the system.

5. A digital communication system according to claim 2 wherein the polling means of a router poll for unknown hosts is in response to the router receiving a message for an unknown destination host, and the message is passed through the network of routers until the destination host is located.

6. A digital communication system according to any previous claim wherein each router contains an LSP option memory for assembling, storing, and analyzing LSP options, the LSP option memory comprising a header section, an address section capable of storing a plurality of addresses, and a general section.

7. A method of operating a digital communication system comprising a network of routers linked together by links and having interfaces with local area networks (LANs) coupled to them, said method including the steps of:

operating the system under a protocol under which each LAN has a subnet address, and each host on a LAN has the subnet address as the high-order part of its own address;

providing each router with a set of interface/LAN tables listing the low-order address portions of the addresses of the hosts attached to the LAN plus the MAC (medium access control) identifiers of those hosts, and a set of link tables listing the subnet addresses of the LANs reachable through those links;

providing both the interface tables and the link tables in the routers with the full addresses of all hosts reachable through those interfaces and links;

each router, upon detection of ARP (address resolution protocol) requests from a source host for a destination host having the same subnet address as the source host but not on the same interface, returning a proxy ARP response giving the router's identification; and

providing each router with means for interrogating the interfaces for unknown hosts.

8. The method of claim 7 including the step of locating unknown hosts by a router by routine systematic polling of predetermined address space.

9. The method of claim 8 including the step of reserving a second predetermined address space for self-announcing hosts which address space is not systematically polled by a router.

10. The method of claim 7 including the step of initiating a poll for an unknown host in response to a router receiving a message for said unknown destination host, and passing the message through the network of routers until the destination host is located.

Patents Act 1977 **Examiner's report to the Comptroller under Section 17** **(The Search report)**	Application number GB 9322910.2
Relevant Technical Fields (i) UK Cl (Ed.M) H4P (PPA, PPG) (ii) Int Cl (Ed.5) H04L 12/46, 12/66	Search Examiner MR J P COULES Date of completion of Search 7 DECEMBER 1994
Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii) ONLINE DATABASES: WPI, INSPEC	Documents considered relevant following a search in respect of Claims :- 1-10

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Category	Identity of document and relevant passages		Relevant to claim(s)
A, E	GB 2267418 A	(ICL PERSONAL SYSTEMS OY) 1 December 1993 whole document	1 and 7

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Electronic Acknowledgement Receipt

EFS ID:	6626645
Application Number:	90010422
International Application Number:	
Confirmation Number:	6565
Title of Invention:	Graphic User Interface For Internet Telephony Application
First Named Inventor/Applicant Name:	6,009,469
Customer Number:	42624
Filer:	Michael R. Casey
Filer Authorized By:	
Attorney Docket Number:	2655-0185
Receipt Date:	14-DEC-2009
Filing Date:	26-FEB-2009
Time Stamp:	12:08:47
Application Type:	Reexam (Third Party)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	20091214_IDS_0185.pdf	119497 783d4aa5c4f2c919c8bd3258fda7eddc476185d5	no	2

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2	Information Disclosure Statement (IDS) Filed (SB/08)	20091211_1449_0185.pdf	4789224 7f127aa6e03f166a671fb8a0dfc23fa974e32d42	no	29
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6	NPL Documents	F0003_One_Per_Desk.pdf	1400117 72c9138f2988bc43ac628c2b75d736de8b71c996	no	24
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7	NPL Documents	F0004_NTIS_WideBand_Integrated.pdf	1550423 59ffcb33e6fbd5e5941bb0297223ff17072849aa	no	39
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8	NPL Documents	F0005_Integrated_VoiceData_PABX.pdf	87079 b36ad7f1eff3a459b4bee53124753c5ac75f0b92	no	2
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15	Foreign Reference	F0012_AU-200059377-A1.pdf	1204979 f4a9fef78f8bf3bbbb696e1e203fc826970a0d02	no	36
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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT APPLICATION OF: Net2Phone, Inc. (Patent No. 6,009,469)
Control No.: 90/010,422
Issue Date: December 28, 1999
Title: **GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION**

Attorney Docket: 2655-0185
Group Art Unit: 3992
Examiner: KOSOWSKI, Alexander
Date: December 14, 2009
Confirmation No.: 6565

INFORMATION DISCLOSURE STATEMENT

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

Sir:

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

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

CHARGE STATEMENT: Deposit Account No. 501860, order no. **2655-0185**.
The Commissioner is hereby authorized to charge any fee specifically authorized hereafter, or any missing or insufficient fee(s) filed, or asserted to be filed, or which should have been filed herewith or concerning any paper filed hereafter, and which may be required under Rules 16-18 (missing or insufficiencies only) now or hereafter relative to this application and the resulting Official Document under Rule 20, or credit any overpayment, to our Accounting/Order Nos. shown above, for which purpose a duplicate copy of this sheet is attached **This CHARGE STATEMENT does not authorize charge of the issue fee until/unless an issue fee transmittal sheet is filed**.

CUSTOMER NUMBER

42624

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

Respectfully submitted,

By: /Michael R. Casey /

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

PATENT ABSTRACTS OF JAPAN

(11)Publication number : **63-131637**
(43)Date of publication of application : **03.06.1988**

(51)Int.Cl. H04L 11/00

H04L 11/00

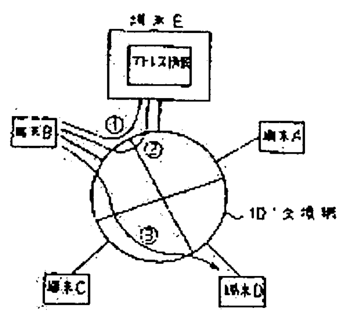
(21)Application number : **61-277727**
(22)Date of filing : **20.11.1986**

(71)Applicant : **FUJITSU LTD**
(72)Inventor : **YAHAGI TAKEHIKO**

(54) ADDRESS MANAGEMENT SYSTEM FOR COMMUNICATION NETWORK

(57)Abstract:
PURPOSE: To contrive the reduction of the quantity of address information provided to each terminal equipment by allowing a management terminal equipment to manage address information of a communication network altogether and allowing general terminal equipments to inquire about the information to the management terminal equipment, thereby simplifying the addition/revision of a terminal equipment address.

CONSTITUTION: For example, a terminal equipment E among lots of terminal equipments A, B... connected to an exchange network is used as the address management terminal equipment, to which address information of the all terminal equipments is given. In case of the communication by each terminal equipment, the address of a terminal equipment being an opposite party of communication is inquired about the address management terminal equipment, and the address informed from the said terminal equipment is used to make communication with the terminal equipment being the communication party. That is, when the terminal equipment B makes communication with the terminal equipment D, the terminal equipment B inquires about the address of the terminal equipment D to the equipment E, which informs the address of the terminal equipment D to the terminal equipment B, and the terminal equipment B uses the informed address to call the terminal equipment D to apply communication. Thus, terminal equipments A~D other than the equipment E do not require to have address information in this way, then the memory capacity is saved.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

⑲日本国特許庁（JP）　　⑪特許出願公開
⑫公開特許公報（A）　昭63－131637

⑤Int.Cl.⁴	識別記号	庁内整理番号	㊸公開 昭和63年(1988) 6月3日
H 04 L 11/00	310	Z－7928－5K 7830－5K	

審査請求 未請求 発明の数 1 （全4頁）

㊹発明の名称　通信ネットワークのアドレス管理方式

㉑特　願　昭61－277727
㉒出　願　昭61(1986)11月20日

⑫発明者　矢作　毅彦　神奈川県川崎市中原区上小田中1015番地　富士通株式会社内
⑪出願人　富士通株式会社　神奈川県川崎市中原区上小田中1015番地
⑭代理人　弁理士　青柳　稔

明　細　書

1.発明の名称

通信ネットワークのアドレス管理方式

2.特許請求の範囲

交換網（10）で接続された多数の端末（A，B，C，……）を有する通信ネットワークの各端末のアドレス管理方式において、

該多数の端末のうちの1つ（E）をアドレス管理端末としてこれに全端末のアドレス情報を持たせ、

各端末はアドレス管理端末に通信相手の端末のアドレスを問合せ、アドレス管理端末から知らされたアドレスを用いて通信相手の端末と通信することを特徴とする通信ネットワークのアドレス管理方式。

3.発明の詳細な説明

（概　要）

通信ネットワークのアドレス情報を管理端末に一括管理させ、一般端末は管理端末に問合せるようにした。

（産業上の利用分野）

本発明は、通信ネットワークの各端末のアドレス管理方式に関する。

（従来の技術）

多数の端末があるコンピュータシステムでは、各端末が相手端末のアドレスを持ち、そのアドレスを用いて所望の相手端末と通信している。第2図で説明すると、10は交換網で、これに多数の端末A，B，C，……が接続される。各端末は相手端末のアドレスを所有、管理、即ち端末Aは端末B～Eのアドレスを、端末Bは端末A，C～Eのアドレスを（以下同様）所有、管理し、相手端末と通信するときは自端末が所有、管理しているアドレスから相手端末のアドレスを知り、それを用いて通信する。

（発明が解決しようとする問題点）

この方式は、通信相手のアドレスを直ちに知り得る利点はあるものの、端末が追加されるときは

既設の全端末が所有、管理するアドレス情報に追加端末のアドレスを追加しなければならず、厄介である。多数の端末が通信網で接続されるシステムとしてはLAN（Local Area Network）があるが、LANは端末の接続、開放が極めて容易という特徴があり、このLANで端末追加、廃止の度に全端末のアドレス情報を更新するのではLANの便利性が損なわれてしまう。また各端末がアドレス情報を持つので、システム全体としては各端末のアドレスが何重にも重復して保管されることになり、不経済である。

本発明はかゝる点を改善し、アドレス管理の簡単化、ネットワーク構築／変更の容易化と、端末で所有する通信相手のアドレス情報量の削減を図ろうとするものである。

〔問題点を解決するための手段〕

第1図に示すように、本発明では交換網に接続された多数の端末A，B，……のＩつ、本例では端末Eをアドレス管理端末とし、これに全端末のアドレス情報を持たせる。そして各端末が通信する際は、通信相手の端末のアドレスをアドレス管理端末に問合せ、該端末から知らされたアドレスを用いて通信相手の端末と通信する。

例えば端末Bが端末Dと通信するときは、端末Bがアドレス管理端末Eに端末Dのアドレスを問合せ①、これを受けてアドレス管理端末Eは端末Dのアドレスを端末Bへ知らせ②、端末Bはこの知らされたアドレスを用いて端末Dを呼び出し、通信する③。

〔作用〕

このようにすれば、アドレス管理端末以外の端末はアドレス情報を持つ必要がないからメモリ容量の削減が可能であり、また端末の加入、廃止に伴なうアドレス情報の更新はアドレス管理端末のみがすればよいから簡単である。

〔実施例〕

第3図に本発明の実施例を示す。各端末A，B，……はインタフェース変換部、送受信制御部などの他にアドレス管理部を持ち、こゝに自端末のLAN内アドレスとアドレス管理端末EのLAN内アドレスを持つ。またアドレス管理端末Eはインタフェース変換部、送受信制御部などの他にアドレス管理部を持ち、こゝに各端末のアドレス情報テーブルを持つ。このテーブルは各端末の論理名称A，B，C，……とその端末のLAN内アドレスを対応させたものである。このテーブルは例えばシステムジェネレーション時にアドレス管理端末Eが各端末A，B，……に自己のLAN内アドレスを送出させて作成する。

第4図に示すようにある端末例えばAがある端末例えばBと通信するとき①は、論理名称＝BからそのLAN内アドレスへの変換を要求する②。自端末が持っているアドレス管理端末のLAN内アドレスを用いて該アドレス管理端末Eに、論理名称＝Bに対応するLAN内アドレスの獲得を要求する③。アドレス管理端末Eはアドレス情報テーブルを検索して該端末BのLAN内アドレス2を得、これを端末Aへ通知する④。端末Aのアドレス管理部はインタフェース変換部へB＝2を通知する⑤。

次に第5図に示すように端末Aは、獲得したLAN内アドレスにより通信を要求する⑥。該端末の送受信制御部は端末Bに通信を要求する⑦。該端末Bは端末Aへ応答を返し、該端末Aの送受信制御部はインタフェース変換部へ通信可能を通知し、該インタフェース変換部は論理名称＝Bとの通信可能を通知する。また端末Bの送受信制御部は自端末へ通信要求が来たことを通知する。これにより、端末Aは端末Bのアドレスを知らないで端末Bとの通信が可能になる。

〔発明の効果〕

以上説明したように本発明によれば、各端末のアドレスはアドレス管理端末で一括管理するので、端末アドレスの追加、変更が簡単であり、個々の端末が持つアドレス情報量が低減する利点が得られる。

4.図面の簡単な説明

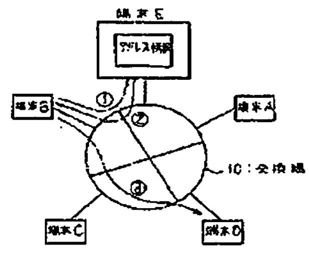
第1図は本発明の要部を示す説明図、

第2図は従来例の説明図、

第3図～第5図は本発明の実施例の説明図である。

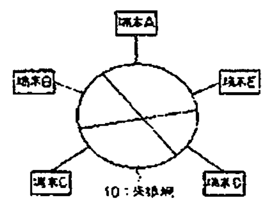
出願人　富士通株式会社

代理人弁理士　青柳　稔



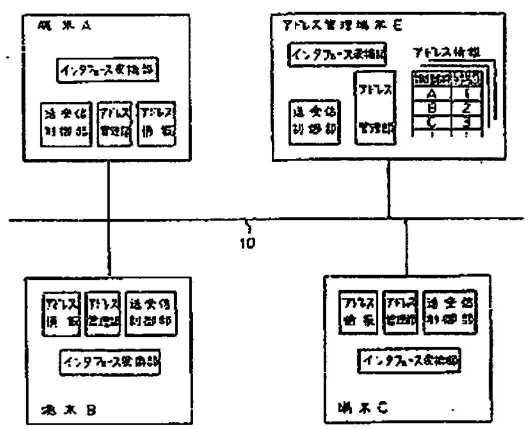
本発明の要部を示す説明図

第1図



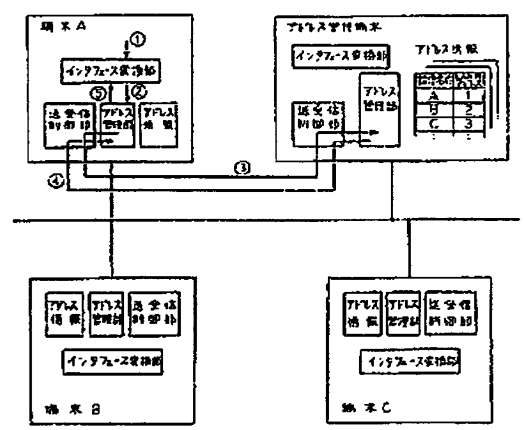
従来例の説明図

第2図



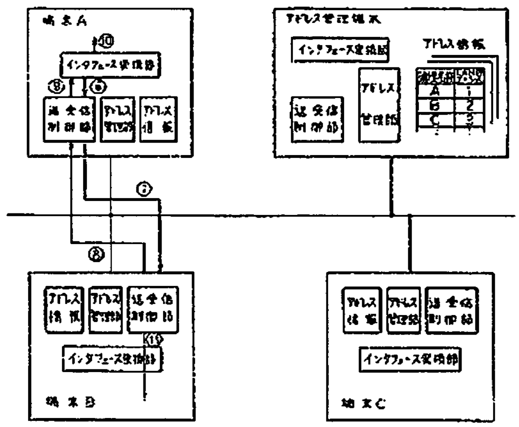
本発明の実施例の説明図

第3図



本発明の実施例の説明図

第4図



本発明の実施例の説明図
第5図

STATEMENT OF RELEVANCY

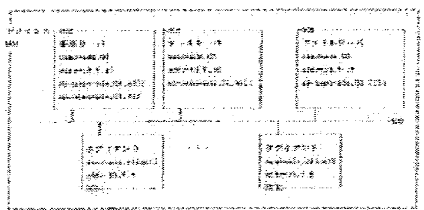
This document was cited in an Office Action corresponding to JP 2008-163825 which is a divisional application corresponding to PCT/US96/15504 (which claims priority to U.S. Patent Application Serial No. 08/533,115, now U.S. Patent No. 6,108,704).

CONSTRUCTING SYSTEM AND CHANGING SYSTEM FOR COMPUTER NETWORK

特許公報番号	JP6062020 (A)
公報発行日	1994-03-04
発明者:	TERADA MASATOSHI; FUKUZAWA JUNJI; TAKASHIMA TOSHIBUMI
出願人	HITACHI LTD
分類:	
一国際:	*G06F15/16; G06F15/177; H04L12/28;* G06F15/16; H04L12/28; (IPC1-7): H04L12/28; G06F15/16
一欧州:	
出願番号	JP19920231282 19920806
優先権主張番号:	JP19920231282 19920806

要約 JP 6062020 (A)

PURPOSE:To provide an address and title managing function accompanied by the transfer of nodes by setting node titles in address request messages and setting the node titles indicating that they belong to other networks in the address request messages. CONSTITUTION:A network system is constituted of a domain A501 managed by a management server 502 and the respective nodes 502-505 are mutually connected by a link 506. Then, when the address request message is present from the node, the server 502 assigns an address imparted beforehand when the node title identical to the specified node title is registered and selects the address from free addresses to be assigned when it is not registered. Also, the effective period of the assigned address is decided corresponding to the length specification of the effective period of the address. Also, when the address request message in which the node title is set is present, the server 502 assigns the address from the free addresses and prepares and transmits a change information message to the management server of the present network.



(19)日本国特許庁（ＪＰ）　(12) **公開特許公報**（Ａ）　(11)特許出願公開番号

特開平6－62020

(43)公開日　平成6年(1994)3月4日

(51)Int.Cl.^{5}	識別記号	庁内整理番号	ＦＩ	技術表示箇所
Ｈ０４Ｌ　12/28				
Ｇ０６Ｆ　15/16	４００　Ｄ	9190－5L		
		8529－5K	Ｈ０４Ｌ　11/00　　３１０　Ｚ	

審査請求　未請求　請求項の数4（全 18 頁）

(21)出願番号　特願平4－231282

(22)出願日　平成4年(1992)8月6日

(71)出願人　000005108
株式会社日立製作所
東京都千代田区神田駿河台四丁目6番地

(72)発明者　寺田　真敏
神奈川県川崎市麻生区王禅寺1099番地　株式会社日立製作所システム開発研究所内

(72)発明者　福澤　淳二
神奈川県川崎市麻生区王禅寺1099番地　株式会社日立製作所システム開発研究所内

(72)発明者　高島　俊文
神奈川県川崎市麻生区王禅寺1099番地　株式会社日立製作所システム開発研究所内

(74)代理人　弁理士　笹岡　茂　（外1名）

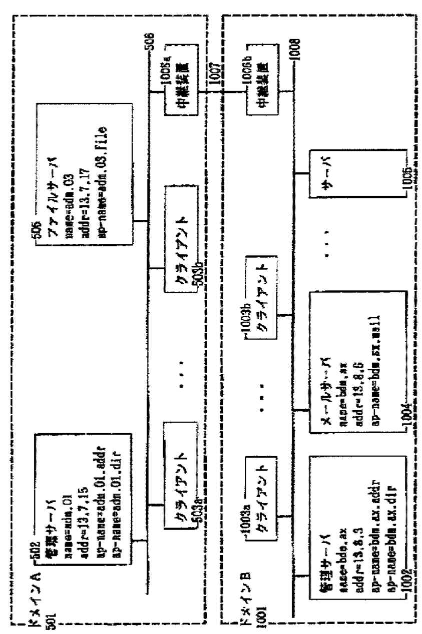
(54)【発明の名称】　コンピュータネットワーク構築方式および変更方式

(57)【要約】

【目的】　ノードの移設を考慮したアドレスおよび名称管理機能を持つコンピュータネットワーク構築方式および変更方式を提供することにある。

【構成】　ノードからのアドレス要求メッセージがあると、管理サーバはメッセージで指定されたノード名称が登録済なら既付与アドレスを割当て、未登録なら空きアドレスの中から選択して割当てる。また、メッセージ中のアドレスの有効期間の長さ指定に応じて割当てアドレスの有効期間を決定する。他ネットワークに属するノード名称を設定したアドレス要求メッセージがあると、管理サーバは、空きアドレスの中から選択してアドレスを割当て、更に現ネットワークの管理サーバへの変更情報メッセージを作成送出する。現ネットワークの管理サーバは、変更情報メッセージを受信し、変更情報に基づき接続変更されたノードに使用されていたアドレスを空きアドレスとして再使用可能にする。

【図10】



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【特許請求の範囲】

【請求項１】　アドレス要求メッセージを送信し自ノードのアドレスの割当てを管理サーバに要求するノードと、アドレスを要求するノードに対してアドレスを割り当てる管理サーバを有するノードを備えるコンピュータネットワークシステムにおけるコンピュータネットワーク構築方式であって、

前記要求するノードはアドレス要求メッセージにノード名称を設定する手段を備え、

前記管理サーバは、前記アドレス要求メッセージで指定されたノード名称をキーとして自管理サーバが既に付与し現在有効であるアドレスを有するノード名称に同一のものが有るか否か調べ、有るときには既に付与したアドレスを前記要求するノードに付与し、否のときには空きアドレスの中から選択して前記要求するノードにアドレスを付与する手段を備えることを特徴とするコンピュータネットワーク構築方式。

【請求項２】　請求項１記載のコンピュータネットワーク構築方式において、前記要求するノードはアドレス要求メッセージに割当てアドレスの有効期間の長さ指定を設定する手段を備え、前記管理サーバは、前記アドレス要求メッセージで指定された有効期間の長さ指定に基づき割当てアドレスの有効期間を決定する手段を備えることを特徴とするコンピュータネットワーク構築方式。

【請求項３】　アドレス要求メッセージを送信し自ノードのアドレスの割当てを管理サーバに要求するノードと、アドレスを要求するノードに対してアドレスを割り当てる管理サーバを有するノードを備える複数のネットワークからなるコンピュータネットワークシステムにおけるコンピュータネットワーク変更方式であって、

前記要求するノードは、自ノードが接続された現ネットワークから他ネットワークに接続を変更するとき、アドレス要求メッセージに他ネットワークに属すことを示すノード名称を設定する手段を備え、

前記他ネットワークの管理サーバは、前記アドレス要求メッセージで指定されたノード名称をキーとして自管理サーバが既に付与し現在有効であるアドレスを有するノード名称に同一のものが有るか否か調べ、有るときには既に付与したアドレスを前記要求するノードに付与し、否のときには空きアドレスの中から選択して前記要求するノードにアドレスを付与する手段と前記現ネットワークの管理サーバへの変更情報メッセージを作成送出する手段を備え、

前記現ネットワークの管理サーバは、前記変更情報メッセージを受信し、該変更情報に基づき前記接続変更された要求するノードに使用されていたアドレスを空きアドレスとして再使用可能にする手段を備えることを特徴とするコンピュータネットワーク変更方式。

【請求項４】　請求項３記載のコンピュータネットワーク変更方式において、

2

前記現ネットワークの管理サーバは、前記変更情報に基づき前記接続変更された要求するノードに使用されていた元のノード名称に対応して変更後のノード名称を別名として登録する手段を備えることを特徴とするコンピュータネットワーク変更方式。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、ＬＡＮ等のネットワークを用いたコンピュータシステムの計算機アドレス、名称管理方式に係り、特にシステム構築時、および構成変更時の構成変更操作の簡易化を図ることを特徴したコンピュータネットワーク構築方式および変更方式に関するものである。

【０００２】

【従来の技術】従来の技術は、特開平２－２２３３６号公報に記載されているように、アドレスサーバに対してアドレス問い合わせメッセージを送信し、その応答メッセージから自計算機のアドレスを取得し、記憶するものとなっていた。

【０００３】

【発明が解決しようとする課題】上述した従来の計算機アドレス管理方式では、ノード移設に伴いアドレスが変更された場合、移設前に使用していたアドレスを空きアドレスとしてリセットする手順が提供されていない。移設ノードから使用していたアドレスをメッセージの送受信処理を用いてリセットを行う場合には、移設に際し一度ノードを起動させ移設前のアドレスを空きアドレスとしてリセットさせる必要がある。また、アドレスサーバ側のローカルな操作でアドレス情報をリセットする方法もあるが、人手を介する必要があるという欠点があった。本発明の目的は、上述の点を鑑み、ノードの移設を考慮したアドレスおよび名称管理機能を持つコンピュータネットワーク構築方式および変更方式を提供することにある。

【０００４】

【課題を解決するための手段】本発明のコンピュータネットワーク構築方式では、自ノードのアドレスを割当て要求するノードはアドレス要求メッセージにノード名称を設定する手段を備え、アドレスを割り当てる管理サーバは、前記アドレス要求メッセージで指定されたノード名称をキーとして自管理サーバが既に付与し現在有効であるアドレスを有するノード名称に同一のものが有るか否か調べ、有るときには既に付与したアドレスを前記要求するノードに付与し、否のときには空きアドレスの中から選択して前記要求するノードにアドレスを付与する手段を備える。また、自ノードのアドレスを割当て要求するノードはアドレス要求メッセージに割当てアドレスの有効期間の長さ指定を設定する手段を備え、管理サーバは、前記アドレス要求メッセージで指定された有効期間の長さ指定に基づき割当てアドレスの有効期間を決定

する手段を備える。本発明のコンピュータネットワーク変更方式では、自ノードのアドレスを割当て要求するノードは、自ノードが接続された現ネットワークから他ネットワークに接続を変更するとき、アドレス要求メッセージに他ネットワークに属すことを示すノード名称を設定する手段を備え、前記他ネットワークの管理サーバは、前記アドレス要求メッセージで指定されたノード名称をキーとして自管理サーバが既に付与し現在有効であるアドレスを有するノード名称に同一のものが有るか否か調べ、有るときには既に付与したアドレスを前記要求するノードに付与し、否のときには空きアドレスの中から選択して前記要求するノードにアドレスを付与する手段と前記現ネットワークの管理サーバへの変更情報メッセージを作成送出する手段を備え、前記現ネットワークの管理サーバは、前記変更情報メッセージを受信し、該変更情報に基づき前記接続変更された要求するノードに使用されていたアドレスを空きアドレスとして再使用可能にする手段を備える。また、前記現ネットワークの管理サーバは、前記変更情報に基づき前記接続変更された要求するノードに使用されていた元のノード名称に対応して変更後のノード名称を別名として登録する手段を備える。

【0005】

【作用】本発明のコンピュータネットワーク構築方式では、ノードからのアドレス要求メッセージがあると、管理サーバは、アドレス要求メッセージで指定されたノード名称と同一のものが登録されていれば、既に付与したアドレスを割当て、同一のものが登録されていなければ、空きアドレスの中から選択して割当てをする。また、アドレス要求メッセージ中のアドレスの有効期間の長さ指定に応じて割当てアドレスの有効期間を決定する。コンピュータネットワーク変更方式では、ノードからの他ネットワークに属すことを示すノード名称を設定したアドレス要求メッセージがあると、管理サーバは、空きアドレスの中から選択してアドレスを割当て、さらに現ネットワークの管理サーバへの変更情報メッセージを作成して送出する。現ネットワークの管理サーバは、変更情報メッセージを受信し、変更情報に基づき接続変更されたノードに使用されていたアドレスを空きアドレスとして再使用可能にし、さらに現ネットワークの管理サーバは、変更情報に基づき接続変更されたノードに使用されていた元のノード名称に対応して変更後のノード名称を別名として登録する。

【0006】

【実施例】以下、（1）章から（2）章において、本実施例に示すネットワークシステムが稼働する環境について説明し、（3）章から（4）章において、ネットワーク構築時の手順について説明する。

【0007】（1）用語説明

本実施例で使われる用語について説明する。

（a）管理サーバ

管理サーバはネットワークシステムのアドレス情報、ディレクトリ情報を保持管理するサーバであり、アドレスを管理するアドレス管理サーバアプリケーション（以下、アドレスサーバ）と、名称を管理するディレクトリ管理サーバアプリケーション（以下、ディレクトリサーバ）の2つのサーバ機能から構成される。なお、ここでは、管理プログラム、制御プログラムをアプリケーションと呼ぶ。

（b）ドメイン

ドメインは管理サーバの管理範囲であり、本実施例のネットワークシステムを構成するノード、利用者端末、アプリケーション、周辺装置等は管理サーバの管理下に入る。

（c）論理アドレス

論理アドレスは、ノードに割り当てられたアドレスであり、広域に渡るネットワークを構築する場合にハードウェアアドレス（例えばMAC（Ｍｅｄｉａ　Ａｃｃｅｓｓ　Ｃｏｎｔｒｏｌ）アドレス）の仕様の違いを吸収したり、階層的なアドレス付けをすることにより宛先ノードへの経路選択を容易にすることができる。論理アドレスとしては、ＴＣＰ／ＩＰ（Ｔｒａｎｓｍｉｓｓｉｏｎ　Ｃｏｎｔｒｏｌ　Ｐｒｏｇｒａｍ／Ｉｎｔｅｒｎｅｔ　Ｐｒｏｔｏｃｏｌ）のＩＰアドレス、ＯＳＩ（Ｏｐｅｎ　Ｓｙｓｔｅｍｓ　Ｉｎｔｅｒｃｏｎｎｅｃｔｉｏｎ）のＮＳＡＰ（Ｎｅｔｗｏｒｋ　Ｓｅｒｖｉｃｅ　Ａｃｃｅｓｓ　Ｐｏｉｎｔ）アドレス等が知られている。本実施例では、”．”で区切られた3桁の数字列を使用する。

【0008】（d）アプリケーションアドレス

アプリケーションアドレスは、一つのノード上に複数のアプリケーション（管理プログラム、制御プログラム）が存在する場合、これを識別するために使用する。本実施例では、1桁の数字列を使用する。

（e）ノード名称

ノード名称は、ノードに割り当てられた名前であり、ヒューマンリーダブルな形でノードの識別を行うために使用する。

（f）アプリケーション名称

アプリケーション名称は、アプリケーションに割り当てられた名前であり、ヒューマンリーダブルな形でアプリケーションの識別を行うために使用する。

【0009】（g）有効期間

有効期間はアドレスサーバが割当てた論理アドレスの寿命（単位：分）であり、論理アドレス取得要求者はこの期間の間、割り当てられた論理アドレスを利用することができる。また、ノード起動時には以前に割り当てられた論理アドレスを削除しなければならない。このように、割り当てた論理アドレスに寿命を持たせたり、起動時削除することにより、ノードの移設等に伴う論理アド

レスの使用取り消し操作を省いている。

（ｅ）有効期間レベル

有効期間レベルは、アドレスサーバが割り当てる論理アドレスの有効期間に対する要求側の提案値であり、ｈｉｇｈ（長期的に割当てアドレスを利用したい場合）、ｍｅｄｉｕｍ（中期的に割当てアドレスを使用したい場合）、ｌｏｗ（短期的に割当てアドレスを利用したい場合）の３値の中から選択する。例えば、ファイルサーバとして据置型の高機能ワークステーションを使用する場合にはノードを移動させせることは少ないので”ｈｉｇｈ”を選択すると良い。この結果、アドレスサーバは寿命の長い有効期間を要求ノードに割り当てるため、論理アドレスの寿命経過に伴う再割当て要求処理が少なくなるとともに、論理アドレスが変更される可能性も少なくなる。また、頻繁にネットワークを移動して利用するような携帯用ワークステーションの場合には”ｌｏｗ”を選択すると良い。この結果、アドレスサーバは寿命の短い有効期間を要求ノードに割り当てるため、移動に伴って使用されなくなる論理アドレスを有効に再利用することができる。

【００１０】（２）実施例の全体構成

本実施例で対象とするネットワークシステムは以下のような特徴を備えている。

（ａ）本ネットワークシステムは外部記憶装置を備え、かつ比較的大きなメモリ及び計算能力を有したノード（以下、サーバ）、例えば据置型の高機能ワークステーションと、より制限されたメモリ及び計算能力しか有さないノードや外部記憶装置を持たないノード（以下、クライアント）、例えば携帯用ワークステーションから構築され、サーバがクライアントに不足する機能を補うことにより、クライアントの利用者であるアプリケーションプログラムや利用者に、より高機能で性能の良いサービスを提供する。

（ｂ）本ネットワークシステムはドメインという考え方を用いてアドレス管理、名称管理を行う。ドメインとは管理サーバの管理範囲のことであり、このようなドメインの概念を導入することにより管理範囲の分割を行い、論理アドレスの自動割り当て、論理アドレスや名称の変更に伴うデータベースの自動更新を実現する。

（ｃ）本ネットワークシステムはノード相互の情報転送形式は、宛先が設定されたメッセージという形で転送し、各ノードはメッセージに設定された宛先と、自ノード内のルート（宛先指定）テーブルに基づき受信メッセージの中継を行い、メッセージを正しい宛先にまで届ける機能を持っている。

【００１１】次に本ネットワークシステムの構成について説明する。図５は、本ネットワークシステム構成の一例を示す図である。本ネットワークシステムは、管理サーバ５０２によって管理される一つのドメインＡ（５０１）から構成されており、ドメインＡ内の各ノードはリ

ンク５０６により相互に接続されている。管理サーバ５０２はドメインＡ内の論理アドレスと名称を管理するノードであり、ノード名称”ｎａｍｅ＝ａｄｍ．０１”、論理アドレス”ａｄｄｒ＝１３．７．１５”が割り当てられており、アプリケーション名称”ａｐ－ｎａｍｅ＝ａｄｍ．０１．ａｄｄｒ”という名称を持つアドレスサーバと、アプリケーション名称”ａｐ－ｎａｍｅ＝ａｄｍ．０１．ｄｉｒ”という名称を持つディレクトリサーバが稼働する。また、メールサーバ５０４はメールサービスを提供するノードであり、このノードにはノード名称”ｎａｍｅ＝ａｄｍ．０２”が割り当てられており、アプリケーション名称として”ａｐ－ｎａｍｅ＝ａｄｍ．０２．ｍａｉｌ”を持つメールサーバアプリケーションが稼働する。ファイルサーバ５０５はファイル登録参照サービスを提供するノードであり、このノードにはノード名称”ｎａｍｅ＝ａｄｍ．０３”が割り当てられており、”アプリケーション名称としてａｐ－ｎａｍｅ＝ａｄｍ．０３．ｆｉｌｅ”を持つファイルサーバアプリケーションが稼働する。クライアント５０３ａ，ｂはドメインＡ内に存在するサーバの利用者であり、それぞれノード名称”ｎａｍｅ＝ａｄｍ．ｃｌｉｅｎｔ１”，”ｎａｍｅ＝ａｄｍ．ｃｌｉｅｎｔ２”が割り当てられている。尚、メールサーバ、ファイルサーバ、およびクライアントの各ノードの論理アドレスについては、ネットワークシステム構築時に管理サーバ５０２により動的に割当てが行われる。

【００１２】次に図１４を用いて、ネットワークシステムを構築する際に使用する名称体系について説明する。図１４は、図５、及び後述する図１０に示すネットワークシステムを構築する際に使用する名称体系を示す。”／”（１４０１）はドメインＡ（５０１）とドメインＢ（１００１）を取り纏める上位の名称である。”／”の直下の名称はドメインに一意に割り当てられる名称であり、”ａｄｍ”（１４０２）はドメインＡを示し、”ｂｄｍ”（１４０３）はドメインＢを示す。ドメイン名称の直下の名称はノードに一意に割り当てられる名称（１４０４，１４０５）であり、ドメイン名称と連結することによりノード名称が作られる。従って、ドメインＡの管理サーバ５０２のノード名称は”ａｄｍ．０１”、メールサーバ５０４のノード名称は”ａｄｍ．０２”、ファイルサーバ５０５のノード名称は”ａｄｍ．０３”となる。同様にドメインＢの管理サーバ１００２のノード名称は”ｂｄｍ．ａｘ”、メールサーバ５０４のノード名称は”ｂｄｍ．ｓｘ”となる。さらにその直下の名称は各ノード上のアプリケーションに一意に割り当てられる名称（１４０６，１４０７）であり、ノード名称と連結することによりアプリケーション名称が作られる。従って、ドメインＡのアドレスサーバアプリケーションのアプリケーション名称は”ａｄｍ．０１．ａｄｄｒ”、ディレクトリサーバアプリケーションのアプリケーショ

ン名称は”ａｄｍ．０１．ｄｉｒ”、メールサーバアプリケーションのアプリケーション名称は”ａｄｍ．０２．ｍａｉｌ”、ファイルサーバアプリケーションのアプリケーション名称は”ａｄｍ．０３．ｆｉｌｅ”となる。同様にドメインＢのアドレスサーバアプリケーションのアプリケーション名称は”ｂｄｍ．ａｘ．ａｄｄｒ”、ディレクトリサーバアプリケーションのアプリケーション名称は”ｂｄｍ．ａｘ．ｄｉｒ”、メールサーバアプリケーションのアプリケーション名称は”ｂｄｍ．ｓｘ．ｍａｉｌ”となる。

【００１３】図４はノードのハードウェア構成であり、図２はハードウェア構成例に従って作られたメールサーバ、ファイルサーバ及び、クライアントノードのソフトウェア構成例を示す。４０３はノード間を接続する回線の入出力等を制御する回線接続制御部、４０５は情報を外部記憶装置４０６に保存するために、外部記憶装置との入出力等を制御する制御部、４０７はキーボードからの入力、ディスプレイへの表示を制御する制御部であり、これらの制御部の中にそれぞれ存在するプロセサとプログラムとにより接続する装置の制御を行う。４０４はプログラムの他、アドレス情報及び受信メッセージを格納するメモリである。４０２はプロセサであり、ノード内ハードウェア間の制御を行う。４０４はメモリ、４０８はディスプレイ、キーボードである。

【００１４】２０２はメールサーバ、ファイルサーバアプリケーション、及びこれらアプリケーションにアクセスするためのプログラムである。２０３は管理サーバに論理アドレスを問合せ、応答を受信するためのプログラムである。２０４は装置の入出力を制御するリンク制御プログラムであり回線制御部４０３、外部記憶装置制御部４０５、端末入出力制御部４０７に置かれる。プログラムスケジューラ２０５は、２０３から２０４までのプログラム実行のスケジューリングと管理を行う。

【００１５】図３はハードウェア構成例に従って作られた管理サーバノードのソフトウェア構成例を示す。アドレスサーバ３０２は、ドメインＡ内の論理アドレス情報を管理する。ディレクトリサーバ３０３は、ドメインＡ内の名称情報を管理し、名称から論理アドレスやＡＰアドレスを導き、これらのアドレス情報をクライアントに提供する。リンク制御部３０４は、装置の入出力を制御するリンク制御プログラムであり、プログラムスケジューラ３０５は、３０２から３０４までのプログラム実行のスケジューリングと管理を行う。

【００１６】図６に、論理アドレスの取得、応答に使用するメッセージ形式を示す。（ａ）は、論理アドレスを取得するためにアドレスサーバに転送される要求メッセージである。ＬＩ６０１ａはメッセージの長さフィールドであり、タイプ６０２ａは本メッセージＡＤＤＲｒｅｑ（Ａｄｄｒｅｓｓ　ｒｅｑｕｅｓｔ）が論理アドレスを取得するために転送される情報であることを示し、アドレスサーバはこの情報を調べ要求メッセージを取り込む。ノード名称６０３ａは送信元ノード名称を設定するフィールドであり、その名称は送信元ノードの利用者が付与する。有効期間レベル６０４ａはアドレスサーバが割り当てる論理アドレスの有効期間に対する送信側の提案値である。履歴情報６０５ａは、ノード名称の変更が発生した場合に使用するフィールドである。（ｂ）は、論理アドレスを割り当てるためにアドレスサーバが送信する応答メッセージである。タイプ６０２ｂは本メッセージＡＤＤＲｒｅｓｐ（Ａｄｄｒｅｓｓ　ｒｅｓｐｏｎｓｅ）が割り当てた論理アドレスを通知するために転送される情報であることを示し、ノード名称６０３ｂは宛先ノード名称が設定され、論理アドレス６０６にはアドレスサーバが割り当てた論理アドレスが格納される。また、有効期間６０７は割当てた論理アドレスの寿命であり、アドレス取得要求者はこの期間（単位：分）の論理アドレスを利用することができる。（ｃ）は、ノード管理情報の再設定を行なう際にアドレスサーバに転送される要求メッセージであり、内容は（ａ）と同様である。これについては、後述の「（４－２）論理アドレスの取得」の項でさらに説明する。

【００１７】（３）ネットワークの新規構築
図５に示すネットワークシステムにクライアント５０３ａを新規に導入する場合について説明する。

【００１８】（３－１）ノード管理情報の設定
図１はノード管理情報の設定手順を示すフローである。ステップ１０２はノード名称の設定を確認する操作であり、クライアント５０３ａは新規導入のためノード名称が未設定なので、ステップ１０３でノード名称”ａｄｍ．ｃｌｉｅｎｔ１”を設定する。既にノード名称が設定されており、これを変更する場合にはステップ１０４を実行する。ステップ１０６ではノード名称の変更を確認し、変更があれば前回設定されていたノード名称を履歴情報として登録し（１０７）、なければ現在設定されているノード名称を履歴情報として登録する（１０８）。ステップ１０９は有効期間レベルの設定を確認する操作であり、クライアント５０３ａは新規導入のため有効期間レベルが未設定なので、ステップ１１０で有効期間レベルを設定するが、クライアント５０３ａがネットワークを移動して利用するような携帯用ワークステーションであることから、ステップ１１０の有効期間レベルとして”ｌｏｗ”を設定する。以降、クライアント５０３ａのノード起動時は、ここで設定されたノード名称、有効期間レベルに基づいてアドレス取得手順が実施される。既に有効期間レベルが設定されており、これを変更する場合にはステップ１１１を実行する。なお、フローにおいて、“→(1)”は“←(1)”への分岐、“→(2)”は“←(2)”への分岐を示す。

【００１９】次に、クライアント５０３ａにおけるアドレス取得手順を図７に従い説明する。

（３－２）論理アドレスの取得
図７は論理アドレス取得手順を示すフローである。ステップ７０２において図６の（ａ）に示す要求メッセージのノード名称フィールド６０３ａにノード名称”ａｄｍ．ｃｌｉｅｎｔ１”を設定、ステップ７０３において有効期間レベル”ｌｏｗ”をフィールド６０４ａに設定、ステップ７０４において履歴情報”ａｄｍ．ｃｌｉｅｎｔ１”をフィールド６０５ａに設定した後、要求メッセージを送信する（７０５）。次にステップ７０６で取得要求の応答を待ち、応答を受信できた場合には応答メッセージの論理アドレスのチェックを行い（７０７）、応答を受信できなかった場合には再度論理アドレスの取得手順を実行する（７１１ｄ）。ステップ７０７で受信論理アドレス値の確認を行い、”ｎｕｌｌ”ならば再度論理アドレスの取得手順（７１１ｃ）を実行し、それ以外ならば受信論理アドレスを登録後（７０８）、有効期間の減算手順にはいる（７１０）。また、有効期間の減算とともに、ステップ７０９，７１１ｂで現在使用している論理アドレスを継続するために、有効期間が切れる前に再度アドレス取得手順を実行する。なお、本実施例では全ての有効期間値を減算の対象としているが、ある特定の有効期間値（例えば有効期間値＝”９９９９”）を持つ論理アドレスについては、有効期間の減算及び、起動時の論理アドレス削除の対象からはずすことにより、一度割り当てられた論理アドレスを有効期間という時間的な制約無しに利用することも可能である。

【００２０】（３－３）論理アドレスの割当て
図８は管理サーバ５０２内のアドレスサーバにおける論理アドレスの割当て手順を示すフローである。ステップ８０２において要求メッセージを受信すると、ステップ８０３において要求メッセージのノード名称フィールド６０３ａに設定されたノード名称を参照する。ステップ８０３はノード名称のみを変更した場合に、論理アドレスを極力変更させないための処理であり、指定されノード名称の論理アドレスが、自アドレスサーバによって割り当てられたものであり、さらにその論理アドレスの割り当て有効期間が過ぎていない場合には、前回割り当てた論理アドレスと同一の論理アドレスを割り当てることにより、論理アドレス値の変更を極力抑えている。クライアント５０３ａは新規導入なので、アドレスサーバはステップ８０４の処理を行わず、ステップ８０５で空きアドレスを探し、論理アドレスとして使用されていない論理アドレス”１３．７．４”を割当て（８０６）、応答メッセージの論理アドレスフィールド６０６に”１３．７．４”を設定し、ステップ８０９で提案された有効期間レベルに従い有効期間をフィールド６０７に設定した後、応答メッセージを論理アドレス取得要求ノードに送信する（８１０）。また、ステップ８０８では他のアドレスサーバ、ディレクトリサーバに変更情報を通知する。

【００２１】図９に管理サーバ５０２が管理するアドレス情報、ディレクトリ情報を示す。アドレス情報９０１はアドレスサーバのデータベースであり、｛ノード名称９０２ａ，割り当て論理アドレス９０３ａ，残り有効期間９０４ａ｝の３項目から構成され、９０２ａ，９０３ａ，９０４ａはクライアント５０３ａに関するエントリ、９０２ｂ，９０３ｂ，９０４ｂはメールサーバ５０４に関するエントリ、９０２ｃ，９０３ｃ，９０４ｃはファイルサーバ５０５に関するエントリとなっている。ノード名称９０２ａは論理アドレス取得要求ノードの名称、論理アドレス９０３ａはアドレスサーバによって割り当てられた論理アドレス値、残り有効期間９０４ａはアドレスサーバが割り当てた論理アドレスの有効期間の残り時間である。アドレスサーバにおいてもステップ７０９に示すような有効期間の減算手順が実行され、残り有効期間がなくなった時点でこの論理アドレスは空きアドレスとして再利用する。ディレクトリ情報９０５はディレクトリサーバのデータベースであり、｛エントリ名称９０６ａ，論理アドレス９０７ａ，ＡＰアドレス９０８ａ，別名９０９ａ｝の４項目から構成され、９０６ａ，９０７ａ，９０８ａ，９０９ａはメールサーバ５０４に関するエントリ、９０６ｂ，９０７ｂ，９０８ｂ，９０９ｂはファイルサーバ５０５に関するエントリとなっている。エントリ名称９０６ａはディレクトリ情報として登録されるアプリケーション名称であり、論理アドレス９０７ａ、ＡＰアドレス９０８ａ、別名９０９ａはその属性値である。

【００２２】（４）ネットワークの再構成
図５に示すネットワークシステムを図１０に示すネットワークシステムに構成を変更する場合について説明する。図１０は、図５に示すネットワークシステムを拡張した構成の一例を示す図である。ドメインＡ（５０１）は管理サーバ５０２によって管理される一つの領域であり既存のネットワークシステムに相当する。ドメインＢ（１００１）は管理サーバ１００２によって管理される領域であり、新たに追加された領域である。ドメインＢ内の各ノードはリンク１００８により相互に接続され、さらに中継装置１００６ａ，１００６ｂとリンク１００７を用いてドメインＡとの相互接続を可能としている。管理サーバ１００２はドメインＢ内の論理アドレスと名称を管理するノードであり、利用者によってノード名称”ｎａｍｅ＝ｂｄｍ．ａｘ”、論理アドレス”ａｄｄｒ＝１３．８．３”が割り当てられており、アプリケーション名称として”ａｐ－ｎａｍｅ＝ｂｄｍ．ａｘ．ａｄｄｒ”を持つアドレスサーバと、アプリケーション名称として”ａｐ－ｎａｍｅ＝ｂｄｍ．ａｘ．ｄｉｒ”を持つディレクトリサーバが稼働する。メールサーバ１００４は、図５のドメインＡに置かれていたメールサーバ５０４を今回の再構成によりドメインＢ内に移設したものであり、ドメインＢへの移設に伴いノード名称が”ｎ

ａｍｅ＝ｂｄｍ．ｓｘ”に、アプリケーション名称が”ａｐ－ｎａｍｅ＝ｂｄｍ．ｓｘ．ｍａｉｌ”に名称が変更された。この他、ドメインＢ内には、各種サーバ１００５、クライアント１００３ａ，１００３ｂが存在する。

【００２３】以下、メールサーバ５０４をドメインＡからドメインＢへ移設する場合の処理手順について説明する。

（４－１）ノード管理情報の再設定

図１に従いメールサーバノード管理情報の再設定手順を説明する。移設に伴いノード名称が変更されたのでステップ１０４でノード名称”ｂｄｍ．ｓｘ”を設定し、ステップ１０６でノード名称の変更を確認後、ステップ１０７で前回設定されていたノード名称”ａｄｍ．０２”を履歴情報として登録する。また、有効期間については前回の設定値”ｈｉｇｈ”を使用するので、ステップ１０９から１１２の設定処理は行わない。

（４－２）論理アドレスの取得

図７に従いメールサーバノードの論理アドレス再取得手順について説明する。ステップ７０２において要求メッセージのノード名称フィールド６０３ｃにノード名称”ｂｄｍ．ｓｘ”を設定、ステップ７０３において有効期間レベル”ｈｉｇｈ”をフィールド６０４ｃに設定、ステップ７０４において履歴情報”ａｄｍ．０２”をフィールド６０５ｃに設定した後、要求メッセージを送信する（７０５）。なお、以降の論理アドレスの取得手順については、項番（３－２）のクライアント５０３ａの場合と同一の手順を踏むので説明を省略する。

（４－３）論理アドレスの割当てと更新

図８に従い管理サーバ１００２内のアドレスサーバによるメールサーバノードの論理アドレス割当て手順について説明する。テップ８０２において要求メッセージを受信すると、ステップ８０３において要求メッセージのノード名称を参照する。メールサーバ１００４はドメインＢにおいて新規導入のため、ステップ８０５で空きアドレスを探し、論理アドレスとして使用されていない論理アドレス”１３．８．６”を割当て、図６の（ｂ）と同様の応答メッセージの論理アドレスフィールド６０６に”１３．８．６”を設定し、ステップ８０９で提案された有効期間レベルに従い有効期間”９９９９”をフィールド６０７に設定した後、応答メッセージを論理アドレス取得要求ノードに送信する（８１０）。また、これに合わせてステップ８０８で他ドメインのアドレスサーバ、ディレクトリサーバに変更情報メッセージを通知する。

【００２４】図１１は、前記ステップ８０８で通知する変更情報を他ドメインのアドレスサーバ、自ドメイン及び他ドメインのディレクトリサーバに通知するための変更情報メッセージを示す。ＬＩ１１０１はメッセージの長さフィールドであり、タイプ１１０２は本メッセージＵＰＤＡＴＥ（Ａｄｄｒｅｓｓ　Ｕｐｄａｔｅ）が変更情報をアドレスサーバ、ディレクトリサーバに通知するための情報であることを示す。ドメインＡのアドレスサーバに変更情報を通知する場合には、宛先サーバ名称１１０３にはドメインＡのアドレスサーバ名称を設定し、送信元サーバ名称１１０４には自アドレスサーバ名称を設定する。変更情報１１０８には、アドレス取得要求ノードのノード名称１１０５として”ｂｄｍ．ｓｘ”、履歴情報１１０６として”ａｄｍ．０２”、論理アドレス１１０７として”１３．８．６”を設定する。また、ドメインＡのディレクトリサーバに変更情報を通知する場合には、宛先サーバ名称１１０３にはドメインＡのディレクトリサーバ名称を設定する。

【００２５】今回のメールサーバ５０４の移設に伴い、この変更情報メッセージは、管理サーバ１００２のアドレスサーバから、管理サーバ５０２のアドレスサーバ、ディレクトリサーバに通知される。変更情報メッセージを受信したドメインＡのアドレスサーバは、履歴情報１１０６をキーとして、ドメインＡ内のメールサーバ５０４に使用されていたアドレスエントリを捜し出したのちリフレッシュを行い、使用されていた論理アドレスを空き論理アドレスとして再使用可能な状態とする。

【００２６】図１２に、メールサーバ５０４移設に伴う論理アドレス、更新処理が完了した時点での管理サーバ５０２（ドメインＡ）のアドレスサーバ（５０２－１）と管理サーバ１００２（ドメインＢ）のアドレスサーバ（１００２－１）が管理するアドレス情報（１２０１，１２１１）を示す。１２０２ｂ，１２０３ｂ，１２０４ｂは管理サーバ１００２（ドメインＢ）のアドレス情報として格納されているドメインＢ内のメールサーバ５０４に関するエントリであり、メールサーバ５０４がドメインＢに移設され、論理アドレスの取得処理が行われた際に登録されたものである。１２０２ａ，１２０３ａ，１２０４ａは管理サーバ５０２（ドメインＡ）のアドレス情報として、メールサーバ５０４がドメインＡに存在していた時に使用されていたエントリであり、変更情報受信時にリフレッシュされ、現時点では空きエントリとなっている。

【００２７】次に変更情報更新後の管理サーバのディレクトリ情報について説明する。本ネットワークシステムにおけるディレクトリサーバアプリケーションは、ＩＳＯ９５９４に規定されるＯＳＩディレクトリに従う問い合わせ、登録情報の更新の他に、アドレスサーバとの間で登録情報の更新手順を持つ。図１３に、メールサーバ５０４移設に伴う論理アドレス、更新処理が完了した時点での管理サーバ５０２（ドメインＡ）のディレクトリサーバ（５０２－２）と管理サーバ１００２（ドメインＢ）のディレクトリサーバ（１００２－２）が管理するディレクトリ情報（１３０１，１３１１）を示す。変更情報メッセージを受信したドメインＡのディレクトリサ

ーバは、図１１に示す履歴情報１１０６をキーとして、ドメインＡ内のメールサーバ５０４に使用されていたディレクトリエントリ”ａｄｍ．０２．ｍａｉｌ”を捜し出したのち、図１１に示すノード名称１１０５からドメインＢに移設されたメールサーバアプリケーション名称”ｂｄｍ．ｓｘ．ｍａｉｌ”を生成する。次にドメインＡのディレクトリサーバは、図１１に示す変更情報として通知された論理アドレス”１３．８．６”（１１０７）と、ディレクトリ情報として格納されていたアプリケーションアドレス”５”（９０８ｂ）を持つエントリ”ｂｄｍ．ｓｘ．ｍａｉｌ”（１３０６ｂ，１３０７ｂ，１３０８ｂ，１３０９ｂ）の生成をドメインＢのディレクトリサーバに要求するとともに、ドメインＡ内のディレクトリ情報の１３０７ａ，１３０８ａをリフレッシュし、別名１３０９ａには移設されたメールサーバのアプリケーション名称”ｂｄｍ．ｓｘ．ｍａｉｌ”を登録する。以上のような処理を経て、ネットワーク再構成時の論理アドレスの割当て、名称の変更処理が終了する。

【００２８】

【発明の効果】１つのノードに複数のアドレスの割当てを防止でき、また、有効期間付きのアドレス割当てを行なうことができる。また、ノード移設による論理アドレスの変更に伴い、移設前に使用していた論理アドレスは、新たに論理アドレスの割当てが行われた時点で空き論理アドレスとなるため、論理アドレスを効率良く利用することができる。さらに、ノード移設に伴いノード名称が変更された場合にも、旧ノード名称に対応して新名称が登録されているので、旧ノード名称でのアクセスが可能である。

【図面の簡単な説明】

【図１】ノード管理情報の設定手順のフローを示す図である。

【図２】ハードウェア構成例に従って作られたメールサーバ、ファイルサーバ及び、クライアントノードのソフトウェア構成例を示す図である。

【図３】ハードウェア構成例に従って作られた管理サーバノードのソフトウェア構成例を示す図である。

【図４】ノードのハードウェア構成を示す図である。

【図５】本ネットワークシステム構成の一例を示す図である。

【図６】論理アドレスの取得、応答に使用するメッセージ形式を示す図である。

【図７】論理アドレス取得手順のフローを示す図である。

【図８】管理サーバ内のアドレスサーバにおける論理アドレスの割当て手順のフローを示す図である。

【図９】管理サーバが管理するアドレス情報、ディレクトリ情報を示す図である。

【図１０】図５に示すネットワークシステムを拡張した構成の一例を示す図である。

【図１１】変更情報メッセージの形式を示す図である。

【図１２】メールサーバ移設に伴う処理終了時点でのドメインＡの管理サーバのアドレスサーバとドメインＢの管理サーバのアドレスサーバが管理するアドレス情報を示す図である。

【図１３】メールサーバ移設に伴う処理終了時点でのドメインＡの管理サーバのディレクトリサーバとドメインＢの管理サーバのディレクトリサーバが管理するディレクトリ情報を示す図である。

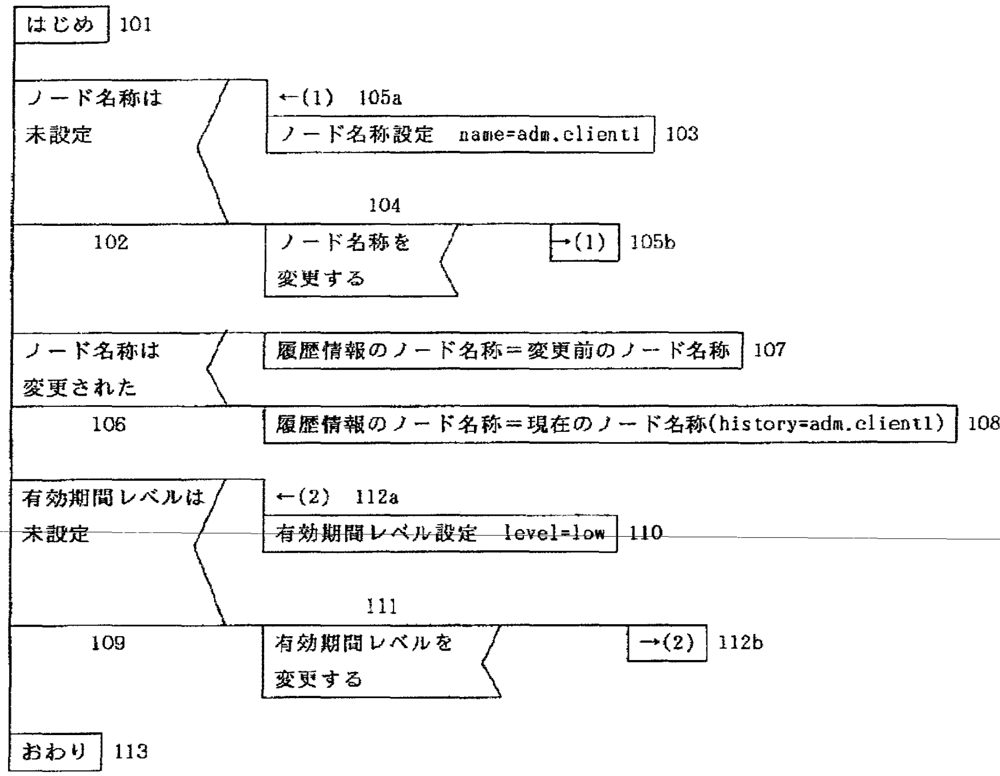
【図１４】ネットワークシステムを構築する際に使用する名称体系を示す図である。

【符号の説明】

４０２　プロセサ
４０３　回線制御部
４０５　外部記憶装置制御部
４０６　外部記憶装置
４０７　端末入出力制御部
４０８　ディスプレイ、キーボード
５０２、１００２　管理サーバ
５０３ａ、５０３ｂ、１００３ａ、１００３ｂ　クライアント
５０４、１００４　メールサーバ
５０５　ファイルサーバ
１００６ａ、１００６ｂ　中継装置
１００５　サーバ

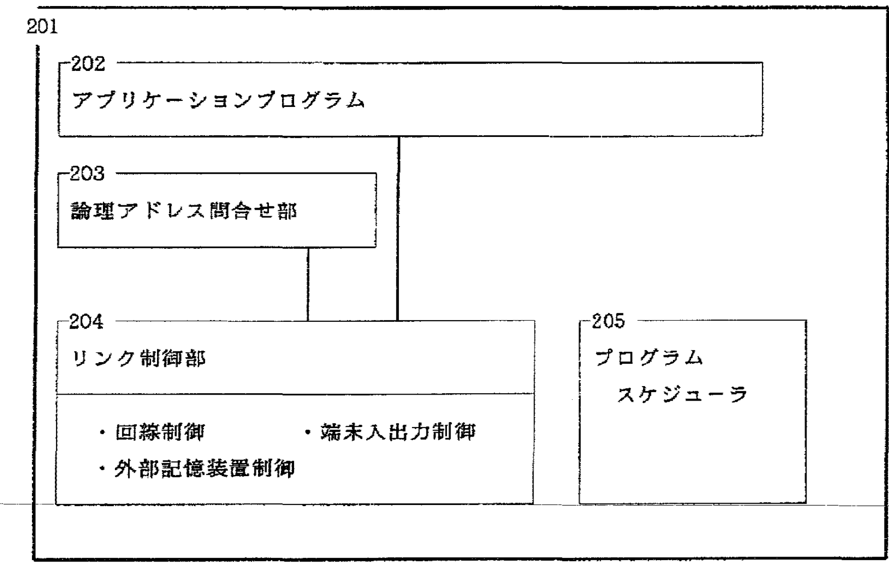
【図1】

【図1】


はじめ
101
ノード名称は
未設定
←(1)
105a
ノード名称設定　name=adm.client1
103
104
102
ノード名称を
変更する
→(1)
105b
ノード名称は
変更された
履歴情報のノード名称＝変更前のノード名称
107
106
履歴情報のノード名称＝現在のノード名称(history=adm.client1)
108
有効期間レベルは
未設定
←(2)
112a
有効期間レベル設定　level=low
110
111
109
有効期間レベルを
変更する
→(2)
112b
おわり
113

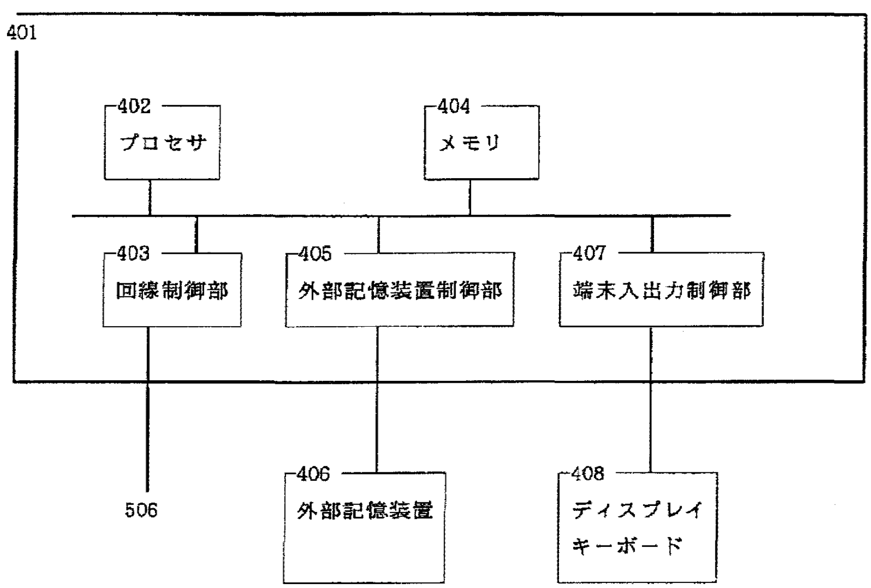
【図２】

【図２】


201
202
アプリケーションプログラム
203
論理アドレス問合せ部
204
リンク制御部
・回線制御
・端末入出力制御
・外部記憶装置制御
205
プログラム
スケジューラ

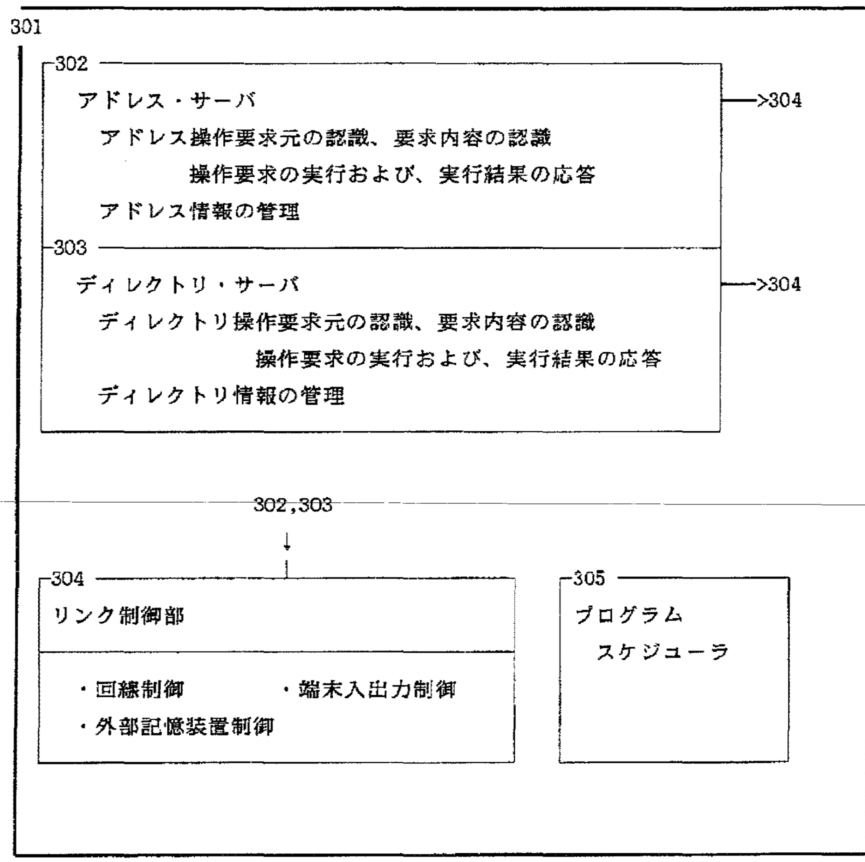
【図４】

【図４】


401
402
プロセサ
404
メモリ
403
回線制御部
405
外部記憶装置制御部
407
端末入出力制御部
506
406
外部記憶装置
408
ディスプレイ
キーボード

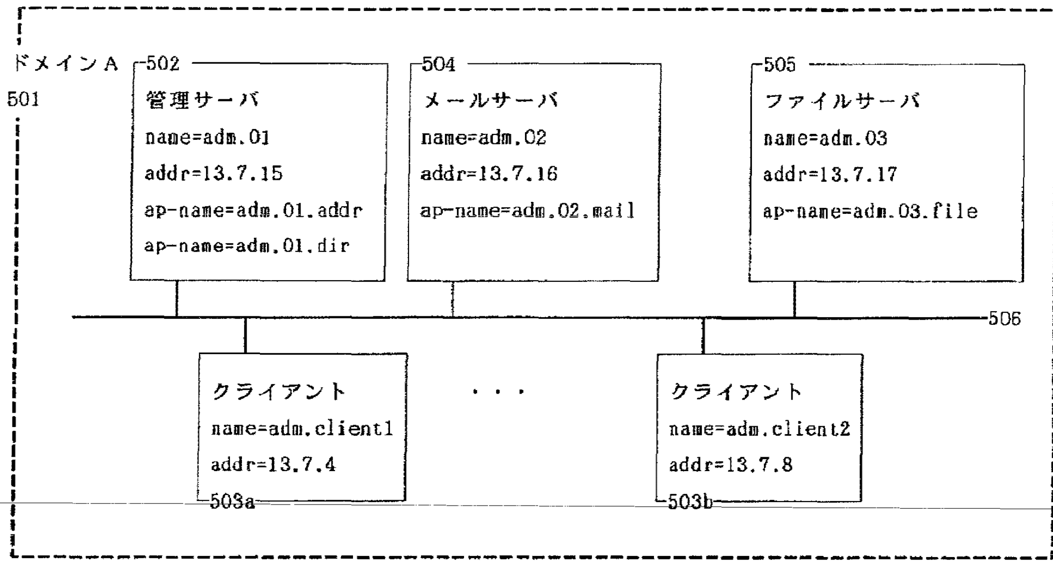
【図3】

【図3】


301
302
アドレス・サーバ
アドレス操作要求元の認識、要求内容の認識
操作要求の実行および、実行結果の応答
アドレス情報の管理
>304
303
ディレクトリ・サーバ
ディレクトリ操作要求元の認識、要求内容の認識
操作要求の実行および、実行結果の応答
ディレクトリ情報の管理
>304
302,303
304
リンク制御部
・回線制御
・端末入出力制御
・外部記憶装置制御
305
プログラム
スケジューラ

【図5】

【図5】



【図6】

【図6】

(a)

L I	タイプ	ノード名称	有効期間レベル	履歴情報
	ADDRreq	adm.client1	low	adm.client1
601a	602a	603a	604a	605a

(b)

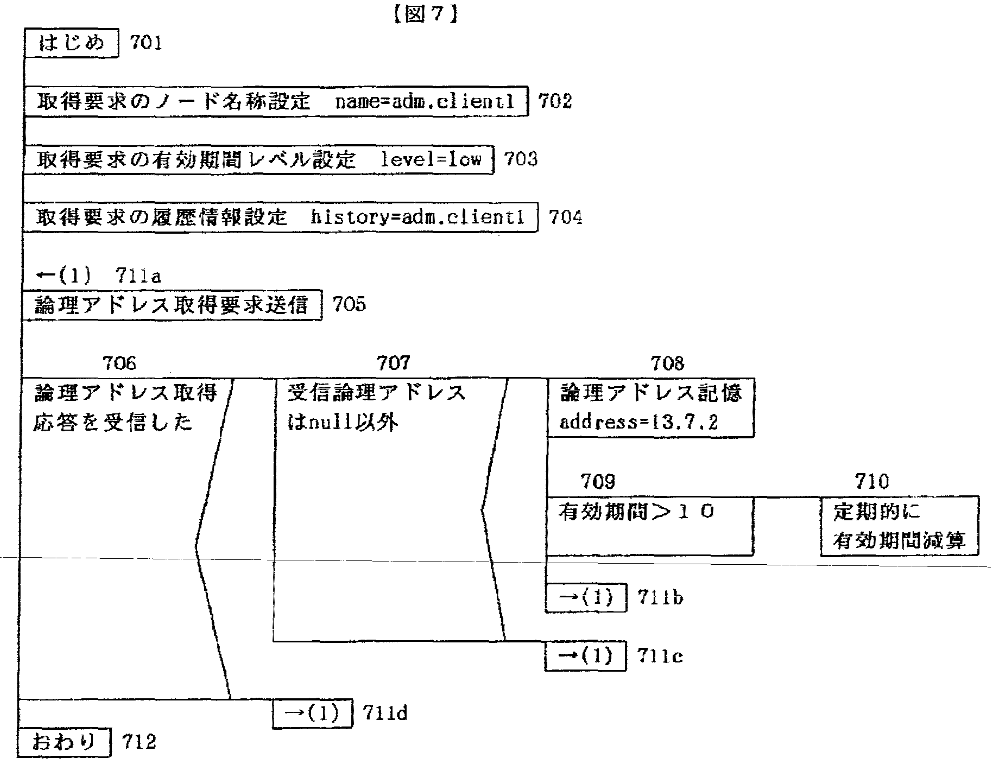
L I	タイプ	ノード名称	論理アドレス	有効期間
	ADDRresp	adm.client1	13.7.4	1000
601b	602b	603b	606	607

(c)

L I	タイプ	ノード名称	有効期間レベル	履歴情報
	ADDRreq	bdm.sx	high	adm.02
601c	602c	603c	604c	605c

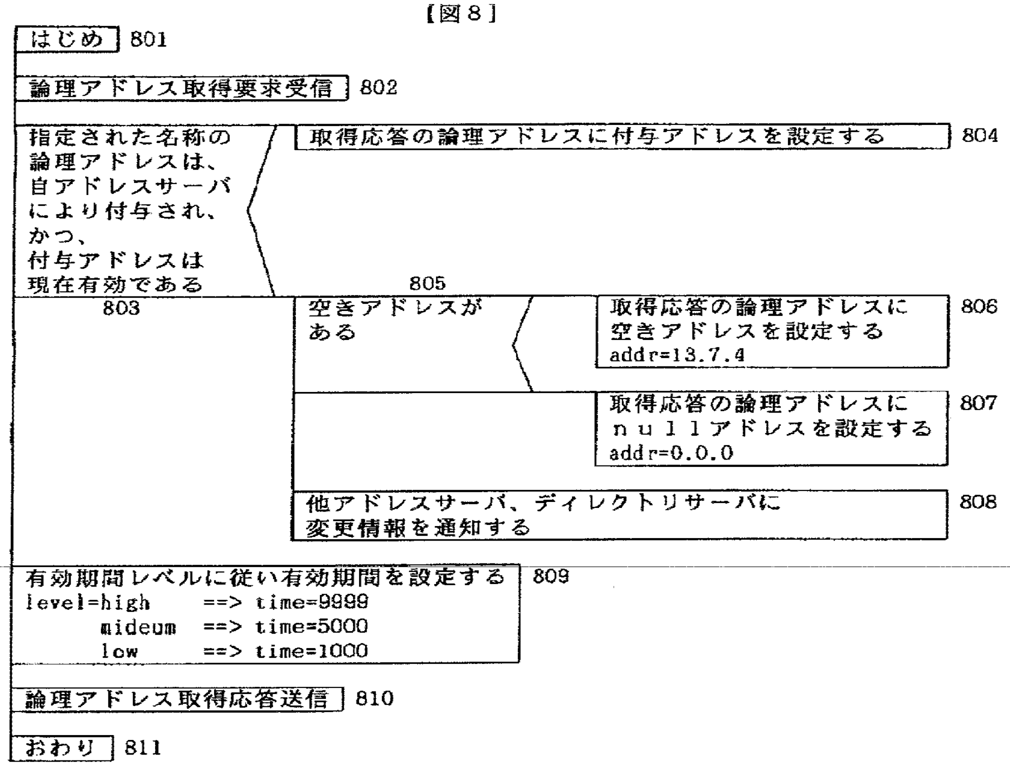
【図7】

【図7】


はじめ 701
取得要求のノード名称設定 name=adm.client1 702
取得要求の有効期間レベル設定 level=low 703
取得要求の履歴情報設定 history=adm.client1 704
←(1) 711a
論理アドレス取得要求送信 705
706
論理アドレス取得応答を受信した
707
受信論理アドレスはnull以外
708
論理アドレス記憶 address=13.7.2
709
有効期間＞１０
710
定期的に有効期間減算
→(1) 711b
→(1) 711c
→(1) 711d
おわり 712

【図8】

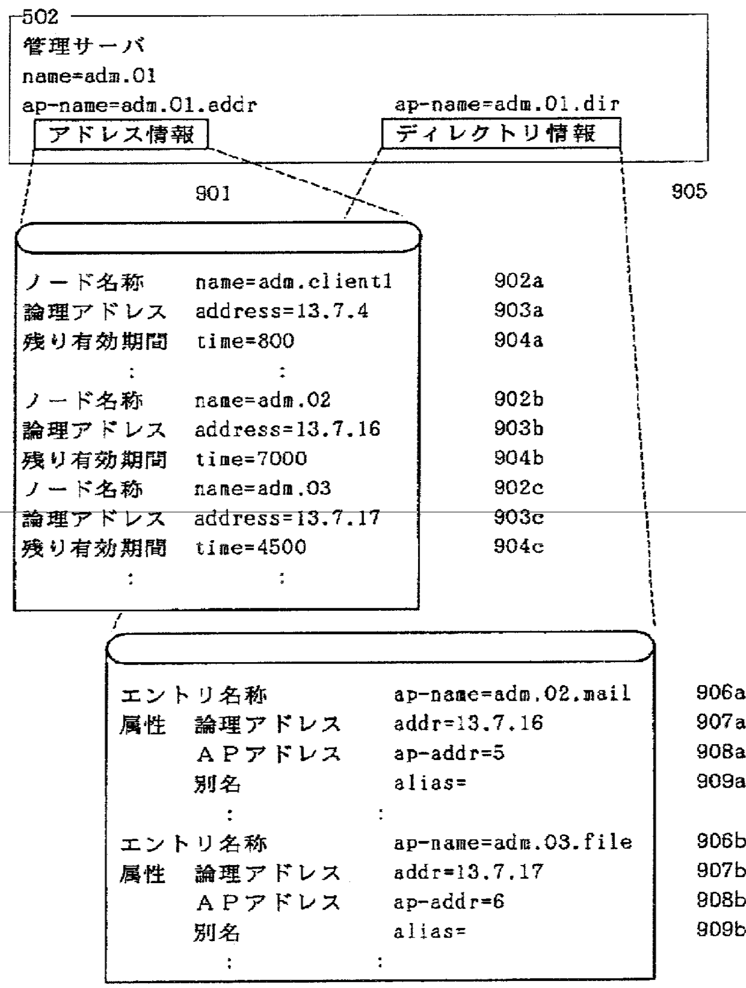
【図8】



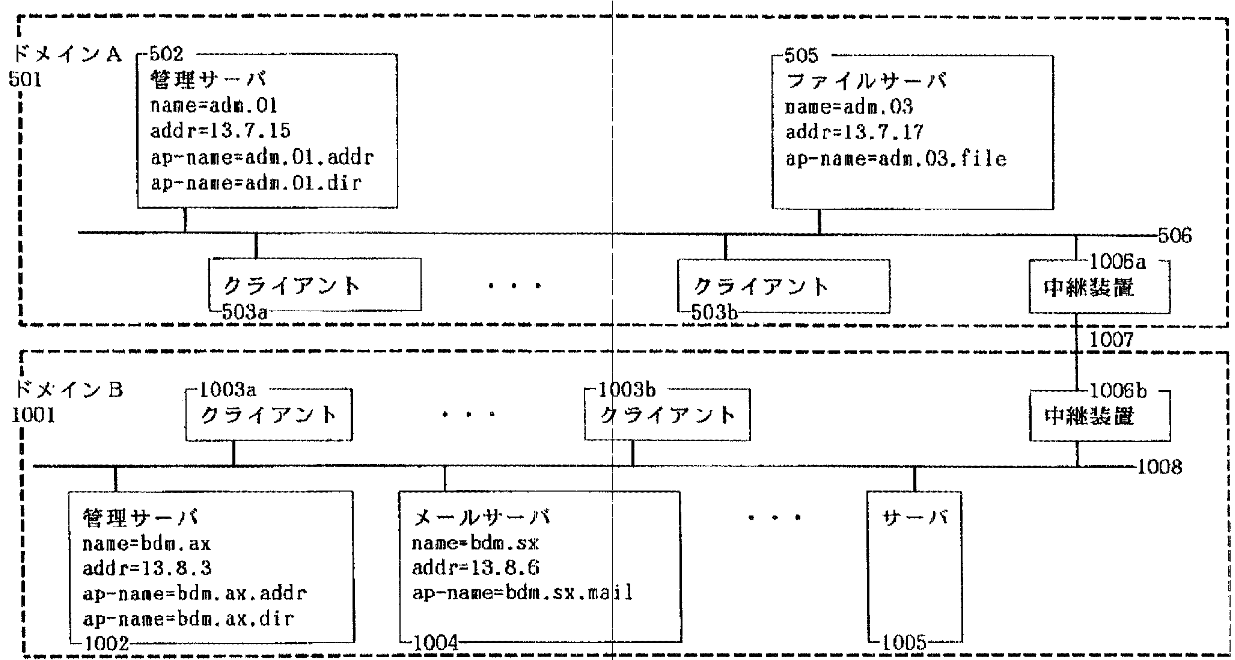
はじめ 801
論理アドレス取得要求受信 802
指定された名称の論理アドレスは、自アドレスサーバにより付与され、かつ、付与アドレスは現在有効である
803
取得応答の論理アドレスに付与アドレスを設定する 804
空きアドレスがある
805
取得応答の論理アドレスに空きアドレスを設定する addr=13.7.4 806
取得応答の論理アドレスにｎｕｌｌアドレスを設定する addr=0.0.0 807
他アドレスサーバ、ディレクトリサーバに変更情報を通知する 808
有効期間レベルに従い有効期間を設定する 809
level=high ==> time=9999
mideum ==> time=5000
low ==> time=1000
論理アドレス取得応答送信 810
おわり 811

【図9】

【図9】


502
管理サーバ
name=adm.01
ap-name=adm.01.addr
ap-name=adm.01.dir
アドレス情報
ディレクトリ情報
901
905
ノード名称 name=adm.client1 902a
論理アドレス address=13.7.4 903a
残り有効期間 time=800 904a
ノード名称 name=adm.02 902b
論理アドレス address=13.7.16 903b
残り有効期間 time=7000 904b
ノード名称 name=adm.03 902c
論理アドレス address=13.7.17 903c
残り有効期間 time=4500 904c
エントリ名称 ap-name=adm.02.mail 906a
属性 論理アドレス addr=13.7.16 907a
ＡＰアドレス ap-addr=5 908a
別名 alias= 909a
エントリ名称 ap-name=adm.03.file 906b
属性 論理アドレス addr=13.7.17 907b
ＡＰアドレス ap-addr=6 908b
別名 alias= 909b

【図１０】

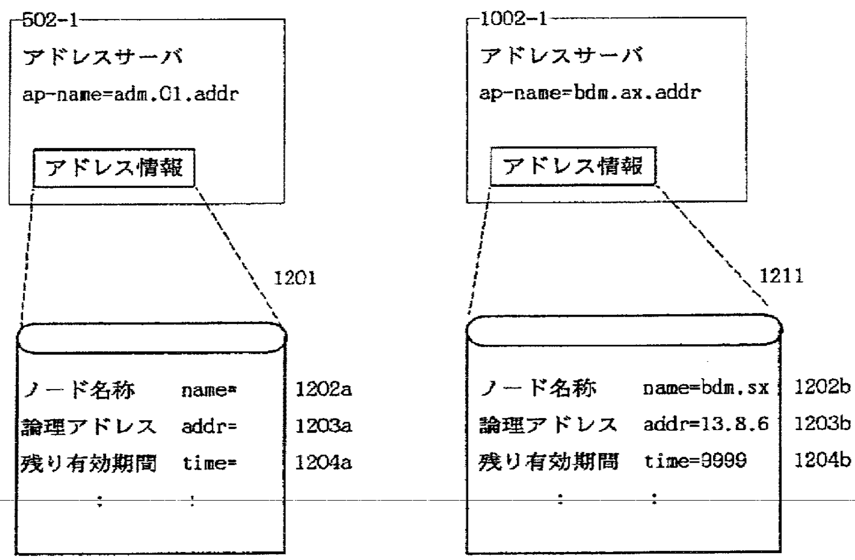


【図１１】

				変更情報 1108		
ＬＩ	タイプ	宛先サーバ名称	送信元サーバ名称	ノード名称	履歴情報	論理アドレス
	UPDATE	adm.01.addr	bdm.ax.addr	bdm.sx	adm.02	13.8.6
1101	1102	1103	1104	1105	1106	1107

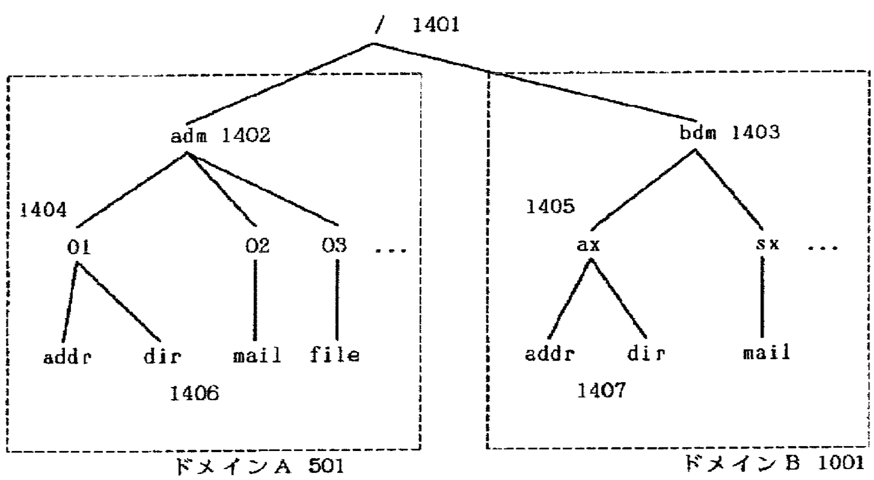
【図１２】

【図１２】



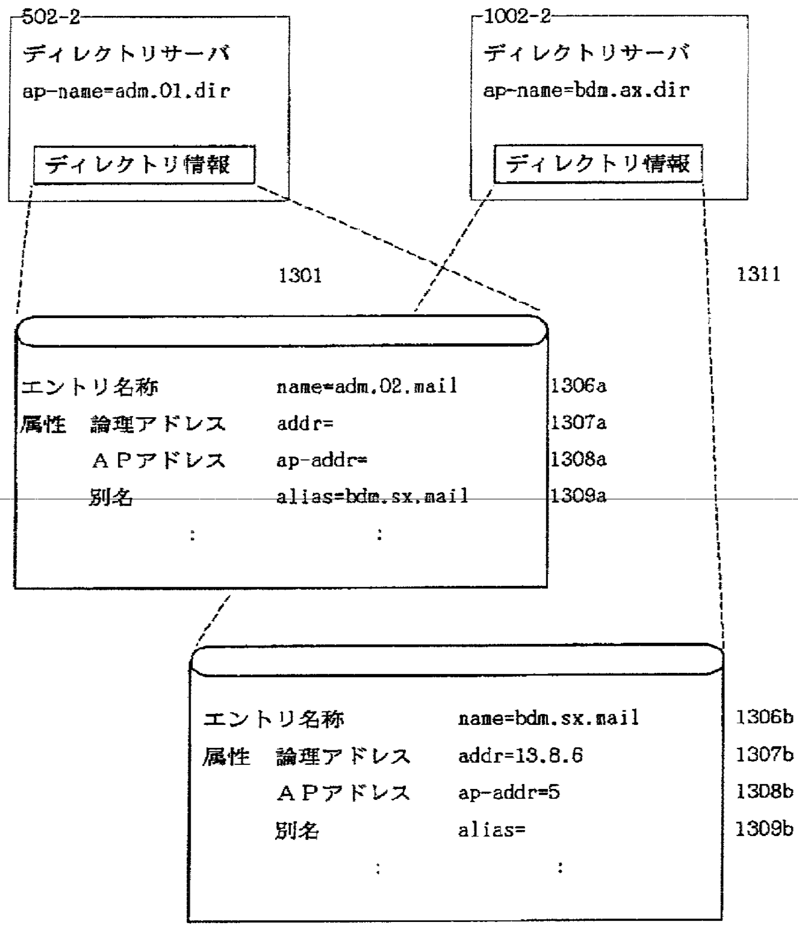
【図１４】

【図１４】



【図13】

【図13】


502-2
ディレクトリサーバ
ap-name=adm.01.dir
ディレクトリ情報
1002-2
ディレクトリサーバ
ap-name=bdm.ax.dir
ディレクトリ情報
1301
1311
エントリ名称　name=adm.02.mail　1306a
属性　論理アドレス　addr=　1307a
ＡＰアドレス　ap-addr=　1308a
別名　alias=bdm.sx.mail　1309a
エントリ名称　name=bdm.sx.mail　1306b
属性　論理アドレス　addr=13.8.6　1307b
ＡＰアドレス　ap-addr=5　1308b
別名　alias=　1309b

MULTIPLEX TRANSMISSION SYSTEM OF VOICE AND DATA

Patent Number: JP59044140

Publication date: 1984-03-12

Inventor(s): KIMURA JIYUNICHI; others: 01

Applicant(s):: NIPPON DENKI KK

Requested Patent: JP59044140

Application Number: JP19820154915 19820906

Priority Number(s):

IPC Classification: H04J6/02 ; H04M11/06

EC Classification:

Equivalents:

Abstract

PURPOSE:To improve transmission efficiency by preventing transmitted data from being erased when data information is transmitted by mixing said information with voice information during the transmission at the multiplex transmission of voice data.
CONSTITUTION:Voice packet information is stored in a voice information memory part 61 of a voice transmission queuing part 6 by a voice receiving channel 11 in the terminating order, and data packet information is stored in a data information memory part 71 of a data transmission queuing part 7 by a data receiving channel 12 in the terminating order. A status control transmission part 29 is a main part of a communication control transmission part 22 and consists of a transmission packet memory part 291 storing transmission information, a frame check code formation part 293 and an interruption code adding part 292 preparing the addition of an interruption display code to the interrupted data packet information as an interruption information and the addition of an information completion code. A communication control receiving part 25 includes a discrimination part 252 to discriminate and store the interruption code.

w/English translation attached

(19) 日本国特許庁 (JP)　　(11) 特許出願公開

(12) 公開特許公報 (A)　　昭59—44140

(51) Int. Cl.3	識別記号	庁内整理番号	(43) 公開 昭和59年(1984) 3月12日
H 04 J 6/02		6914—5K	
H 04 M 11/06		A 7345—5K	発明の数 1
			審査請求 有

(全 11 頁)

(54) 音声・データ多重化伝送方式

(21) 特　　願　昭57—154915

(22) 出　　願　昭57(1982) 9月6日

(72) 発 明 者　木村順一
東京都港区芝五丁目33番1号日本電気株式会社内

(72) 発 明 者　坂本明男
東京都港区芝五丁目33番1号日本電気株式会社内

(71) 出 願 人　日本電気株式会社
東京都港区芝5丁目33番1号

(74) 代 理 人　弁理士 内原晋

明　　細　　書

1　発明の名称

音声・データ多重化伝送方式

2　特許請求の範囲

(1)　データ通信回線で転送中のデータ情報に音声情報を割込ませ時分割多重化して伝送する音声・データ多重化伝送方式において、第1のフレームでデータ情報を転送中に音声情報の転送要求が発生したとき転送済みのデータ情報の後に中断情報を加えて新しく第2のフレームを形成し、前記第1のフレームの未転送データ情報を第3のフレームに移し、転送要求のあった前記音声情報を新しいフレームに形成して前記第2のフレームに続けて転送し、前記第3のフレームは待合せ音声情報のすべてを転送した後に転送し、かつこの第3のフレームが前記第1のフレームにおいて分割された最終データ情報であるときはこの最終データ情報の後に完了情報を加え最終フレームとして転送することを特徴とする音声・データ多重化伝送方式。

(2)　フレーム分割するとき送信済データ情報に続けて中断情報を、またフレーム分割された最終データ情報には続けて完了情報を付加し、中断されたデータ情報メモリに中断情報を書込む割込情報付加手段を送信側に備えることを特徴とする特許請求の範囲第(1)項記載の音声・データ多重化伝送方式。

(3)　受信フレームの最後に前記中断情報を持つデータ情報を並べ、前記完了情報を持つデータ情報の受信でまとめて継続再生する分割情報識別・蓄積・再生手段を受信側に備えることを特徴とする特許請求の範囲第(1)項記載の音声・データ多重化伝送方式。

3.　発明の詳細な説明

本発明は、同一通信回線に音声とデータとの情報を混在させて通信を行う音声・データ多重化伝送方式に関する。

一般に、音声通信とデータ通信とは種々の相違点がある。例えば、データ通信は即時性を重要視せず、端末間の伝送遅延を生じても許されるが、対話形式である音声通信は即時性が厳しく要求され、端末間の遅延を実用上差支えないように小さくする必要がある。又、トラヒックの点からみると、データ通信はデータの発生がランダムに近い上その長さは広い範囲で多種多様であるのに対し、音声通信は呼の発生がランダムに近くても音声呼の伝送情報は集中する傾向にあり、しかも音声として送信すべき情報は周期的に発生しその長さは短かく一定である。

近年、このような性質の異る音声通信とデータ通信とを同一の通信回線に多重化して伝送する複合通信システムが開発されている。

従来の音声・データ多重化伝送方式は、データを送信中に音声の送信要求が発生すると、送信中のデータが中断され音声が送信されたが、再び始めから前記データが送信される。

従来の音声・データ多重化伝送方式についてパケット通信を例とし第1図及び第2図を参照して説明する。第1図は従来の音声・データ多重化伝送方式の一構成例を示すブロック図、また第2図は第1図において同一通信回線に音声パケット情報とデータパケット情報とを多重化伝送するときの時間関係を示すタイムチャートである。

第1図において、通信回線1を挟んで送信側及び受信側にそれぞれ回線送信部3及び回線受信部4があり、パケット情報を順次送受信する。通信制御送信部2は、音声送信チャンネル11からの音声パケット情報とデータ送信チャンネル12からのデータパケット情報とを受け回線送信部3を経て通信回線1へ転送する。回線受信部4から情報を受けた通信制御受信部5は音声パケット情報を音声受信チャンネル13へ、又データパケット情報をデータ受信チャンネル14へ送る。通信制御送信部2は音声送信チャンネル11からの音声パケット情報を到着順に並べる音声用送信待行列部6と、データパケット情報を到着順に並べるデータ用送信待行列部7と、音声用送信待行列部6で待つ音声パケット情報を引出し、この待ちが無くなるとデータ用送信待行列部7で待つデータパケット情報を引出し次段の回線制御送信部9へ送るが、音声パケット情報が音声用送信待行列部6に入ったことを検知したときは、データパケット情報が送出中でもこの送出を停止し、前記音声パケット情報をその待ちが無くなるまで送出する待行列制御部8と、受信するパケット情報を受けその前にアドレス符号A，制御符号C（音声パケット情報の伝送には付加されない）を付加し一フレームの終りにフレームチェックシーケンス符号FCSを付加する回線制御送信部9とを備える。

次に伝送パケット情報のフォーマットについて説明する。伝送されるパケットは第1ビットから第8ビットまでの8ビットでオクテットを構成し、たとえばユーザデータ最大126オクテットを含む情報が送信チャンネル11，12から送信待行列6，7へ送られ記憶される。この送信待行列6，7から伝送のために回線制御送信部9へ引き出された一つの情報は、その情報の前にアドレス符号A，制御符号C（符号Cは音声のときにない）のそれぞれ1オクテットが付加される。通信回線へは、各フレームの区切りとしてフレーム開始にフラグシーケンス符号Fの1オクテットを第1ビットから順に送信し、続いてアドレス符号A，制御符号C（音声にはない），パケット情報の順に、それぞれのオクテットは第1ビットから順列に、送信される。（第2図のフレーム・フォーマット参照）。各オクテットの送信は第8ビットの送信後に送信完了し、次のオクテットの第1ビット送信までの時間内に更に次の送信オクテットの準備をさせる。フレームチェックシーケンス符号FCSは、オクテット単位にアドレス符号Aのオクテットから生成多項式によりCRC（巡回符号チェック）演算を行って作成し、パケット情報の最後のオクテット送信に続いて送信する。続いてフレーム終了を意味するフラグシーケンス符号Fを送信するが、続くパケット情報がある場合には次のフレームの最初を兼ねる符号Fとなる。

次に第3図及び第4図によりパケット情報の送

信手順を説明する。第3図は送信要求あるパケット情報を受信、記憶してから送信するまでの手順を示すフローチャート、又第4図はパケット情報のフレーム終結手順を示すフローチャートである。
まずデータパケット情報D1の例で説明する。動作ステップS0はデータパケット情報D1を状態制御送信部9に記憶し、フラグシーケンス符号Fの送信を指示する動作を示す。動作ステップS1はこの指示による符号Fの送信動作を示す。符号Fの送出が終ると動作ステップS2によりこの一オクテット（8ビット）の送信確認をする。動作ステップS19は、前に続き今回のパケット情報D1の転送をするとき、動作ステップS1の送信確認以前に前のパケット情報を消去し、今回のデータパケット情報D1を転送する動作である。前記動作ステップS1に続き記憶から引出されたアドレス符号Aが動作ステップS3で送信される。動作ステップS4は送信中の符号Aに対するCRC演算を行う動作である。動作ステップS5は符号Aの一オクテット及びこれに続く8ビット毎の一オクテット送信終了毎にそれぞれ送信確認する動作を示す。動作ステップS6は動作ステップS4に続いて順次送信する一オクテット分を示す。動作ステップS7は動作ステップS5に引き続き、符号Aのオクテットから送信中のオクテットまでに対しCRC演算し剰余を記憶する動作を示す。動作ステップS8は動作ステップS5に続いて、音声パケット情報の待合せの有無（音声パケット情報送信の場合は省略される）及び待合せ無しのときは動作ステップS6の次に送信すべきオクテットの有無を調べる動作を示す。（第6図のデータ分割の有無は本発明による動作のため後で説明する。）動作ステップS9は、音声待，未送信オクテット共に無しのとき、動作ステップS7で記憶した演算結果をフレームチェックシーケンス符号FCSとして送信する指示の動作を示す。第4図において、動作ステップS10で一オクテット送信中に次に送信すべきオクテットが記憶されていないことから動作ステップS9が符号FCSの送信を指示するため、動作ステップS10に続いて符号FCSの二オクテット分を送信する動作ステップS11がある。動作ステップS12は動作ステップS10の一オクテット送信確認動作を示す。動作ステップS13は符号FCSの前半の一オクテットに対する送信確認動作を示し、動作ステップS14は符号FCS送信に続くフラグシーケンス符号Fの送信動作を示す。動作ステップS15で符号Fの一オクテットが送信され、動作ステップS16が符号FCSの後半の一オクテットに対する送信確認することにより、動作ステップS17で音声パケット情報待合せの有無及びデータパケット情報待合せの有無をチェックする。動作ステップS18は送出済データパケット情報D1をメモリから消去する動作を示し、動作ステップS19は待合せている場合はデータのパケット情報を状態制御送信部9に転送する動作を示す。音声パケット情報の送信も上記同様の動作手順である。

データパケット情報D1の送信中に音声パケット情報V1の送信要求が発生したときに、各オクテット送信後の動作ステップS5（送信確認）に続く動作ステップS8でチェックして音声パケット情報の待合せを知る。従来の状態制御送信部2は動作ステップS8で音声パケット情報V1の待合せを知ると直ちに7ビット以上連続して"1"を送る放棄信号を送信して、これまで送信した途中までのデータパケット情報D1を状態制御送信部5の記憶から消去し、待合せ中の音声パケット情報V1を新たに記憶してゆく。音声パケット情報が前記同様の動作手順で送信終了すると、先に中断したデータパケット情報D1が再び状態制御送信部9に記憶され改めて初めから送信される。データ用送信待行列部7のデータパケット情報の記憶は、状態制御送信部9へ転送した分がすべて送信し終った後消去され、データ用送信待行列部7内の待合せ順序が一つ先へ進む。

一方受信手順は第5図及び第6図のフレーム受信手順を示すフローチャートにより説明する。まずフラグシーケンス符号Fの一オクテット分を第1ビットから第8ビットまで動作ステップS30

て受信する。動作ステップS31は符号Fに続くアクセス符号Aの一オクテット受信動作であり、動作ステップS32はフレーム開始の符号Fの識別動作である。動作ステップS31で受信した符号は動作ステップS34で符号Aと識別され、動作ステップS35で受信オクテットが符号Fでないと判断されると動作ステップS37で今後受信する情報が音声かデータかを区別する。動作ステップS33は符号Aに続くオクテットの受信動作で、データパケット情報受信の場合は制御符号Cが受信される。また動作ステップS36では符号A以後の受信オクテットに対し定められた生成多項式によるCRC演算を行う。各オクテット受信後は、動作ステップS39で符号識別し、動作ステップS40で符号Fでないと判断したときは動作ステップS41で前記同様CRC演算を行う。（動作ステップS42は本発明のために追加される動作で後で説明する。）第6図において、動作ステップS44,S45,S46は前記第5図における動作ステップS39,S40,S41と同じである。動作ステップS43でフレーム終結を意味するフラグシーケンス符号Fを受信するとき、動作ステップS49は符号Fを識別し、動作ステップS50で符号Fの確認後、動作ステップS51は符号Fの直前に受信したオクテットまでのCRC演算結果をビットパターンチェックする動作をする。音声情報受信の場合には、このビットパターンチェックの良否に拘らず、動作ステップS52でこの音声情報を次の段階へ転送するが、データ情報の場合、チェック結果が不良のときは動作ステップS53により送信側に再送要求動作し、チェック結果が良いときに動作ステップS57により音声の場合と同様、次の段階へこのデータ情報を転送する。（動作ステップS54,S55,S56は本発明のために追加される動作であり、後で説明する。）図面に示していないが、受信ビットが連続して七つ"1"のときは放棄信号を受信し、これまで受信し通信制御受信部5内に記憶したものは直ちに消去し、次の受信はフレーム開始の符号Fから改めて受信が始まる。途中まで転送し、音声パケット情報V1に割込まれたデータパケット情報D1は音声用送信待行列部6で待つ音声パケット情報のすべてを送信した後に再び最初から送信される。この場合、放棄されたデータパケット情報D10の転送時間分だけ通信回線1の伝送時間が無効となり、音声が多い場合は殆んどデータの伝送ができず、その回線のすべてを無効とする可能性が大きい。

このように従来の音声・データ多重化伝送方式には、データ情報を送信中に音声情報を割込ませて送信するときそれまで送信済のデータが放棄されるので、放棄されたデータ情報分の伝送時間が無駄となり通信回線の伝送効率が低下するという欠点がある。

本発明の目的は上記欠点を除去し、音声とデータとを多重化伝送する通信回線の伝送効率を改善できる音声・データ多重化伝送方式を提供することにある。

本発明による音声・データ多重化伝送方式は、同一通信回線で送信中のデータ情報に音声情報を割込ませ時分割多重化して伝送する音声・データ多重化伝送方式において、第1のフレームでデータ情報を転送中に音声情報の転送要求が発生したとき転送済みのデータ情報の後に中断情報を加えて新しく第2のフレームを形成し、前記第1のフレームの未転送データ情報を第3のフレームに形成し、転送要求のあった前記音声情報を第4のフレームに形成して前記第2のフレームに続けて転送し、前記第3のフレームは待合せ音声情報のすべてを転送した後に転送し、且つこの第3のフレームが前記第1のフレームにおいて分割された最終データ情報であるときにはこの最終データ情報の後に完了情報を加え最終フレームとして転送し、この最終フレームの転送後、それまで分割転送されたデータ情報を復元再生することを特徴とし、又送信側にはフレーム分割するとき送信済データ情報に続けて中断情報を、又フレーム分割された最終データ情報には続けて完了情報を付加し、中断されたデータ情報メモリに中断情報を書込む割込情報付加手段を備え、又受信側には受信フレー

ムの最後に前記中断情報を持つデータ情報を並べ、前記完了情報を持つデータ情報の受信でまとめて組織再生する分割情報識別・蓄積・再生手段を備えることを特徴とする。

次に本発明について第7図乃至第10図、更に第3図乃至第6図のフローチャートを加え、詳細に説明する。第7図は本発明の音声・データ多重化伝送方式の一実施例を示すブロック図、第8図は第7図において同一通信回線に音声パケット情報とデータパケット情報とを混在させて多重化伝送するときの時間関係を示すタイムチャート、第9図は第7図における各部メモリ部及び転送フレームのフォーマットを示すフォーマット概要図、また第3図乃至第6図及び第10図は第7図における送信，受信動作を説明するフローチャートである。第7図において、音声パケット情報は音声受信チャンネル11により音声用送信待行列部6の音声情報メモリ部61に受信順に記憶され、データパケット情報はデータ受信チャンネル12によりデータ用送信待行列部7のデータ情報メモリ部71に受信順に記憶される。状態制御送信部29は通信制御送信部22の主要部で送信情報を記憶する送信パケットメモリ部291と、アドレス符号Aのオクテットから送信最後のオクテットまでのCRC演算をしフレームの最後に付加するフレームチェックシーケンス符号FCSを作成するフレームチェック符号作成部293と、分割されたデータパケット情報に中断情報として割込み符号INTを、又完了情報として情報完了符号FINの付加を準備し、本発明のために付加される割込符号付加部292とを含む。状態制御受信部25は受信パケットを一時記憶する受信パケットメモリ251と、分割されたデータ情報を順次分割データ情報メモリ部254に記憶して最終情報到着まで待たせる分割データ受信待行列部253と、最終情報の到着で全分割情報を一つに復元再生する再生部255と、本発明のために必要な割込符号の識別・記憶する識別部252とを含む。第7図において、特に説明のないものは第1図と同じ機能であり同一符号が付与されている。第8図は第7図において、同一通信回線に音声パケット情報とデータパケット情報とを多重化伝送するときの時間関係を示すタイムチャートである。送信側からデータパケット情報D1，D2を送信中に音声パケット情報V1，V2の送信要求がありデータパケット情報D11，D12，D21，D22に分割されて送信され、受信側で再び再生される時間関係が示されている。送信前のパケット情報V1，V2，V3及びD1，D2，D3はそれぞれ送信待行列部61及び71に記憶され、通信回線1上に送信されるためまず状態制御送信部29の送信パケットメモリ部291へ転送されてアドレス符号A，制御符号C（データパケットの場合のみ）が付加され、パケット情報の送信終了後フレームチェックシーケンス符号作成部293でフレームチェックシーケンス符号FCSが付加され、更に回線送信部3でフラグシーケンス符号Fを付加し、通信回線1には一オクテットの符号F，符号A，符号Cに続いてパケット情報が更に続いて二オクテットの符号FCS，一オクテットの符号Fで一フレームを終結する。データパケット情報が分割されたときはパケット情報と符号FCSとの間に割込付加符号INT，FINが一オクテット挿入される。次に第9図によつてメモリ部のフォーマット及びパケット情報に符号付加する状況を説明する。第9図(a)，(b)，(c)，(d)，(e)及び(f)はそれぞれ第7図における音声情報メモリ部61，データ情報メモリ部71，送信パケットメモリ部291，送信フレーム211，受信パケットメモリ部251及び分割データ情報メモリ部254の符号収容位置を示すフォーマット概要図で、横一段が8ビット構成（一オクテット）で送信構成の単位となる。各メモリの上段はメモリ情報に対するメモリ制御部でその下から転送された符号、情報が書き込まれる。第9図(c)の記号A，Cの欄はパケット通信のフレーム構成として固有のアドレス符号A，制御符号C（音声の場合にはこの符号Cはない）が書込まれる。第9図(d)は通信回線1上を転送される順序を示すフォーマットで、一段が一オクテットを意味しフレームチェックシーケンス符号FCSは二オクテ

ット分16ビットで構成されることを示す。第9図(f)では分割された中断情報が転送情報の内の制御記憶エリヤに記憶され再生のときに活用される。

次に第3図，第4図及び第10図を参照して送信手順を説明する。第3図は送信要求あるパケット情報を受信メモリしてから送信する手順を示すフローチャート、第4図はパケット情報送信のフレーム終了手順を示すフローチャート、又第10図はパケット情報の割込転送があったときの転送中断および転送完了を示すフローチャートである。第3図及び第4図の一般転送手順は既に述べたので省略し、本発明に関するデータパケット情報の分割転送について説明する。データパケット情報D1の送出中は、一オクテットの情報転送（動作ステップS6）毎の送信確認（動作ステップS5）に続き、アドレス符号Aから送信中のオクテットまでのCRC演算（動作ステップS7）と共に動作ステップS8がある。動作ステップS8で次順序転送信号29が音声用送信待行列部6の音声情報メモリ部61の情報記憶の存在を確認したとき、音声はデータに優先転送を必要とするので、第10図における動作ステップS21でデータパケット情報D1の転送中断を準備し、割込表示符号INTを割込符号付加部292から抽出し転送準備する。この時第9図(c)の一オクテット2915を送出中とし、この動作ステップS20が終ると、一方に引続いて前記符号INTを転送する動作ステップS23、他方に送信確認の動作ステップS22を経て、送信中の符号INTまでのCRCおよびフレームチェックシーケンス符号FCSの送信指示（動作ステップS25）と共にデータパケット情報D1の中断位置（第9図(c)の符号2915）をデータ情報メモリ部71のメモリ制御部711（第9図(d)に示す）に書込む（動作ステップS24）。一オクテットの前記符号INT転送（動作ステップS23）が終ると送信確認し（動作ステップS12）、二オクテットの前記符号FCS送信（動作ステップS11）となり、前に記載した第4図のフレーム終了手順となる。動作ステップS17で割込む音声パケット情報の待合せがあるので、動作ステップS18で送信パケットメモリ部291のデータパケット情報D1を消去した後、動作ステップS19で改めて音声情報メモリ部61から音声パケット情報V1を送信パケットメモリ部291へ転送する。第3図に戻り、音声パケット情報V1は動作ステップS19で転送されているので、フレーム転送開始の動作ステップS1でフラグシーケンス符号Fの一オクテット転送から前述の一連のパケット情報の転送準備（第3図）とフレーム終了手順（第4図）とによって転送される。音声パケット情報V1の転送終了のとき動作ステップS17では転送未完のデータパケット情報D1が残っているので動作ステップS19でデータ情報メモリ部71から送信パケットメモリ部291へ情報の移転がある。動作ステップS24（第10図）で転送中断のメモリ位置が書込まれているので今回の移転は未送出分のデータパケット情報D12のみで、第9図(c)においては符号2916から転送される。この情報転送動作ステップS19に続きフラグシーケンス符号Fの一オクテットの転送（第3図動作ステップS1）に続いてアドレス符号Aと残りのデータパケット情報D12が第3図の転送手順に従って転送され動作ステップS8で音声パケット情報が無いうえ、転送すべき情報も終ると、本実施例ではデータパケット情報の分割のあったものに対しては分割完了符号FINを抽出し転送準備する第10図の動作ステップS26へ、分割のなかったものは非分割表示符号NINの抽出と転送準備との動作ステップS28へ進む。動作ステップS20の一オクテット情報の転送に続き、一方では準備された符号FIN又はNINの転送動作ステップS27又はS29、他方では送信確認動作ステップS22及び符号FCSの作成・送出準備動作ステップS25以下第4図のフレーム終了手順に続く。

次に受信側の手順を第5図及び第6図を参照して説明するが一般手順は既に述べたので省略する。第5図において、動作ステップS31でアドレス符号Aを受信した結果、動作ステップS37で受信パケット情報がデータと判断され、動作ステッ

プS33で符号Aに続く一オクテットの受信以後各オクテット毎の動作ステップS39,S40で受信符号がINT,FIN,NINの何れかを確認したとき、この符号を記憶するが二オクテットの符号FCSに続く一オクテットの符号Fを識別するまでこれらの符号INT,FIN,NINは利用できないので、三オクテットにわたるメモリが符号識別部252に必要となる。このため、動作ステップS42は三オクテット前の符号INT,FIN又はNINの記憶を消去し次にここで受信したオクテットの符号を記憶する動作となる。フレーム終結の符号Fを動作シーケンスS50で確認し、フレームチェックシーケンス符号FCSまでのCRC演算により所定のビットパターンチェックがOKの場合は動作ステップS54の判断により、符号INTのときは動作ステップS55で受信したデータパケット情報を分割データ受信待行列部253に順次記憶し、符号FINのときは動作ステップS56で受信データパケット情報を分割データ受信待行列部253に記憶した後、情報再生部255にすべての記憶を取出して順序通り連結編集しデータ受信チャンネル14へ転送し、又符号NINのときは動作ステップS57で通信回線1から受信して一時記憶した受信パケットメモリ部251から直接データ受信チャンネル14へ転送する。音声パケット情報によって分断されたデータパケット情報は同一通信回線に他のデータパケット情報の割込みなしで転送されるので割込表示符号INTにより分割データ受信待行列部253に順次記憶し、情報完了符号FINによりデータパケット情報D11,D12のみを連結編集すれば容易に再生できる。なお、第7図に示したブロックの回路はいずれも一般的技術により簡単に実現できるものである。

上記実施例では各種メモリ部及び制御部が分散されているが、伝送制御局あるいは交換局が備える共通バスで結ばれたレジスタ群及び中央制御装置により本発明の機能を発揮できる。

本発明の音声・データ多重化制御方式はデータ送信中に音声送信要求があっても送信中データを破棄せず、割込表示符号を付して割り込まれたことを表示してから音声を送信し、残りのデータを送信すると共に受信側ではデータ受信のとき一時記憶し、割込表示符号を付したフレームのデータ情報には後続の受信データ情報を連結し完了符号の付されたフレームのデータ情報までをまとめて一つのデータに再生する機能が付加されている。この機能は従来のデータ情報のフレーム長が無効な情報伝送のフレーム間隔以上に長くできなかったことも解決する。

以上説明したように本発明によって、音声とデータとが多重化伝送される通信回線における伝送効率を改善できるという効果が得られる。

4 図面の簡単な説明

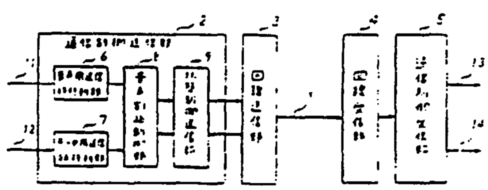
第1図は従来の音声・データ多重化伝送方式の一構成例を示すブロック図、第2図は第1図において同一通信回線に音声パケット情報とデータパケット情報とを多重化伝送するときの時間関係を示すタイムチャート、第3図は本発明の音声・データ多重化伝送方式の一実施例における転送データパケット情報を送信メモリに記憶してからの送信手順を示すフローチャート、第4図は第3図に続くパケット情報転送のフレーム終結手順を示すフローチャート、第5図は第3図の送信手順によって送信されたパケット情報の受信手順を示すフローチャート、第6図は第5図に続くパケット情報転送フレームの終結受信手順を示すフローチャート、第7図は本発明の音声・データ多重化伝送方式の一実施例を示すブロック図、第8図は第7図において同一通信回線に音声パケット情報とデータパケット情報とを多重化伝送するときの時間関係を示すタイムチャート、第9図は第7図における各種メモリ部及び転送フレームのフォーマットを示すフォーマット概要図、第10図は第3図に続く本発明により追加される割込情報付加に関する動作手順を示すフローチャートである。

1……通信回線、6……音声用送信待行列部、7……データ用送信待行列部、22……通信制御送信部、25……通信制御受信部、29……状態

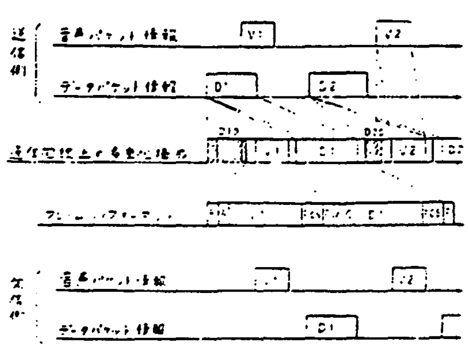
制御送信部、251……受信パケットメモリ部、252……情報識別部、253……分割データ受信待行列部、255……情報再生部、291……送信パケットメモリ部、292……割込符号付加部（割込情報付加手段）、293……フレームチェックシーケンス符号作成部。

代理人 弁理士 内原 晋

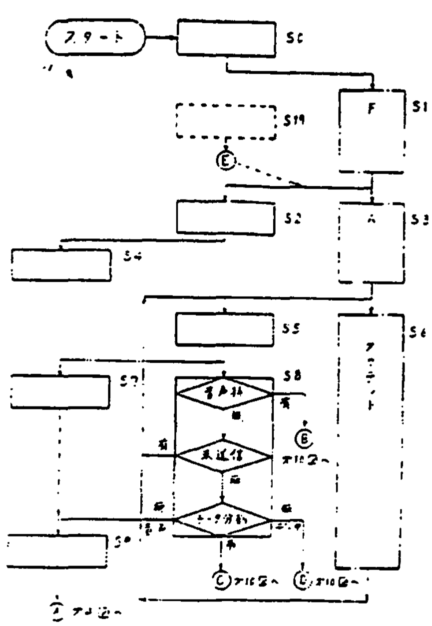
第1図



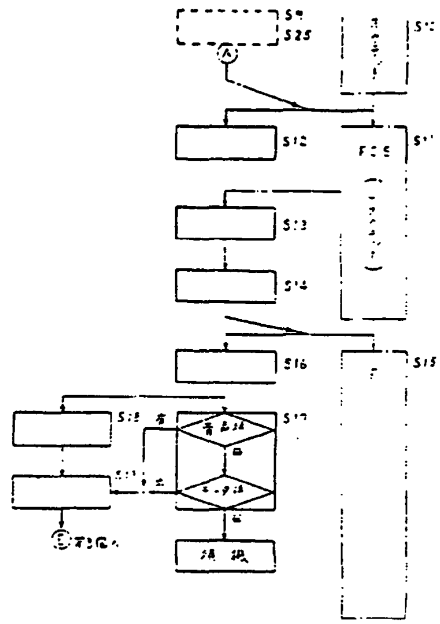
第2図



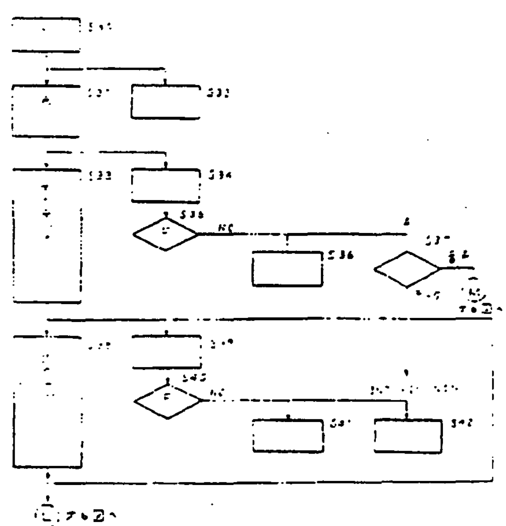
第3図



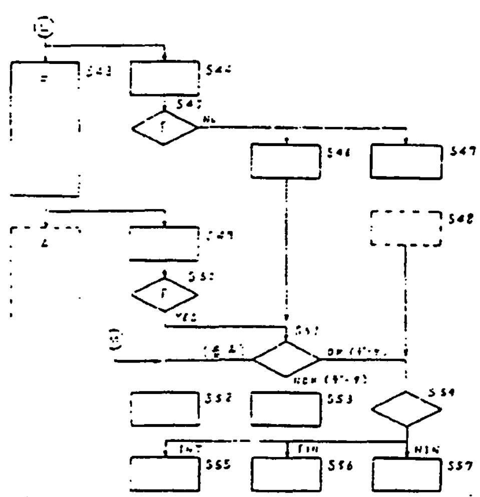
第4図



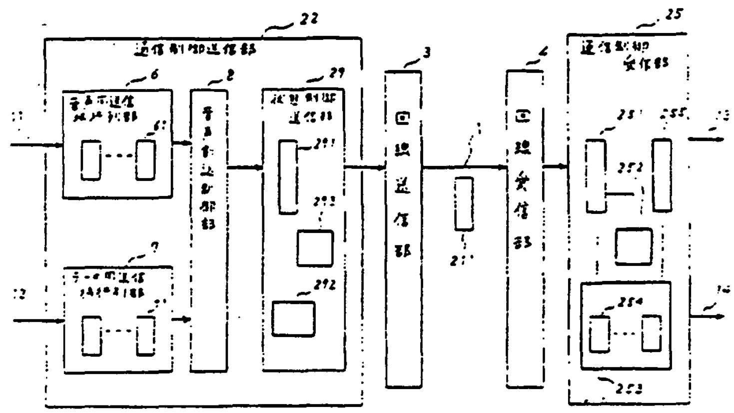
第5図



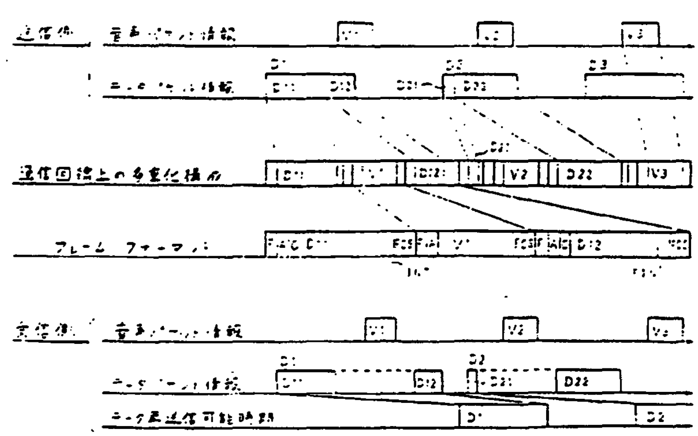
第6図



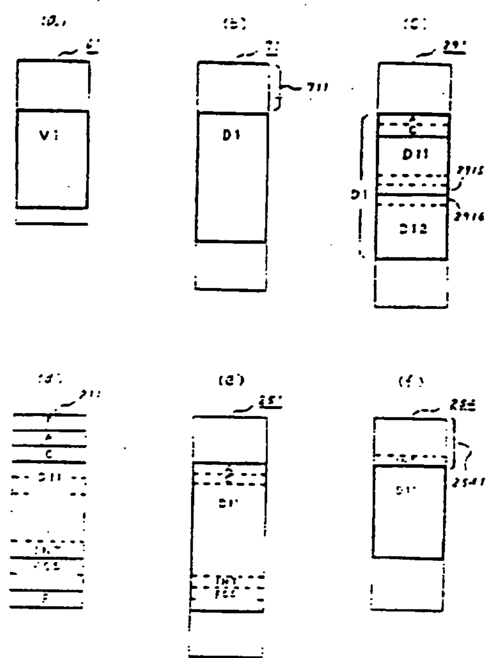
第7図



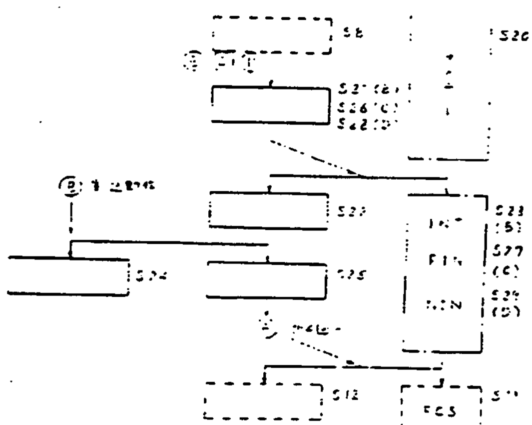
第8図



第9図



第10図



VOICE/DATA MULTIPLEXING TRANSMISSION METHODS
[Onsei/deta Tajuka Densohoshiki]

Junichi Kimura, et al.

Translated by: U.S.-Japan Translations

Kokai Japanese Patent
Kokai Sho 59-44140

PUBLICATION COUNTRY	(10):	JA
DOCUMENT NUMBER	(11):	Sho 59-44140
DOCUMENT KIND	(12):	(A)
PUBLICATION DATE	(45):	March 12, 1984
APPLICATION NUMBER	(21):	Sho 57-154915
APPLICATION DATE	(22):	September 6, 1982
ADDITION TO	(61):	NA
INTERNATIONAL CLASSIFICATION	(51):	IPC: H 04 L 6/02 H 04 M 11/06
DOMESTIC CLASSIFICATION	(52):	NA
PRIORITY COUNTRY	(33):	NA
PRIORITY NUMBER	(31):	NA
PRIORITY DATE	(32):	NA
INVENTOR	(72):	Junichi Kimura Nippon Electric Corp. 33-1 Shiba 5-chome, Minato-ku, Tokyo, Japan
INVENTOR	(72):	Akio Sakamoto Nippon Electric Corp. 33-1 Shiba 5-chome, Minato-ku, Tokyo, Japan
APPLICANT	(71):	Nippon Electric Corp. 33-1 Shiba 5-chome, Minato-ku, Tokyo, Japan

SPECIFICATION

1. Title of the Invention:

Voice/data Multiplexing Transmission Methods

2. Claim:

(1) Voice/data multiplexing transmission methods, which are characterized by the fact that in the voice/data multiplexing transmission method in which data information being transmitted using the same communications line, is interrupted by voice information to proceed with time sharing multiplexing to transmit the data information, when a request is made to transmit voice information while the data information is being transmitted in the first frame, an interrupt information is added after the data information which has been transmitted to form a new second frame; a non-transmitted data information in the aforementioned first frame forms a third frame; the aforementioned voice information requested to be transmitted forms a fourth frame which is transmitted after the aforementioned second frame; the aforementioned third frame is transmitted after the queuing voice information is totally transmitted; if the third frame is the final data information divided in the aforementioned first frame, a completion information is added after the final data information to form a last frame to be transmitted.

(2) Voice/data multiplexing transmission methods as described in Claim (1) in which when divided by frames, an interrupt information is added following the data information which has been transmitted, and a completion information is added following the last data information which has been divided, and a means to add an interrupt information is equipped at the sender side

to write an interrupt information in the data information memory which has been interrupted.

(3) Voice/data multiplexing transmission methods as described in Claim (1) in which a means of identifying/accumulating/reproducing the divided information is equipped at the receiver side to line up the data information queuing the aforementioned interrupt information at the end of the frame received and edit and reproduce when the data information queuing the aforementioned completion information is received.

3. Detailed Description of the Invention:

This invention concerns voice/data multiplexing transmission methods to perform communications by mixing voice and data information using the same communications line.

In general, there are many differences between voice communications and data communications. For example, real time responses are not important in data communications so that the occurrence of delays in transfer between terminals is allowed.

On the other hand, voice communications in a conversational style strictly requires real time responses so that delays between terminals must be minimized to have practically no harmful effects. From the standpoint of traffic, data occur almost randomly in data communications and the lengths of data are diverse within the limits. Although calls in voice communications occur at random, voice, namely transfer information tends to be concentrated and the information to be transmitted as voice occurs periodically and the lengths are short and constant.

Recently, a complex communications system is being developed to be able to transmit both voice communications and data communications having different characteristics by multiplexing using the same communications line.

In the conventional voice/data multiplexing transmission systems, the data being transmitted are cancelled when a voice transmission request occurs during data transmission to proceed with voice transmission and the aforementioned data are then transmitted again from the beginning.

The conventional voice/data multiplexing transmission methods will be explained using packet communications as an example by referring to Figures 1 and 2. Figure 1 is a block diagram showing an example configuration of the conventional voice/data multiplexing transmission method. Figure 2 is a time chart showing the time relationships when voice packet information and data packet information are multiplexed and transmitted using the same communications line in Figure 1.

In Figure 1, a line transmission unit 3 and a line reception unit 4 are located at the transmission side and at the reception side, respectively, having a communications line 1 in the middle to sequentially transmit the packet information. The communication control transmission unit 2 receives the voice packet information from the voice transmission channel 11 and the data packet information from the data transmission channel 12 and transfers then to the communications line 1 via the line transmission unit 3. The communication control reception unit 5, which receives information from the line reception unit 4, transmits the voice packet information to the voice reception channel 13 and transmits the data packet information to the data reception channel 14. The communication control unit 2 consists of the following units: a voice transmission queue unit 6 which lines up the voice packet information from the voice transmission channel 11 in the order of arrival; a data transmission queue unit 7 which lines up the data packet information in the order of arrival; a voice interrupt control unit 8 which draws the voice packet information queuing in the voice transmission queue unit 6, which draws the data packet information queuing in the data transmission queue unit 7 when all the queuing voice packet information has been withdrawn and transmits them to the status control transmission unit 9 at the next stage, but when it detects the entrance of the voice packet information to the voice transmission queue unit 6, it stops transmission of the data packet information which has been selected and instead, it transmits the voice packet information until all the queuing information has been exhausted; and a status control transmission unit 9 which receives the packet information to be transmitted and which adds an address code A and a control code C (not added when transmitting the voice packet information) in front of the information and adds a frame check sequence code FCS at the end of each frame.

The format of the packet information transferred will be explained below. The packet to be transferred forms an octet containing 8 bits from the first bit to the eighth bit. For example, the call user data, which is the information containing a maximum of 128 octets is transferred from the transmission channels 11 and 12 to the transmission queue units 6 and 7 and then saved. For transferring from the transmission queue units 6 and 7, one of the information transferred to the status control transmission unit 9 receives an address code A and a control code C (no code C in the case of voice information) so that each one octet is added in front of the information. One octet coded with flag sequence code F is transmitted in the order from the first bit at the beginning of the frame at the division of each frame and subsequently, the address code A, control code C (none in the case of voice information), and the packet information are transmitted in this order in series from the first bit in each octet (See the frame format in Figure 2). The transmission of each octet is checked whenever the eighth bit is transmitted and the next octet to be transmitted is prepared within the time period until the eighth bit of the next octet. A frame check sequence code FCS is created by performing a CRC calculation (cyclic code check) using generating polynomials from the octet of the address code A at each octet unit and transmitted subsequently to the last octet transmission of the packet information. Subsequently, the flag sequence code F implying the frame ending is transmitted. If there is subsequent packet information, a code F that is also the beginning of the next frame is used.

The transmission procedures for packet information will be explained by referring to Figures 3 and 4. Figure 3 is a flow chart showing the procedures when a request for the packet information to be transmitted is received and saved and until the time when it is transmitted. Figure 4 is a flow chart showing the frame ending procedures for packet information. An example of the data packet information D1 will be explained first. The operational step S0 stores the data packet information D1 in the status control transmission unit 9 and indicates an action to instruct transmission of the flag sequence code F. The operational step S1 shows the transmission operation of the code F under this instruction. When the transmission of the code F is over, the transmission of one octet (8 bits) is checked by the operational step S2. The operational step S19 is an action to delete the previous packet information within the time of transmission of the operational step S1 to store the current data packet information D1. Subsequent to the aforementioned operational step S1, the address code A withdrawn from the memory is transmitted at the operational step S3. The operational step S4 is an action to perform CRC calculation for the code A while being transmitted. The operational step S5 shows an action to check each transmission whenever ending transmission of one octet of the code A and one octet for the following 8 bits. The operational step S6 shows a portion for one octet subsequently transmitted after the operational step S4. The operational step S7 shows an action to perform CRC calculation from the octet of the code A to the octet being transmitted each time after the operational step S5. The operational step S8 is an action following the operational step S5 which is an action to investigate the presence/absence of queuing for voice packet information (omitted in the case of voice packet information transmission) and the presence/absence of the octet to be transmitted next after the operational step S6 if queuing is absent (the presence/absence of data division in Figure 6 is due to the actions in this invention so that this will be explained later). The operational step S9 is an action of the instruction to transmit the operational results stored at the operational step S7 as the frame check sequence code FCS when both voice queuing and non-transmitted octets are absent. In Figure 4, the operational step S9 instructs the transmission of the code FCS since the octet to be transmitted next while one octet is being transmitted is not stored at the operational step S10 so that the operational step S11 transmits two octet portions for the code FCS after the operational step S10. The operational step S12 is an action to check the transmission of one octet at the operational step S10. The operational step S13 shows an action to check the transmission for the former half of one octet of the code FCS and the operational step S14 shows an action to transmit the flag sequence code F subsequent to the transmission of the code FCS. At the operational step S15, one octet of the code F is transmitted and the operational step S16 checks the transmission for the latter half of the one octet of the code FCS so that the operational step S17 checks the presence/absence of queuing of the voice packet information and the presence/absence of queuing of the data packet information. The operational step S18 shows an action to delete the transmitted data packet information D1 from the memory and the operational step S19 shows an action to store queued voice or data packet information within the status control transmission unit 9. When transmitting the voice packet information, similar operational procedures as mentioned above are followed.

When a transmission request for the voice packet information V1 occurs while the data packet information D1 is being transmitted, the request is checked at the operational step S8 after the operational step S5 (checking the transmission) after transmitting each octet to inform queuing of the voice packet information. The conventional communication control transmission unit 2 transmits abort signals which send more than 7 bits of ``1'' continuously once queuing of the voice packet information V1 is informed at the operational step S8 to delete the data packet information D1 which has been received in the middle from the status control transmission unit 5 and newly stores the voice packet information V1 being queued. When the transmission of the voice packet information ends through the operational procedures as mentioned above, the data packet information D1 which has been interrupted earlier is stored again in the status control transmission unit 9 from which the data packet information D1 is transmitted from the beginning. The memory of the data packet information in the data transmission queue unit 7 is deleted after the portion transferred to the status control transmission unit 9 is totally transmitted and the order of queuing in the data transmission queue unit 7 is advanced by one position.

The reception procedures will be explained by referring to the flow chart showing the frame reception procedures shown in Figures 5 and 6. One octet portion of the flag sequence code F from the first bit to the eighth bit is initially received at the operational step S30. The operational step S31 is a one-octet reception action for the access code A following the code F and the operational step S32 is a recognition action of the code F for starting the frame. The code received at the operational step S31 is recognized as a code A at the operational step S34 and if the octet received is recognized as not being the code F at the operational step S35, the information which will be received in the future will be distinguished whether they are voice or data information. The operational step S33 is the reception action for the octet following code A and in the case of reception of data packet information, a control code C is received. At the operational step S36, a CRC calculation is carried out using the generating polynomials, which are defined for the octet received after the code A. After receiving each octet, the code is identified at the operational step S39 and if it is recognized as not to be the code F at the operational step S40, the same CRC calculation as mentioned above is carried out at the operational step S41 (the operational step S42 is an additional action added for this invention and will be explained later). In Figure 6, the operational steps S44, S45, and S46 are the same as operational steps S39, S40, and S41 in Figure 5. When the flag sequence code F implying the frame ending is received at the operational step S43, the code F is identified at the operational step S49 and the code F is checked at the operational step 50. Subsequently, the operational step S51 is an action to check the bit pattern for the CRC calculation results until the octet received immediately before the code F. In the case of receiving the voice information, this voice information is transferred to the next stage at the operational step S52 regardless of the results of this bit pattern checking. In the case of the data information, a resend command is requested to the sender side by the operational step S53 if the result of checking is inadequate. If the result of checking is satisfactory, this data information is transferred to the next stage as in the case of the voice information at the operational step S57 (the operational steps S54, S55, and S56 are the steps added to this invention and will be explained later). If the bits received consist of seven consecutive ``1''s, it implies abort signals so that the contents received and stored in the communications control reception unit 5 are deleted immediately and the next reception starts again from the code F at the beginning of the frame. The data packet information D1 that has been transferred in the middle and interrupted by the voice packet information V1 is transmitted again from the beginning after the voice packet information queuing in the voice transmission queue unit 6 has been totally transmitted. In this case, the transmission time of the communications line 1 is invalidated for the portion of transferring time for the data packet information D10 that has been cancelled so that if the volume of voice information is large, the data are hardly transmitted and there is a high possibility that all the data in the gap become invalid.

According to the conventional voice/data multiplexing transmission method, the data, which is already being transmitted, are cancelled when the voice information interrupts the transmission of data information so that the drawback is that the transmission time used for the data information cancelled is wasted and the transmission efficiency of the communications line is reduced.

The purpose of this invention is to provide voice/data multiplexing transmission methods, which can improve the transmission efficiency for the communications line, which multiplexes and transmits voice and data information by overcoming the above-mentioned drawbacks.

According to this invention's voice/data multiplexing transmission method, the data information which is being transmitted by the same communications line are interrupted by the voice information, which are transmitted after time sharing multiplexing. This voice/data multiplexing transmission method is characterized as follows. When a transfer of voice information is requested, while the data information is being transferred in the first frame, a second frame is newly formed by adding an interrupt information after the data information which has already been transferred and the non-transferred data information in the aforementioned first frame forms a third frame. The aforementioned voice information, which has been requested to be transferred, forms a fourth frame, which is transferred after the aforementioned second frame. The aforementioned third frame is transferred after the queuing voice information is totally transferred. In this case, if the third frame is the final data information, which has been divided from the aforementioned first frame, completion information is added after this final data information and transferred as a final frame. After the final frame is transferred, the data information, which has been divided and transferred, is restored and reproduced. An interrupt information addition means is equipped at the transmission side so that an interrupt information is added after the transmitted data information when dividing the frame and a completion information is added to the final data information divided from the frame to write the interrupt information in the interrupted data information memory. A divided information identifying/accumulating/reproducing means is equipped at the receiver side so that the data information having the aforementioned interrupt information is lined up at the end of the reception frame and when the data information having the aforementioned completion information is received, the data information is edited and reproduced.

This invention will be explained by referring to Figures 7 through 10 along with the flow charts shown in Figures 3 through 6. Figure 7 is a block diagram showing an example of this invention's voice/data multiplexing transmission method. Figure 8 is a time chart showing the time relationships when the voice packet information and the data information, which are mixed in the same communications line, are multiplexed and transmitted as in Figure 7. Figure 9 is a format outlined diagram showing various memory units and formats of the transfer frames in Figure 7. Figures 3 through 6 and Figure 10 are flow charts explaining the transmission and reception actions in Figure 7. In Figure 7, the voice packet information is stored in the order of arrival in the voice information memory unit 61 in the voice transmission queue unit 6 by the voice reception channel 11 and the data packet information is stored in the order of arrival in the data information memory unit 71 in the data transmission queue unit 7 by the data reception channel 12. The status control transmission unit 29 contains a transmission packet memory unit 291 which stores the transmission information in the key section of the communication control transmission unit 22; a frame check code creation unit 293 which creates a frame check sequence code FCS which performs a CRC calculation from the octet with the address code A to the octet of the last transmission to be added at the end of the frame; and an interrupt code addition unit 292 added to this invention by providing an interrupt expressing code INT as an interrupt information in the interrupted data packet information and the addition of the information completion code FIN as a completion information. The communication control reception unit 25 contains a reception packet memory 251 to store the reception packet; a divided data reception queue unit 253 which stores the divided data information in the sequentially divided data information memory unit 254 to queue until the last information arrives, a reproduction unit 255 which restores and reproduces all the divided information into one when the final information arrives; and an identifying unit 252 which identifies and stores the necessary interrupt codes which are needed in this invention. In Figure 7, the symbols, which are not particularly explained, have the same functions as in Figure 1 and the same codes are added. Figure 8 is a time chart showing the time relationships when the voice packet information and the data packet information are multiplexed and transmitted using the same communications line in Figure 7. The transmission of voice packet information V1 and V2 is requested while the data packet information D1 and D2 are transmitted from the transmission side and divided into the data packet information D11, D12, D21 and D22 which are regenerated at the reception side. The packet information V1, V2 and V3 and D1, D2 and D3 at the transmission side are stored respectively in the transmission queue units 61 and 71. Since they are transmitted onto the communications line 1, they are initially transferred to the transmission packet memory unit 291 of the status control transmission unit 29 where the address code A and the control code C (only in the case of data packets) are added. After the end of transmission of the packet information, the frame check sequence code FCS is added in the frame check sequence code creation unit 293, and in addition, a flag sequence code F is added in the line transmission unit 3. One frame ends with one octet code F, code A and code C, packet information, 2 octet coded FCS and one octet code F. When the data packet information is divided, an interrupt codes INT and FIN are inserted between the packet information and the code FCS by one octet. The formats including memory and the statuses when adding codes to the packet information are explained in Figure 9. Figures 9 (a), (b), (c), (d), (e), and (f) are format outlined diagrams showing the storage positions for codes for the units in Figure 7: voice information memory unit 61, data information memory unit 71, transmission packet memory unit 291, transmission frame 211, reception packet memory unit 251, and divided data information memory unit 254. One horizontal row indicates an 8-bit configuration (one octet), which is the unit, used for checking transmission. The upper side in each memory is a memory control unit for the memory information, and codes and information, which are transferred from the lower side, are written in this side. Specific address code A and control code C (no code C in the case of voice information) in the frame configuration of the packet communication are written in the rows indicated by A and C in Figure 9 (c). Figure 9 (d) is a format showing the order of transfer on the communications line 1. One row means one octet and the frame check sequence code FCS is configured of 16 bits for two octets. Figure 9 (f) is used when reproducing since the divided interrupt information is stored in the control unit area before the transfer information.

The transmission procedures will be explained by referring to Figure 3, Figure 4 and Figure 10. Figure 3 is a flow chart showing the procedures of transmission after the packet information requested for transmission is received and memorized. Figure 4 is a flow chart showing the procedures to end the frames of the packet information transmission. Figure 10 is a flow chart showing the transfer interruption and transfer completion at the time of interrupts transfer of the packet information. Since the general transfer procedures in Figures 3 and 4 have already been described, their explanations will be omitted. Only the division transfer for the data packet information in this invention will be explained. While the data packet information D1 is being transmitted, the transmission is checked (operational step S5) every one octet information transfer (operational step S6) and subsequently the operational step S8 comes in along with the CRC calculation (operational step S7) from the address code A till the octet being transmitted. When the status control transmission unit 29 checks the presence of information memory in the voice information memory unit 61 of the voice transmission queue unit 6 at the operational step S8, voices require priority transfer to data so that transfer interrupt for the data packet information D1 is prepared at the operational step S21 in Figure

10 and the interrupt indication code INT is extracted from the interrupt code addition unit 292 to be ready to be transferred. In this case, one octet 2915 in Figure 9 (c) is being transmitted. When this operational step S20 is completed, one direction follows the operational step S23 to transfer the aforementioned code INT and the other direction follows the operational step S22 to write (operational step S24) the interrupt position for the data packet information D1 (code 2915 in Figure 9 (c)) in the memory control unit 711 of the data information memory unit 71 (indicated in Figure 9 (b)) along with the CRC calculation until the code INT being transmitted and instruction to transmit the frame check sequence code FCS (operational step S25). When the transfer of the aforementioned code INT (operational step S23) of one octet ends, the transmission is checked (operational step S12) and the aforementioned code FCS of two octets is transmitted (operational step S11). Subsequently, the frame ending procedures shown in Figure 4 as described previously takes place. Since the interrupt voice packet information is queuing at the operational step 17, the data packet information D1 in the transmission packet memory unit 291 is deleted at the operational step S18 and then the voice packet information V1 is transferred from the voice information memory unit 61 to the transmission packet memory unit 291 at the operational step S19. Since the voice packet information V1 is stored at the operational step S19 as shown in Figure 3, the voice packet information V1 is transferred by the aforementioned series of packet information transfer procedures starting from one octet transfer of the flag sequence code F (Figure 3) and the frame ending procedures (Figure 4) at the operational step S1 for starting frame transferring. When the transfer of the voice packet information V1 ends, the transfer incomplete data packet D1 is queued at the operational step S17 so that the information transfer from the data information memory unit 71 to the transmission packet memory unit 291 at the operational step S19 will transfer only the incomplete transfer portion of the data packet information D12 at the

current transfer since the memory position for the transfer interrupt is written at the operational step S24 (Figure 10) and only the portion after the code 2916 in Figure 9 (c) is transferred. After one octet of the flag sequence code F is transferred (operational step S1 in Figure 3), the address code A and the remaining data packet information D12 are transferred by the transfer procedures shown in Figure 3 at this information transfer operational step S19. If no voice packet information is present and the information to be transferred is finished, at operational step S8 the information completion code FIN is extracted when the data packet information has been divided and the operational step S26 in Figure 10 follows to be ready for transferring. If there is no division, the operational step S28 is followed to extract a non-division indication code NIN and to be ready for transferring. After the one octet information transfer at the operational step S20, one direction proceeds with the operational steps S27 or S29 to transfer the codes FIN or NIN as provided, and the other direction proceeds with the operational step S22 to check the transmission and the operational step 25 to create the code FCS and to be ready for the transmission followed by the frame ending procedures shown in Figure 4.

The procedures at the reception side will be explained by referring to Figures 5 and 6. Since the general procedures have already been described previously, their explanation will be omitted. The procedures in Figure 5 are as follows. As a result of reception of the address code A at the operational step S31, the packet information received is determined as data at the operational step S37. When the codes received are identified as INT, FIN or NIN at the operational steps S39 and 40 for each octet after receiving one octet following the code A at the operational step S33, these codes INT, FIN and NIN can not be used until one octet code F is identified after the two octet code FCS stored in these codes. Therefore, the information identification unit 252 must have a memory space for three octets. For this reason, at the operational step 42, the codes

INT, FIN or NIN stored before the three octets are deleted and the octet codes newly received are stored. The code F for frame ending is checked at the operational sequence S50 and if the specified bit pattern check is OK after the CRC calculation until the frame check sequence code FCS, the following procedures are determined at the operational step S54. In the case of code INT, the data packet information received at the operational step S55 are sequentially stored in the divided data reception queue unit 253. In the case of code FIN, the data packet information received at the operational step S56 is stored in the divided data reception queue unit 253 and then the memory is totally extracted in the information reproduction unit 255 in the order received to be connected and edited before transferring to the data reception channel 14. In the case of code NIN, the data packet information is received from the communications line 1 at the operational step S57 and directly transferred from the reception packet memory unit 251 where the data is stored to the data reception channel 14. The interrupted data packet information by the voice packet information is transferred without interrupts by other data packet information to the same communications line. Therefore, the interrupted data packet information is stored sequentially in the division data reception queue unit 253 by the interrupt indication code INT and only the data packet information D11 and D12 are connected and edited by the information completion code FIN so that the data packet information can be reproduced easily. The blocked circuits shown in Figure 7 can be easily implemented by the common technology.

In the above-mentioned example, various memory units and control units are decentralized, but this invention's functions can be exhibited by using a group of registers which are connected using a common bus having transmission terminals or switching centers and a central processing unit.

In this invention's voice/data multiplexing control method, a request for voice transmission while the data is being transmitted does not cancel the data, which have already been transmitted. An interrupt indication code is added to indicate an interrupt and after the voice transmission, the remaining data are transmitted. The data, which has already been transmitted, is temporarily stored at the reception side. The framed data information attached with an interrupt indication code is connected to the subsequent reception data information and the connected reception data information along with the framed data information attached with a completion code are reproduced into single data. This function solves the problem in the conventional system in that the frame lengths of the data information cannot exceed the frame gaps of the periodic voice information.

According to this invention, the transmission efficiency using the communications line by multiplexed transmission of voice and data can be improved.

4. Brief Explanation of the Figures

Figure 1 is a block diagram showing an example configuration for the conventional voice/data multiplexing transmission method. Figure 2 is a time chart showing the time relationships when multiplexing transmissions using the same communications line as in Figure 1 sends the voice packet information and the data packet information.. Figure 3 is a flow chart showing the transmission procedures after the desired packet information to be transferred in the transmission memory in the example of this invention's voice/data multiplexing transmission method. Figure 4 is a flow chart showing the frame ending procedures for the subsequent packet information transfer following the procedures shown in Figure 3. Figure 5 is a flow chart showing the reception procedures for the packet information, which has been transmitted, by the transmission procedures shown in Figure 3. Figure 6 is a flow chart showing the ending reception procedures for the subsequent packet information transferred frame after the procedures shown in Figure 5. Figure 7 is a block diagram showing an example of this invention's voice/data multiplexing transmission method. Figure 8 is a time chart showing the time relationships when the multiplexing transmission method using the same communications line in Figure 7 sends the voice packet information and the data packet information. Figure 9 is a format outline showing the formats of various memory units and transfer frames in Figure 7. Figure 10 is a flow chart showing the operational procedures regarding the interrupt information addition added in this invention after the procedures shown in Figure 3.

1: Communications line
6: Voice transmission queue unit
7: Data transmission queue unit
22: Communication control transmission unit
25: Communication control reception unit
29: Status control transmission unit
251: Reception packet memory unit
252: Information identification unit
253: Division data reception queue unit
255: Information reproduction unit
291: Transmission packet memory unit
292: Interrupt code addition unit (means to add interrupt information)
293: Frame check sequence code preparation unit

Figure 1.

2: Communications control transmission unit
3: Line transmission unit
4: Line reception unit
5: Communications control reception unit
6: Voice transmission queue unit
7: Data transmission queue unit
8: Voice interrupt control unit
9: Status control transmission unit

Figure 2.

A: Sender side
B: Voice packet information
C: Data packet information
D: Multiplexing configuration on the communications line
E: Frame format
F: Receiver side
G: Voice packet information
H: Data packet information

Figure 3

A: Start
B: Voice queuing
C: Not transmitted
D: Data division
E: To Figure 4
F: To Figure 10
G: Yes
H: No
I: Voice
J: Data
K: Octet

Figure 4

A: To Figure 3
B: Yes
C: Voice queuing
D: No
E: Data queuing
F: Queuing
G: Octet
H: (2 octet)

Figure 5

S23: Octet
S38: Octet
L: to Figure 6
M: to Figure 6
A: Data
B: Voice

Figure 6

A: (Voice)
B: OK (Data)
C: NOK (Data)

Figure 7

22: Communications control transmission unit
6: Voice transmission queue unit
7: Data transmission queue unit
8: Voice interrupt control unit
29: Status control transmission unit
3: Line transmission unit
4: Line reception unit
25: Communications control reception unit

Figure 8

A: Sender side
B: Voice packet information
C: Data packet information
D: Multiplexing configuration on the communications line
E: Frame format
F: Receiver side
G: Voice packet information
H: Data packet information
I: Data retransmission possible time

Figure 9

Figure 10

A: to Figure 4
S20: Octet
B: Interrupt action

Electronic Acknowledgement Receipt

EFS ID:	6626771
Application Number:	90010422
International Application Number:	
Confirmation Number:	6565
Title of Invention:	Graphic User Interface For Internet Telephony Application
First Named Inventor/Applicant Name:	6,009,469
Customer Number:	42624
Filer:	Michael R. Casey
Filer Authorized By:	
Attorney Docket Number:	2655-0185
Receipt Date:	14-DEC-2009
Filing Date:	26-FEB-2009
Time Stamp:	12:20:42
Application Type:	Reexam (Third Party)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	NPL Documents	F0057_ISR_US9615504.pdf	396157 e27eccddcd4afd0e46c5474618b0320ce804ee73	no	10

Warnings:

Information:

2	NPL Documents	F0058_gitman_economic_analysis.pdf	1874599 ee5313be03ddc6271d488165e869732cbadd8df5	no	22
Warnings:					
Information:					
3	NPL Documents	F0059_huelamo_end_user_premises.pdf	712273 6bafdfc025cd5f1a9069bdc68730628aae79dc6a	no	11
Warnings:					
Information:					
4	NPL Documents	F0060_RFC978.pdf	102320 21230c20d1270e7c861516a43079c6e0e80ff401	no	5
Warnings:					
Information:					
5	NPL Documents	F0061_RFC1055.pdf	202556 4200eae0048397a08bb15b27455eee7761ea1a37	no	6
Warnings:					
Information:					
6	NPL Documents	F0062_james_mills_data_voice.pdf	223076 99ef23fe5bf7c3074fe2a3c50b94bc2a9f6dc87c	no	6
Warnings:					
Information:					
7	NPL Documents	F0063_james_forgie_speech.pdf	527034 da96c67c7acc4ba388869f0654b9727f97330cb3	no	8
Warnings:					
Information:					
8	NPL Documents	F0064_james_forgie_voice_conferencing.pdf	500690 a64174568406c29dfe7866ab66ec3a5fa4ba6cda	no	8
Warnings:					
Information:					
9	NPL Documents	F0065_Janes_1979_80.pdf	154076 9aed6ddfad82f64d8ec6a9194a15c938e7bbfe7f	no	3
Warnings:					
Information:					
10	NPL Documents	F0066_Janes_1985.pdf	421297 e446be3eb5d4585d956eb7002280badf407b9504	no	5
Warnings:					
Information:					

11	NPL Documents	F0067_Janes_1989.pdf	617418 b157dff49070abeda57d8c608f714d6688678297	no	5
Warnings:					
Information:					
12	NPL Documents	F0068_Janes_1990_91.pdf	2431238 42a92bed6d324612d6393dcb84cb77220d5c5fec	no	17
Warnings:					
Information:					
13	NPL Documents	F0069_Janes_1992_93.pdf	628193 21d4e5f3edaf3a02e9efb3aca1c85067ddcbac48	no	6
Warnings:					
Information:					
14	NPL Documents	F0070_Jim_stevens_Much_more.pdf	262071 50b7e1f91ccb105e4c051099e673685fa777489b	no	9
Warnings:					
Information:					
15	NPL Documents	F0071_John_bellamy_Digital_Telephony.pdf	428289 d4118e2dd0b29ce876e901d342c492025712356f	no	7
Warnings:					
Information:					
16	Foreign Reference	F0072_JP-63-131637.pdf	183914 c3613862827a91f19076ae80574921c36bce9cee	no	6
Warnings:					
Information:					
17	Foreign Reference	F0073_JP_6-62020.pdf	2765194 414e1cc6f9741c12c8db57735f1d3be644d83841	no	20
Warnings:					
Information:					
18	NPL Documents	F0074_JP2008163825_Office_Action_Translation.pdf	487599 edbec99254efe8b8f883d933ac13ebd36e6c0010	no	3
Warnings:					
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19	Foreign Reference	F0075_JP-59-44140.pdf	1272933 cb52899aaa212045567f925588a887a5511a54ba	no	36
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38	NPL Documents	F0094_r_w_meba_Experiments_in_Wideband.pdf	233947 d37bd24c9482b32dd1ac11c1e925b45a56301c9d	no	7

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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 : G06F 13/00 | A1

(11) International Publication Number: WO 94/22087

(43) International Publication Date: 29 September 1994 (29.09.94)

(21) International Application Number: PCT/US94/00004

(22) International Filing Date: 3 January 1994 (03.01.94)

(30) Priority Data:
08/033,914 19 March 1993 (19.03.93) US

(81) Designated States: AU, CA, JP, KR, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

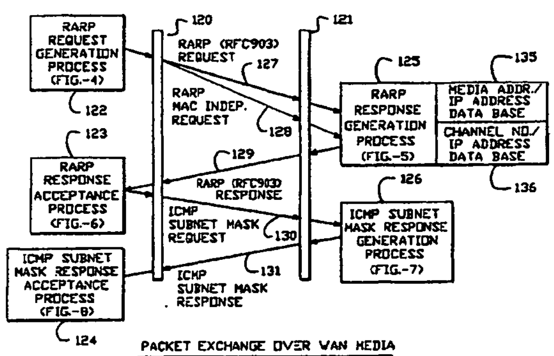
Published
With international search report.

(71) Applicant: 3COM CORPORATION [US/US]; 5400 Bayfront Plaza, P.O. Box 58145, Santa Clara, CA 95052-8145 (US).

(72) Inventors: NILAKANTAN, Chandrasekharan; 3774 Woodbark Court, San Jose, CA 95117 (US). LOI, Ly; 34852 Winchester Placa, Fremont, CA 94555 (US). ARUNKUMAR, Nagaraj; 3041 Cedar Ridge Court, San Jose, CA 95148 (US). SEAMAN, Michael, John; 350 Elan Village Lane, #206, San Jose, CA 95134 (US).

(74) Agent: HAYNES, Mark, A.; Haynes & Davis, Suite 170, 2180 Sand Hill Road, Menlo Park, CA 94025-6935 (US).

(54) Title: SYSTEM FOR REVERSE ADDRESS RESOLUTION FOR REMOTE NETWORK DEVICE



PACKET EXCHANGE OVER WAN MEDIA

(57) Abstract

A reverse address resolution protocol for use in a communication network which allows resolution logic to provide a higher level protocol information (such as an IP address) to a source of a request (127) for such information (122), independent of the physical network address of such source. The protocol is used in a processor having a plurality of ports, at least one of such ports connected by a point-to-point channel to a remote network device. Reverse address resolution protocol is responsive (129) to a resolution request from the remote network device across the point-to-point channel to supply the higher level protocol information based upon the port through which the resolution request is received (125), rather than the physical network address of the requesting device. Thus, a remote device may be coupled to a network, and connected to a central management site across a point-to-point communication link, in a "plug and play" mode. The person connecting the device to the remote network does not need to determine the physical network address of the device or configure the device with a higher level address protocol.

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SYSTEM FOR REVERSE ADDRESS RESOLUTION FOR REMOTE NETWORK DEVICE

FIELD OF THE INVENTION

The present invention relates to start up protocols for devices in communication networks; and more particularly to systems which allow a machine without a configured higher level protocol address to obtain such address without a unique machine identifier.

DESCRIPTION OF RELATED ART

A widely accepted series of international standards describing network architectures is known as the OSI reference model. See, generally, Tannenbaum, Computer Networks, 2nd Ed., 1988, Prentice-Hall. According to this model, network communications are divided into a plurality of protocols within layers of the model. Local Area Networks (LANs) operate using medium access protocols within the lower layers, layers 1 and 2, of the OSI model, such as the carrier sense multiple access with collision detection CSMA/CD, IEEE Standard 802.3, also known as ETHERNET, and the token ring access ring method of IEEE Standard 802.5. These two lower layers are typically broken down into the physical layer and the data link layer, with the data link layer being further broken down into a media access control (MAC) layer, and a logical link layer.

Systems, such as personal computers, workstations, and mainframe computers, attached to the LANs each have a distinct lower level protocol identifier known as the physical network address or MAC address. LAN frames forwarded to a destination system on the network under these lower level protocols contain the destination system MAC address, or other physical network address, as a destination. LAN frames forwarded from a source system on the network contain the source system MAC address, or other physical network address, as a source address. Systems communicate by encapsulating additional protocols (OSI layers 3-7) within the lower layer LAN frames. These higher level protocols are grouped into suites such as the TCP/IP protocol suite and the XNS protocol suite. Many LANs contain groups of end systems that use different higher level protocol suites. These higher level protocol suites also assign unique higher level protocol identifiers to systems which transmit or receive frames in the network.

For instance, an internet protocol IP address is assigned to each system operating within an internet protocol network. The internet protocol address includes a network address portion and a host address portion. The network address portion identifies a network within which the system resides, and the host address portion uniquely identifies the system in that network. Processors routing packets in an internet protocol network rely on the network address portion of the IP address in a frame to find the local area network of the destination machine. Once the local area network of the destination is located, the frame is forwarded to that network where the host address portion is relied upon to assign a MAC address for the destination machine to the packet. Thus, higher level protocol address places the device in a particular network or subnetwork, so that the higher level protocol can effectively manage the routing of packets among the networks, without maintaining a table of the unique physical access layer identifiers for all of the terminals in the network.

In order to communicate in such a network, the machine must first obtain its higher level protocol address. This address is typically assigned by a central authority, such as the Internet Activities Board, or by a network manager. Normally, a particular machine learns its IP address by a configure operation, in which a technician uses a local terminal to configure the machine. In a centrally managed network, this could be a cumbersome task, involving travel of skilled personnel away from the central management location. However, a reverse address resolution protocol RARP has been developed for networks such as TCP/IP or SNMP protocols. The RARP allows a machine without a configured IP address to obtain an IP address from a remote server. The machine broadcasts a request and waits until an RARP server responds. In the request, the requesting machine must provide its physical network address (MAC address) to uniquely identify itself, allowing the server to map it into an IP address.

This RARP protocol works fine, so long as the central management site is aware of the physical network address of the devices being added to the network. In order to find out the physical network address, all of the system being added to the network must be passed through the central management site so that the address can be read from these machines, or a local technician must read the physical network address from the machine and telephone the central site. This process makes connecting a new device to a network difficult. Further, this process of physically reading the physical network address from the box is prone to human errors. Such addresses are typically very long (MAC addresses are 48 bits long), and can be misread or typed in erroneously.

It is desirable to have so-called "plug and play" network devices. Such devices can be plugged in and turned on by unskilled personnel. However, the need to find out the physical network address of the box detracts from this ability.

Accordingly, it is desirable to provide a technique for resolving higher level protocol addresses, without reliance on the lower level protocol addresses.

SUMMARY OF THE INVENTION

The present invention provides a reverse address resolution protocol for use in a communication network which allows resolution logic to provide a higher level protocol address, or other information, to a source of a request for such address, independent of the physical network address of such source. The protocol according to the present invention is used in a processor having a plurality of ports, at least one of such ports connected by a point-to-point channel to a remote network device. The reverse address resolution protocol is responsive to a resolution request from the remote network device across the point-to-point channel to supply the higher level protocol address based upon the port through which the resolution request is received, rather than the physical network address of the requesting device. Thus, a remote device may be coupled to a network, and connected to a central management site across a point-to-point communication link in a "plug and play" mode. The person connecting the device to the remote network does not need to determine the physical network address of the device or configure the device with a higher level address protocol. All this can be handled automatically.

Thus, the present invention can be characterized as an apparatus for resolving higher level protocol addresses in response to resolution requests from a source of resolution requests in a communication network. The apparatus comprises a central processor having a plurality of ports for connection to the communication network, and resolution logic which is coupled to the communication network and in communication with the central processor. The resolution logic provides a higher level protocol identifier in response to a particular port in the plurality of ports through which the resolution request is received by the central processor, independent of the lower level protocol identifier of the source of the resolution request. The resolution logic may be a routine executed by the central processor, or a routine executed by a network management processor coupled to the communication network, and in communication with the central processor.

The resolution logic, according to one aspect, includes a resolution table that is configurable independent of the lower level protocol identifiers, which assigns higher level protocol identifiers to particular ports of the central processor through which the resolution requests may be received.

The higher level protocol identifier may comprise an internet protocol IP address, which includes a network address for the source of the resolution request, and a host address for the source of the resolution request. Further, the higher level protocol may be utilized by a network management system, which communicates network-wide, while the lower level protocol comprises a medium access protocol.

The resolution logic, according to the present invention, relies on the source of the resolution request being coupled across a point-to-point communication channel to the particular port of the processor receiving the request. In this way, the port serves as a virtual identifier for the source of the request.

Thus, the present invention can also be characterized as an apparatus for connecting a first network and a second network. This apparatus includes a communication link, a first processor, and a second processor. The first processor has a first interface coupled to the first network and a second interface coupled to the communication link. The second processor has a lower level protocol identifier and is coupled to the second network and to the communication link. Resolution logic is coupled to the first network to provide a higher level protocol identifier to the second processor in response to a resolution request through the second interface of the first processor, independent of the lower level protocol identifier of the second processor. In this manner, the first processor can configure the higher level protocol addresses for devices in the system, independent of the lower level protocol addresses.

According to another aspect of the invention, the first processor includes resources to provide network services to frames of data in the first and second networks through the first and second interfaces, and the second processor includes resources to extend the second interface of the first processor transparently to the second network.

The resolution logic may comprise a routine executed by the first processor, or a routine executed by a network management processor located in the first network.

Accordingly, a technique which greatly improves the "plug and play" capability of a network device has been provided. Remote networks may be set up using this system, without requiring error prone and cumbersome techniques to acquire the physical network address of each device being added to the network.

Other aspects and advantages of the present invention can be seen upon review of the figures, the detailed description, and the claims which follow.

BRIEF DESCRIPTION OF THE FIGURES

Fig. 1 is a schematic diagram of a system including the reverse address resolution logic according to the present invention.

Fig. 2 illustrates a prior art packet exchange sequence for reverse address resolution over LAN media.

Fig. 3 illustrates a packet exchange sequence over a WAN medium as extended according to the present invention.

Fig. 4 illustrates the resolution request generation process used in the sequence of Fig. 3.

Fig. 5 illustrates the resolution request response generation process used in the sequence of Fig. 3.

Fig. 6 illustrates the resolution request response acceptance process used in the sequence of Fig. 3, which results in a request for a subnet mask in IP networks.

Fig. 7 is a diagram of the subnet mask response generation process used in the sequence of Fig. 3.

Fig. 8 is a diagram of the subnet mask response acceptance process used in the sequence of Fig. 3.

Fig. 9 is a schematic diagram illustrating one network environment in which the present invention may be used.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A detailed description of preferred embodiments of the present invention is provided with respect to Figs. 1-9. Fig. 1 illustrates application of the present invention in a preferred embodiment. Figs. 2-8 illustrate the extended protocol for reverse address resolution used in a preferred embodiment of the present invention. Fig. 9 provides an overview of a network in which the present invention may be applied.

Fig. 1 provides a schematic diagram of an apparatus for connecting a first network 10 to a second network 11 using address resolution logic 25 according to the present invention. The first network 10 includes a first LAN 9 which includes a plurality of end systems and a server, and may be interconnected to other LANs using intermediate systems (not shown) known in the art. Coupled to the LAN 9 is a boundary router 12. The boundary router 12 is an intermediate system in the network which provides network resources serving higher level protocol suites which, in one unique embodiment, constitute routing resources. As such, the boundary router 12 maintains end system directories 13 for the local LAN 9 and global routing information 14 to serve the routing functions according to the higher level protocol suites. Thus, the end system directories will include DEC end system tables, IPX end system tables, IP end system tables, and others to serve other protocol suites that are operating in the network 10. The boundary router 12 may also be coupled to other portions of the corporate data network as schematically illustrated at arrow 15.

The boundary router 12 includes a local interface 16 which serves the local LAN 9 providing access to the network resources within the boundary router to end systems on LAN 9. The boundary router could also have interfaces to other local LANs as well. In addition, the boundary router 12 includes a remote routing interface 17, which provides an interface to the network resources for end systems in the remote network 11. In support of the remote interface 17, the boundary router maintains end system directories 18 serving the higher level protocol suites in the remote network 11.

As illustrated schematically by the hatched symbol 19, the remote network 11 appears to the end systems in the local LAN 9 as if it were a LAN connected locally to the boundary router 12. This appearance is maintained across a communication link 20, which may use telephone or other dial up lines, leased lines, satellites, wireless systems, or other communication media configured as a point-to-point channel, to a routing adapter 21, which is coupled to the remote network 11. The remote network 11 includes a remote LAN 22 to which a plurality of end systems and servers may be connected as known in the art. In addition, the LAN 22 may be coupled to other LANs in the remote network 11 through intermediate systems (not shown) as known in the art. The routing adapter 21 provides resources for extending the remote routing interface 17 transparently to the remote network 11 across the communication link 20. From the perspective of the remote network 11, the routing adapter 21 provides the same functionality as a router, while the routing adapter itself operates independent of the higher level protocol suites.

The system thus provides efficient communication between remote networks, and a corporate network, through a boundary router (e.g., net 11, routing adaptor 21, link 20, boundary router 12, net 9).

The routing adapter 21 includes hardware performing physical network access protocols for connection to the network 22. Also, such hardware is assigned a physical network address, or MAC address, to uniquely identify the system for the lower level protocol suites. However, in order to participate in the higher level protocol suites managed by the boundary router 12 or elsewhere in the central network 10, an identifier which serves such higher level protocols is needed for the routing adapter 21. Thus, the boundary router 12 includes resolution logic 25 to provide such identifier in response to the interface 17 across which a request for such identifier is received.

Figs. 2-8 illustrate the reverse address resolution protocol executed by the resolution logic 25 in the boundary router of Fig. 1 according to a preferred embodiment, in which the higher level protocol address comprises an internet protocol IP address, such as used by SNMP (Simple Network Management Protocol) standard network management servers.

Fig. 2 illustrates the prior art mechanism which is utilized in the preferred system on ports of the routing adaptor coupled to LAN media. The structure of Fig. 2 includes a first interface 100 corresponding to the RARP client port of the routing adapter 21, and a second interface 101 corresponding to an RARP server in the local network 11. The routing adapter includes RARP request generation process 102, an RARP response acceptance process 103, and an ICMP subnet mask response acceptance process 104. The resolution logic 25 in the RARP server includes an RARP response generation process 105, and an ICMP subnet mask response generation process 106.

Using the industry standard RARP request generation process, as specified in RFC 903 dated June, 1984, the RARP request generation process 102 in the client generates an RARP RFC 903 request 107, which includes the client's MAC address. This request 107 is received at the server interface 101 and the RARP response generation process 105 generates a response 108 by accessing a database or other logic which assigns an IP address based upon the MAC address in the request 107. The RARP response acceptance process 103 in the client receives the IP address from the response 108, stores it as appropriate in the client, and generates an ICMP subnet mask request 109. The server 101 receives the request 109 and the ICMP subnet mask response generation process 106 supplies a subnet mask response 110 to the client 100. The ICMP subnet mask response acceptance process 104 then configures the client with the IP address and the subnet mask, and assigns the address of the server 101 as the default gateway address.

Fig. 3 illustrates this process as extended according to the present invention for reverse address resolution independent of the physical network address of the client. In this aspect, the interface 120 corresponds to the routing adapter 21 operating as an RARP client. The interface 121 corresponds to the interface 17 of the boundary router 12 operating as an RARP server. The RARP server 121 need not be located in the boundary router 12. Rather, it can be located in any in system or intermediate system coupled to the networks served by the boundary router 12.

In the extended sequence, as illustrated in Fig. 3, the routing adapter also includes an RARP request generation process 122 (Fig. 4), an RARP response acceptance process 123 (Fig. 6), and an ICMP subnet mask response acceptance process 124 (Fig. 8). The RARP server in the boundary router includes an RARP response generation process 125 (Fig. 5) and an ICMP subnet mask response generation process 126 (Fig. 7).

As in the prior art system, the RARP request generation process 122 in the client 120 generates an RARP RFC 903 request 127. Also, the process 122 generates an extended request 128, which indicates to the receiver that the address resolution must be conducted independent of the MAC address.

The RARP response generation process 125 receives both the RFC 903 request 127 and the MAC independent request 128. If the response can be served with the RFC 903 request, then the response generation process 125 proceeds that way. However, if the MAC address of the client 120 has not been previously communicated to the response generation process 125, then the MAC independent request 128 must be utilized.

The RARP response generation process 125 is coupled to a media address/IP address database 135 and to a channel number/IP address database 136. These databases are configured by the network manager to assign IP addresses throughout the network. The channel number/IP address database is relied upon when the media address (MAC address) of the client 120 is not available at the time the IP address is configured.

In either event, the RARP response generation process 125 generates an RARP RFC 903 response 129 which includes an IP address. The RARP response acceptance process 123 in the client 120 accepts the IP address and generates an ICMP subnet mask request 130. In the server 121, the ICMP subnet mask response generation process 126 supplies an ICMP subnet mask response 131. The client 120 receives that response and executes the ICMP subnet mask acceptance process 124.

Fig. 4 shows the RARP request generation process corresponding to block 122 of Fig. 3. This routine loops through all of the interfaces or ports on the remote node, also called a leaf node, to determine its IP address. The algorithm starts with an interface up message 400. After an interface up message, the algorithm tests whether the IP address is available in local storage (step 401). If the address is available in local storage, then the routine is done, as indicated at step 402. If the IP address is not available, then an index for the interfaces is set to the first interface (step 403). Next, the algorithm tests whether the interface is up (step 404). If the interface is up, then the RFC 903 RARP request is sent through the interface (step 405). Next, the algorithm tests whether the interface is wide area network WAN interface (step 406). If it is a WAN interface, then the extended RARP request is sent which requires response independent of the MAC address (step 407).

If at step 404, the interface is not up, or if at step 406, the interface is not a WAN interface, or after the extended RARP request is sent in step 407, the algorithm loops to step 408. In step 408, the algorithm tests whether the index indicates that the last interface has been tested. If not, the index is incremented in step 409 and the algorithm returns to step 404. If the last interface has been served, then the algorithm tests whether any requests have been successfully sent out and are still pending (step 410). If there are no requests pending because no request was successfully sent, then a send request alarm is set (step 411) and the algorithm is done. If there are requests pending in step 410 because one or more requests were successfully sent, then a request retransmission alarm is set in step 412, and the algorithm is done.

The request retransmission alarm results in re-execution of the loop beginning at step 413 which proceeds directly to step 401. The send request alarm set by step 411 results in re-execution of the loop beginning with step 414. After step 414, the algorithm tests whether any requests are still pending in step 415. If there are pending requests, the algorithm is done, if there are no pending requests, then the loop is entered by proceeding to step 401.

Thus, the RARP request generation process 122, as shown in Fig. 4, sends both the standard RFC 903 RARP request, which requires response based on the MAC address, and an extended RARP request, which requires response independent of the MAC address, across WAN interfaces. The WAN interface in the preferred system is the point-to-point communication channel 120 between the boundary router and the routing adapter of Fig. 1.

Thus, the extended RARP interface composes a message using the standard message format according to RFC 903. The message is sent in the data portion of an ethernet frame. An Ethernet frame carrying an RARP request has the usual preamble, ethernet source and destination addresses, and packet type fields in front of the frame. The frame type contains the value 0x8035 to identify the contents as an RARP message. The data portion of the frame contains the 28-octet RARP message.

The RARP client obtains the physical network address of the interface on which the RARP request will be sent out according to the standard techniques known in the art. The RARP request contains the RARP client's physical network address (MAC address) as the source hardware address field, and 0xFFFFFFFFFFFF as the destination hardware address. Both the source and destination higher level protocol addresses are undefined, thus, 0. The RARP request opcode is 3 for the standard RARP RFC 903. The protocol according to the present invention uses opcode 16 for the extended request requiring MAC address independent resolution. Of course, any other available opcode could be used.

When the RARP client sends out its first broadcast request for address resolution, it also sets a retransmission timer at 5 seconds according to one embodiment (step 412). This large delay ensures that the server has ample time to satisfy the request and return an answer. When the timer expires, if the client already has an IP address, it cancels the timer and the RARP client goes idle. Otherwise, for each interface which is up, it broadcasts another request and sets the timer again. It will retransmit indefinitely until it receives a response. At each retransmission, the timer will double until it reaches a maximum value 15 minutes. From then on, it will continue using this value.

The RARP client accepts only one response and discards any duplicate responses. Thus, before accepting any response, the client first ensures that no IP address has already been assigned to it.

Fig. 5 illustrates the RARP response generation process corresponding to block 125 of Fig. 3. This algorithm begins with receiving the RARP request 127 or 128 in step 500. After step 500, the algorithm tests whether it is a standard RFC 903 request (step 501).

If the request is the standard RFC 903 format request at step 501, then the algorithm searches the media address/IP address database 135 in step 502.

If the request was not in the standard RFC 903 format, then the algorithm tests whether it is in the extended format (e.g. opcode 16) in step 503. If it is in the extended format, then the channel number/IP address database is searched in step 504. If the request is not in either format, then the algorithm is done as indicated at step 505.

After searching the database in step 502 or in step 505, the algorithm tests whether a matching entry was found in step 506. If no matching entry was found, then the algorithm is done in block 505. If a matching entry was found, then the algorithm formats and sends an RFC 903 RARP response packet which provides an IP address to the client (step 507).

Fig. 6 illustrates the RARP response acceptance process 123 of Fig. 3. This algorithm begins with receiving the RARP response in step 600 which was generated in step 507 of Fig. 5. First, the algorithm determines whether the response is expected in step 601. If it is not expected, then the RARP response is discarded in step 602, and the algorithm is done in step 603. If the response is expected, then the algorithm tests whether an IP address is already available in local storage (step 604). If the address is already available, then the process loops to step 602. If the IP address is not available in step 604, then the IP address from the RARP response is saved in local storage (step 605). After step 605, all pending alarms in the client are cancelled (step 606), and an ICMP subnet mask request is sent across the interface (block 607). After sending the subnet mask request in step 607, an ICMP subnet mask request retransmission alarm is set in step 608, and the algorithm is done.

Thus, once the client or leaf node has obtained the IP address, it initiates an ICMP address mask request to the responder, and sets a retransmission timer of 5 seconds (step 608). The request specifies the RARP server which provided the IP address as the destination. If the leaf node does not obtain a successful response, and its retransmission timer expires, it will broadcast another ICMP subnet mask request on all available interfaces and reset the timer to 5 seconds. The maximum number of retransmissions is 10 in one embodiment. If the tenth retransmission fails, it assigns the natural subnet mask to the IP address class. This ensures that the software does not flood the network indefinitely with unnecessary traffic.

Fig. 7 illustrates the ICMP subnet mask response generation process corresponding to block 126 of Fig. 3. This process begins with receiving the ICMP subnet mask request in step 700. After receipt of the request, a response is generated and sent to the client in step 701. After sending the response, which includes a subnet mask for the previously sent IP address, the algorithm is done (step 702).

Fig. 8 illustrates the ICMP subnet mask response acceptance process corresponding to block 124 of Fig. 3. This algorithm is initiated upon receipt of the ICMP response in step 800. When the response is received, the subnet mask is saved in step 801. Next, any pending alarms are cancelled in step 802. After cancelling the alarms in step 802, the RARP server which supplied the responses to the earlier request is defined as the default gateway in step 803. After defining the default gateway, the algorithm is done as indicated at step 804.

If an ICMP retransmission alarm is asserted, this routine receives an indication in step 805. First, the algorithm determines in response to this alarm whether a maximum number of retries has been exceeded in step 806. If it has been exceeded, then the natural mask is utilized for the IP address as indicated at step 807, and the RARP server is set as the default gateway in step 803. If the maximum number of retries has not been exceeded, then an ICMP subnet mask request is generated in step 807, and the ICMP request retransmission alarm is reset in step 808. Finally, the algorithm is done as indicated at step 804.

Thus, a preferred embodiment of the present invention extends the RARP standard reverse address resolution protocol to provide for a special request independent of the MAC address of the client. The RARP server uses the standard ARP table for mapping network physical addresses to IP addresses. It also includes a port-to-IP address table (channel number/IP address) which is used to respond to the extended RARP requests for MAC independent resolution. This table maps a port number or channel number to an IP address. This method of assigning IP addresses avoids the hassle of having to know the MAC address of the RARP client in advance.

This technique may be extended to other types of protocols, such as the BootP protocol which provides for vendor extensions. In this aspect, the vendor extensions may also be used for other functions that can be initialized based on the channel number or port upon which request is received by the server. Thus, the BootP request may request an IP address, a configuration manager ID, and configuration information independent of its MAC or physical network address.

Fig. 9 illustrates a network configuration in which the present invention may be utilized. According to the configuration of Fig. 9, a central node 900 includes a plurality of ports labelled 1, 2, 3, 4, 5, and 6. Ports 2, 4, and 5 are coupled to respective LANs 901, 902, and 903. LAN 903 includes a system operating as a network management processor 904, which may be executing such protocols as the SNMP or a Telnet protocol relying on IP addresses to access end systems and intermediate systems in the network.

Port 1 is coupled across a point-to-point communication link 905 to a leaf node 906. Leaf node 906 is coupled to LAN 907.

Similarly, node 3 is coupled across point-to-point channel 908 to leaf node 909. Leaf node 909 is coupled to a LAN 910.

Port 6 is coupled across point-to-point channel 911 to leaf node 912. Leaf node 912 is coupled to LAN 913.

As illustrated in the figure, LAN 913, link 911, LAN 903, and LAN 902 are all managed as a single IPX network, IPX 1. LAN 907 and LAN 901 are managed as a single IPX network, IPX 2. LAN 910 is managed as an

AppleTalk network. The entire configuration is managed as a single IP network for the purposes of the network management processor 904. Thus, all of the leaf nodes 906, 909, 912 need an IP address for the purposes of the network management processor 904. These IP addresses may be assigned according to the present invention independent of the physical network address of the leaf node using the MAC address independent IP address resolution logic 914 according to the present invention.

Also, the network management processor 904 may include a server to manage the IP address configuration according to the present invention. For instance, a BootP protocol vendor extension could be used to tag a request packet requesting an IP address for a leaf node (e.g., node 906) with a channel number for link 905 and node number for central node 900. The central node 900 would then pass the tagged request packet to the remote network management processor 904. The network management processor 904 could then service the request packet with a database based upon the channel number and node number in the tagged request packet.

In the implementation described above based on the modified RARP protocol, the point-to-point channels were implemented using a PPP link, such that the physical port on the central node 900 could be used as a basis for configuring IP addresses. This node number is passed along with the packet to the processor in the central node according to standard techniques.

Other systems may implement more than one channel on a given physical port on the central node. For instance, a frame relay system may be used on a given link. In such a system, the DLCI (Data Link Communication Identifier) is carried with every packet on every logical connection between two points in the network. An X.25 type network which uses switched virtual circuits may also be coupled through a particular physical port on the central node 900. In such system, the X.25 address of the calling device could be used as a basis for specifying the point-to-point channel. Similarly, an ISDN port could use the unique identifier for the calling node (Q.931 address) which is used for call set up.

Accordingly, the present invention provides the ability to add new leaf nodes to a network, without requiring the network manager to know the physical network address of the leaf node before it is connected to the network. This greatly simplifies the process of adding new leaf nodes to the network, minimizes the chance of error in communicating the physical network addresses to the network manager, and otherwise contributes to the desired "plug and play" aspect of leaf node hardware.

The foregoing description of preferred embodiments of the present invention has been provided for the purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise forms disclosed. Obviously, many modifications and variations will be apparent to practitioners skilled in this art. The embodiments were chosen and described in order to best explain the principles of the invention and its practical application, thereby enabling others skilled in the art to understand the invention for various embodiments and with various modifications as are suited to the particular use contemplated. It is intended that the scope of the invention be defined by the following claims and their equivalents.

CLAIMS

What is claimed is:

1. An apparatus for resolving higher level protocol identifiers in response to resolution requests from a source of resolution requests in a communication network, the source having a lower level protocol identifier, comprising:

a processor having a plurality of channels for connection to the communication network; and

resolution logic, coupled with the communication network and in communication with the processor, to provide a higher level protocol information in response to a particular channel in the plurality of channels through which a resolution request is received by the processor independent of the lower level protocol identifier of the source of the resolution request.

2. The apparatus of claim 1, wherein the resolution logic comprises a routine executed by the processor.

3. The apparatus of claim 1, wherein the communication network includes a network management processor in communication with the processor, and the resolution logic comprises a routine executed by the network management processor.

4. The apparatus of claim 1, wherein the resolution logic includes a resolution table configurable independent of lower level protocol identifiers, for assigning the higher level protocol information to particular channels of the processor through which resolution requests may be received.

5. The apparatus of claim 1, wherein the higher level protocol information comprises a network address for the source of the resolution request.

6. The apparatus of claim 5, wherein the lower level protocol information comprises a physical network address for the source of the resolution request.

7. The apparatus of claim 6, wherein the higher level protocol information comprises an internet protocol IP address.

8. The apparatus of claim 1, wherein the higher level protocol information comprises a network address for the source of the resolution request, and a host address for the source of the resolution request.

9. The apparatus of claim 1, wherein the higher level protocol comprises a network management protocol, and the lower level protocol comprises a medium access protocol.

10. The apparatus of claim 1, wherein the processor includes resources to provide network services to frames of data in the communication network through the plurality of channels.

11. An apparatus for connecting a first network and a second network, comprising:

a communication link;

a first processor, having a first interface coupled to the first network and a second interface coupled to the communication link;

a second processor having a lower level protocol identifier and coupled to a second network and to the communication link; and

resolution logic, coupled with the first network, to provide a higher level protocol information to the second processor in response to a resolution request through the second interface of the first processor independent of the lower level protocol identifier of the second processor.

12. The apparatus of claim 11, wherein the higher level protocol information comprises a network address for the second network.

13. The apparatus of claim 12, wherein the lower level protocol identifier comprises a physical network address for the second processor.

14. The apparatus of claim 13, wherein the higher level protocol information comprises an internet protocol IP address.

15. The apparatus of claim 11, wherein the higher level protocol information comprises a network address for the second network, and a host address for the second processor.

16. The apparatus of claim 11, wherein the higher level protocol comprises a network management protocol, and the lower level protocol comprises a medium access protocol.

17. The apparatus of claim 11, wherein the first processor includes resources to provide network services to frames of data in the first and second networks through the first and second interfaces, and the second processor includes resources to extend the second interface of the first processor transparently to the second network.

18. The apparatus of claim 11, wherein the resolution logic comprises a routine executed by the first processor.

19. The apparatus of claim 11, wherein the first network includes a network management processor, and the resolution logic comprises a routine executed by the network management processor.

20. The apparatus of claim 11, wherein the resolution logic includes a resolution table configurable independent of the lower level protocol identifier of the second processor, for assigning the higher level protocol information to the second processor in response to the interface through which the resolution request is received by the first processor.

21. The apparatus of claim 11, wherein the communication link comprises a point-to-point channel, connecting the second interface of the first processor and the second processor.

22. An apparatus for connecting a first local area network and a second local area network, comprising:

a communication link including a point-to-point channel;

a first processor, having a first interface coupled to the first local area network and a second interface coupled to the point-to-point channel of the communication link;

a second processor having a physical network identifier and coupled to the second local area network and to the point-to-point channel of the communication link; and

network management resources, coupled with the first local area network, operating according to a network management protocol, and including resolution logic to provide a network management protocol information to the second processor in response to a resolution request through the second interface of the first processor, independent of the physical network identifier of the second processor.

23. The apparatus of claim 22, wherein the resolution logic includes a resolution table configurable independent of the physical network identifier of the second processor, for assigning the network management protocol information to the second processor in response to the interface through which the resolution request is received by the first processor.

24. The apparatus of claim 22, wherein the network management protocol information comprises an internet protocol IP address.

25. The apparatus of claim 22, wherein the resolution logic comprises a routine executed by the first processor.

26. The apparatus of claim 22, wherein the first network includes a network management processor controlling the network management resources, and the resolution logic comprises a routine executed by the network management processor.

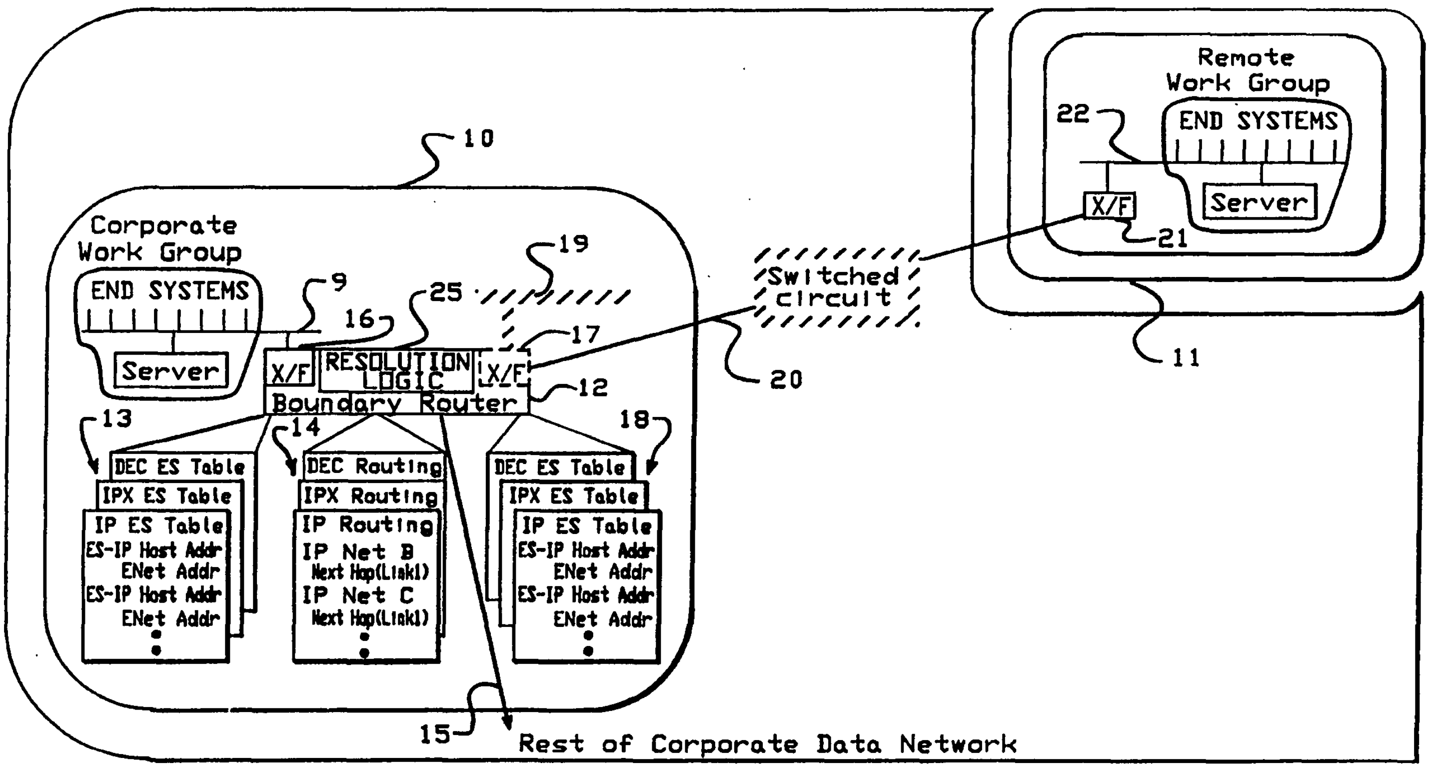

10
Corporate Work Group
END SYSTEMS
Server
9
16
25
19
RESOLUTION LOGIC
X/F
X/F
17
Boundary Router
12
13
14
18
DEC ES Table
IPX ES Table
IP ES Table
ES-IP Host Addr
ENet Addr
ES-IP Host Addr
ENet Addr
DEC Routing
IPX Routing
IP Routing
IP Net B
Next Hop(Link1)
IP Net C
Next Hop(Link1)
DEC ES Table
IPX ES Table
IP ES Table
ES-IP Host Addr
ENet Addr
ES-IP Host Addr
ENet Addr
15
Rest of Corporate Data Network
Switched circuit
20
Remote Work Group
22
END SYSTEMS
X/F
Server
21
11

FIG.—1

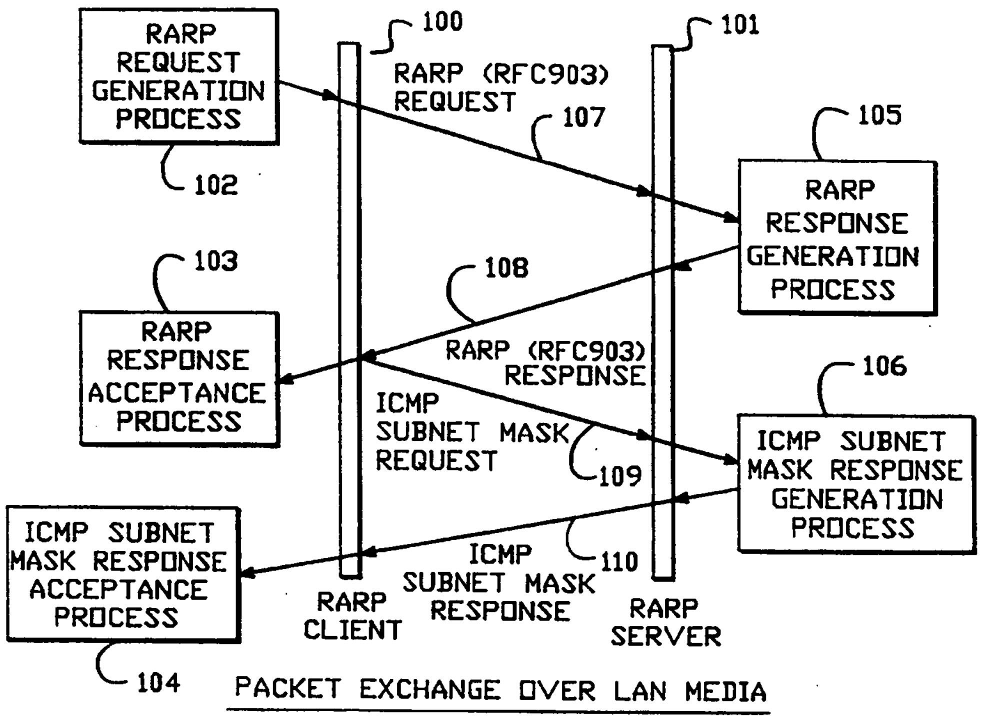


FIG.—2
(PRIOR ART)

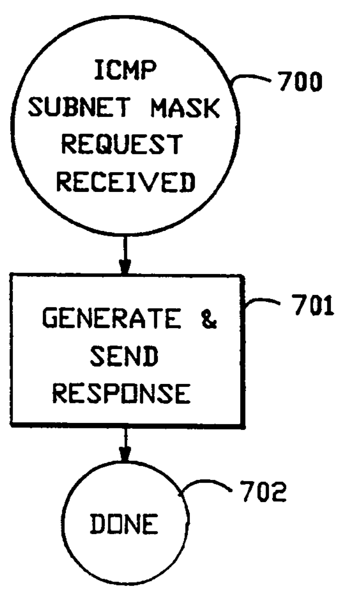
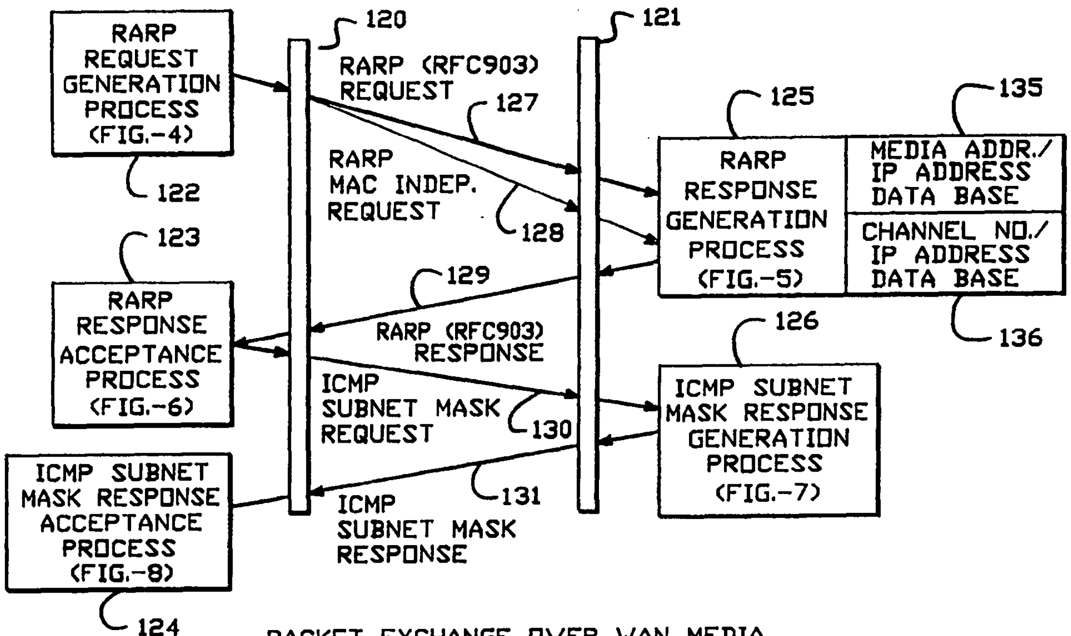
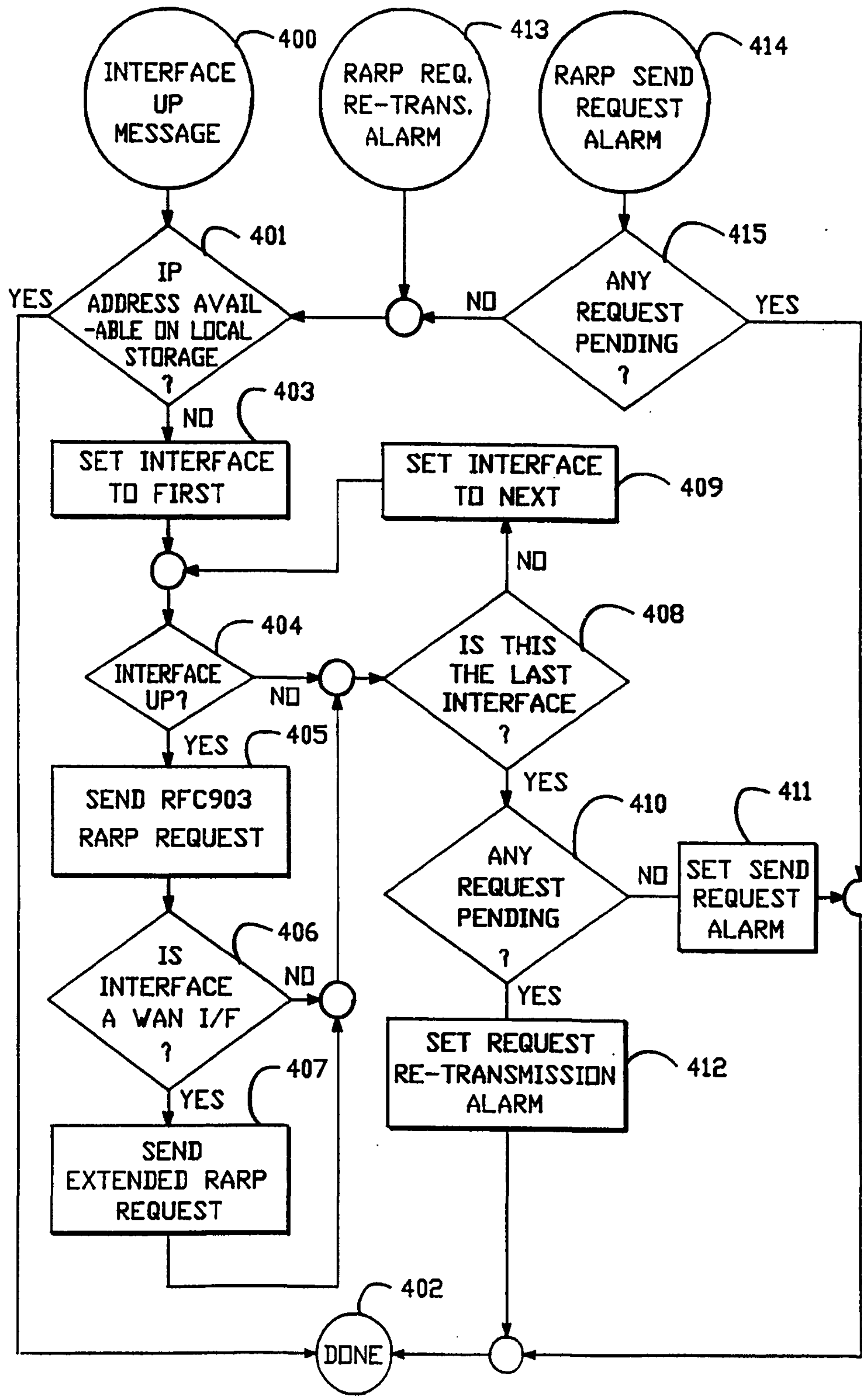


FIG.—7



PACKET EXCHANGE OVER WAN MEDIA

FIG.-3



INTERFACE UP MESSAGE
400
RARP REQ. RE-TRANS. ALARM
413
RARP SEND REQUEST ALARM
414
IP ADDRESS AVAIL -ABLE ON LOCAL STORAGE ?
401
YES
NO
ANY REQUEST PENDING ?
415
NO
YES
SET INTERFACE TO FIRST
403
SET INTERFACE TO NEXT
409
NO
INTERFACE UP?
404
NO
YES
IS THIS THE LAST INTERFACE ?
408
YES
SEND RFC903 RARP REQUEST
405
ANY REQUEST PENDING ?
410
NO
SET SEND REQUEST ALARM
411
IS INTERFACE A WAN I/F ?
406
NO
YES
SET REQUEST RE-TRANSMISSION ALARM
412
YES
407
SEND EXTENDED RARP REQUEST
402
DONE

FIG.-4

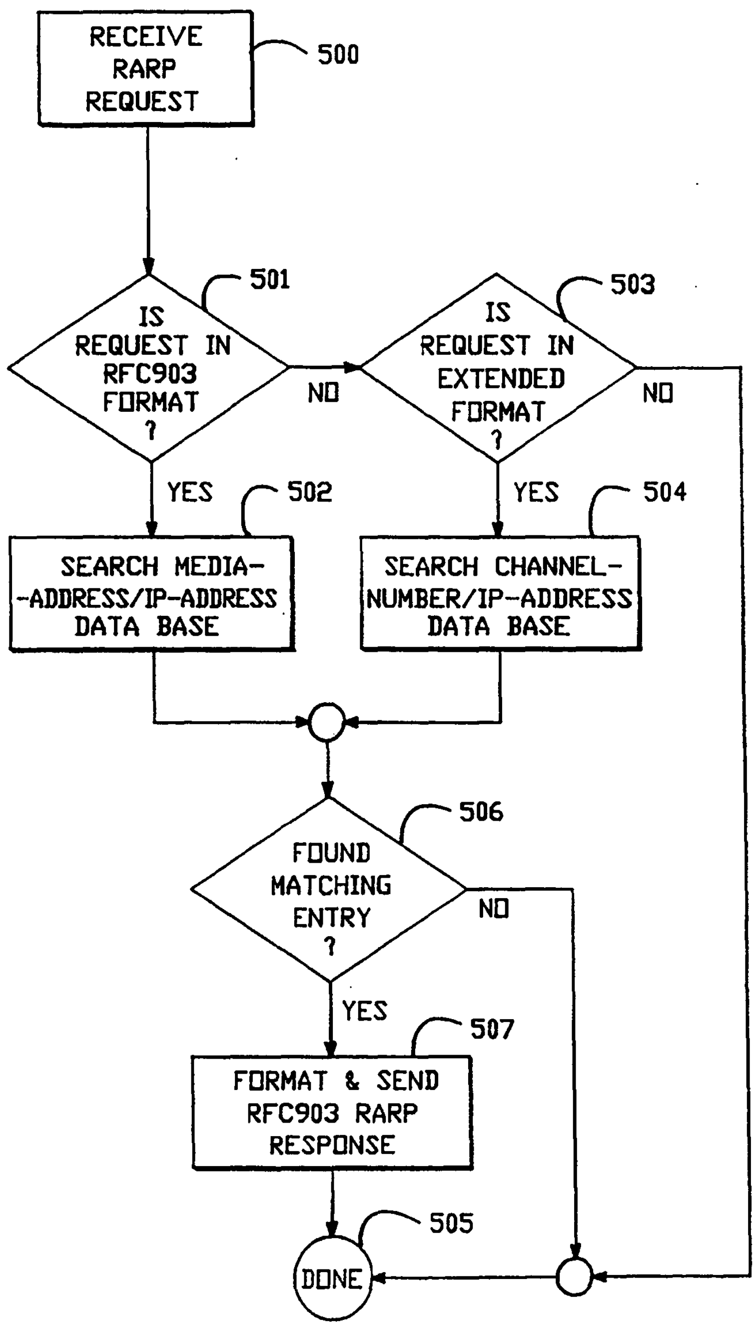

RECEIVE RARP REQUEST
500
IS REQUEST IN RFC903 FORMAT ?
501
NO
IS REQUEST IN EXTENDED FORMAT ?
503
NO
YES
502
YES
504
SEARCH MEDIA- -ADDRESS/IP-ADDRESS DATA BASE
SEARCH CHANNEL- NUMBER/IP-ADDRESS DATA BASE
FOUND MATCHING ENTRY ?
506
NO
YES
507
FORMAT & SEND RFC903 RARP RESPONSE
505
DONE

FIG.—5

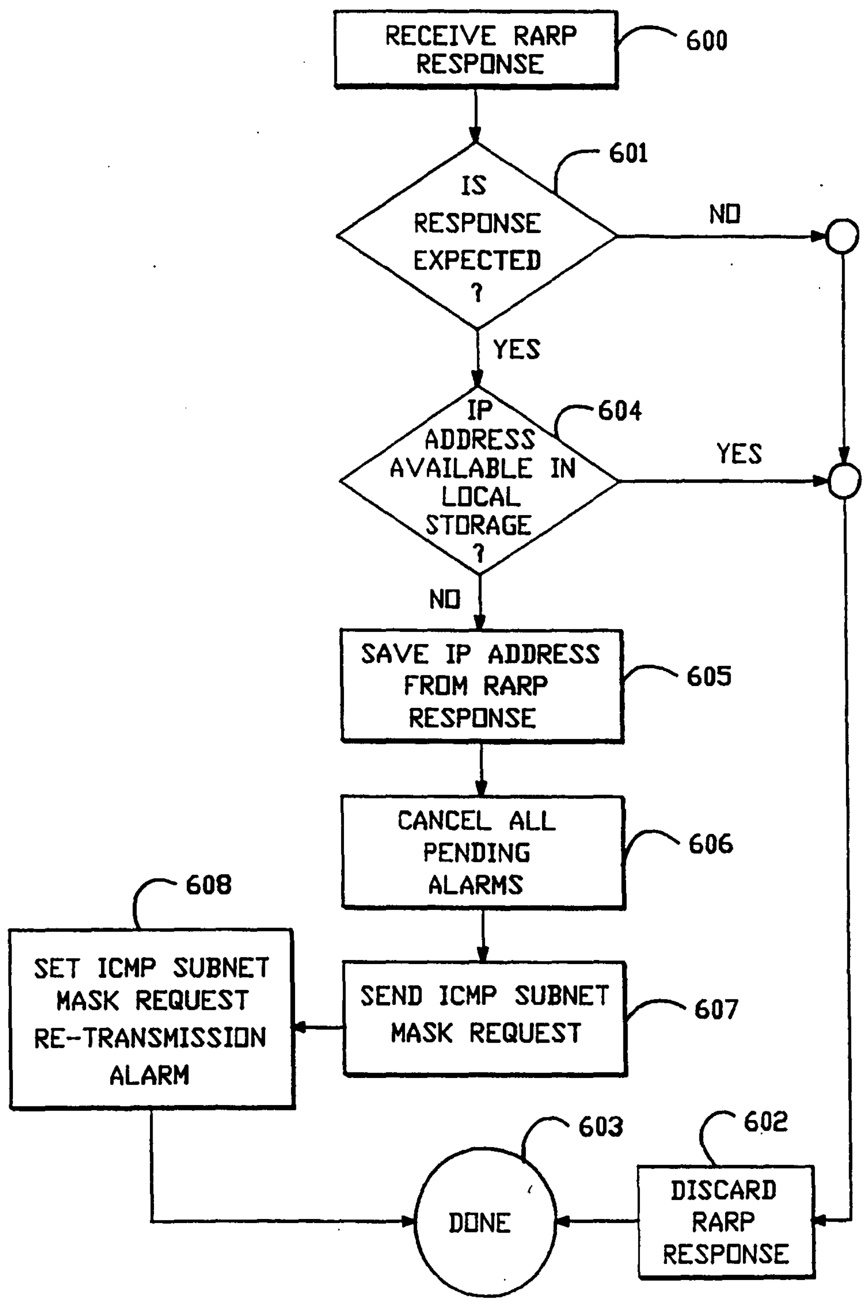

RECEIVE RARP RESPONSE
600
IS RESPONSE EXPECTED ?
601
NO
YES
IP ADDRESS AVAILABLE IN LOCAL STORAGE ?
604
YES
NO
SAVE IP ADDRESS FROM RARP RESPONSE
605
CANCEL ALL PENDING ALARMS
606
608
SET ICMP SUBNET MASK REQUEST RE-TRANSMISSION ALARM
SEND ICMP SUBNET MASK REQUEST
607
603
602
DONE
DISCARD RARP RESPONSE

FIG.-6

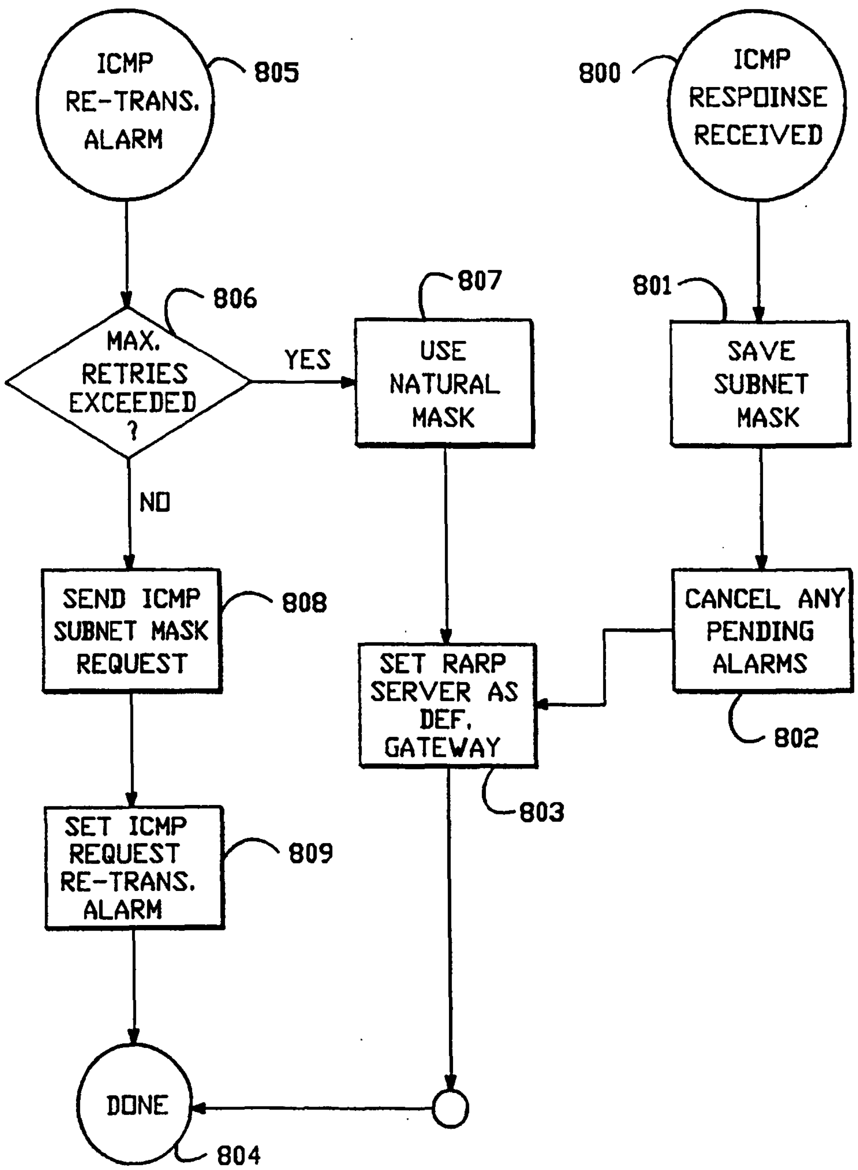

ICMP
RE-TRANS.
ALARM
805
ICMP
RESPOINSE
RECEIVED
800
806
MAX.
RETRIES
EXCEEDED
?
YES
807
USE
NATURAL
MASK
801
SAVE
SUBNET
MASK
NO
SEND ICMP
SUBNET MASK
REQUEST
808
SET RARP
SERVER AS
DEF.
GATEWAY
CANCEL ANY
PENDING
ALARMS
802
803
SET ICMP
REQUEST
RE-TRANS.
ALARM
809
DONE
804

FIG.-8

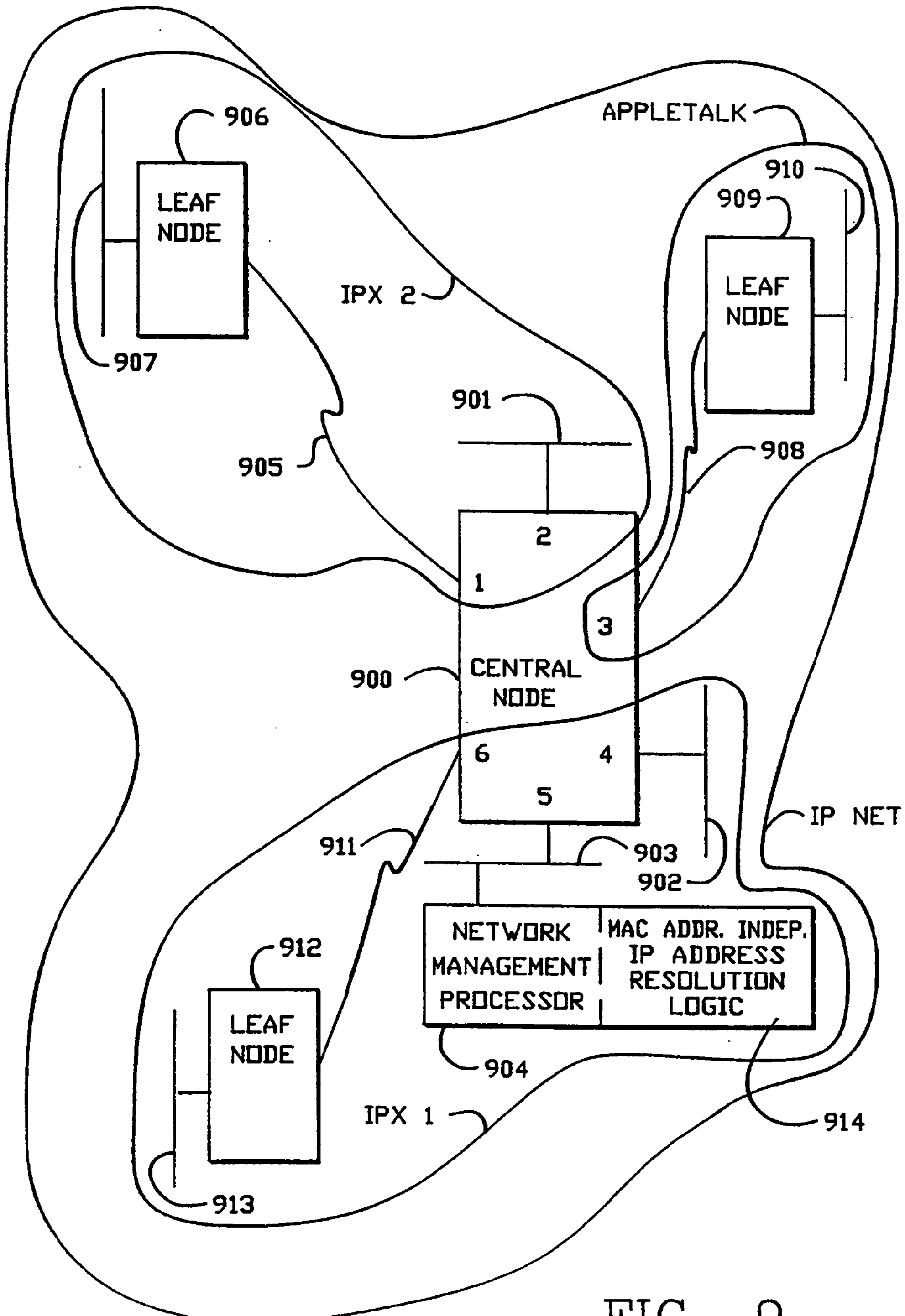

APPLETALK
906
LEAF NODE
910
909
LEAF NODE
IPX 2
907
901
905
908
2
1
3
900
CENTRAL NODE
6
4
5
IP NET
911
903
902
912
NETWORK MANAGEMENT PROCESSOR
MAC ADDR. INDEP. IP ADDRESS RESOLUTION LOGIC
LEAF NODE
904
IPX 1
914
913

FIG.—9

INTERNATIONAL SEARCH REPORT	International application No. PCT/US94/00004

A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :G06F 13/00
US CL :395/200
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 395/200

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Please See Extra Sheet.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A, E	US, A, 5,289,579 (PUNJ) 22 February 1994, col. 2 lines 48-56.	1-26
X, E	US, A, 5,287,103 (KASPRZYK ET AL) 15 February 1994, col. 2 lines 15-25, col. 4 lines 45-51, 67-68.	1-26
X, P	US, A, 5,251,300 (HALLIWELL ET AL) 5 October 1993, col. 1 lines 32-43, 46-50, 55-56, col. 2 lines 21-24.	1-5, 11, 12, 18-23, 25,26
X	US, A, 5,113,495 (UEHARA) 12 May 1992, col. 1 lines 16-19, col. 2 lines 34-37, col. 6 lines 8-10, 22-25, col. 7 lines 16-34, 59-67.	1-5, 11-12, 17-23, 25-26

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
29 March 1994	04 MAY 1994
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231	Authorized officer DALE SHAW B. Nandy
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US94/00004

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Loi, "RARP Design Specification"-Draft, 21 August 1992 3Com Corp-Network Systems Div., pages 1-11.	1-26
A	Arunkumar, "Boundary Routing Design Specification"-Draft, 14 September 1992 3Com Corp-Network Systems Div., pages 1-13.	1-26
A	Plummer, "An Ethernet Address Resolution Protocol -or- Converting Network Protocol Address to 48.bit Ethernet Address for Transmission on Ethernet Hardware", November 1982 Symbolics, Inc.	1-26
A	Finlayson et al., "A Reverse Address Resolution Protocol", June 1984 Stanford University.	1-26

Form PCT/ISA/210 (continuation of second sheet)(July 1992)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US94/00004

B. FIELDS SEARCHED
Electronic data bases consulted (Name of data base and where practicable terms used):

APS
search terms: reverse address resolution protocol, RARP, processor, channels, communication network, resolution logic, logic, table, internet protocol, IP address

Form PCT/ISA/210 (extra sheet)(July 1992)*

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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : H04L	A2	(11) International Publication Number: WO 97/14234 (43) International Publication Date: 17 April 1997 (17.04.97)

(21) International Application Number: PCT/US96/15504

(22) International Filing Date: 25 September 1996 (25.09.96)

(30) Priority Data:
08/533,115 25 September 1995 (25.09.95) US

(71) Applicant: NETSPEAK CORPORATION [US/US]; Suite 104, 902 Clint Moore Road, Boca Raton, FL 33487 (US).

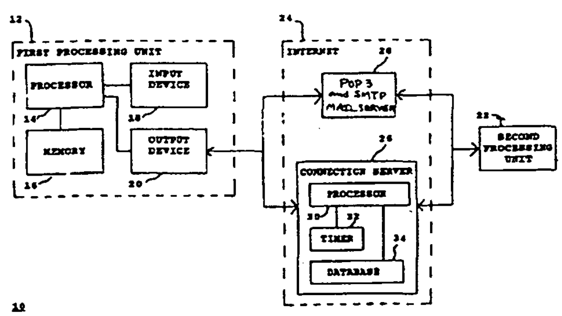
(72) Inventor: HUTTON, Glenn, W.; Apartment 206, 9725 Hammocks Boulevard, Miami, FL 33196 (US).

(74) Agent: JOBSE, Bruce, D.; Bookstein & Kudirka, P.C., One Beacon Street, Boston, MA 02108 (US).

(81) Designated States: AU, BR, CA, CN, JP, KR, MX, RU, SG, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
Without international search report and to be republished upon receipt of that report.

(54) Title: POINT-TO-POINT INTERNET PROTOCOL



(57) Abstract

A point-to-point Internet protocol exchanges Internet Protocol (IP) addresses between units to establish a point-to-point communication link between the processing units through the Internet. In accordance with the disclosed protocol, a method of locating a user process over a computer network, the user process having a dynamically assigned network protocol address comprises the steps of (a) maintaining in a computer memory a compilation of entries, each entry comprising a network protocol address of a user process connected to the computer network; and (b) in response to identification of one of the entries by a requesting user processor, providing the network protocol address of the identified entry to the requesting user process. In accordance with another embodiment of the invention, a computer system having an audio transducer and a display device and being operatively coupled to other computers and a server over a computer network comprises (a) means for transmitting an E-mail signal containing a network protocol address of a first process to a second process over the computer network; (b) means for receiving a second network protocol address from the second process over the computer network; and (c) means, for responsive to the second network protocol address for establishing a communication link between the first process and the second process over the computer network.

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POINT-TO-POINT INTERNET PROTOCOL

FIELD OF THE INVENTION

The present invention relates, in general, to data processing systems, and more specifically, to a method and apparatus for facilitating audio communications over computer networks.

BACKGROUND OF THE INVENTION

The increased popularity of on-line services such as AMERICA ONLINE™, COMPUSERVE®, and other services such as Internet gateways have spurred applications to provide multimedia, including video and voice clips, to online users. An example of an online voice clip application is VOICE E-MAIL FOR WINCIM and VOICE E-MAIL FOR AMERICA ONLINE™, available from Bonzi Software, as described in "Simple Utilities Send Voice E-Mail Online", MULTIMEDIA WORLD, VOL. 2, NO. 9, August 1995, p. 52. Using such Voice E-Mail software, a user may create an audio message to be sent to a predetermined E-mail address specified by the user.

Generally, devices interfacing to the Internet and other online services may communicate with each other upon establishing respective device addresses. One type of device address is the Internet Protocol (IP) address, which acts as a pointer to the device associated with the IP address. A typical device may have a Serial Line Internet Protocol or Point-to-Point Protocol (SLIP/PPP) account with a permanent IP address for receiving E-mail, voicemail, and the like over the Internet. E-mail and voicemail is generally intended to convey text, audio, etc., with any routing information such as an IP address and routing headers generally being considered an artifact of the communication, or even gibberish to the recipient.

Devices such as a host computer or server of a company may include multiple modems for connection of users to the Internet, with a temporary IP address allocated to each user. For example, the host computer may have a general IP address "XXX.XXX.XXX," and each user may be allocated a successive IP address of XXX.XXX.XXX.10, XXX.XXX.XXX.11, XXX.XXX.XXX.12, etc. Such temporary IP addresses may be reassigned or recycled to the users, for example, as each user is successively connected to an outside party. For example, a host computer of a company may support a maximum of 254 IP addresses which are pooled and shared between devices connected to the host computer.

Permanent IP addresses of users and devices accessing the Internet readily support point-to-point communications of voice and video signals over the Internet. For example, realtime video teleconferencing has been implemented using dedicated IP addresses and mechanisms known as reflectors. Due to the dynamic nature of temporary IP addresses of some devices accessing the Internet, point-to-point communications in realtime of voice and video have been generally difficult to attain.

SUMMARY OF THE INVENTION

The above deficiencies in the prior art and the previously described needs are fulfilled by the present invention which provides, a directory server utility for providing the dynamically assigned network protocol addresses of client processes currently coupled to the computer network. Accordingly to one embodiment of the present invention, a method of locating users having dynamically assigned network protocol addresses comprises the steps of maintaining a compilation of entries, each entry comprising a network protocol address of a client process connected to the computer network, and, in response to identification of one of the entries by a requesting client process, providing the network protocol address of the identified entry to the requesting client process.

In accordance with another embodiment of the invention, a computer system having an audio transducer and a display device and being operatively coupled to other computers and a server over a computer network comprises (a) means for transmitting an E-mail signal containing a network protocol address of a first process to a second process over the computer network; (b) means for receiving a second network protocol address from the second process over the computer network; and (c) means, for responsive to the second network protocol address for establishing a communication link between the first process and the second process over the computer network.

BRIEF DESCRIPTION OF THE DRAWINGS

The features of the invention will become more readily apparent and may be better understood by referring to the following detailed description of an illustrative embodiment of the present invention, taken in conjunction with the accompanying drawings, in which:

FIG. 1 illustrates, in block diagram format, a system for the disclosed point-to-point Internet protocol;

FIG. 2 illustrates, in block diagram format, the system using a secondary point-to-point Internet protocol;

FIG. 3 illustrates, in block diagram format, the system of FIGS. 1-2 with the point-to-point Internet protocol established;

FIG. 4 is another block diagram of the system of FIGS 1-2 with audio communications being conducted;

FIG. 5 illustrates a display screen for a processing unit;

FIG. 6 illustrates another display screen for a processing unit;

FIG. 7 illustrates a flowchart of the initiation of the point-to-point Internet protocols;

FIG. 8 illustrates a flowchart of the performance of the primary point-to-point Internet protocols; and

FIG. 9 illustrates a flowchart of the performance of the secondary point-to-point Internet protocol.

DETAILED DESCRIPTION

Referring now in specific detail to the drawings, with like reference numerals identifying similar or identical elements, as shown in FIG. 1, the present disclosure describes a point-to-point network protocol and system 10 for using such a protocol.

In an exemplary embodiment, the system 10 includes a first processing unit 12 for sending at least a voice signal from a first user to a second user. The first processing unit 12 includes a processor 14, a memory 16, an input device 18, and an output device 20. The output device 20 includes at least one modem capable of, for example, 14.4 kbaud communications and operatively connected via wired and/or wireless communication connections to the Internet or other computer networks such as an Intranet, i.e., a private computer network. One skilled in the art would understand that the input device 18 may be implemented at least in part by the modem of the output device 20 to allow input signals from the communication connections to be received. The second processing unit 22 may have a processor, memory, and input and output devices, including at least one modem and associated communication connections, as described above for the first processing unit 12. In an exemplary embodiment, each of the processing units 12, 22 may execute the WEBPHONE™ Internet telephony application available from NetSpeak Corporation, Boca Raton, FL, which is capable of performing the disclosed point-to-point Internet protocol and system 10, as described herein.

The first processing unit 12 and the second processing unit 22 are operatively connected to the Internet 24 by communication devices and software known in the art, such as an Internet Service Provider (ISP) or an Internet gateway. The processing units 12, 22 may be operatively interconnected through the Internet 24 to a connection server 26, and may also be operatively connected to a mail server 28 associated with the Internet 24.

The connection server 26 includes a processor 30, a timer 32 for generating time stamps, and a memory such as a database 34 for storing, for example, E-mail and Internet Protocol (IP) addresses of logged-in units. In an exemplary embodiment, the connection server 26 may be a SPARC 5 server or a SPARC 20 server, available from SUN MICROSYSTEMS, INC., Mountain View, CA, having a central processing unit (CPU) as processor 30, an operating system (OS) such as UNIX, for providing timing operations such as maintaining the timer 32, a hard drive or fixed drive, as well as dynamic random access memory (DRAM) for storing the database 34, and a keyboard and display and/or other input and output devices (not shown in FIG. 1). The database 34 may be an SQL database available from ORACLE or INFORMIX.

In an exemplary embodiment, the mail server 28 may be a Post Office Protocol (POP) Version 3 mail server including a processor, memory, and stored programs operating in a UNIX environment, or, alternatively, another OS, to process E-mail capabilities between processing units and devices over the Internet 24.

The first processing unit 12 may operate the disclosed point-to-point Internet protocol by a computer program described hereinbelow in conjunction with FIG. 6, which may be implemented from compiled and /or interpreted source code in the C++ programming language and which may be downloaded to the first processing unit 12 from an external computer. The operating computer program may be stored in the memory 16, which may include about 8 MB RAM and/or a hard or fixed drive having about 8 MB. Alternatively, the source code may be implemented in the first processing unit 12 as firmware, as an erasable read only memory (EPROM), etc. It is understood that one skilled in the art would be able to use programming languages other than C++ to implement the disclosed point-to-point network protocol and system 10.

The processor 14 receives input commands and data from a first user associated with the first processing unit 12 though the input device 18, which may be an input port connected by a wired, optical, or a wireless connection for electromagnetic transmissions, or alternatively may be transferable storage media, such as floppy disks, magnetic tapes, compact disks, or other storage media including the input data from the first user.

The input device 18 may include a user interface (not shown) having, for example, at least one button actuated by the user to input commands to select from a plurality of operating modes to operate the first processing unit 12. In alternative embodiments, the input device 18 may include a keyboard, a mouse, a touch screen, and/or a data reading device such as a disk drive for receiving the input data from input data files stored in storage media such as a floppy disk or, for example, an 8 mm storage tape. The input device 18 may alternatively include connections to other computer systems to receive the input commands and data therefrom.

The first processing unit 12 may include a visual interface for use in conjunction with the input device 18 and output device 20 similar to those screens illustrated in FIGS. 5-6, discussed below. It is also understood that alternative devices may be used to receive commands and data from the user, such as keyboards, mouse devices, and graphical user interfaces (GUI) such as WINDOWS™ 3.1 available form MICROSOFT Corporation, Redmond, WA., and other operating systems and GUIs, such as OS/2 and OS/2 WARP, available from IBM CORPORATION, Boca Raton, FL. Processing unit 12 may also include microphones and/or telephone handsets for receiving audio voice data and commands, speech or voice recognition devices, dual tone multi-frequency (DTMF) based devices, and/or software known in the art to accept voice data and commands and to operate the first processing unit 12.

In addition, either of the first processing unit 12 and the second processing unit 22 may be implemented in a personal digital assistant (PDA) providing modem and E-mail capabilities and Internet access, with the PDA providing the input/output screens for mouse interactions or for touchscreen activation as shown, for example, in FIGS. 5-6, as a combination of the input device 18 and output device 20.

For clarity of explanation, the illustrative embodiment of the disclosed point-to-point Internet protocol and system 10 is presented as having individual functional blocks, which may include functional blocks labeled as "processor" and "processing unit". The functions represented by these blocks may be provided through the use of either shared or dedicated hardware, including, but not limited to, hardware capable of executing software. For example, the functions of each of the processors and processing units presented herein may be provided by a shared processor or by a plurality of individual processors. Moreover, the use of the functional blocks with accompanying labels herein is not to be construed to refer exclusively to hardware capable of executing software. Illustrative embodiments may include digital signal processor (DSP) hardware, such as the AT&T DSP16 or DSP32C, read-only memory (ROM) for storing software performing the operations discussed below, and random access memory (RAM) for storing DSP results. Very large scale integration (VLSI) hardware embodiments, as well as custom VLSI circuitry in combination with a general purpose DSP circuit, may also be provided. Any and all of these embodiments may be deemed to fail within the meaning of the labels for the functional blocks as used herein.

The processing units 12, 22 are capable of placing calls and connecting to other processing units connected to the Internet 24, for example, via dialup SLIP/PPP lines. In an exemplary embodiment, each processing unit assigns an unsigned long session number, for example, a 32- bit long sequence in a *.ini file for each call. Each call may be assigned a successive session number in sequence, which may be used by the respective processing unit to associate the call with one of the SLIP/PPP lines, to associate a <ConnectOK> response signal with a <Connect Request> signal, and to allow for multiplexing and demultiplexing of inbound and outbound conversations on conference lines, as explained hereinafter.

For callee (or called) processing units with fixed IP addresses, the caller (or calling) processing unit may open a "socket", i.e. a file handle or address indicating where data is to be sent, and transmit a <Call> command to establish communication with the callee utilizing, for example, datagram services such as Internet Standard network layering as well as transport layering, which may include a Transport Control Protocol (TCP) or a User Datagram Protocol (UDP) on top of the IP. Typically, a processing unit having a fixed IP address may maintain at least one open socket and a called processing unit waits for a <Call> command to assign the open socket to the incoming signal. If all lines are in use, the callee processing unit sends a BUSY signal or message to the callee processing unit. As shown in FIG. 1, the disclosed point-to-point Internet protocol and system 10 operate when a callee processing unit does not have a fixed or predetermined IP address. In the exemplary embodiment and without loss of generality, the first processing unit 12 is the caller processing unit and the second processing unit 22 is the called processing unit. When either of processing units 12, 22 logs on to the Internet via a dial-up connection, the respective unit is provided a dynamically allocated IP address by the a connection service provider.

Upon the first user initiating the point-to-point Internet protocol when the first user is logged on to the Internet 24, the first processing unit 12 automatically transmits its associated E-mail address and its dynamically allocated IP address to the connection server 26. The connection server 26 then stores these addresses in the database 34 and time stamps the stored addresses using timer 32. The first user operating the first processing unit 12 is thus established in the database 34 as an active on-line party available for communication using the disclosed point-to-point Internet protocol. Similarly, a second user operating the second processing unit 22, upon connection to the Internet 24 through the a connection service provider, is processed by the connection server 26 to be established in the database 34 as an active on-line party.

The connection server 26 may use the time stamps to update the status of each processing unit; for example, after 2 hours, so that the on-line status information stored in the database 34 is relatively current. Other predetermined time periods, such as a default value of 24 hours, may be configured by a systems operator.

The first user with the first processing unit 12 initiates a call using, for example, a Send command and/or a command to speeddial an N^{TH} stored number, which may be labeled [SND] and [SPD] [N], respectively, by the input device 18 and/or the output device 20, such as shown in FIGS. 5-6. In response to either the Send or speeddial commands, the first processing unit 12 retrieves from memory 16 a stored E-mail address of the callee corresponding to the N^{TH} stored number. Alternatively, the first user may directly enter the E-mail address of the callee.

The first processing unit 12 then sends a query, including the E-mail address of the callee, to the connection server 26. The connection server 26 then searches the database 34 to determine whether the callee is logged-in by finding any stored information corresponding to the callee's E-mail address indicating that the callee is active and on-line. If the callee is active and on-line, the connection server 26 then performs the primary point-to-point Internet protocol; i.e. the IP address of the callee is retrieved from the database 34 and sent to the first processing unit 12. The first processing unit 12 may then directly establish the point-to-point Internet communications with the callee using the IP address of the callee.

If the callee is not on-line when the connection server 26 determines the callee's status, the connection server 26 sends an OFF-LINE signal or message to the first processing unit 12. The first processing unit 12 may also display a message such as "Called Party Off-Line" to the first user.

When a user logs off or goes off-line from the Internet 24, the connection server 26 updates the status of the user in the database 34; for example, by removing the user's information, or by flagging the user as being off-line. The connection server 26 may be instructed to update the user's information in the database 34 by an off-line message, such as a data packet, sent automatically from the processing unit of the user prior to being disconnected from the connection server 26. Accordingly, an off-line user is effectively disabled from making and/or receiving point-to-point Internet communications.

As shown in FIGS. 2-4, the disclosed secondary point-to-point Internet protocol may be used as an alternative to the primary point-to-point Internet protocol described above, for example, if the connection server 26 is non-responsive, inoperative, and/or unable to perform the primary point-to-point Internet protocol, as a non-responsive condition. Alternatively, the disclosed secondary point-to-point Internet protocol may be used independent of the primary point-to-point Internet protocol. In the disclosed secondary point-to-point Internet protocol, the first processing unit 12 sends a <ConnectRequest> message via E-mail over the Internet 24 to the mail server 28. The E-mail including the <ConnectRequest> message may have, for example, the subject

[*wp#XXXXXXXX#nnn.nnn.nnn.#emailAddr]

where nnn.nnn.nnn.nnn. is the current (i.e. temporary or permanent) IP address of the first user, and XXXXXXXX is a session number, which may be unique and associated with the request of the first user to initiate point-to-point communication with the second user.

As described above, the first processing unit 12 may send the <ConnectRequest> message in response to an unsuccessful attempt to perform the primary point-to-point Internet protocol. Alternatively, the first processing unit 12 may send the <ConnectRequest> message in response to the first user initiating a SEND command or the like.

After the <ConnectRequest> message via E-mail is sent, the first processing unit 12 opens a socket and waits to detect a response from the second processing unit 22. A timeout timer, such as timer 32, may be set by the first processing unit 12, in a manner known in the art, to wait for a predetermined duration to receive a <ConnectOK> signal. The processor 14 of the first processing unit 12 may cause the output device 20 to output a Ring signal to the user, such as an audible ringing sound, about every 3 seconds . For example, the processor 14 may output a *.wav file, which may be labeled RING.WAV, which is processed by the output device 20 to output an audible ringing sound.

The mail server 28 then polls the second processing unit 22, for example, every 3-5 seconds, to deliver the E-mail. Generally, the second processing unit 22 checks the incoming lines, for example, at regular intervals to wait for and to detect incoming E-mail from the mail server 28 through the Internet 24.

Typically, for sending E-mail to users having associated processing units operatively connected to a host computer or server operating an Internet gateway, E-mail for a specific user may be sent over the Internet 24 and directed to the permanent IP address or the SLIP/PPP account designation of the host computer, which then assigns a temporary IP address to the processing unit of the specified user for properly routing the E-mail. The E-mail signal may include a name or other designation such as a user name which identifies the specific user regardless of the processing unit assigned to the user; that is, the host computer may track and store the specific device where a specific user is assigned or logged on, independent of the IP address system, and so the host computer may switch the E-mail signal to the device of the specific user. At that time, a temporary IP address may be generated or assigned to the specific user and device.

Upon detecting and/or receiving the incoming E-mail signal from the first processing unit 12, the second processing unit 22 may assign or may be assigned a temporary IP address. Therefore, the delivery of the E-mail through the Internet 24 provides the second processing unit 22 with a session number as well as IP addresses of both the first processing unit 12 and the second processing unit 22.

Point-to-point communication may then be established by the processing unit 22 processing the E-mail signal to extract the <ConnectRequest> message, including the IP address of the first processing unit 12 and the session number. The second processing unit 22 may then open a socket and generate a <ConnectOK> response signal, which includes the temporary IP address of the second processing unit 22 as well as the session number of the first processing unit.

The second processing unit 22 sends the <ConnectOK> signal directly over the Internet 24 to the IP address of the first processing unit 12 without processing by the mail server 28, and a timeout timer of the second processing unit 22 may be set to wait and detect a <Call> signal expected from the first processing unit 12.

Realtime point-to-point communication of audio signals over the Internet 24, as well as video and voicemail, may thus be established and supported without requiring permanent IP addresses to be assigned to either of the users or processing units 12, 22. For the duration of the realtime point-to-point link, the relative permanence of the current IP addresses of the processing units 12, 22 is sufficient, whether the current IP addresses were permanent (i.e. predetermined or preassigned) or temporary (i.e. assigned upon initiation of the point-to-point communication).

In the exemplary embodiment, a first user operating the first processing unit 12 is not required to be notified by the first processing unit 12 that an E-mail is being generated and sent to establish the point-to-point link with the second user at the second processing unit 22. Similarly, the second user is not required to be notified by the second processing unit 22 that an E-mail has been received and/or a temporary IP address is associated with the second processing unit 22. The processing units 12, 22 may perform the disclosed point-to-point Internet protocol automatically upon initiation of the point-to-point communication command by the first user without displaying the E-mail interactions to either user. Accordingly, the disclosed point-to-point Internet protocol may be transparent to the users. Alternatively, either of the first and second users may receive, for example, a brief message of "CONNECTION IN PROGRESS" or the like on a display of the respective output device of the processing units 12, 22.

After the initiation of either the primary or the secondary point-to-point Internet protocols described above in conjunction with FIGS. 1-2, the point-to-point communication link over the Internet 24 may be established as shown in FIGS. 3-4 in a manner known in the art. For example, referring to FIG. 3, upon receiving the <ConnectorOK> signal from the second processing unit 22, the first processing unit 12 extracts the IP address of the second processing unit 22 and the session number, and the session number sent from the second processing unit 22 is then checked with the session number originally sent from the first processing unit 12 in the <ConnectRequest> message as E-mail. If the session numbers sent and received by the processing unit 12 match, then the first processing unit 12 sends a <Call> signal directly over the Internet 24 to the second processing unit 22; i.e. using the IP address of the second processing unit 22 provided to the first processing unit 12 in the <ConnectOK> signal.

Upon receiving the <Call> signal, the second processing unit 22 may then begin a ring sequence, for example, by indicating or annunciating to the second user that an incoming call is being received. For example, the word "CALL" may be displayed on the output device of the second processing unit 22. The second user may then activate the second processing unit 22 to receive the incoming call.

Referring to FIG. 4, after the second processing unit 22 receives the incoming call, realtime audio and/or video conversations may be conducted in a manner known in the art between the first and second users through the Internet 24, for example, by compressed digital audio signals. Each of the processing units 12, 22 also display to each respective user the words "IN USE" to indicate that the point-to-point communication link is established and audio or video signals are being transmitted.

In addition, either user may terminate the point-to-point communication link by, for example, activating a termination command, such as by activating an [END] button or icon on a respective processing unit, causing the respective processing unit to send an <End> signal which causes both processing units to terminate the respective sockets, as well as to perform other cleanup commands and functions known in the art.

FIGS. 5-6 illustrate examples of display screens 36 which may be output by a respective output device of each processing unit 12, 22 of FIGS. 1-4 for providing the disclosed point-to-point Internet protocol and system 10. Such display screens may be displayed on a display of a personal computer (PC) or a PDA in a manner known in the art.

As shown in FIG. 5, a first display screen 36 includes a status area 38 for indicating, for example, a called user by name and/or by IP address or telephone number; a current function such as C2; a current time; a current operating status such as "IN USE", and other control icons such as a down arrow icon 40 for scrolling down a list of parties on a current conference line. The operating status may include such annunciators as "IN USE," "IDLE," "BUSY," "NO ANSWER," "OFFLINE," "CALL," "DIALING," "MESSAGES," and "SPEEDDIAL."

Other areas of the display screen 36 may include activation areas or icons for actuating commands or entering data. For example, the display screen 36 may include a set of icons 42 arranged in columns and rows including digits 0-9 and commands such as END, SND, HLD, etc. For example, the END and SND commands may be initiated as described above, and the HLD icon 44 may be actuated to place a current line on hold. Such icons may also be configured to substantially simulate a telephone handset or a cellular telephone interface to facilitate ease of use, as well as to simulate function keys of a keyboard. For example, icons labeled L1-L4 may be mapped to function keys F1-F4 on standard

PC keyboards, and icons C1-C3 may be mapped to perform as combinations of function keys, such as CTRL-F1, CTRL-F2, and CTRL-F3, respectively. In addition, the icons labeled L1-L4 and C1-C3 may include circular regions which may simulate light emitting diodes (LEDs) which indicate that the function or element represented by the respective icon is active or being performed.

Icons L1-L4 may represent each of 4 lines available to the caller, and icons C1-C3 may represent conference calls using at least one line to connect, for example, two or more parties in a conference call. The icons L1-L4 and C1-C3 may indicate the activity of each respective line or conference line. For example, as illustrated in FIG. 5, icons L1-L2 may have lightly shaded or colored circles, such as a green circle, indicating that each of lines 1 and 2 are in use, while icons L3-L4 may have darkly shaded or color circles, such as a red or black circle, indicating that each of lines 3 and 4 are not in use. Similarly, the lightly shaded circle of the icon labeled C2 indicates that the function corresponding to C2 is active, as additionally indicated in the status are 38, while darkly shaded circles of icons labeled C1 and C3 indicate that such corresponding functions are not active.

The icons 42 are used in conjunction with the status area 38. For example, using a mouse for input, a line that is in use, as indicated by the lightly colored circle of the icon, may be activated to indicate a party's name by clicking a right mouse button for 5 seconds until another mouse click is actuated or the [ESC] key or icon is actuated. Thus, the user may switch between multiple calls in progress on respective lines.

Using the icons as well as an input device such as a mouse, a user may enter the name or alias or IP address, if known, of a party to be called by either manually entering the name, by using the speeddial feature, or by double clicking on an entry in a directory stored in the memory, such as the memory 16 of the first processing unit 12, where the directory entries may be scrolled using the status area 38 and the down arrow icon 40.

Once a called party is listed in the status area 38 as being active on a line, the user may transfer the called party to another line or a conference line by clicking and dragging the status area 38, which is represented by a reduced icon 46. Dragging the reduced icon 46 to any one of line icons L1-L4 transfers the called party in use to the selected line, and dragging the reduced icon 46 to any one of conference line icons C1-C3 adds the called party to the selected conference call.

Other features may be supported, such as icons 48-52, where icon 48 corresponds to, for example, an ALT-X command to exit the communication facility of a processing unit, and icon 50 corresponds to, for example, an ALT-M command to minimize or maximize the display screen 36 by the output device of the processing unit. Icon 52 corresponds to an OPEN command, which may, for example, correspond to pressing the O key on a keyboard, to expand or contract the display screen 36 to represent the opening and closing of a cellular telephone. An "opened" configuration is shown in FIG. 5, and a "closed" configuration is shown in FIG. 6. In the "opened" configuration, additional features such as output volume (VOL) controls, input microphone (MIC) controls, waveform (WAV) sound controls, etc.

The use of display screens such as those shown in FIGS. 5-6 provided flexibility in implementing various features available to the user. It is to be understood that additional features such as those known in the art may be supported by the processing units 12, 22.

Alternatively, it is to be understood that one skilled in the art may implement the processing units 12, 22 to have the features of the display screens in FIGS. 5-6 in hardware; i.e. a wired telephone or wireless cellular telephone may include various keys, LEDs, liquid crystal displays (LCDs), and touchscreen actuators corresponding to the icons and features shown in FIGS. 5-6. In addition, a PC may have the keys of a keyboard and mouse mapped to the icons and features shown in FIGS. 5-6.

Referring to FIG. 7, the disclosed point-to-point Internet protocol and system 10 is illustrated. First processing unit 12 initiates the point-to-point Internet protocol in step 56 by sending a query from the first processing unit 12 to the connection server 26. If connection server 26 is operative to perform the point-to-point Internet protocol, in step 58, first processing unit 12 receives an on-line status signal from the connection server 26, such signal may include the IP address of the callee or a "Callee Off-Line" message. Next, first processing unit 12 performs the primary point-to-point Internet protocol in step 60, which may include receiving, at the first processing unit 12, the IP address of the callee if the callee is active and on-line. Alternatively, processing unit 60 may initiate and perform the secondary point-to-point Internet protocol in step 62, if the called party is not active and/or on-line.

Referring to FIG. 8, in conjunction with FIGS. 1 and 3-4, the disclosed point-to-point Internet protocol and system 10 is illustrated. Connection server 26 starts the point-to-point Internet protocol, in step 64, and timestamps and stores E-mail and IP addresses of logged-in users and processing units in the database 34 in step 66. Connection server 26 receives a query from a first processing unit 12 in step 68 to determine whether a second user or second processing unit 22 is logged-in to the Internet 24, with the second user being specified, for example, by an E-mail address. Connection server 26 retrieves the IP address of the specified user from the database 34 in step 70, if the specified user is logged-in to the Internet, and sends the retrieved IP address to the first cellular telephone may include various keys, LEDs, liquid crystal displays (LCDs), and touchscreen actuators corresponding to the icons and features shown in FIGS. 5-6. In addition, a PC may have the keys of a keyboard and mouse mapped to the icons and features shown in FIGS. 5-6.

Referring to FIG. 7, the disclosed point-to-point Internet protocol and system 10 is illustrated. First processing unit 12 initiates the point-to-point Internet protocol in step 56 by sending a query from the first processing unit 12 to the connection server 26. If connection server 26 is operative to perform the point-to-point Internet protocol, in step 58, first processing unit 12 receives an on-line status signal from the connection server 26, such signal may include the IP address of the callee or a "Callee Off-Line" message. Next, first processing unit 12 performs the primary point-to-point Internet protocol in step 60, which may include receiving, at the first processing unit 12, the IP address of the callee if the callee is active and on-line. Alternatively, processing unit 60 may initiate and perform the secondary point-to-point Internet protocol in step 62, if the called party is not active and/or on-line.

Referring to FIG. 8, in conjunction with FIGS. 1 and 3-4, the disclosed point-to-point Internet protocol and system 10 is illustrated. Connection server 26 starts the point-to-point Internet protocol, in step 64, and timestamps and stores E-mail and IP addresses of logged-in users and processing units in the database 34 in step 66. Connection server 26 receives a query from a first processing unit 12 in step 68 to determine whether a second user or second processing unit 22 is logged-in to the Internet 24, with the second user being specified, for example, by an E-mail address. Connection server 26 retrieves the IP address of the specified user from the database 34 in step 70, if the specified user is logged-in to the Internet, and sends the retrieved IP address to the first processing unit 12 in step 72 to enable first processing unit 12 to establish point-to-point communications with the specified second user.

The disclosed secondary point-to-point Internet protocol operates as shown in FIG. 9. First processing unit 12 generates an E-mail signal, including a session number and a first IP address corresponding to a first processing unit in step 76. First processing unit 12 transmits the E-mail signal as a <ConnectRequest> signal to the Internet 24 in step 78. The E-mail signal is delivered through the Internet 24 using a mail server 28 to the second processing unit 22 in step 80. Second processing unit 22 extracts the session number and the first IP address from the E-mail signal in step 82 and transmits or sends the session number and a second IP address corresponding to the second processing unit 22, back to the first processing unit 12 through the Internet 24, in step 84. First processing unit 12 verifies the session number received from the second processing unit 22 in step 86, and establishes a point-to-point Internet communication link between the first processing unit 12 and second processing unit 22 using the first and second IP addresses in step 88.

While the disclosed point-to-point Internet protocols and system have been particularly shown and described with reference to the preferred embodiments, it is understood by those skilled in the art that various modifications in form and detail may be made therein without departing from the scope and spirit of the invention. Accordingly, modifications such as those suggested above, but not limited thereto, are to be considered within the scope of the invention.

What is claimed is:

1. A method of locating a user over a computer network comprising the steps of :

   A. maintaining a list having a plurality of entries, each entry comprising the current Internet protocol address for a user connected to the Internet; and

   B. in response to selection of one of the list entries by a requesting user, providing the corresponding Internet protocol address of the selected entry to the requesting user.

2. A method for locating users having dynamically assigned network protocol addresses over a computer network, the method comprising the steps of:

   A. maintaining in a computer memory, a compilation of entries, each entry comprising a network protocol address of a user process connected to the computer network;

   B. in response to identification of one of the entries by a requesting user process, providing the network protocol address of the identified entry to the requesting user process.

3. The method of claim 2 wherein the network protocol address is an Internet protocol address.

4. The method of claim 2 further comprising the step of:

   C. modifying the compilation of entries.

5. The method of claim 4 wherein step C further comprises:

C.1 modifying an entry of the compilation upon the occurrence of a predetermined event.

6. The method of claim 5 wherein the predetermined event comprises notification from a user process that the user process is coupled to the network.

7. The method of claim 5 wherein the predetermined event comprises expiration of a predefined time interval since notification from the user process.

8. In a computer system having a display and audio transducer, the computer system coupled to other computers and a server over a computer network, the apparatus for establishing a point-to-point communication link comprising:

a. means for transmitting, from the first process to a server, a query as to whether a second process is connected to the computer network;

b. means for receiving a network protocol address of the second process from the server when the second process is connected to the computer network; and

c. means, responsive to the network protocol address of the second process, for establishing a point-to-point communication link between the first process and the second process over the computer network.

9. The computer apparatus of claim 8 further comprising:

d. means for receiving audio data and transmitting the audio data to the second processor over the established point-to-point communication link.

10. In a computer system, the computer system having an audio transducer and a display device and being operatively coupled to other computer system and a server over a computer network, apparatus for establishing a point-to-point communication link comprising:

a. means for transmitting an E-mail signal containing a network protocol address from the first process to a second client process over the computer network;

b. means for receiving a second network protocol address from the second process over the computer network; and

c. means, responsive to the second network protocol address, for establishing a point-to-point communication link between the first process and the second process over the computer network.

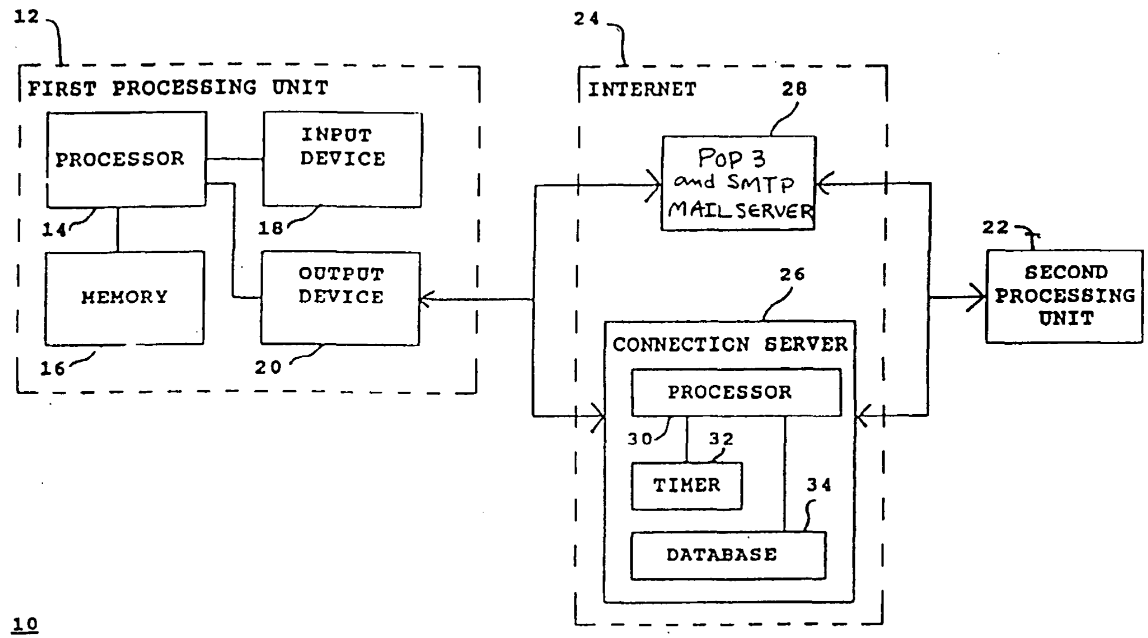
12
FIRST PROCESSING UNIT
PROCESSOR
14
INPUT DEVICE
18
MEMORY
16
OUTPUT DEVICE
20
24
INTERNET
28
PoP 3 and SMTP MAIL SERVER
26
CONNECTION SERVER
PROCESSOR
30
32
TIMER
34
DATABASE
22
SECOND PROCESSING UNIT
10

FIG. 1

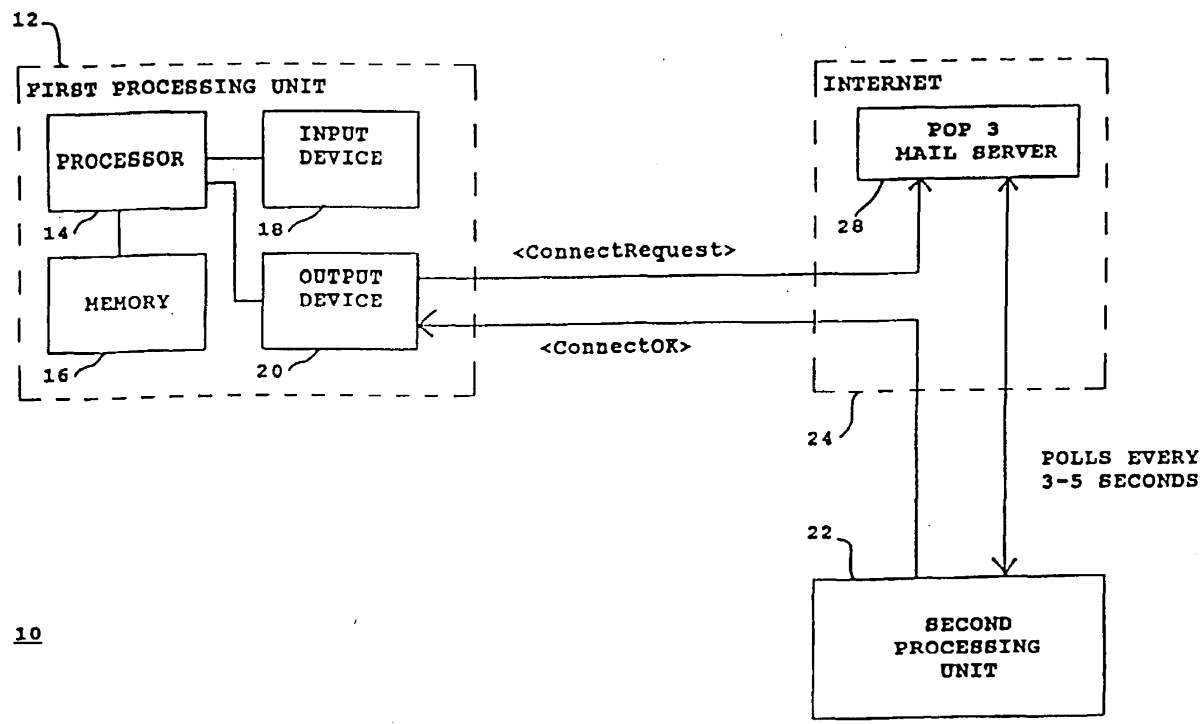
12
FIRST PROCESSING UNIT
PROCESSOR
INPUT DEVICE
14
18
MEMORY
OUTPUT DEVICE
16
20
<ConnectRequest>
<ConnectOK>
INTERNET
POP 3 MAIL SERVER
28
24
POLLS EVERY 3-5 SECONDS
22
SECOND PROCESSING UNIT
10

FIG. 2

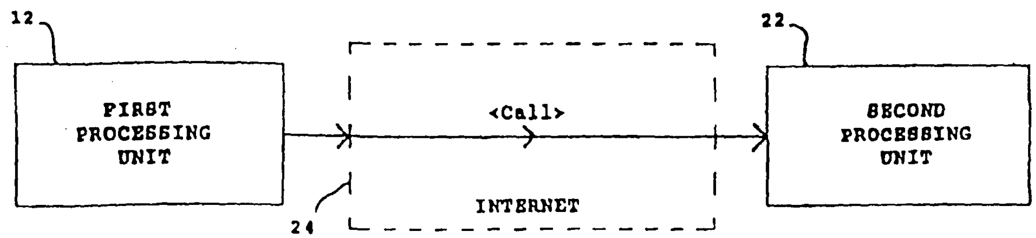
12
22
FIRST PROCESSING UNIT
<Call>
SECOND PROCESSING UNIT
INTERNET
24

FIG. 3

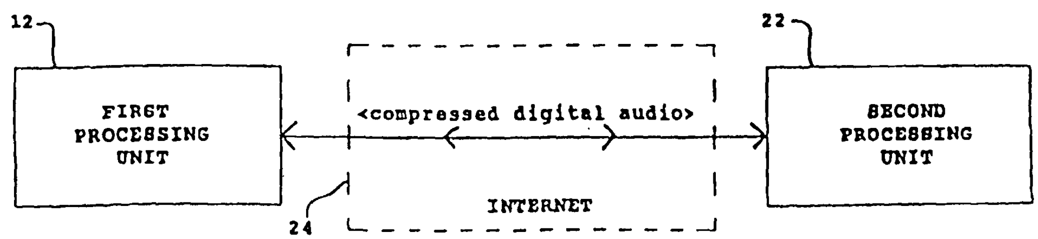
12
22
FIRST PROCESSING UNIT
<compressed digital audio>
SECOND PROCESSING UNIT
INTERNET
24

FIG. 4

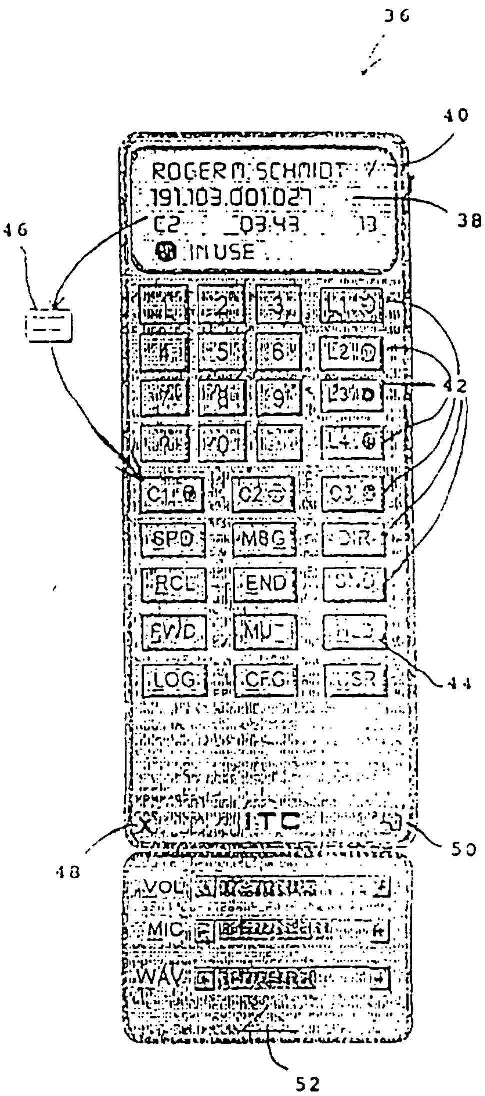
36
40
ROGER M. SCHMIDT
191.103.001.027
C2 03:43 13
IN USE
38
46
1
2
3
4
5
6
7
8
9
0
L1
L2
L3
L4
C1
C2
C3
SPD
MSG
DIR
RCL
END
FWD
MUT
LOG
CFG
42
44
ITC
48
50
VOL
MIC
WAV
52

FIG. 5

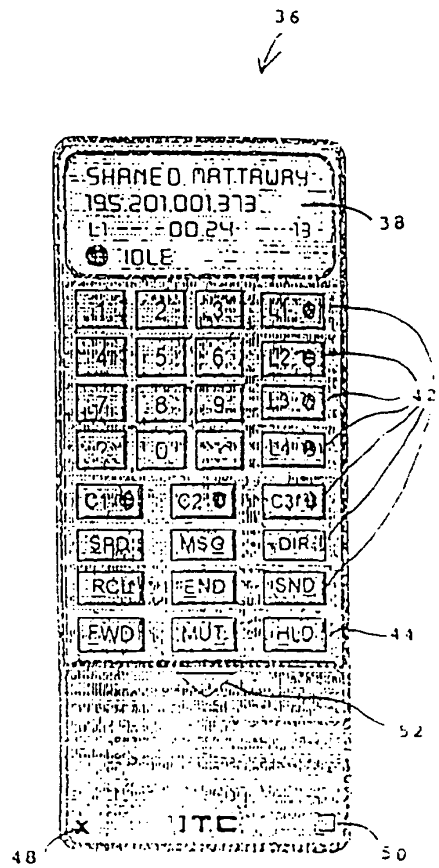
36
SHANE D. MATTAURY
195.201.001.373
L1 00:24 13
IDLE
38
1
2
3
4
5
6
7
8
9
0
L1
L2
L3
L4
C1
C2
C3
SPD
MSG
DIR
RCL
END
SND
FWD
MUT
HLD
42
44
52
ITC
48
50

FIG. 6

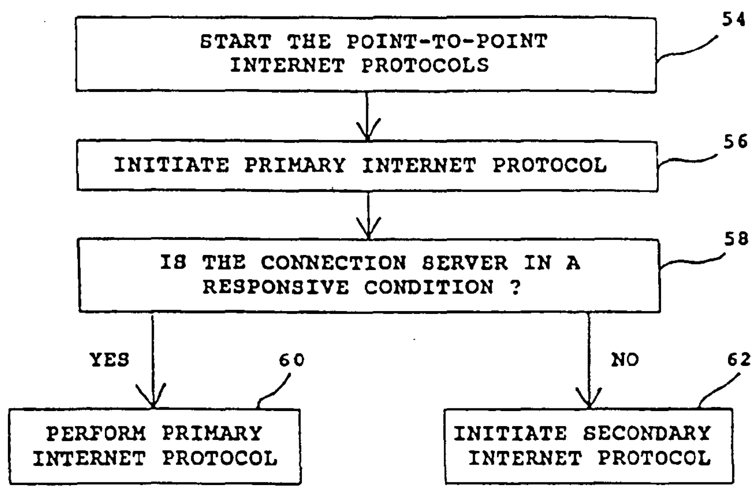
START THE POINT-TO-POINT INTERNET PROTOCOLS
54
INITIATE PRIMARY INTERNET PROTOCOL
56
IS THE CONNECTION SERVER IN A RESPONSIVE CONDITION ?
58
YES
60
NO
62
PERFORM PRIMARY INTERNET PROTOCOL
INITIATE SECONDARY INTERNET PROTOCOL

FIG. 7

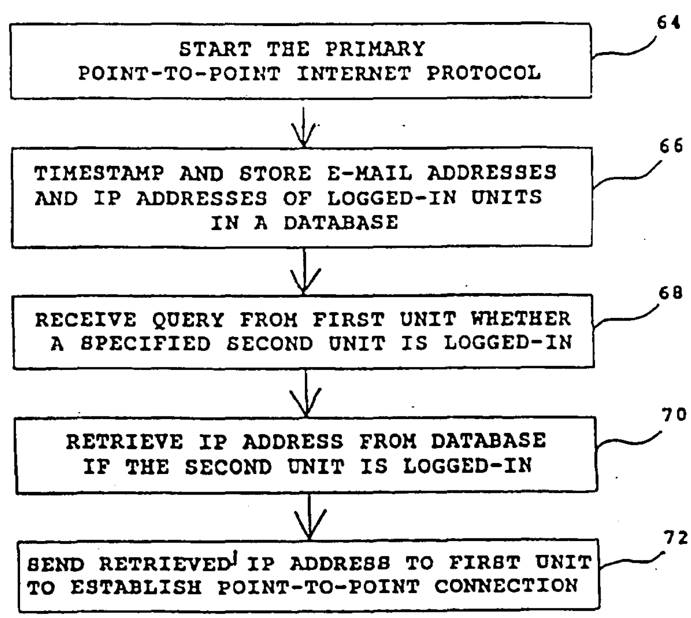
START THE PRIMARY POINT-TO-POINT INTERNET PROTOCOL
64
TIMESTAMP AND STORE E-MAIL ADDRESSES AND IP ADDRESSES OF LOGGED-IN UNITS IN A DATABASE
66
RECEIVE QUERY FROM FIRST UNIT WHETHER A SPECIFIED SECOND UNIT IS LOGGED-IN
68
RETRIEVE IP ADDRESS FROM DATABASE IF THE SECOND UNIT IS LOGGED-IN
70
SEND RETRIEVED IP ADDRESS TO FIRST UNIT TO ESTABLISH POINT-TO-POINT CONNECTION
72

FIG. 8

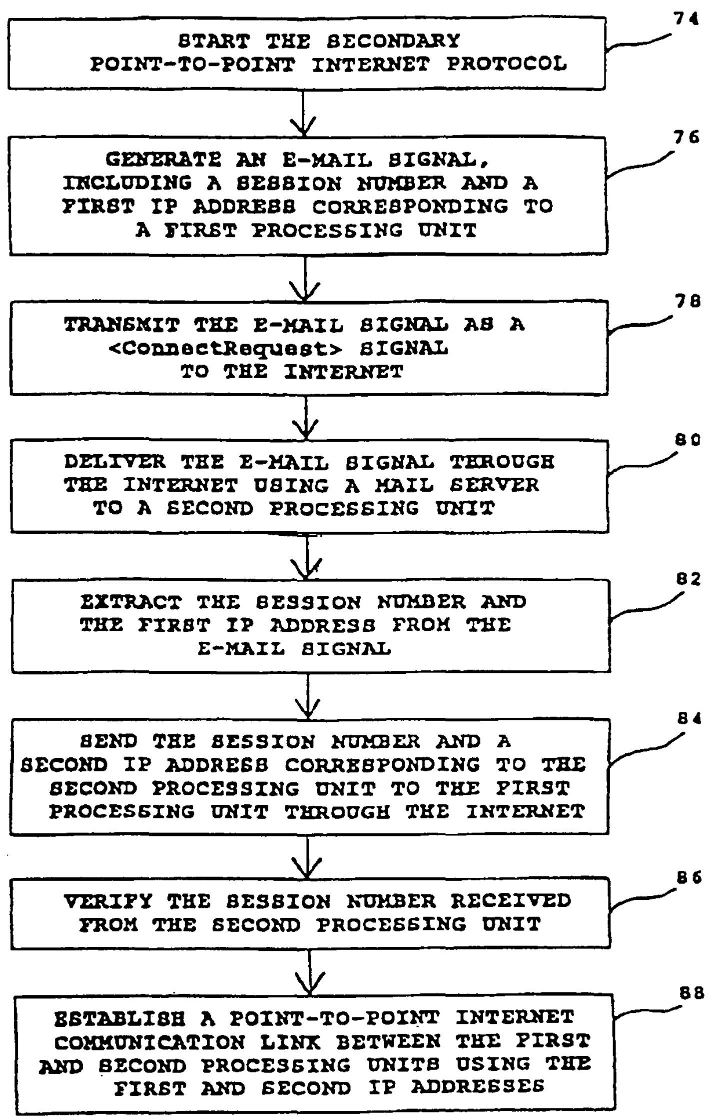
START THE SECONDARY POINT-TO-POINT INTERNET PROTOCOL
74
GENERATE AN E-MAIL SIGNAL, INCLUDING A SESSION NUMBER AND A FIRST IP ADDRESS CORRESPONDING TO A FIRST PROCESSING UNIT
76
TRANSMIT THE E-MAIL SIGNAL AS A <ConnectRequest> SIGNAL TO THE INTERNET
78
DELIVER THE E-MAIL SIGNAL THROUGH THE INTERNET USING A MAIL SERVER TO A SECOND PROCESSING UNIT
80
EXTRACT THE SESSION NUMBER AND THE FIRST IP ADDRESS FROM THE E-MAIL SIGNAL
82
SEND THE SESSION NUMBER AND A SECOND IP ADDRESS CORRESPONDING TO THE SECOND PROCESSING UNIT TO THE FIRST PROCESSING UNIT THROUGH THE INTERNET
84
VERIFY THE SESSION NUMBER RECEIVED FROM THE SECOND PROCESSING UNIT
86
ESTABLISH A POINT-TO-POINT INTERNET COMMUNICATION LINK BETWEEN THE FIRST AND SECOND PROCESSING UNITS USING THE FIRST AND SECOND IP ADDRESSES
88

FIG. 9

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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6: H04M	A2	**(11) International Publication Number:** WO 98/11704 **(43) International Publication Date:** 19 March 1998 (19.03.98)

(21) International Application Number: PCT/US97/16504

(22) International Filing Date: 12 September 1997 (12.09.97)

(30) Priority Data:

08/713,077	12 September 1996 (12.09.96)	US
08/832,709	11 April 1997 (11.04.97)	US
Not furnished	27 August 1997 (27.08.97)	US

(71) Applicant: DIALNET, INC. [US/US]; 148 Allston Street, Cambridge, MA 02139 (US).

(72) Inventors: LEE, Don, Joon; 148 Allston Street #2, Cambridge, MA 02139 (US). YAN, Charles; 29 Knollwood Court, Burlington, MA 01803 (US).

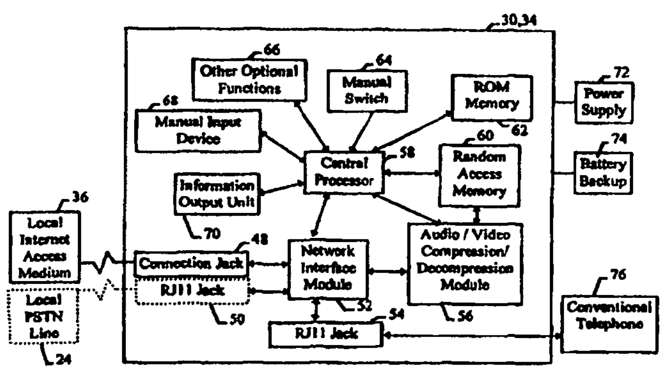
(74) Agent: GORDON, Peter, J.; Wolf, Greenfield & Sacks, P.C., 600 Atlantic Avenue, Boston, MA 02210 (US).

(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published

Without international search report and to be republished upon receipt of that report.

(54) Title: DEDICATED SYSTEM AND PROCESS FOR DISTRIBUTED COMMUNICATION ON A PACKET-SWITCHED NETWORK



(57) Abstract

A dedicated appliance for packet-switched voice communication is provided with a mechanism to ensure that both the caller and a recipient of voice communication having a similar appliance have a connection to the packet-switched network. Such an appliance eliminates the need for complex and expensive multimedia computer systems and Internet telephony software which requires a pre-existing network connection for both parties prior to initiating communication. In one embodiment of the invention, a caller's appliance may cause a recipient's appliance to connect to the packet-switched network through the access medium of the recipient. Another mechanism which enables switching between circuit-switched and packet-switched voice communication allows for both kinds of communication to be used by the same appliance. Once connected to the network, the caller and recipient may establish a connection therebetween over the packet-switched network to permit communication. Network service providers (NSP) which provide access to the packet-switched networks for users do not need to dedicate connection ports to voice communication and therefore can allow use of any connection port for any purpose with the existing infrastructure.

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ML	Mali
MN	Mongolia
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NL	Netherlands
NO	Norway
NZ	New Zealand
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TD	Chad
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DEDICATED SYSTEM AND PROCESS FOR DISTRIBUTED COMMUNICATION ON A PACKET-SWITCHED NETWORK

Field of the Invention

The present invention is related to communication over packet-switched networks. The present invention is more particularly related to voice communication using such networks.

Background of the Invention

Voice communication typically uses a circuit-switched network. Such a network is maintained by regional and long distance telecommunication carriers, and typically provides a dedicated channel for each connection established between subscribers for voice communication. A circuit-switched network is expensive to operate, which in turn causes users to incur significant charges, particularly for long distance calls. Additionally, each connection requires a direct path between two locations, typically determined using a complex algorithm. Additionally, each connection is recorded for billing purposes. The overhead incurred for billing is a substantial portion of the cost in maintaining the network.

Recently there has been an increased interest in the use of packet-switched networks for voice communication. In particular, a global network of computers using a packet-switched network. commonly known as the Internet, has been the platform for some computer software that allows for voice communication between two or more individuals connected to the Internet.

Because packet-switched networks are less expensive to use and more versatile than circuit-switched networks, there is an increasing interest in developing their use for voice and video communication. However, there are some drawbacks to packet-switched networks. First, packet-switched networks are used primarily for general data communication. At present, it generally does not guarantee reliable real-time performance, particularly for voice communication. The lack of reliable real-time communication results in degradation of the quality of voice data transmitted over the network. These problems will eventually be overcome as technology and communication standards develop. A second problem is that both users who wish to communicate by voice over a packet-switched network have to have operative connections to the network. It is not possible at the present time to initiate voice communication over the packet-switched network without each party establishing their own connection to the network prior to communication being initiated by one of the parties. This requirement is in stark contrast to the circuit-switched networks where the recipient of a conventional telephone call is notified, for example, by ringing of a telephone.

Some current proposals for using packet-switched networks for telephone communication either are computer software (e.g., the Internet Phone software from VocalTec of Northvale, New Jersey and the WebPhone software by Netspeak of Boca Raton, Florida) which are loaded onto a general purpose multimedia computer system with a modem or use centralized systems known as "hop-off" servers which translate between packet-switched data packets and electronic voice signals expected by a circuit-switched network and which generate outgoing phone calls through a regular telephone network (also called a plain old telephone system (POTS)). Some of the problems with the first kind of computer software are that the cost, complexity, and inconvenience of using the computer and the software is significant. To receive incoming calls, the computer system needs to be continuously, on wasting much electricity, and needs to have a continuous link to the Internet which can incur online charges from an access provider. Furthermore, the computer system uses much of the computer's central processor power that could otherwise be used for increasing performance on other software applications. The problem with the second kind of system is that it has operations costs similar to those associated with circuit-switched networks for general-purpose consumer and business use. In particular, current service providers to the Internet might have to dedicate bandwidth and connection ports for the sole purpose of providing voice communication and these dedicated servers are not useful for other kinds of data communication. Additionally, it is becoming increasingly likely that individual consumers may have one or more means to access the packet-switched network via various media such as cable television lines, optical fibers, wireless, digital subscriber lines, other than telephone lines. Having such versatility to easily switch among several options to conduct voice communication through any of these media would benefit consumers and businesses.

Summary of the Invention

A dedicated appliance for packet-switched voice communication is provided with a mechanism to ensure that both the caller and a recipient of voice communication having a similar appliance has a connection to the packet-switched network. Such an appliance eliminates the need for complex and expensive multimedia computer systems and Internet telephony software which requires a pre-existing network connection for both parties prior to initiating communication. In one embodiment of the invention, a caller's appliance may cause a recipient's appliance to connect to the packet-switched network through the access medium of the recipient. Another mechanism which enables switching between circuit-switched and packet-switched voice communication allows for both kinds of communication to be used by the same appliance.

Once connected to the network, the caller and recipient may establish a connection therebetween over the packet-switched network to permit communication. Network service providers (NSP) which provides access to the packet-switched networks for users do not need to dedicate connection ports to voice communication and therefore can allow use of any connection port for any purpose with the existing infrastructure.

Accordingly, one aspect of the invention is a communication system using a packet-switched network. The communication system includes a first network access system for providing access to the packet-switched network. A second network access system also provides access to the packet-switched network. A first appliance has a mechanism for connecting to the first network access system through a first access medium, and sends and receives packets through this connection to the packet-switched network. A second user appliance has similar capabilities. In addition, the second user appliance has mechanisms for causing the first appliance to connect to the packet-switched network through the first network access system. The first and second appliances then can send and receive packets to and from one another through the packet-switched network.

Another aspect of the invention is an appliance for communication using a packet-switched network. The appliance connects to a first access medium, and in turn connects to a first network access system connected to the packet-switched network using the access medium. The appliance includes a mechanism for causing another appliance to be connected. through a second access medium, to a second network access system connected to the packet-switched network. After the connection of the other appliance is made, the two appliances may send and receive packets through the packet-switched network to each other.

In one embodiment of the invention, the first appliance is caused to connect to the packet-switched network by first connecting with the first appliance using a public switched telephone network (PSTN) encompassing a local exchange carriers (LEC) and an inter-exchange carrier (IXC) then instructing the first appliance to connect to the first network access system using its access medium. In another embodiment of the invention, the first appliance is caused to connect to the packet-switched network by the second appliance dialing the first appliance using PSTN and then having the first appliance use the caller identification service of the LEC to connect to the first network access system using its access medium. In another embodiment of the invention, the first appliance is caused to connect to the packet-switched network by the second appliance identifying the first network access system and then by instructing the first network access system to connect with the first appliance through the access medium connected to the first appliance. In another embodiment of the invention, the first appliance is caused to connect to the packet-switched network by the second appliance identifying and instructing the first network dial-out service provider to inform the first appliance to connect through the access medium connected to the first appliance. In yet another embodiment, the first appliance is continuously connected to the first network access system and is caused to connect to the packet-switched network by the second appliance. In any embodiment of the invention, the appliance also way initiate any conventional calls using the PSTN.

Another aspect of the invention, which may be used in combination with other aspects of the invention, is a database system for storing information supporting a communication system using a packet-switched network, wherein first and second appliances are connected through first and second access media to first and second network access systems which are connected to the packet-switched network. The database stores user information for each of the first and second appliances, such as a first unique identifier indicating an address for the appliance accessible using the packet-switched network and a second unique identifier indicating an access mechanism for establishing a connection over an access medium between the first and second network access systems and the first and second appliances. The database responds to queries to return one of the first and second unique identifiers as well as any other pertinent user information.

In another aspect of the invention, an appliance selects whether a conventional telephone call is made or whether the call is made over the packet-switched network. In another aspect of the invention, the connection to the packet-switched networks made after the identifier of the recipient is input to the appliance by the caller.

Brief Description of the Drawings

In the drawings,

Fig. 1 is a block diagram of a voice communication system in accordance with the present invention;

Fig. 2a is a more detailed block diagram of one embodiment of the telephone appliance shown in Fig. 1;

Fig. 2b is a more detailed block diagram of another embodiment of the telephone appliance shown in Fig. 1;

Fig. 3 is a more detailed block diagram of the central database (CBD) shown in Fig. 1;

Fig. 4 is a more detailed diagram of the dedicated communication facility (DCF) as shown in Fig. 1;

Fig. 5a is a flow chart of one embodiment of a process for making an Internet telephone call using the voice communication system of the present invention;

Fig. 5b is a flow chart of another embodiment of a process for making an Internet telephone call using the LEC caller identification service with the voice communication system of the present invention;

Fig. 6a is a flow chart of an embodiment of a process for using the voice communication system of the present invention using dial-out possibilities with existing network service providers;

Fig. 6b is a flow chart of another embodiment of a process for using the voice communication system of the with dedicated dial-out service providers;

Fig.7 is a flow chart of an embodiment of a process for using the voice communication system of the present system with a continuous link to a packet-switched network;

Fig. 8 is a flow chart describing the process to check if a recipient's telephone number has an appliance.

Fig. 9 is a flow chart describing how the telephone appliance contacts a local Internet service provider to establish a PPP/SLIP link;

Fig. 10 is a flow chart describing how the central database is updated;

Fig. 11 is a flow chart describing how the recipient's dedicated communication facility makes an outgoing telephone call;

Fig. 12 is a flow chart describing query processing in the central database;

Fig. 13 illustrates an example information packet for the central database; and

Fig. 14 is a diagram illustrating an example data portion of a packet containing one or more type length and value entities.

Detailed Description

The present invention will be more completely understood through the following detailed description which should be read in conjunction with the attached drawing in which similar reference numbers indicate similar structures.

Referring now to Fig. 1, the voice communication system of the present invention is shown in comparison to a conventional voice communication system. A conventional system includes a conventional telephone 20 connected to a telephone network 22. The telephone network 22 includes a local exchange carrier (LEC) 24 connected to an inter-exchange carrier 26 (IXC) (i.e., long distance carrier) and a second LEC 28. The network 22 allows users of conventional phone 20 to contact a recipient using conventional telephone 20' over long distances. In one embodiment of the present invention, an appliance 30, described in more detail below, is used to access a packet-switched network 32, such as the Internet, to contact a recipient having another similar appliance 34 or any compatible systems abiding to International Telecommunications Union (ITU) multimedia communications standards for packet-switched communication, such as H.320, H.323 and H.324. While the invention is described herein with reference to the Internet, it should be understood that it is generally applicable to any packet-switched protocols and networks that allow for packet-switching capabilities, included but not limited to, TCP/IP, IPX, ATM, Ethernet, ISDN, and PSTN, using a variety of communications standards, including, but not limited to, ITU standards H.320, H.323 and H.324. The network 32 is accessed by appliances 30 and 34 via network access media 36 and 38. Such access may be provided over several possible access media. Such access media include, but are not limited to POTS, cable television cable lines, electric power lines, optical fibers, wireless, satellite, digital subscriber lines, etc. The term "access media" as used herein is intended to mean any mechanism for access to the network, whether analog, digital, optical or wireless. The access media allow access to a public or private network service provider 40 or 42 such as an Internet service provider, which may be local to each user. The network service providers 40 and 42 access a packet-switched network 44, such as a large global network, commonly called the Internet, and have access to a central database 46, described in more detail below, of users of the appliances 30 and 34 or an otherwise compatible system which may utilize such a database.

Using the conventional communications network 22, the user 20 typically has access charges incurred for access to the local telephone company, and per call access charges due to a long distance carrier that supports the public switched telephone network. In the present invention, the users of appliances 30 and 34 typically incur charges for obtaining access through a local network access medium 36 and 38 such as the local telephone company and/or a network service provider 40 and 42.

The appliance 30, 34 will now be described in connection with Figs. 2a and 2b. One form of packaging of the appliance may be a separate box that connects between a connector to the network access medium and a conventional telephone 76 for which the circuitry is shown in Fig 2a. This form of packaging may be integrated with other appliances such as cable television converter boxes and high-definition digital televisions to provide integrated telephony services using cable Internet access or video telephony using a small window image on a high-definition television (HDTV) set.

Another form of packaging of the appliance may be like a conventional telephone for which the circuitry shown in Fig. 2b is same as in Fig. 2a except for numeric keypad 66', handset with a transmitter 78 (e.g., microphone) and receiver 80 (e.g., speaker), and an integrated conventional telephone interface electronics 77. Yet another form of packaging could be a single household model for allowing all phones connected to the main household phone line to use Internet telephony.

The appliance has an Internet access jack 48 to permit connection to a network service provider. The Internet access jack can also accommodate other network connections depending on the network access medium such as coaxial cable connector for cable access or a conventional phone jack such as an RJ-11 connector if connecting to an LEC via a POTS modem. If the connection jack 48 is not a conventional phone jack, a conventional phone jack 50 such as an RJ11 jack can be made available for connection to the PSTN line for making conventional calls. Such means of network and phone connection allows the appliance to function just like a regular phone for local phone calls, but for long-distance phone calls, which may be detected by examining the telephone number of the appliance users from the central database 46, it may connect automatically into the network, if there is an appliance user corresponding to the telephone number, or into an IXC if there is no appliance user corresponding to the telephone number.

The appliance does not require both parties to be already linked to the network to initiate communication. At least five modes of operation may be provided for establishing a connection with the recipient. One mode uses a conventional long-distance telephone call to cause the recipient's appliance 34 to initiate a connection with its own network service provider, as described in more detail below. A second mode causes the recipient's appliance to connect with its own network service provider by using caller identification of the caller as described in more detail below. A third mode causes the network service provider local to the recipient to initiate the connection with the recipient, as described in more detail below. A fourth mode causes a network dial-out service provider local to the recipient to initiate the connection with the recipient as described in more detail below. A fifth mode causes the caller's appliance to directly connect to the recipient's appliance with a continuous connection to the network service provider as described in more detail below. These modes of operation may be compatible with each other depending on the available type of network access by each of the calling parties. The software for causing these operation modes can also be adapted for running on conventional computer systems running on various operating systems for example Unix, Microsoft's Windows, IBM OS/2, and Apple operating system.

The appliance 30, 34 in Fig.2a and 2b shows two possible embodiments of the invention. The appliance 30, 34 includes a network interface module 50 and 50' such as a POTS modem for establishing communication with the network access medium 36 through connection jack or port 48, a central processor, a random access memory 60 and 60', digital signal processor chip 56 and 56' to conduct dedicated audio and/or video compression and decompression, a manual input device 68 and 68' such as a keypad, and an information output unit 70 and 70' such as an LCD display and/or voice messaging software system directly to a receiver 80' or to the handset of a conventional telephone 76 to inform the appliance user of any necessary status or decision requests.

A power supply 72 and 72' provides power to the appliance 30 and a back-up battery 74 and 74' maintains operation during a power outage. Other features 66 and 66' may also be included such as those for data encryption and decryption, speaker phone, caller ID, call waiting, conferencing, and voice mail. A manual switch 64 and 64' or software setup change allows for switching between operation modes, of which three are described in more detail below. The appliance operates in full-duplex mode to allow both parties to talk at once.

The central processor unit 58 and 58' may be a microprocessor such as Motorola 68000 or Intel 486 chip. The central processor performs all high-level controls such as providing a point-to-point protocol (PPP) or Serial Line Internet Protocol (SLIP) for TCP/IP (Transmission Control Protocol/Internet Protocol) communications, protocols of ITU standards such as H.323 for real-time multi-media communications, and may also conduct encryption/decryption functions. The appliance uses the random access memory 60 and 60' to temporarily store operation code and data during operation. The network interface module 52 and 52' may be a stand-alone chip, chipsets, and/or other means that provide communication between the local communication medium 36 such as but not limited to POTS, ISDN, wireless such as satellite or cellular, or cable television networks. A POTS modem may be implemented using a commercially available modem chipset such as those produced by Rockwell which are prevalent in the market. For cable Internet access, a cable modem by Motorola and an Ethernet interface chipset can be used as the network interface module. These network interface modules may be designed to be modular such as using the PCMCIA standard so that the appliance can be easily modified for interfacing to the desired choice of network access.

A read only memory (ROM) chip 62 and 62', such as programmable erasable read only memory (EPROM) chip or Flash ROM chip, contains high-level control computer program code to manage all the other devices and deal with network protocols and standards. Flash ROMs provide the added benefit for automatic field upgradability for quick and easy software updates and patches which can be easily performed by the user. Such control code is described in more detail below by the flowcharts describing the appliance operation. The memory chip 62 and 62' may also be programmed to contain a unique network address, a phone number of a local network access provider, memory cache to store information such as recipients' network addresses and telephone numbers, long-distance calling codes that are currently serviced by network service providers for communication with such an appliance, and networking information such as gateway and authentication information. These user setups will be discussed in detail.

Audio compression and decompression may be provided by the central processor 58 and 58' or by dedicated audio/video compressors/decompressors 56 and 56' such as the TrueSpeech CT8020 Digital Signal Processor (DSP) chip available from DSP Group, Inc. of California or by general purpose DSP chips such as Analog Devices' AD21xx family of DSP chips or Texas Instruments' TMS320 family of DSP chips that can be programmed with audio or video compressors and decompressors (codecs) licensed or sold by numerous vendors, such as Lucent Technologies, Intel, and DSP Group. Audio codecs can comply to the following International Telecommunications Union (ITU) standard such as G.711, G.722, G.728, G.723, G.723.1, and G.729. G.723 and G.723.1 standards are preferred for low bit-rate voice communications on low bandwidth network access medium such as POTS. Video compression and decompression may comply to the following ITU standard such as H.261 and H.263. H.263 is preferred for low bit-rate video communications on low bandwidth network access media.

Both the audio and video codec standards mentioned support ITU H.32x multimedia communication standards. The use of these ITU standards allow the appliance to be interoperable with other computer systems or software that use the same standards.

The central processor in connection with the network interface module operate to establish a network connection such as TCP/IP through the network access medium. The multimedia communications standard used for network communications can include ITU standards such as H.320, H.323, and H.324.

When the connection is established, incoming packets are processed by the DSP chip as directed by the central processor to convert analog audio signals from the transmitter 78 usually a microphone for voice, a charge coupled display (CCD) camera, or the handset of a conventional phone 76 and output digital audio and/or video information to the network. The DSP chip also converts the digital audio information to an analog signal to be output to the receiver 70 such as a speaker or an LCD or television video display or to the handset of a conventional phone 76. The central processor 58 and 58' and the DSP chip can produce packets abiding by a specific communication and network protocols to be transferred via the network interface module 52 and 52' and the local network access medium 36 to the other party. It is also possible to integrate the voice compression & decompression, the high-level central processing functions, and modem functions controlled by a single DSP chip applications specific integrated circuit (ASIC) chip eliminating the need for dedicated chips.

The central database (CDB) 46 will now be described in more detail in connection with Fig. 3. This database is directly connected to a packet-switched network with a static network address as a place of information reference to allow lookup of appliance users or compatible system users as part of the call connection process. A dedicated CDB comprises of a server 80, such as a Digital Alpha server and a fast database 82, such as those commercially-available from Oracle Corporation. The dedicated database also should include a router 84, such as those available from Cisco Systems or Bay Networks, which connects to the network using a high-speed access medium such as a T1 or T3 line connection to network backbones. Duplicates 80' and 82' of the server and database located physically in a geographically different location provides for redundancy for fast access or in case one system becomes inoperative. Databases also may reside at any available network service provider.

The information stored in both the primary and redundant databases are synchronized at regular intervals using standard coherency techniques to maintain the same information. The user information stored in the database includes a unique identifier such as the user's telephone number. The slot for this value in the database is generally permanent for all users of appliances or a compatible appliance or system that is allowed to use this communication system. The value may be modified for example, if a user changes location. The database also includes for each user an identifier which indicates an address for the user when the user's appliance is connected to the packet-switched network. This identifier may be dynamic or fixed, depending on how the addresses are assigned by the network. These network identifiers are used to establish call connection between two or more users. The database may also include other useful or pertinent information for each user such as a subscriber's name, residential address, e-mail address, network service provider's IP address, and billing information.

As the user base increases, the CDBs may be distributed geographically to maximize the efficiency of CDB access and for redundancy. Multiple CDBs can be synchronized to make sure that the databases contain the same information for redundancy. It is also possible to have distinct databases with respective redundant databases for separate groups of users in different locations especially as subscriptions increase. Queries can be processed, for example, by multicasting or broadcasting them to each database.

The following is a scenario of using distinct databases for specific regions. Each database, wherever located world-wide, contains the network addresses of every CDB and the information of every appliance user in that local region. If a new CDB is installed, all existing CDBs are updated with the new CDB's IP address. If a caller in one location calls a recipient at a remote location and the recipient's information is unavailable when the caller's appliance contacts the local CDB, the CDB associates the long-distance dialing codes (e.g. country and area code) with the remote CDB's network address to allow the caller's appliance to establish a link with the remote CDB at the recipient's location. The remote CDB may then take over to continue the process of linking the communication channel between the caller and recipient. In instances where some other recipient's information is used which does not provide sufficient locale information such as the recipient's Internet username or domain name, the CDB can multicast or broadcast the recipient's information to all other CDBs in order to identify the locale of the recipient. Once the remote CDB has been identified, it can then take over to continue the process of establishing the communication channel between the caller and the recipient.

The central database responds to queries from dedicated communication facilities (described below), individual appliances, or any otherwise compatible system that complies to a database query protocol. The response includes packets of stored user data when a match is found. The database permits users with dynamically assigned network addresses to be located. Additionally, this database allows one person to request a connection with another person who is not presently connected to the network. The database also can identify a phone number that allows the network service provider of the individual to make an outgoing phone call from the network to the local individual.

Referring now to Fig. 4, each network service provider supporting this voice communication system also should include functions of a dedicated communication facility (DCF) in order to support a mode of operation where a connection to a recipient appliance is initiated by the service provider. Each DCF may be comprised of a router 90 which may be connected via a high speed access medium (e.g., T1 or T3) to the network, a server 92, remote and network access hardware 94, switch 96 to access the access medium used by the user of appliance, such as a telephone switch, and POTS modem pools 98.

The construction of the system shown in Fig. 4 is very similar to systems used by conventional network service providers. However, most of such network service providers are not programmed to allow outgoing dial-out to subscribers using a network access medium such as POTS, ISDN or Cable. Generally, they are programmed only to respond to incoming telephone calls. However, many systems may have the capability to make such outgoing phone calls. By providing additional functionality to identify an available access line, such capability may be used to initiate a telephone call with a recipient appliance 30. Such capability is useful in the second mode of operation to be described in more detail below.

A first mode of operation of this system uses a conventional long distance call via PSTN for initiating a connection between the recipient and its network service provider. The process of establishing a communication channel between two appliances using this mode of operation will now be described in connection with Fig. 5a using the Internet as an example. First, the caller dials the recipient's telephone number into the appliance using a conventional telephone connected to the appliance or directly into an appliance that is integrated with a conventional telephone in step 100. The appliance then determines, in step 101, whether the telephone call is long distance. If the telephone call is not a long distance call, the appliance allows for a conventional local telephone call over a plain old telephone system (POTS), in step 102. For example, in the U.S., if the call is determined to be a long distance call from the standard telephone number prefix such as a "1" for inter-state or intra-state long-distance call or "011 + country code" for international long-distance call, the caller's appliance then checks its internal phonebook to see if the recipient's number is present (step 103) as described in detail with Fig. 8. If the recipient's number is found in the phonebook, the calling process continues to step 104. The appliance establishes in step 104 a connection with the recipient's appliance by a conventional circuit-switched network call. If the call is not answered, as determined in step 105, and if no retry is to be performed (step 106), the user may hang up (step 108) by placing the phone handset on-hook. If the call is answered, the caller informs the recipient that a call with this appliance is being made. For example, the caller may request that the recipient press a key on the telephone handset, such as the "*" key or pressing a button the appliance. If the recipient cannot be connected via the appliance for any reason (step 112), a conventional toll call may be continued (step 114) and eventually terminated (step 116); the phonebook check of step 103 helps to minimize this occurrence but it is conceivable that the recipient's appliance could be malfunctioning or has been disconnected. If the recipient has a properly functioning appliance, both appliances hang up (in step 118) and both parties' appliances automatically connect with their network service providers, as described in more detail below in connection with Fig. 8. They may obtain an IP address (steps 120 and 122) dynamically or may already have a static IP address assigned by their network service provider.

With an IP address, each party's appliance then contacts a centralized database to exchange the network addresses to each party (steps 124 and 126) referencing each party's unique identifier such as their respective telephone numbers, as described in more detail below in connection with Fig. 10. In particular, the central database is updated with the recipient's IP address in step 124 and the central database is updated with the caller's IP address in step 126. The caller then queries the central database to receive the recipient's IP address in step 128, as described in more detail below in connection with Fig. 12. If the address is not found, as determined in step 130, the caller's appliance continuously tries to identify the recipient's IP address as indicated by 130 in the loop back to step 128. If one minute or other time limit. has passed, the attempts to access an IP address are terminated and the caller is informed in step 134. The telephone call then may be terminated. If the IP address is found, the caller may establish contact and make a TCP connection with the recipient as indicated at step 136. Also, if the recipient is using the telephone line for general Internet access and the recipient's computer system has a software that is compatible with the appliance running, a connection also may be attempted. If the connection is not obtained as determined in step 138, and if a retry operation is not to be performed as determined in step 140, the caller may be informed of the lack of connection in step 142 and the phone hangs up in step 144. For example, if the recipient is using a telephone line and receives a busy signal or is already on the phone with an Internet call in progress, the recipient's DCF will send a packet to the caller's appliance of the busy signal. However, upon establishing network access and a connection, the two parties may begin talking as indicated in step 146. When the call is terminated by either party by placing the handset on-hook, the TCP/IP connection is terminated in step 148 and the appliance hangs up in step 150.

One benefit to the first mode of operation is that it uses the existing services available from most POTS network service providers without modifying their software or hardware. Another benefit to this mode is that the caller may call from any compatible communication system rather than an appliance if the caller somehow knows that the recipient has this appliance or the caller' appliance is provided with the protocol to contact the central database and conduct outgoing PSTN toll calls to the recipient.

There are a couple of minor drawbacks with this first mode of operation. First, there could be delays possibly from one-half to around five minutes depending on distance and network traffic conditions to establish a connection. Second, every time a long-distance call is initiated, the caller may incur charges for this initial connection making frequent calls somewhat costly and reducing the freedom to call as frequently as desired. In order to minimize costs for these initial toll-calls, third-party conventional long-distance service providers may be used to allow the caller to be charged on a fraction of a second segments (e.g. one-sixth of a minute) rather than for a full minute.

A second mode of distributed operation is similar to the first mode which requires an initiating conventional long-distance call, however, the toll charge can be eliminated using a local caller identification (Caller ID) service as shown in Fig. 5b. The caller dials the recipient's number using the telephone handset in step 430. The appliance will determine if the call is local or long-distance by counting the digits and checking the calling area code. If the call is long-distance, the caller's appliance automatically looks up the internal phonebook in step 432 to check if the telephone number is associated with an appliance user. If the telephone number is determined to be associated with an appliance user, the caller's appliance will request if an Internet call is desired. The caller's appliance may be set-up to automatically select the Internet call mode if the number dialed checks with the internal phonebook. If an Internet call is not desired, the appliance will just continue with PSTN toll call (step 436). If an Internet call is desired, the caller's appliance will dial the number and will make sure to allow for a maximum of only two or three rings (usually two) to let the recipient's appliance identify the caller's telephone number (step 440). If the recipient has not yet picked up the phone and the appliance detects that the caller is an appliance user by checking its internal phonebook in step 442, the recipient's appliance will wait until the ringing stops in step 446. If the recipient picks up the phone before the appliance has had a chance to identify the caller, the operation reverts back to the first mode. If the caller is identified not to be an appliance user as determined by the internal phone book, then the recipient's appliance will let the call process as a conventional one (step 444) and let the phone ring. After waiting for two or three rings, the caller's appliance will then automatically hang up in step 448 and continue with the rest of the first mode of operation beginning with step 122'. If the recipient has not yet picked up the phone and the caller has been identified as an appliance user by the recipient's appliance, the recipient's appliance will then continue to establish an Internet connection with steps 120' and 124'. While the appliance attempts to establish an Internet call connection and the recipient picks up the phone, the appliance will so inform the recipient that an Internet call is in progress with the caller identified on, for example, an LCD display. The recipient will have control to cancel an Internet call in progress if so desired by pressing a button on the appliance or a button on the handset such as the "*" or "#."

Benefits to the second mode of operation is that it uses the existing services available from most POTS network service providers without modifying their software or hardware just like the first mode of operation. Another same benefit to this mode is that the caller may call from any compatible communication system rather than an appliance if the caller somehow knows that the recipient has this appliance or the caller' appliance is provided with the protocol to contact the central database and conduct outgoing PSTN toll calls to the recipient. However, one major disadvantage of the caller being charged for the initial PSTN toll call associated with the first mode of operation is reduced or eliminated. The second mode of operation also eliminates the need for the recipient to intervene by picking up the handset and pressing a button to initiate an Internet call as in the first mode of operation. The second mode of operation increases the ease of establishing an Internet call and also helps to reduce PSTN long-distance charges even further.

A third mode of distributed operation is used when network service providers have the ability to call out to the recipient via its network access medium, with similar capabilities of a DCF, for example, as shown in Fig. 4. This mode of operation will now be described in connection with Fig. 6. With this embodiment, the appliance is configured with a local DCF telephone number, however assigned, or other mechanism to access the network. The customer information including at least the subscriber's telephone number and DCF's network address may then be transferred to the central database (CDB) of subscribers and/or maintained on a DCF database.

The flow of information in the third mode of operation will first be described using the Internet protocol as an example. When a caller attempts to make a long-distance call, the appliance automatically accesses a local DCF or an NSP (since an outgoing call to the caller is unnecessary) by means of the local network access medium to gain network access to the packet-switched network via for example a standard PPP/SLIP and authentication. When connection to the DCF/NSP is established, the caller's appliance sends a query packet (described below) containing the recipient's telephone number or other distinct identification information such as a residential address, IP address, electronic mail address, to initiate a long-distance call.

Upon determining at least the recipient's DCF network address, the caller's appliance, caller's DCF/NSP, or the CDB contacts the recipient's DCF to transmit an information packet (described below) that contains the recipient's local telephone number or other information such as the caller's network address. To minimize delays, one method is to have the CDB directly send the recipient's telephone number and caller's network address directly to the recipient's DCF. However, selected information, its point of origin and its transfer method may vary among different implementations.

With the recipient's local telephone number, the recipient's DCF then makes an outgoing call to authenticate and to establish network access via PPP/SLIP if using POTS with the recipient's appliance. Authentication may be made by the DCF prior to making the outgoing call if the recipient's information received is sufficient for such pre-authentication in order to minimize delays.

The following will describe a few methods of initiating a communication channel through a packet-switched network. In one method, if the recipient answers the call and the recipient's appliance is provided with the caller's network address by a CDB or its DCF, the recipient's appliance may directly contact the caller's appliance with the caller's network address to initiate a communication channel. In another method, the recipient's appliance or DCF sends an information packet containing the recipient's network address to the caller's appliance upon which the caller's appliance initiates the communications channel using the recipient's network address. Whichever way, a communication link between the caller and the recipient may be established to begin transmitting information packets over the network.

One embodiment of the data flow associated with the third mode of operation will now be described in more detail in connection with the flow chart of Fig. 6a. In particular, the caller dials the recipient's telephone number into the appliance using a conventional telephone connected to the appliance or directly into the appliance integrated with a conventional telephone in step 200. The appliance then determines whether the telephone call is long distance, as determined in step 202. If the telephone call is not a long distance call, the appliance makes a local telephone call over a plain old telephone system (POTS), in step 204. If the call is determined to be a long distance call, the caller's appliance checks its internal phonebook to see if the recipient's number is present (step 205) as described in detail with Fig. 8. If the recipient's number is found in the phonebook, the calling process continues to step 206. The caller's appliance automatically dials a local network service provider (NSP) or DCF to establish a PPP/SLIP link (step 206), as described in more detail below in connection with Fig. 9. If a PPP/SLIP link is not established as determined in step 208, a retry may be performed in steps 210 and 206 or the appliance or caller may hang up in step 212. If a PPP/SLIP link is established, the caller's appliance sends a packet with the recipient's access information to the local central database (step 214) and queries the central database for the IP address of the recipient's dedicated communication facility step 216. This step is described in more detail below in connection with Fig. 12. If the IP address of the recipient's dedicated communication facility is not found, as determined in step 218, the caller may be given an option to make a conventional toll call in step 220. If no toll call is to be made, the appliance or caller hangs up in step 222. Otherwise, a toll call may be made through a conventional public switched telephone network in step 224. When the call is completed, the caller hangs up in step 226.

If the caller connects to the network and identifies the IP address of the recipient's dedicated communication facility, the appliance then sends a packet with a caller's IP address and the recipient's access information, e.g., its telephone number, to the recipient's dedicated communication facility in step 228. This information allows the recipient's DCF to connect with the recipient's appliance over the recipient's network access medium, for example, by making a

DOSP is not found, as determined in step 518, the caller may be given an option to make a conventional toll call in step 520. If no toll call is to be made, the appliance or caller hangs up in step 524. Otherwise, a toll call may be made through a conventional public switched telephone network in step 522. When the call is completed, the caller hangs up in step 514.

If the caller connects to the network and identifies the IP address of the recipient's DOSP, the caller's appliance then sends a packet with the recipient's access information, e.g., its telephone number, to the recipient's DOSP in step 526. This information allows the recipient's DOSP to connect with the recipient's appliance over the recipient's network access medium, for example, by making a telephone call, to establish a point-to-point protocol link in step 528. During this process, the caller may be informed of the call status with phone ringing sounds on the recipient's telephone. This process is described in more detail below in connection with Fig. 11. If a link is established, the DOSP requests the recipient to indicate acceptance of the network phone call by, for example, pressing the "*" button on the handset in step 530. Steps 530 through 566 is essentially the same as that of the first and second modes of operation shown in Fig. 5a from steps 110 through 144.

A benefit of the fourth mode of operation is that initial long distance toll calls over the public switched telephone network for establishing an network connection between the caller and the recipient are completely eliminated. Another benefit of the fourth mode is that it does not involve modification to network service providers but rather uses less expensive (compared to network service providers) dedicated dial-out service providers to allow the outgoing telephone calls to be made to the recipient. However, the delay in making a connection may be twice as long in comparison to the first mode.

The fifth mode of operation will now be described with reference to Fig. 7. If continuous network access such as cable Internet access is used by the caller, a continuous network link is provided so that there will not be a need to dial into the service provider nor conduct authentication. If the recipient has such continuous Internet access, the caller automatically dials the recipient via packet-switched means without the need for conducting a short long-distance call as associated with the first mode of operation; the caller could have accessed the Internet via any means. This is similar to the third mode of operation described above using POTS Internet access however, using a continuous Internet access such as cable does not require any modifications to the cable service provider. This operation mode is also much faster for connection than the first, second, or third mode of operation.

telephone call, to establish a point-to-point protocol link in step 230. During this process, the caller may be informed of the call status with phone ringing sounds on the recipient's telephone. This process is described in more detail below in connection with Fig. 11. If a link is established, the recipient's DCF sends a packet with a recipient's appliance IP address to the caller's appliance in step 232. The caller's appliance then connects to the recipient's appliance via a TCP/IP connection in step 236. Also, if the recipient is using the telephone line for Internet access and the recipient's computer system has a software that is compatible with the appliance running, a connection also may be attempted. If a connection is not achieved as determine in step 238, a retry operation may be performed in steps 240 and 236. Otherwise, the caller may be informed that no connection is established in step 242 and the appliance hangs up in step 244. For example, if the recipient is using a telephone line and receives a busy signal or is already on the phone with an Internet call in progress, the recipient's DCF sends a packet to the caller's appliance of the busy signal. If a TCP/IP connection is made, the two parties may begin talking as indicated in step 246. When the call is terminated, the TCP/IP connection is terminated in step 248 and the parties may hang up as indicated at 244.

A benefit of the third mode of operation is that initial long distance toll calls over the public switched telephone network for establishing an network connection between the caller and the recipient are completely eliminated. The delay in making a connection may be reduced in comparison to the first mode as well. This third mode does involve modification to network service providers to allow the outgoing telephone calls to be made.

The fourth mode of operation is similar to the third mode by using dial-out service providers (DOSP) that could be located at many locations world-wide where there are large concentrations of appliance users rather than depending on network service providers to provide dial-out service. These dial-out service providers would be connected to the Internet and have dial-out capability using modem banks to inform the recipient's appliance of an incoming Internet call. This operation eliminates the need to modify existing network service providers for dial-out capability. Figure 6b shows the operation and will be described.

Steps 500 through 514 is the same as the third mode of operation described previously. If a PPP/SLIP link is established in step 510, the caller's appliance sends a packet with the recipient's access information to the local central database (step 516) and queries the central database for the IP address of the recipient's dial-out service provider in step 518. This step is described in more detail below in connection with Fig. 12. If the IP address of the recipient's

An example of using the appliance with a continuous cable television Internet access will be described. The appliance may be equipped with a network interface module comprising an Ethernet interface card connected to a cable modem such as those manufactured by Motorola. The appliance may be connected to both the cable Internet access line and the local exchange carrier. The unique MAC address that comes with each Ethernet interface card is registered with the cable Internet access provider for authentication. If static IP address is not assigned, the cable Internet access provider will automatically assign a dynamic IP address to the user whenever a connection is established using the Ethernet interface card's unique MAC address. If dynamic IP addressing is used, the appliance updates the central database upon obtaining a new IP address.

Fig. 7 shows an example of a task flow for establishing a connection using a continuous Internet link. Caller dials the recipient's number (step 450) and the appliance determines if the call is a long-distance call in step 452. If it is not a long-distance call, a local POTS call may be made. Otherwise, the caller's appliance may check the phonebook (step 455) as an option and if the recipient's telephone number is found, it sends a packet with the recipient's phone number to the central database (CDB) in step 456. Regardless of whether the phonebook function is used or not used, a CDB query is made (step 458) with the recipient's phone number and if the recipient's IP address is found (step 460) the caller's appliance attempts to establish a connection with the recipient's appliance in step 470. If the recipient's IP address is not found, then the caller is notified to decide on making a conventional toll call in step 462. After a conventional toll call is made in step 464, the caller then hangs up (step 466). If a conventional call is not made, the caller simply hangs up (step 468). If the recipient's IP address is found, the caller's appliance attempts to connect in step 472. If a connection is not made, the caller's appliance attempts to retry in step 474. If after several retries the connection could not be established, the caller is informed (step 480) and the caller hangs up in step 482. If a connection is made, the call is initiated in step 476 via TCP. Upon call completion, the TCP connection is closed with the recipient's appliance (step 478) and the call is terminated in step 482. The continuous connection to the network such as those with cable Internet access provider simplifies and speeds up the network call connection process.

Fig. 8 describes in more detail how a caller's appliance or compatible system checks and updates the phonebook of a recipient such as performed in step 101 of Fig. 5a and step 205 of Fig. 6a. The process of looking up a phone book eliminates the requirement of establishing a long-distance call and incurring toll charges to determine if a recipient is capable of receiving a network call via the Internet and also provides the caller an option to cancel the call without establishing a toll connection with the recipient. If the recipient's phone number is found in its internal phonebook, the processes in Fig. 5 or Fig. 6 continue. However, if the recipient's phone number is not found, the caller is informed of this status (step 404) and requests the caller to decide if the appliance or compatible system should check if the recipient is a subscriber (step 406). If the caller decides not to conduct the check, the caller is given the option to continue with a PSTN toll call (step 408). If the caller decides not to continue with a toll call, the appliance hangs-up (step 414). Otherwise, a conventional long-distance call is made (step 410) and upon call completion, the appliance hangs-up. If the caller decides to check if a recipient is a subscriber, the caller's appliance dials into the local network service provider to establish a PPP/SLIP link (step 416). Upon establishing the PPP/SLIP link, the caller's appliance queries a central database server with the recipient's telephone number to check the status of the recipient's subscriber status (step 418). If the recipient is determined to be not a subscriber, i.e., not in the database at the decision step 420, then the procedure for a request to continue with a PSTN toll call (steps 408-414) is carried out. Otherwise, the central database sends a confirmation packet to the caller's appliance with the telephone number and any other pertinent information (step 422). The caller's appliance automatically updates the phonebook with the recipient's information (step 424) and the caller is informed of the update (step 426). Upon completion the subsequent steps are then continued. The appliance's user interface will allow any telephone number in the phonebook to be added, deleted, or edited.

How the appliance dials into a network service provider or dedicated communication facility to establish PPP/SLIP link will now be described in more detail in connection with Fig. 9. This example assumes that the network service providers are accessed using a regular telephone line (i.e. POTS). It is possible to make such a connection via a cable television modem or by connection through electrical power lines, among other mechanisms. In this embodiment, the appliance makes a regular telephone call to a network service provider to make a connection as indicated at step 250. If a connection is not made, as determined in step 252, the appliance may retry this operation as indicated at 254 and 250. Otherwise, the caller may be informed that connection was not made in step 256 and the appliance hangs up in step 258. If a connection to the network service provider is made, authentication information is sent to the provider in step 260. If authentication is not achieved, as determined in step 262, a retry of the authentication operation may be performed as indicated at 264 and 260. Otherwise, the caller may be informed that authentication was not achieved in step 266 and the appliance hangs up in step 268. If authentication is achieved, a PPP/SLIP link may be established in step 270. Successful establishment of this link, as determined in step 272 results in the appliance being successfully connected to the network. Otherwise, a retry operation may need to performed in step 274 and 250.

Referring now to Fig. 10, the process of updating the central database with a network address will now be described in more detail. Each appliance has a CDB network address already encoded. If the appliance happens to have a CDB network address not in its locale, during initial setup when the user inputs the telephone number and other calling codes, the remote CDB automatically assigns an network address of a CDB in the appliance's locale and updates the appliance with the new CDB network address. Using a local CDB should help decrease connection time for calling. It also may help increase the connection speed for someone who wants to call the appliance because the recipient's local CDB may be directly contacted rather than by multicasting or broadcasting.

The CDB updating process involves sending information which comprise of the current network address and any other correlating unique information such as a telephone number for updating to the central database server in step 280. This information is sent in a packet, of which example formats will be described in more detail below in connection with Figs. 13 and 14. The appliance then awaits for a reply from the central database in step 282. If a reply does not indicate that data has been successfully updated, as determined in step 284, an attempt to update the information is retried in step 280. It may be desirable to put a time out operation in this loop, as indicated at 283. If a time out occurs, the caller is informed and may hang up as indicated at 285.

Referring now to Fig. 12, the logic flow of the central database will now be described in more detail. In particular, the central database server receives a request in step 290 that indicates the recipient's telephone number or other means for access that provides a unique identification of how the recipient connects to the network. This may be, for example, a telephone number. The database is then searched by the server for the recipient's unique identification information in step 292. If it is not found, a "not found" packet is then sent in step 294. If the information is found, the recipient's data, such as the network address of the dedicated communication facility used by the recipient and its personal network address and any other pertinent information. are packaged in a packet which is then sent to the caller's appliance in step 298.

The CDB request may be substituted by broadcasting and multicasting for any mode of operation. In such an embodiment, the caller's appliance processes the information packet and broadcast/multicast it to the world-wide Internet or other "white-page" services such as the "People Find" service from Lycos, or the "Big Yellow" Internet business yellow pages to obtain the recipient's individual information. The CDB or the recipient's DCF answers with at least the DCF network address when a matching recipient is found. After establishing contact with the CDB or recipient's DCF, the caller's appliance has the option to store and maintain the recipient's information in a local cache, i.e., phonebook for future use to minimize continual connections with CDB in an effort to reduce delays in establishing contact with the recipient for subsequent phone calls. If the recipient's or recipient's DCF network address is unavailable, the caller's appliance is informed and may be provided with an option to make a conventional long-distance phone call or automatically switch to the first mode of operation if the recipient was determined to be a subscriber as described above.

Example packet types which may be used by the system are shown in Figs. 13 and 14. These packets are transmission control protocol (TCP) packets that communicate over dedicated ports. The TCP packet shown in Fig. 13 includes a first byte of data indicating a type which may include a central database query, phone query, dedicated communication facility update, phone update, additions and deletions, or message indicating the party is ready to talk. The next four bytes of data indicate a length which represents the length of the data field 304 which follows. The data portion of the packet may contain one or more type, length and value entities, such as shown in Fig. 14. The type field 306 indicates a type such as whether the data includes a phone number. The length field 308 indicates the length of the value field 310. By using such packets, each of the central database, dedicated communication facility and the appliance readily may identify information which it needs to process, and how that information should be processed.

How a recipient's dedicated communication facility dials a recipient's appliance to establish a PPP/SLIP link, such as performed in step 230 of Fig. 6, will now be described in more detail in connection with Fig. 11. This operation is performed in manner similar to how a computer generally contacts a network server provider via a modem. In particular, the dedicated communication facility dials out to the recipient via the plain old telephone system (POTS) or other access media used by the appliance, in step 320. After step 320, if the caller hangs up during the outgoing call step 328, the caller's appliance will inform the recipient's DCF to cancel the call before disconnecting from TCP/IP connection in step 330. In step 322, upon being informed of the caller appliance's on-hook status, the recipient's DCF cancels the outgoing call to the recipient. If the call is answered in step 322, authentication is performed in step 323. If authentication is not achieved, the appliance hangs up in step 328. If authentication is achieved, then an IP address is set in 324 and a PPP/SLIP link is established in 326. If the call is not answered, the dedicated communication facility hangs up in step 328 and informs the caller.

A user interface also may be provided for call status notification and setting up the appliance for initial and continual use. The user may be presented with menu items or call status such as by visual means with a liquid crystal display, audible means with voice messages to the speaker, or a combination thereof. The user may interact with the appliance via one or more means such as with a numeric keypad found on a conventional phone attached to the appliance, pushbuttons, dials, or by voice commands to the handset that may be recognized by the appliance.

A set of main menu items for the appliance may include (a) phonebook, (b) Internet access setup, (c) dialing setup, and (d) auto upgrade. When the phone book menu item is selected, phone numbers may be displayed and scrolled using an electro-mechanical thumb-dial interface attached to a potentiometer. Push buttons for deleting and editing a telephone number may be provided. New telephone numbers might be added, edited, or deleted manually using the numeric dialing keypad on the conventional telephone connected to the appliance. The Internet access setup if using POTS might include an Internet service provider's telephone number, username, and password. ASCII or foreign characters may be entered into the appliance by, for example, using the same thumb-nail dial described previously to select a character, the numeric dialing keypad on the conventional telephone attached to the appliance, or a dedicated keypad. The dialing setup might include the user's telephone number with area code and country code, call waiting cancel, and other dial-out prefixes. The auto upgrade menu item, which may be used with Flash ROM for field upgradability, may be executed with a single command from the user. Upon receiving the user command, the appliance automatically upgrades the appliance's software by auto-dialing into the network service provider, establishing a networking link such as PPP and TCP/IP, contacting a pre-programmed network address supporting a software download, uploading to the network address the model and version of the appliance, receiving the updated software or patches, hanging up, and executing the downloaded software in the appliance.

By using the mechanisms described above, a caller's appliance ensures that a connection is made between the packet-switched network and the recipient of a telephone call. At least three modes of operation may be used in order to ensure that this connection is made. Additionally, with these appliances the network service providers of the caller and recipient do not require dedicated ports for voice communication. Accordingly, the cost of long distance calls may be reduced without substantially increasing the cost of maintenance of specialized voice communication hardware on the part of the network access providers. By providing a dedicated appliance such telephony is not limited to computer users and owners. With these features this telephony appliance may be used in the same manner as a conventional telephone.

Having now described a few embodiments of the invention, it should be apparent to those skilled in the art that the foregoing is merely illustrative and not limiting, having been presented by way of example and practice. Numerous modifications and other embodiments are within the scope of one of ordinary skill in the art.

For example, other communication protocols over a packet-switched network may be used such as TCP/IP, Frame Relay, ISDN, and IPX providing for reliable transmission or User Datagram Protocol (UDP) that uses Real-Time Protocol (RTP) to handle streaming audio and video and which is a part of the ITU H.323 standard for unreliable transmission. Wireless and asynchronous transfer mode (ATM) networks operating using packet or cell switching also may be used.

Additional functionality also may be provided, such as video and wireless capabilities. An example of video and wireless capability might include a mobile appliance that functions in a vehicle such as an automobile where the outgoing packet-switched communications signals such as video signals are sent by processing video images of the sender using a charge-coupled display (CCD) area sensors such as those sold by Sony Corporation and audio signals are sent by processing voice or audio from the sender using a microphone with active acoustical error cancellation circuitry for full-duplex hands-free speakerphone operation. The incoming packet-switched communication signals are also processed and delivered to the recipient via same wireless means. The incoming processed audio may be transmitted, for example, through the automobile's speakers via radio frequency (RF) signals sent directly to a radio's antenna inside the vehicle. The incoming processed video may be transmitted via a high-resolution liquid crystal display (LCD) such as those sold by Fujitsu or a miniature cathode ray tube (CRT) such as those found on small television sets for which the image of the recipient can be seen directly from a visual display or viewed, for example, reflected off the front windshield of an automobile so that the driver quickly can focus in and out of the visual image while driving.

Flowing fax transmissions to conventional fax machines or storing fax transmissions also may be added by using standard fax and reliable network transmission protocols. Capability commonly found in conventional telephones also may be added, such as number memory, a mute button, a redial button, speed dial, alphanumeric keypad, answering service, caller identification, call-waiting option, calling capability without using telephone number, caller identification memory, teleconferencing, full duplex speaker phone, cordless handset, voice mail, etc. These functions may be integrated using telephony application programming interfaces (TAPI) developed by Microsoft and Intel for computer telephony application development such as those for PBX systems.

An appliance also may be constructed so as to accommodate different telephony standards such as telephone jacks and various POTS transmission laws such as A-law and Mu-law.

These and other modifications are contemplated as falling within the scope of the invention as defined by the appended claims and equivalents thereto.

CLAIMS

1. A communication system for communication using a packet switched network, comprising:

a first network access system for providing access to the packet switched network;

a second network access system for providing access to the packet switched network;

a first appliance having means for connecting to the first network access system through a first access medium, and means for sending and receiving packets through the means for connecting to the packet switched network;

a second user appliance having means for connecting to the second network access system through a second access medium, wherein the second appliance includes means for causing the first appliance to connect to the packet switched network through the first network access system using the means for connecting to the first network access system, and means for sending and receiving packets to and from the first appliance through the means for connecting and the packet switched network.

2. The communication system of claim 1, wherein the means for causing the first appliance to connect to the packet switched network in the second appliance comprises:

means for connecting with the first appliance using a public switched telephone network; and

means for instructing the first appliance to connect to the first network access system using the means for connecting of the first appliance.

3. The communication system of claim 1, wherein the means for causing the first appliance to connect to the packet switched network in the second appliance comprises:

means for identifying the first network access system; and

means for instructing the first network access system to connect with the first appliance through the means for connecting in the first appliance.

4. The communication system of claim 1, further comprising:

a central database of user information including, for each of the first and second appliances, a first unique identifier indicating an address for the appliance accessible using the packet switched network and a second unique identifier indicating an access mechanism for establishing a connection over an access medium between the first and second network access systems and the first and second appliances, and comprising means, operative in response to a query, for returning one of the first and second unique identifiers.

5. An appliance for communication using a packet switched network,

means for connecting the appliance to a first access medium;

means for connecting to a first network access system connected to the packet switched network using the access medium;

means for causing another appliance to be connected through a second access medium to a second network access system connected to the packet switched network; and

means for sending communication packets through the packet switched network to the other appliance after connection of the other appliance to the packet switched network is established.

6. A database system for storing information supporting a communication system using a packet switched network, wherein first and second appliances are connected through first and second access media to first and second network access systems which are connected to the packet switched network, comprising:

means for storing user information including, for each of the first and second appliances, a first unique identifier indicating an address for the appliance accessible using the packet switched network and a second unique identifier indicating an access mechanism for establishing a connection over an access medium between the first and second network access systems and the first and second appliances; and

means, operative in response to a query, for returning one of the first and second unique identifiers.

7. The database system of claim 6, further comprising means for adding user information to the database.

8. The database system of claim 6, further comprising means for deleting user information from the database.

9. The database system of claim 6, further comprising means for updating user information in the database.

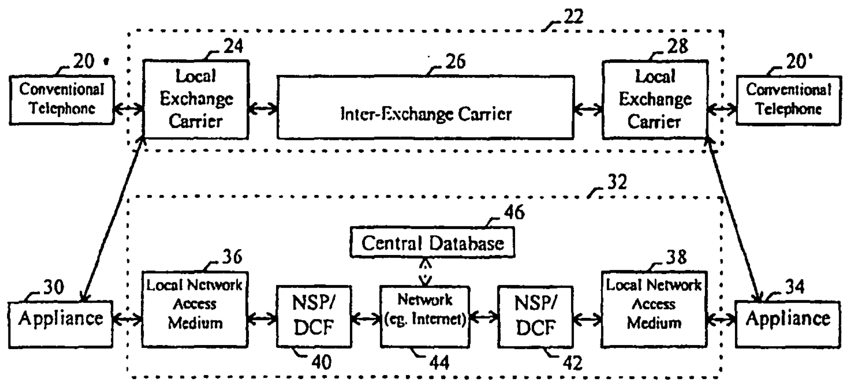

22
20
Conventional Telephone
24
Local Exchange Carrier
26
Inter-Exchange Carrier
28
Local Exchange Carrier
20'
Conventional Telephone
32
46
Central Database
36
Local Network Access Medium
30
Appliance
NSP/ DCF
40
Network (eg. Internet)
44
NSP/ DCF
42
38
Local Network Access Medium
34
Appliance

FIG. 1

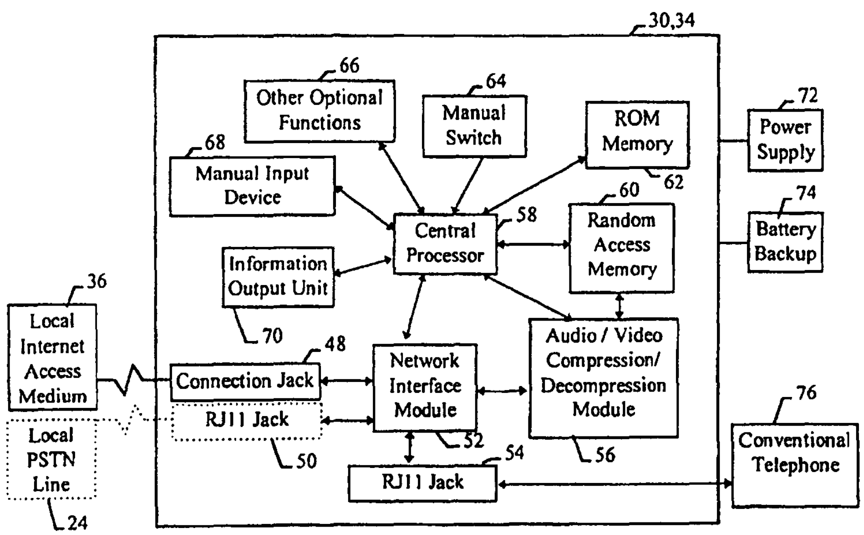

30,34
66
Other Optional Functions
64
Manual Switch
ROM Memory
62
72
Power Supply
68
Manual Input Device
60
Random Access Memory
58
Central Processor
74
Battery Backup
Information Output Unit
36
70
Local Internet Access Medium
48
Connection Jack
Network Interface Module
Audio / Video Compression/ Decompression Module
76
RJ11 Jack
Local PSTN Line
50
52
54
RJ11 Jack
56
Conventional Telephone
24

FIG. 2a

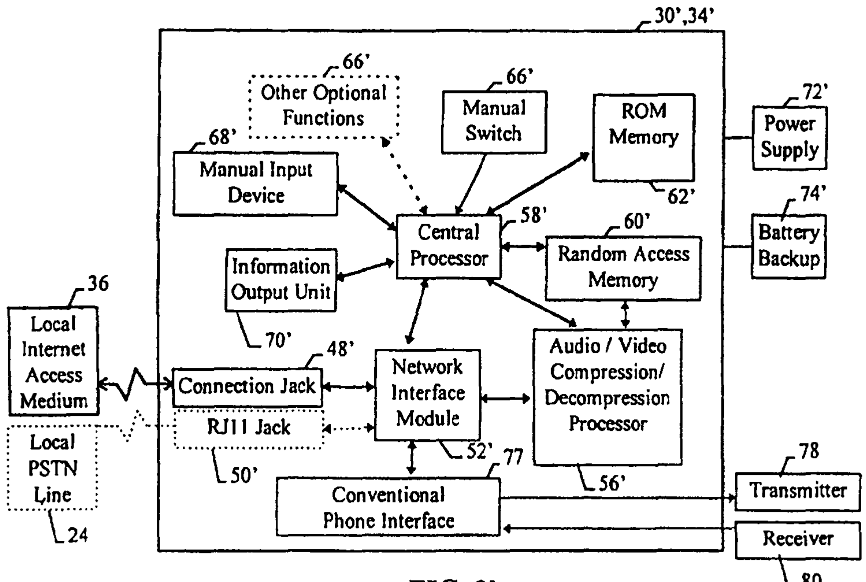

30',34'
66'
Other Optional Functions
66'
Manual Switch
ROM Memory
72'
Power Supply
68'
Manual Input Device
62'
74'
Battery Backup
58'
Central Processor
60'
Random Access Memory
36
Information Output Unit
Local Internet Access Medium
70'
48'
Connection Jack
Network Interface Module
Audio / Video Compression/ Decompression Processor
RJ11 Jack
Local PSTN Line
52'
77
78
50'
56'
Conventional Phone Interface
Transmitter
24
Receiver
80

FIG. 2b

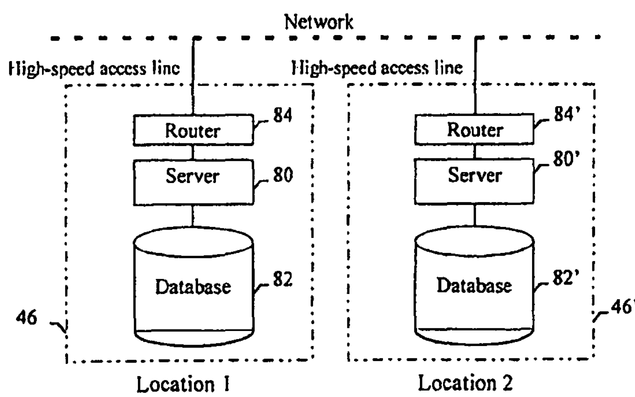

Network
High-speed access line
High-speed access line
Router
84
Router
84'
Server
80
Server
80'
Database
82
Database
82'
46
46'
Location 1
Location 2

FIG. 3

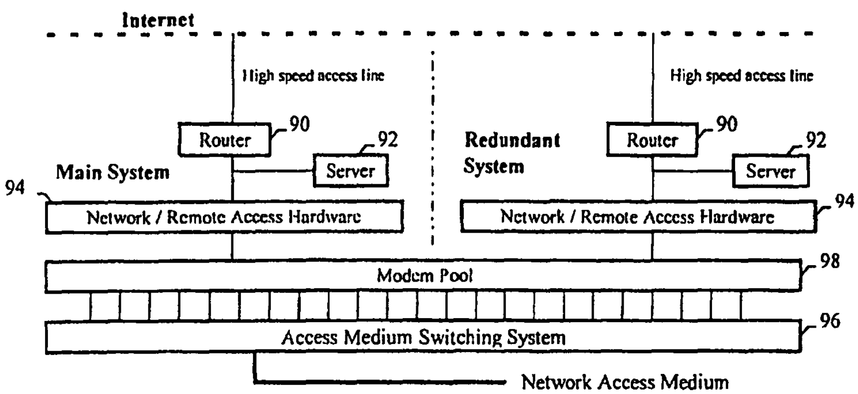
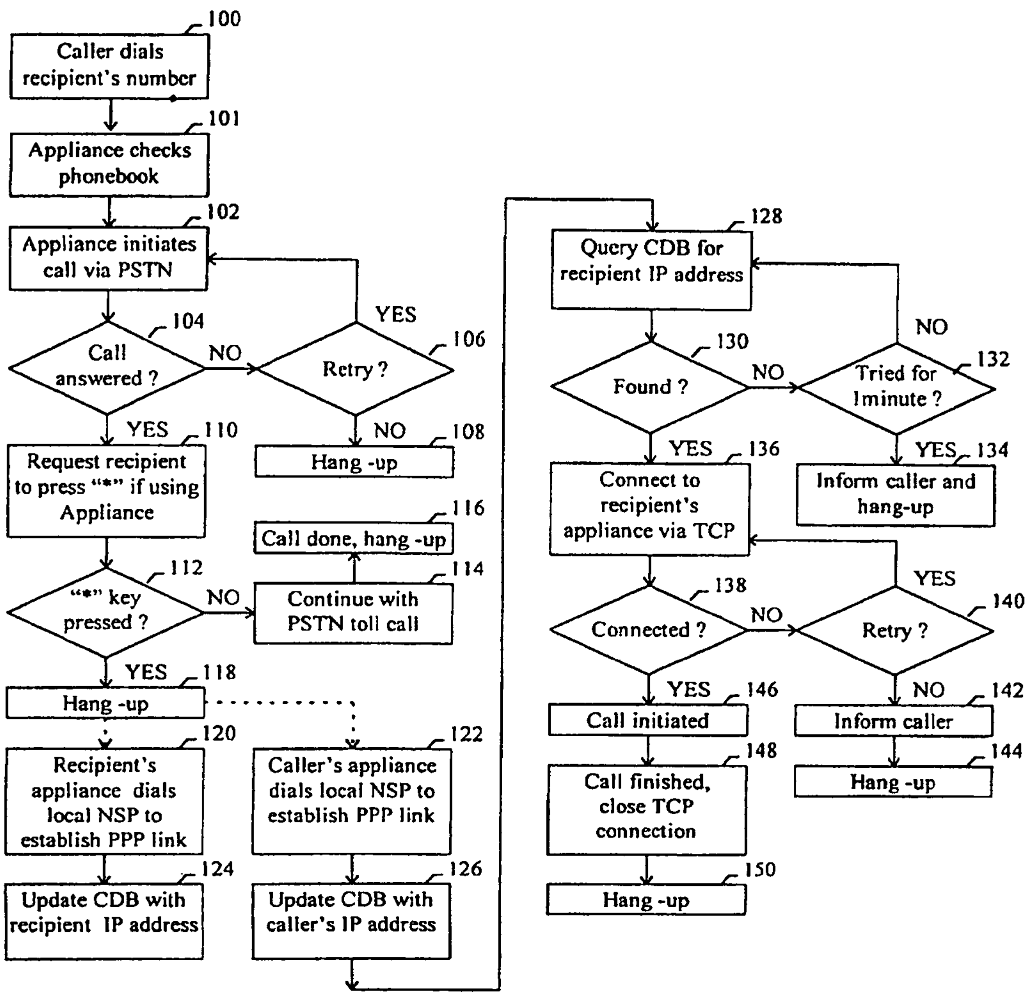

Internet
High speed access line
High speed access line
Router
90
92
Server
Main System
Redundant System
Router
90
92
Server
94
Network / Remote Access Hardware
Network / Remote Access Hardware
94
Modem Pool
98
Access Medium Switching System
96
Network Access Medium

FIG. 4



100
Caller dials recipient's number
101
Appliance checks phonebook
102
Appliance initiates call via PSTN
104
Call answered ?
NO
YES
106
Retry ?
YES
NO
108
Hang -up
110
Request recipient to press "*" if using Appliance
112
"*" key pressed ?
NO
114
Continue with PSTN toll call
116
Call done, hang -up
YES
118
Hang -up
120
Recipient's appliance dials local NSP to establish PPP link
122
Caller's appliance dials local NSP to establish PPP link
124
Update CDB with recipient IP address
126
Update CDB with caller's IP address
128
Query CDB for recipient IP address
130
Found ?
NO
132
Tried for 1minute ?
NO
YES
134
Inform caller and hang-up
YES
136
Connect to recipient's appliance via TCP
138
Connected ?
NO
140
Retry ?
YES
NO
142
Inform caller
144
Hang -up
YES
146
Call initiated
148
Call finished, close TCP connection
150
Hang -up

FIG. 5a

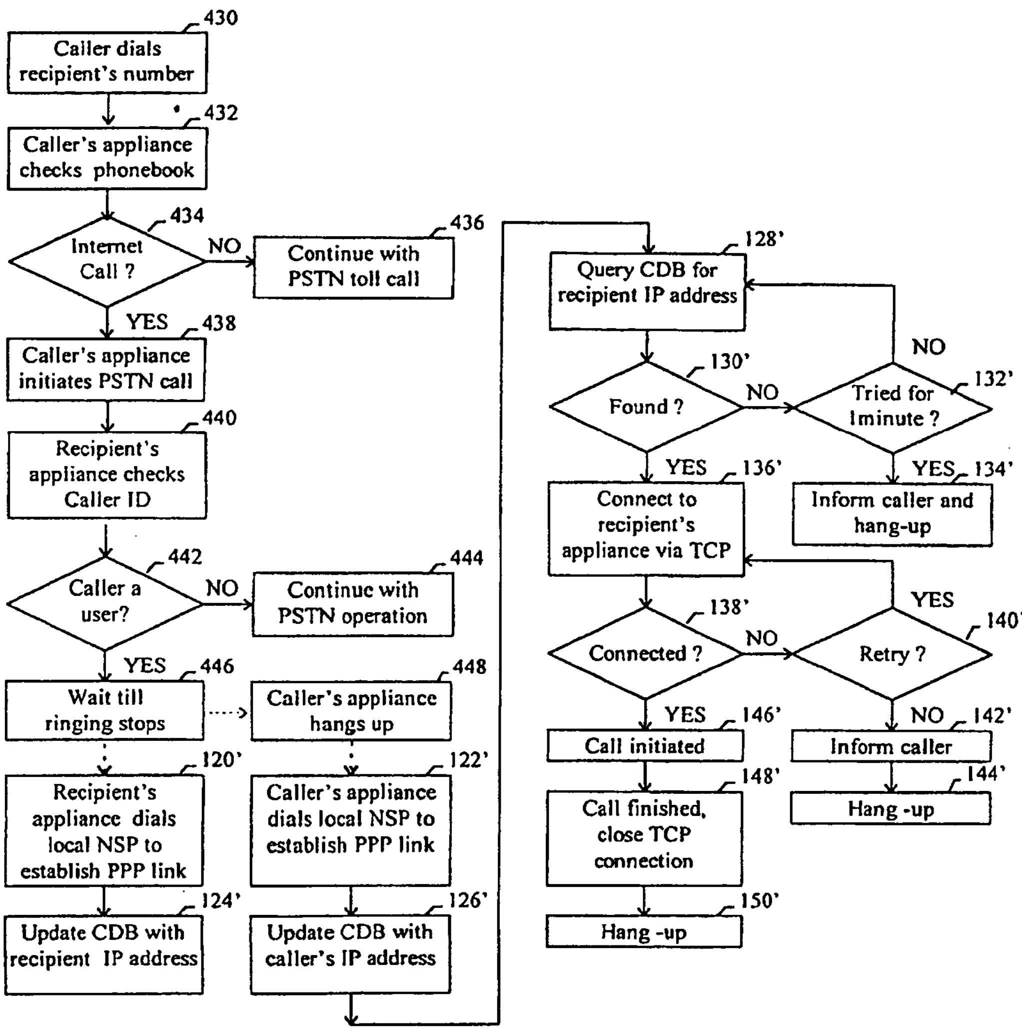

430
Caller dials recipient's number
432
Caller's appliance checks phonebook
434
Internet Call ?
NO
436
Continue with PSTN toll call
YES
438
Caller's appliance initiates PSTN call
440
Recipient's appliance checks Caller ID
442
Caller a user?
NO
444
Continue with PSTN operation
YES
446
Wait till ringing stops
448
Caller's appliance hangs up
120'
Recipient's appliance dials local NSP to establish PPP link
122'
Caller's appliance dials local NSP to establish PPP link
124'
Update CDB with recipient IP address
126'
Update CDB with caller's IP address
128'
Query CDB for recipient IP address
130'
Found ?
NO
132'
Tried for 1minute ?
NO
YES
134'
Inform caller and hang-up
YES
136'
Connect to recipient's appliance via TCP
138'
Connected ?
NO
140'
Retry ?
YES
NO
142'
Inform caller
144'
Hang -up
YES
146'
Call initiated
148'
Call finished, close TCP connection
150'
Hang -up

FIG. 5b

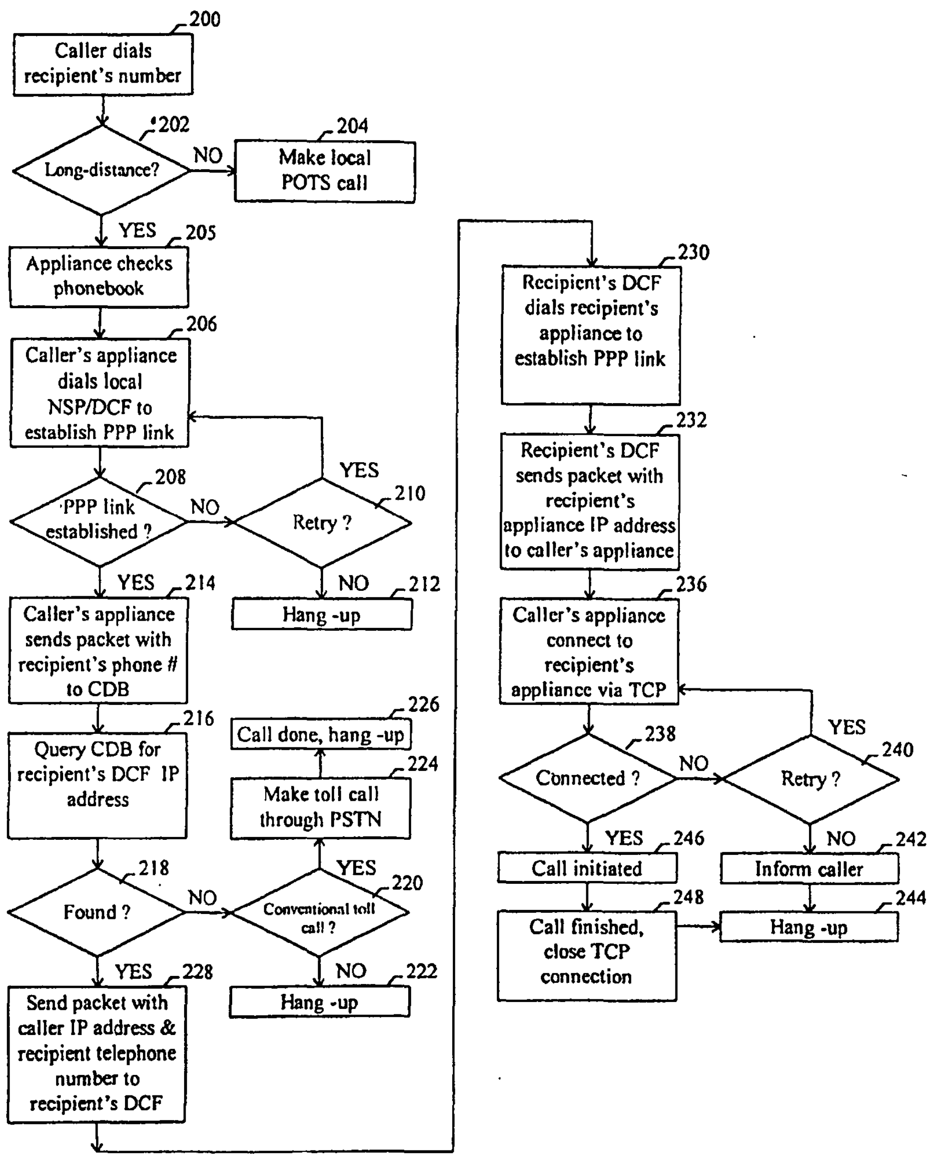

200
Caller dials recipient's number
202
Long-distance?
NO
204
Make local POTS call
YES
205
Appliance checks phonebook
206
Caller's appliance dials local NSP/DCF to establish PPP link
208
PPP link established ?
NO
210
Retry ?
YES
NO
212
Hang -up
YES
214
Caller's appliance sends packet with recipient's phone # to CDB
216
Query CDB for recipient's DCF IP address
226
Call done, hang -up
224
Make toll call through PSTN
218
Found ?
NO
220
Conventional toll call ?
YES
NO
222
Hang -up
YES
228
Send packet with caller IP address & recipient telephone number to recipient's DCF
230
Recipient's DCF dials recipient's appliance to establish PPP link
232
Recipient's DCF sends packet with recipient's appliance IP address to caller's appliance
236
Caller's appliance connect to recipient's appliance via TCP
238
Connected ?
NO
240
Retry ?
YES
YES
246
Call initiated
NO
242
Inform caller
248
Call finished, close TCP connection
244
Hang -up

FIG. 6a

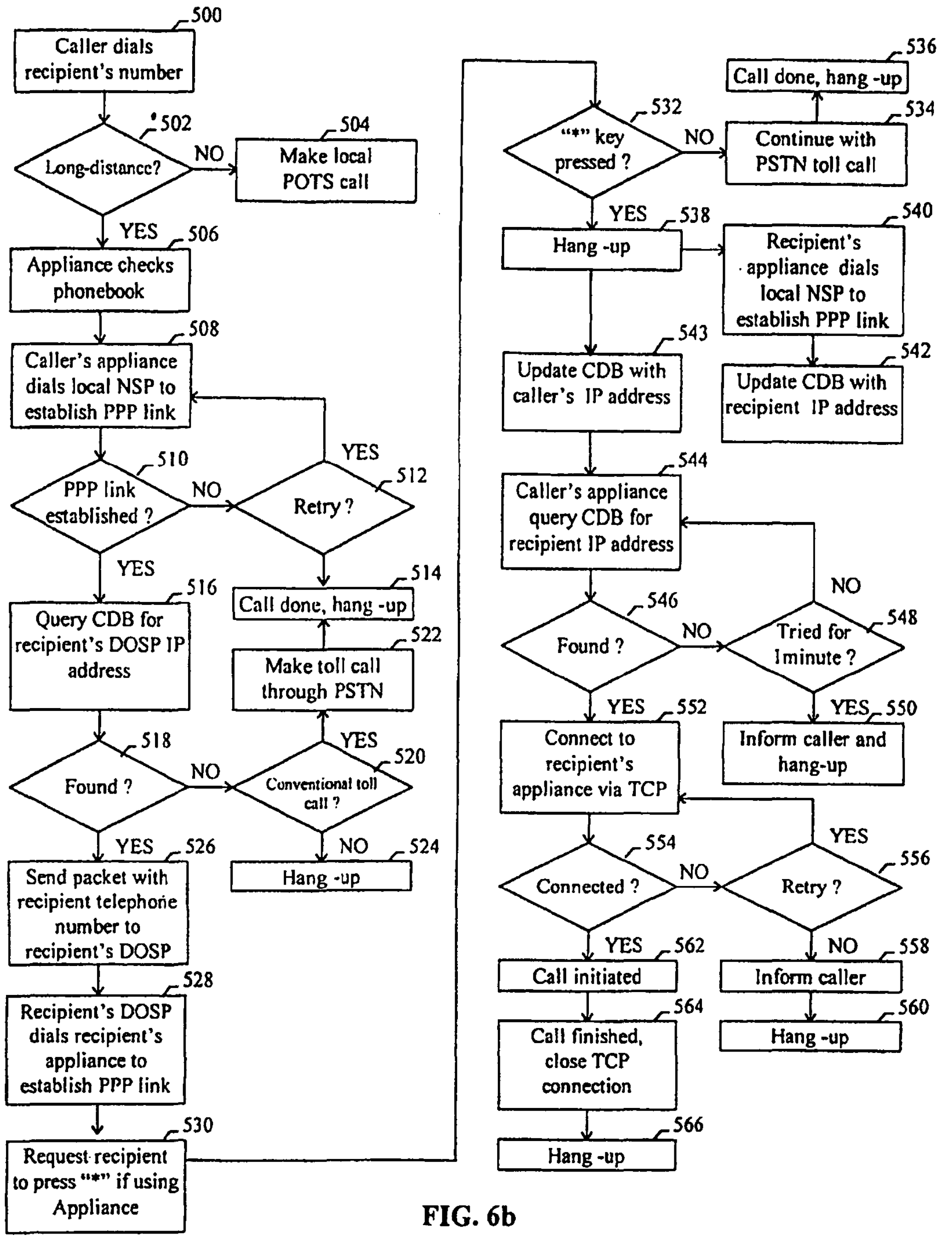

500
Caller dials recipient's number
502
Long-distance?
NO
504
Make local POTS call
YES
506
Appliance checks phonebook
508
Caller's appliance dials local NSP to establish PPP link
510
PPP link established ?
NO
512
Retry ?
YES
514
Call done, hang -up
YES
516
Query CDB for recipient's DOSP IP address
518
Found ?
NO
520
Conventional toll call ?
YES
522
Make toll call through PSTN
NO
524
Hang -up
YES
526
Send packet with recipient telephone number to recipient's DOSP
528
Recipient's DOSP dials recipient's appliance to establish PPP link
530
Request recipient to press "*" if using Appliance
532
"*" key pressed ?
NO
534
Continue with PSTN toll call
536
Call done, hang -up
YES
538
Hang -up
540
Recipient's appliance dials local NSP to establish PPP link
542
Update CDB with recipient IP address
543
Update CDB with caller's IP address
544
Caller's appliance query CDB for recipient IP address
546
Found ?
NO
548
Tried for 1minute ?
NO
YES
550
Inform caller and hang-up
YES
552
Connect to recipient's appliance via TCP
554
Connected ?
NO
556
Retry ?
YES
NO
558
Inform caller
560
Hang -up
YES
562
Call initiated
564
Call finished, close TCP connection
566
Hang -up

FIG. 6b

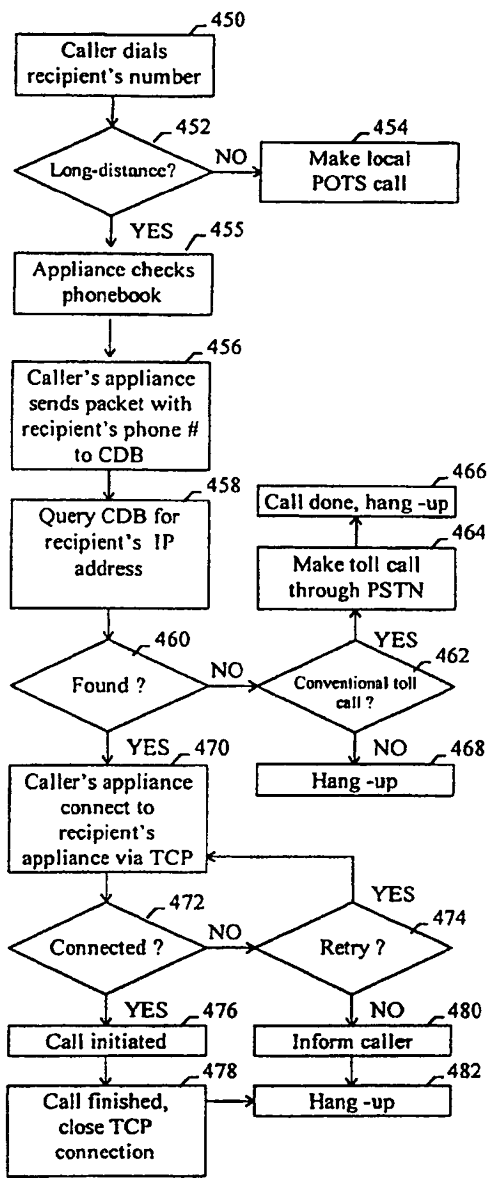

450
Caller dials recipient's number
452
Long-distance?
NO
454
Make local POTS call
YES
455
Appliance checks phonebook
456
Caller's appliance sends packet with recipient's phone # to CDB
458
Query CDB for recipient's IP address
466
Call done, hang -up
464
Make toll call through PSTN
460
Found ?
NO
YES
462
Conventional toll call ?
YES
470
NO
468
Hang -up
Caller's appliance connect to recipient's appliance via TCP
YES
472
474
Connected ?
NO
Retry ?
YES
476
NO
480
Call initiated
Inform caller
478
482
Call finished, close TCP connection
Hang -up

FIG. 7

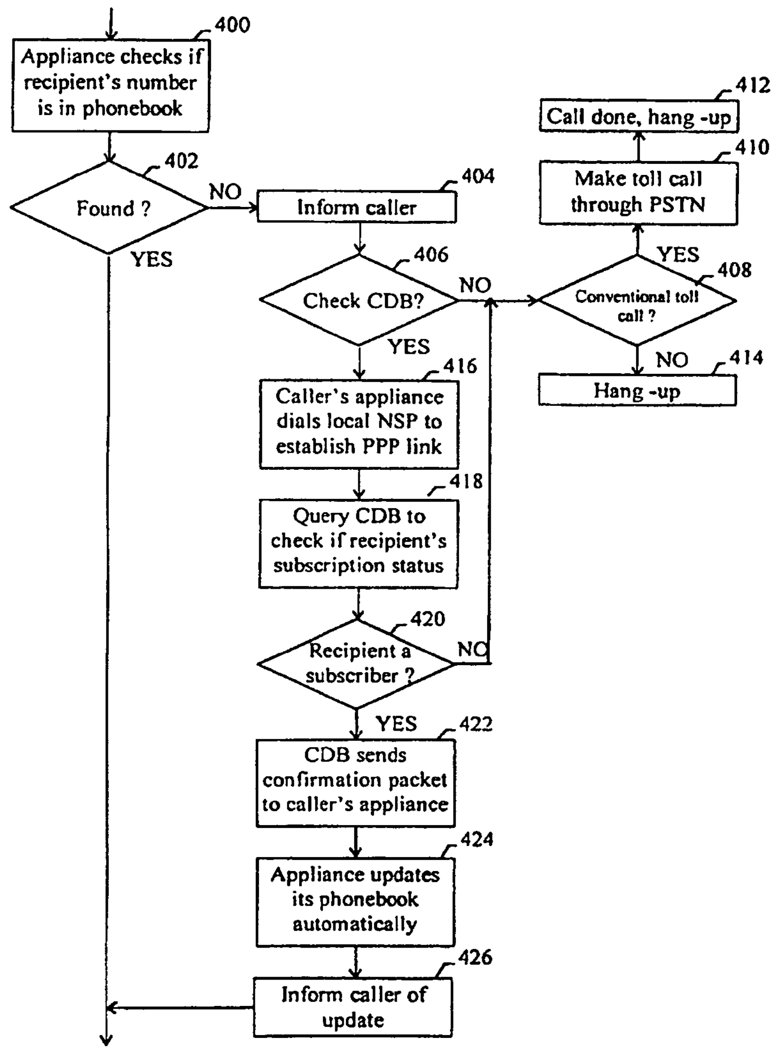

400
Appliance checks if recipient's number is in phonebook
402
Found ?
NO
YES
404
Inform caller
406
Check CDB?
NO
YES
416
Caller's appliance dials local NSP to establish PPP link
418
Query CDB to check if recipient's subscription status
420
Recipient a subscriber ?
NO
YES
422
CDB sends confirmation packet to caller's appliance
424
Appliance updates its phonebook automatically
426
Inform caller of update
408
Conventional toll call ?
YES
NO
410
Make toll call through PSTN
412
Call done, hang -up
414
Hang -up

FIG. 8

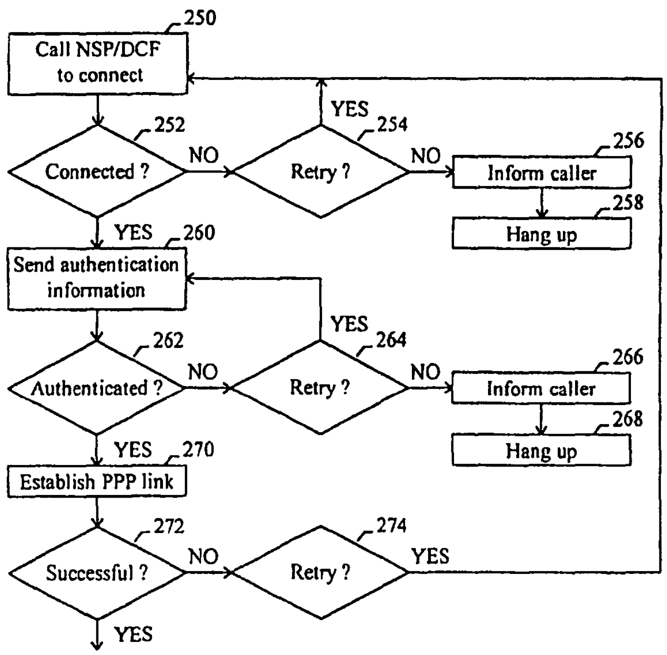

250
Call NSP/DCF to connect
252
Connected ?
NO
YES
254
Retry ?
NO
YES
256
Inform caller
258
Hang up
260
Send authentication information
262
Authenticated ?
NO
YES
264
Retry ?
NO
YES
266
Inform caller
268
Hang up
270
Establish PPP link
272
Successful ?
NO
YES
274
Retry ?
YES

FIG. 9

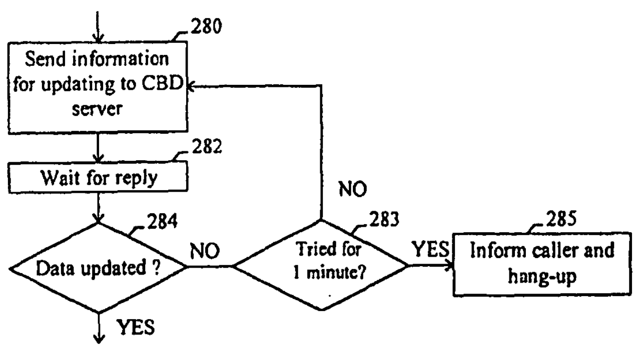

280
Send information for updating to CBD server
282
Wait for reply
284
Data updated ?
NO
YES
283
Tried for 1 minute?
NO
YES
285
Inform caller and hang-up

FIG. 10

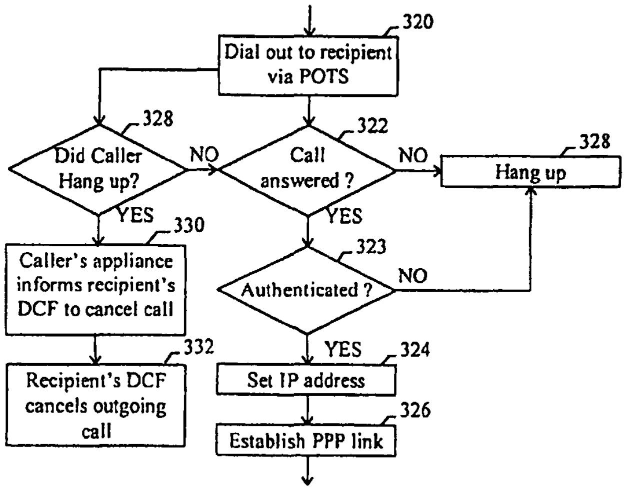

320
Dial out to recipient via POTS
328
Did Caller Hang up?
NO
322
Call answered ?
NO
328
Hang up
YES
330
Caller's appliance informs recipient's DCF to cancel call
YES
323
Authenticated ?
NO
332
Recipient's DCF cancels outgoing call
YES
324
Set IP address
326
Establish PPP link

FIG. 11

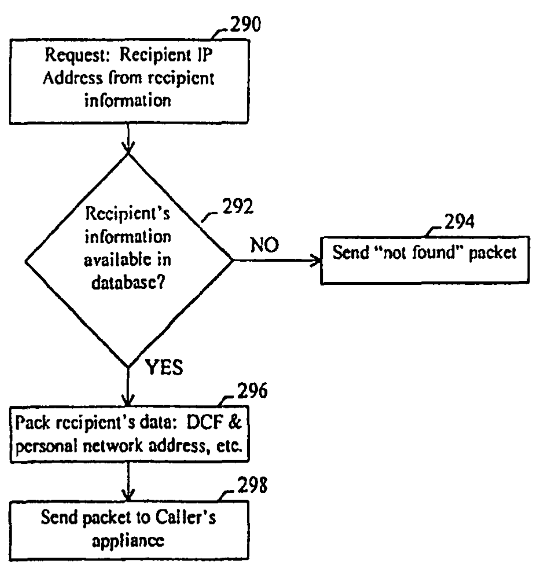

290
Request: Recipient IP Address from recipient information
292
Recipient's information available in database?
NO
294
Send "not found" packet
YES
296
Pack recipient's data: DCF & personal network address, etc.
298
Send packet to Caller's appliance

FIG. 12

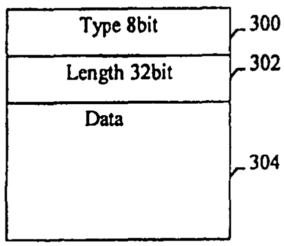

Type 8bit
Length 32bit
Data
300
302
304

FIG. 13

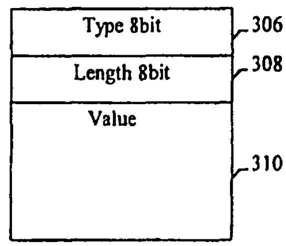

Type 8bit
Length 8bit
Value
306
308
310

FIG. 14

Electronic Acknowledgement Receipt	
EFS ID:	6626950
Application Number:	90010422
International Application Number:	
Confirmation Number:	6565
Title of Invention:	Graphic User Interface For Internet Telephony Application
First Named Inventor/Applicant Name:	6,009,469
Customer Number:	42624
Filer:	Michael R. Casey
Filer Authorized By:	
Attorney Docket Number:	2655-0185
Receipt Date:	14-DEC-2009
Filing Date:	26-FEB-2009
Time Stamp:	12:38:07
Application Type:	Reexam (Third Party)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	NPL Documents	F0095_r_p_mcNamara_some_considerations.pdf	292918 5a0807f235f0a2a9d5b567dd8774603dda7914c2	no	5

Warnings:

Information:

2	NPL Documents	F0096_randy_cole_packet_voice_when.pdf	662089 2ef3af38d393b013e58d9dbb1aa29715601a7a07	no	10
Warnings:					
Information:					
3	NPL Documents	F0097_scott_flinn_coordinating_heterogeneous.pdf	1104908 160e963fe6320d1247d97276dfd8c2551297bfb8	no	16
Warnings:					
Information:					
4	NPL Documents	F0098_shimmi_hattori_integrated_digital_switching.pdf	656025 5701ee25e31d8c6361c49a8e318ed6fbf46c7494	no	7
Warnings:					
Information:					
5	NPL Documents	F0099_steve_oltmanns_voice_and_comm.pdf	391732 c05641632275c8278bca8ad63a144a10f0dfd8d4	no	6
Warnings:					
Information:					
6	NPL Documents	F0100_stuart_cheshire_Internet_mobility.pdf	1104263 b67c0f0d22d63e1a7ccc95e2e9696c099634b4a1	no	12
Warnings:					
Information:					
7	NPL Documents	F0101_susan_angebranndt_integrating_audio.pdf	1090942 c89e79c6ba015c7db698853b50f1db619f0a7232	no	19
Warnings:					
Information:					
8	NPL Documents	F0102_t_kamae_visualTerminals.pdf	1251355 28397972aedc3a141e144c7ab154040e8ee36bed	no	22
Warnings:					
Information:					
9	NPL Documents	F0103_t_kamae_voiceData.pdf	584972 3d0b694d2ab6027a3d62fa97b31231ccf7545b34	no	9
Warnings:					
Information:					
10	NPL Documents	F0104_t7540_digital_codec.pdf	2473859 715431ab20d6feb3620ca090b50b937620204304	no	66
Warnings:					
Information:					

11	NPL Documents	F0105_takashi_yamada_new_technologies.pdf	218690 9633e563853595444d287cdd1d2677db5c8bd5b6	no	7
Warnings:					
Information:					
12	NPL Documents	F0106_talk_description.pdf	290918 dcf7e75689b55455926a336a53fafaa31483ae4b	no	2
Warnings:					
Information:					
13	NPL Documents	F0107_Nikkei_Communications_with_SOR.pdf	1297348 c4a382f4c31e75666d1280d416785c6b58d9f771	no	7
Warnings:					
Information:					
14	NPL Documents	F0108_theodore_bially_voice_communication.pdf	1047412 2c36160bba3c6376e069ec3e8685a0bb52439c19	no	14
Warnings:					
Information:					
15	NPL Documents	F0109_toru_tsuda_approach_to_multi-service.pdf	420528 e13729eeaf92cbcaf69e3892bca4add454dc364a	no	7
Warnings:					
Information:					
16	NPL Documents	F0110_Translation_Kokai_H7-129488.pdf	1380439 93da8abe7003f0a96bc5f683c173ddd234e7f94a	no	7
Warnings:					
Information:					
17	NPL Documents	F0114_v_jacobson_rfc1185.pdf	664872 0624db5bd5c7bd08fce1d2d3d94916429ab2c805	no	20
Warnings:					
Information:					
18	NPL Documents	F0115_v_jacobson_rfc1323.pdf	1169785 247de0bb795a6e552f26558b785cd21a86992559	no	35
Warnings:					
Information:					
19	NPL Documents	F0116_vinton_cerf_packet_satellite.pdf	185290 18850c4eb7093f475750badf637d51083fb2f5fa	no	5
Warnings:					
Information:					

20	NPL Documents	F0117_vocaltec_internet_phone.pdf	946693 89a0631dbb3477a904b2c38f3a043c91070b94f4	no	5
Warnings:					
Information:					
21	Foreign Reference	F0118_WO-94-22087.pdf	1152846 92391f87f9a32fdfe9fd61b1307306bb2244edee	no	36
Warnings:					
Information:					
22	Foreign Reference	F0119_WO-97-14234.pdf	1135850 2e57db3d957190c4e5d1bbf6d9f9cd6a1fa4ec01	no	32
Warnings:					
Information:					
23	Foreign Reference	F0120_WO-98-11704.pdf	1721918 d0b89d65d64480fa15abe7af93f510dedfd28777	no	42
Warnings:					
Information:					
24	NPL Documents	F0121_written_opinion_in_PCTUS9615504.pdf	227005 8d4e06cf9e2b33fa0d2c65c78dc585b248e92e9f	no	7
Warnings:					
Information:					
25	NPL Documents	F0111_90010416_20090827_Office_Action.pdf	2144633 4bdc8ac8d581175ac57c458f9e50fb4d8a9131a8	no	18
Warnings:					
Information:					
26	NPL Documents	F0112_90010421_20090814_Office_Action.pdf	2727622 eb422d24f5c7b035f4674bdc4439fcb080bb33b1	no	22
Warnings:					
Information:					
27	NPL Documents	F0113_90010424_20090825_Office_Action.pdf	1618055 41849c265a0dd903718eb79041a4aae3ebf9f57b	no	14
Warnings:					
Information:					
28	Reexam Certificate of Service	20091214_COS_0185.pdf	56773 fc2ff2d493804f00a3ed99f6c4fd603d119b0bab	no	1
Warnings:					
Information:					

Total Files Size (in bytes):	28019740

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

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

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT APPLICATION OF:	Attorney Docket: 2655-0185
Net2Phone, Inc. (Patent No. 6,009,469)	Group Art Unit: 3992
Control No.: 90/010,422	Examiner: KOSOWSKI, Alexander
Issue Date: December 28, 1999	Date: November 25, 2009
Title: **GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION**	Confirmation No.: 6565

RESPONSE TO NON-FINAL REJECTION IN A RE-EXAMINATION

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

Sir:

In response to the Office Action dated August 25, 2009 (and having had the deadline for responding extended one month), the Assignee hereby submits:

Amendments to the Claims beginning on page 2 of this paper; and

Remarks/Arguments beginning on page 3 of this paper.

AMENDMENTS TO THE CLAIMS

In the re-examination, please amend claim 1 as follows:

1. (Amended) A computer program product for use with a computer system having a display and an audio transducer, the computer system capable of executing a first process and connecting to other processes and a server process over a computer network, the computer program product comprising a computer usable medium having computer readable code means embodied in the medium comprising:

a. program code for generating a user-interface enabling control of a first process executing on the computer system;

b. program code for determining the currently assigned network protocol address of the first process upon connection to the computer network;

c. program code responsive to the currently assigned network protocol address of the first process, for establishing a communication connection with the server process and for forwarding the assigned network protocol address of the first process and a unique identifier of the first process to the server process upon establishing a communication connection with the server process; and

d. program code means, responsive to user input commands, for establishing a point-to-point communications with another process over the computer network.

REMARKS/ARGUMENTS

Favorable reconsideration, in view of the present amendment and in light of the following discussion, is respectfully requested.

STATUS OF THE CLAIMS AND SUPPORT FOR THE CHANGES TO CLAIM 1

Upon entry of this amendment, the status of the claims will be as follows:

Claims 1-3, 5, 6, 8, 9 and 14-18 will be pending and are the subject of this re-examination. Claims 4, 7 and 10-13 are not subject to re-examination.

Claim 1 has been amended to provide a missing "of" between "control" and "a." The change is self-supporting and does not introduce any new matter. No claims other than claim 1 have been amended, and no claims have been added or canceled herewith.

RESPONSE TO REJECTIONS

In the outstanding Office Action, three rejections under 35 U.S.C 103(a) were made as follows:

1. Claims 1-3, 5, 6, 8, 9, and 14-18 were alleged to be obvious over the combination of NetBIOS and RFC 1531, Pinard and the VocalChat User's Guide;
2. Claims 1-3, 5, 6, 8, 9, and 14-18 were alleged to be obvious over the combination of the Etherphone papers in view of Vin and further in view of RFC 1531, Pinard and the VocalChat User's Guide; and
3. Claims 1-3, 5, 6, 8, 9, and 14-18 were alleged to be obvious over the combination of the VocalChat references in view of RFC 1531 and Pinard.

Each of those rejections is respectfully traversed for the reasons set forth below. Reference is made throughout this response to the Declaration Of Ketan Mayer-Patel Under 37 C.F.R. 1.132 (hereinafter the "Mayer-Patel Declaration") attached hereto as Exhibit 1.

The rejection of Claims 1-3, 5, 6, 8, 9, and 14-18 over the combination of NetBIOS, RFC 1531 Pinard and VocalChat User's Guide

Claims 1-3

Claim 1 recites "a. program code for generating a user-interface enabling control of a first process executing on the computer system." With respect to the limitation of "program code for generating a user-interface enabling control of a first process executing on the computer system," the Office Action alleges that "computers executing NetBIOS ***may contain*** DOS operating systems or may operate on other operating systems, which examiner notes inherently contain at least text-based user interfaces." That "inherency" argument is respectfully challenged. First, even stating that NetBIOS "may contain" DOS operating systems is an admission by itself that NetBIOS need not actually contain a DOS operating system, and, therefore, NetBIOS does not inherently contain at least text-based user interfaces. Furthermore, the recitation of "other operating systems" also does not inherently mean that "text-based user interfaces" are provided. For example, embedded systems need not have a display or a text interface even though they may have operating systems. The Office Action also has not asserted that this limitation is taught by RFC 1531. Thus, limitation (a) has not been shown to be taught by either applied reference. See Exhibit 1, Mayer-Patel Declaration, paragraphs 18-19.

Claim 1 also recites "b. program code for determining the currently assigned network protocol address of the first process upon connection to the computer network." With respect to that limitation, the Office Action admits that NetBIOS does not teach this limitation. To address the admitted deficiency, the Office Action alleges that such a limitation is taught by RFC 1531 because "RFC 1531 teaches dynamically assigning IP address on a TCP/IP network by an Internet access server." An examination of limitations (a) and (b) together, however, shows that the Office Action has not alleged, much less proven, that the currently assigned network protocol address is that of the first process which the Office Action alleged was the "text-based user interface." The Office Action has not even identified any motivation for the text-based interface to have its currently assigned network protocol address determined. Thus, limitation (b) has not been shown to be taught by either applied reference. See Exhibit 1, Mayer-Patel Declaration, paragraph 20.

Claim 1 further recites "c. program code responsive … for forwarding the assigned network protocol address of the first process and a unique identifier of the first process to the server process upon establishing a communication connection with the server process." As the Office Action has not shown that the assigned network protocol address of the first process is determined, the Office Action also has not shown that the assigned network protocol address of the first process would be forwarded to the server upon establishing a communication connection with the server process. Similarly, the Office Action has not shown that the alleged text-based user interfaces would have a unique identifier to be forwarded to the server. The Office Action further has not shown that such a limitation is taught by RFC 1531. Accordingly, limitation (c) has not been shown to be taught by either applied reference. See Exhibit 1, Mayer-Patel Declaration, paragraph 21.

Claim 1 also recites "d. program code, responsive to user input commands, for establishing a point-to-point communications with another process over the computer network." The Office Action cites NetBIOS, pgs. 397-400, as teaching that "point-to-point communication is established upon initiation between nodes once target names and addresses have been found." This assertion, however, fails to allege, much less prove, that such code is "responsive to user input commands" as no user input commands have been identified. Even assuming that text-based user interfaces were taught by NetBIOS, the Office Action still would not have shown that point-to-point communications are inherently established "responsive to user input commands." The text-based user interfaces could have been used for non-communicating functions or even functions that use non-point-to-point communications. The Office Action further has not shown that such a limitation is taught by RFC 1531. Accordingly, limitation (d) has not been shown to be taught by either applied reference. See Exhibit 1, Mayer-Patel Declaration, paragraph 22.

Since none of the limitations of claim 1 have been shown to be taught by the applied combination of references, claim 1 and dependent claims 2 and 3 are not rendered obvious by the proposed combination. See Exhibit 1, Mayer-Patel Declaration, paragraph 23.

No Ability to Combine the References as in Claims 1-3, 5, 6, 8, 9, and 14-18

In addition, the Office Action has not proven that one of ordinary skill in the art would have been able to combine the references as proposed. The Office Action acknowledges that NetBIOS does not teach "program code for determining the currently assigned network protocol address of the first process upon connection to the computer network." The Office Action asserts that it would have been obvious to one skilled in the art at the time the invention was made to utilize dynamically assigned IP addresses from Internet access servers in the invention taught by NetBIOS. The Office Action further alleges that "it would have been obvious … to determine the currently assigned network address of the first process upon connection to the computer network in the invention taught by NetBIOS above since this allows for automatic reuse of an address … and since examiner notes the use of dynamic IP address assignment … are old and well known … and are useful to eliminate the burdensome task of manually assigning IP addresses for all networked computers." See Exhibit 1, Mayer-Patel Declaration, paragraph 24.

The assignee respectfully submits that the obviousness conclusion drawn by the Office Action is mistaken. The Office Action speculates, with hindsight, as to why a person of ordinary skill might want to combine the two references, but does not acknowledge the problems that would arise in doing so, and does not provide any prior art that would indicate how the problems that dynamic addressing would bring into a NetBIOS type system could be resolved by those of ordinary skill at the time the patent was filed. See Exhibit 1, Mayer-Patel Declaration, paragraph 24.

In the context of point-to-point communication, widespread use of dynamically assigned addresses does not solve NetBIOS problems, it creates further problems. The assignee agrees that dynamically assigned addresses were known, and the patent in re-examination specifically states in that regard, "Due to the dynamic nature of temporary IP addresses of some devices accessing the Internet, point-to-point communications in realtime of voice and video have been generally difficult to attain." Col. 2, lines 35-38. See Exhibit 1, Mayer-Patel Declaration, paragraph 25.

But it is not enough to prove that the cause of a problem existed, namely the problematic use of changing addresses. The Office Action must show by citation of prior art that the problem was recognized, and that the solution for NetBIOS was either known or trivially apparent from the known art. See *Innogenetics, N.V. v. Abbott Laboratories*, 512 F.3d 1363, 1373 (Fed Cir. 2008). ("The district court was nevertheless correct that knowledge of a problem and motivation to solve it are entirely different from motivation to combine particular references to reach the particular claimed method."). If the requester of reexamination had such prior art it would undoubtedly have been provided as part of its exhaustive reexamination request. The fact that there is none is testimony to the lack of teaching in the prior art sufficient to enable the person of ordinary skill to make the suggested combination.

The NetBIOS reference cited in the request, moreover, indicates the opposite. For example, Section 15.1.7 of the NetBIOS reference (entitled "Consistency of the NBNS Data Base") recognizes that the association between a node, a registered name and an IP address is tenuous, even in an environment that uses static IP addresses. "Even in a properly running NetBIOS scope the NBNS and its community of end-nodes may occasionally lose synchronization with respect to the true state of name registrations." To minimize the impact of this problem, the reference states, "Various approaches have been incorporated into the NetBIOS-over-TCP protocols" which it then proceeds to describe. See Exhibit 1, Mayer-Patel Declaration, paragraph 25.

However, by incorporating DHCP and adopting dynamic address allocation as used by Internet access providers, the synchronization problem would become more disruptive, not less. Dynamic addressing introduced a new uncertainty to the relationships among the NBNS and its community of end-nodes and a new set of obstacles to NetBIOS synchronization that *are not addressed by the NetBIOS reference*. Consider the case of a node that is turned-off and then subsequently turned back on, or a node that has simply lost its Internet connection for some technical reason or whose DHCP lease has expired and then re-established a connection. In a dynamic addressing environment, such a node would most likely obtain a new IP address when it was turned back on that was different than the one it had when it registered its name. This change could lead to any number of node-name-IP address synchronization problems for the disclosed NetBIOS protocols. See Exhibit 1, Mayer-Patel Declaration, paragraph 26.

For example, because the NBNS does not know the node's new address, the NBNS would be unable to send to the node a Name Release Request or a Name Conflict Demand or request that the node send it a Name Status Request. Because communication from the node would be originating at a new address that was not recognized by the NBNS, a node's response to a Name Query Request (assuming it somehow knew that its name had been challenged, perhaps from before it lost network connectivity) would not be recognized. A node would also be unable to confirm its association with registered names by sending Name Refresh Request packets to the NBNS. If a session between two NetBIOS applications were cut-off, re-establishing the communication would be especially difficult where the ability of a called entity to obtain both its associated name and its associated IP address were in doubt. As a result, the Office Action has not demonstrated that a solution to the problems created by exposure of NetBIOS to DHCP and dynamic addressing has been addressed by any of the applied references.[1] See Exhibit 1, Mayer-Patel Declaration, paragraph 27.

[1] Besides dynamic addressing, Internet access would pose other challenges to a NetBIOS system. For example, because NetBIOS was designed for use on local area networks with small numbers of computers, trust among the network participants is assumed. That assumption cannot be transferred to a global Internet made up of unknown, and sometimes malevolent, entities. An implementation of NetBIOS on the public Internet would necessitate non-trivial adaptations to ensure that its services perform correctly and return accurate information. There is no discussion of security issues in the cited references. See Exhibit 2, from http://www.w3schools.com/Site/site_security.asp which instructs Microsoft Windows users whose computers access the Internet to disable NetBIOS over TCP/IP in order to solve their security problems. See Exhibit 1, Mayer-Patel Declaration, paragraph 27.

The Office Action also has not identified anything in the cited art that suggests how a person of ordinary skill is to go about the redesign of NetBIOS and the solving of obstacles to NetBIOS operation that are created by Internet access; *problems that were recognized and left as warnings unresolved in the NetBIOS reference*.[2] See Exhibit 1, Mayer-Patel Declaration, paragraph 28.

Merely citing to dynamic addressing, i.e., the source of those problems, is insufficient as the Supreme Court and the Federal Circuit have repeatedly made clear. See *Depuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1326 (Fed. Cir. 2009) citing *inter alia KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398 (2007) and U.S. v. Adams, 383 U.S. 39 (1966), for the proposition that obviousness requires not only "the expectation that prior art elements are capable of being physically combined, but also that the combination would have worked for its intended purpose," and also quoting *In re ICON Health & Fitness, Inc.*, 496 F.3d 1374, 1382 (Fed. Cir. 2007) as saying "[A] reference teaches away from a combination when using it in that combination would produce an inoperative result."

In view of the foregoing, the proposed rejection of claims 1-3 over the combination of NetBIOS and RFC 1531 can be compared to a patent that claims a vehicle that travels on water where one piece of prior art shows a land vehicle and another shows water. The fact that water creates a problem for the land vehicle does not disclose that the person of ordinary skill would know how to build a vehicle capable of crossing the water. Thus, claims 1-3 are patentable over the combination of NetBIOS and RFC 1531. See Exhibit 1, Mayer-Patel Declaration, paragraph 29.

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[2] The cited references go out of their way *to avoid* describing how a NetBIOS protocol might work in inter-connected network environments that that are *less complex* than the Internet and that *predate* DHCP. See Section 4.6 ("The proposed standard recognizes the need for NetBIOS operation across a set of networks interconnected by network (IP) level relays (gateways.) However, the standard assumes that this form of operation will be less frequent than on the local MAC bridged-LAN.")

Claims 5 and 6

Claim 5 recites "determining the currently assigned network protocol address of the first process upon connection to the computer network." The Office Action admits that this limitation is not taught by NetBIOS but alleges that "RFC 1531 teaches dynamically assigning IP addresses on a TCP/IP network by an Internet access server." The Office Action further alleges that "it would have been obvious … to determine the currently assigned network address of the first process upon connection to the computer network in the invention taught by NetBIOS above since this allows for automatic reuse of an address … and since examiner notes the use of dynamic IP address assignment … are old and well known … and are useful to eliminate the burdensome task of manually assigning IP addresses for all networked computers." However, as described above with respect to claims 1-3 and the alleged motivation to combine NetBIOS and RFC 1531, the Office Action has only speculated, with hindsight, as to why a person of ordinary skill might want to combine the two references, and has neither addressed the problems that would arise in doing so, nor provided any prior art that would indicate how these problems could be designed-around or otherwise resolved by those of ordinary skill at the time the patent was filed. Thus, claim 5 and dependent claim 6 are patentable over the applied NetBIOS and RFC 1531 references. See Exhibit 1, Mayer-Patel Declaration, paragraph 30.

Claims 8, 9 and 14-18

Claim 8 recites "querying the server process to determine if the first callee process is accessible." The Office Action asserts that this limitation is taught by NetBIOS and cites pages 377, 388, 389 and 446 as supporting the proposition that "a query is sent to the NBNS to determine if another node is logged in and discover[s] the node[']s IP address." However, the Office Action has not shown how knowing that a name has been registered equates to "determin[ing] if the first callee process is accessible." While NetBIOS uses name entries with "active" statuses as part of its name management process, an analysis of how that "active" status is used shows that "an active name" is not synonymous with determining if the first callee process is accessible. An active name simply refers to a name that has been registered and that has not yet been de-registered, independent of whether the associated computer is or is not accessible. As shown on page 447 (and reproduced below), the Node_Name entries stored with respect to a NetBIOS Name Server contain a series of fields including the "ACT" field. See Exhibit 1, Mayer-Patel Declaration, paragraph 31.

```
The NAME_FLAGS field:

                                          1   1   1   1   1   1
  0   1   2   3   4   5   6   7   8   9   0   1   2   3   4   5
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| G |  ONT  |DRG|CNF|ACT|PRM|          RESERVED                 |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

The NAME_FLAGS field is defined as:

Symbol      Bit(s)   Description:

RESERVED     7-15    Reserved for future use.  Must be zero (0).
PRM             6    Permanent Name Flag.  If one (1) then entry
                     is for the permanent node name.  Flag is zero
                     (0) for all other names.
ACT             5    Active Name Flag.  All entries have this flag
                     set to one (1).
CNF             4    Conflict Flag.  If one (1) then name on this
                     node is in conflict.
DRG             3    Deregister Flag.  If one (1) then this name
                     is in the process of being deleted.
ONT           1,2    Owner Node Type:
                        00 = B node
                        01 = P node
                        10 = M node
                        11 = Reserved for future use
G               0    Group Name Flag.
                     If one (1) then the name is a GROUP NetBIOS
                     name.
                     If zero (0) then it is a UNIQUE NetBIOS name.
```

The ACT field is a single bit field (in bit 5) that signifies an "Active Name Flag. ***All entries have this flag set to one (1)***." (Emphasis added.) If all name entries have this flag set to one (1), then the NetBIOS name server cannot be using the Active Name Flag as a means of separately tracking whether the entity that owns the name is "active," let alone what its "on-line" status might be. See Exhibit 1, Mayer-Patel Declaration, paragraph 32.

The NetBIOS reference also does not teach that the active status of a name in the NetBIOS server is an indication of the active status of the owner of that name. To the contrary, when information about whether the owner of a name is "active" may be relevant, for example when a new entity seeks to register a name that has already been registered in the NetBIOS name server, the NetBIOS reference describes an elaborate set of interactions used to test whether the existing owner of the registered name is active or inactive. It does not rely on the fact that the name is active in the NetBIOS name server (See Section 15.2.2.2 and 15.2.2.3 entitled "Existing Name and Owner is Inactive"). See Exhibit 1, Mayer-Patel Declaration, paragraph 33.

The NetBIOS reference also does not teach that an acquired IP address can be reasonably relied upon by a requesting end-node to confirm that an end-node associated with a sought name is, in fact, "accessible." The NetBIOS reference describes at least two different scenarios where a second end-node sends a rejection response to the first end-node notwithstanding the fact that an end-node is connected to the computer network and active with respect to the sought name. See Section 16.1.1 ("There exists a NetBIOS LISTEN compatible with the incoming call, but there are inadequate resources to permit establishment of a session…The called name does, in fact, exist on the called node, but there is no pending NetBIOS LISTEN compatible with the incoming call."). No distinction is made in the reference between the rejection response in these cases and the rejection response in cases where the called name does not exist on the called end-node. Section 16.1.1 also states "In all but the first case, a rejection response is sent back over the TCP connection to the caller." See Exhibit 1, Mayer-Patel Declaration, paragraph 34.

The Office Action also has not alleged that any of the remaining references teach this limitation missing from the NetBIOS reference. As such, claim 8 and its dependent claims (claims 9 and 14-18) are not rendered obvious by the cited combination of references. See Exhibit 1, Mayer-Patel Declaration, paragraph 35.

The rejection of claims 1-3 over the combination of the Etherphone papers in view of Vin and further in view of RFC 1531

Claims 1-3

Claim 1, as amended, recites "a. program code for generating a user-interface enabling control of a first process executing on the computer system" and "d. program code means, responsive to user input commands, for establishing a point-to-point communications with another process over the computer network." When read together, it can be seen that the Office Action has not alleged that these limitations are taught by the applied combination of references. See Exhibit 1, Mayer-Patel Declaration, paragraph 37.

With respect to the limitation "a. program code for generating a user-interface enabling control of a first process executing on the computer system," the Office Action cites Swinehart and Zellweger as teaching that "workstations include GUI's." Later, with respect to the limitation "d. program code means, responsive to user input commands, for establishing a point-to-point communications with another process over the computer network," the Office Action asserts that "after acquiring the network address of a callee, voice datagrams are transmitted directly amont [sic; among] the participants, bypassing the control server." However, by "participants" it appears that the Office Action is referring to Etherphones participating in a telephone call. As such, the Office Action has not shown that the datagrams are transmitted as part of a point-to-point communication from the workstation (which was alleged as having the first process) to one of the Etherphones. In fact, with respect to limitation (c), the Office Action confirms that its interpretation is that the "workstation address [is] transmitted to the Voice Control Server when connected" -- not the Etherphone's network address. See Exhibit 1, Mayer-Patel Declaration, paragraph 38.

Similarly, looking at it from the opposite perspective, if the voice datagrams are actually going from one Etherphone to another, then the Office Action has not shown how the "currently assigned network protocol address of the first process" is the address of the Etherphone and how the Etherphone has a display or "a user-interface enabling control a first process" on that Etherphone. The Office Action also has not alleged that RFC 1531 teaches this limitation missing from the Etherphone references. Thus, claims 1-3 are not rendered obvious by the proposed combination. See Exhibit 1, Mayer-Patel Declaration, paragraph 39.

Claims 5 and 6

Claim 5 recites "A. determining the currently assigned network protocol address of the first process upon connection to the computer network" and "D. establishing a point-to-point communication with another process over the computer network." As described above with respect to claim 1, when these two limitations are examined together, it can be seen that the Office Action has not met its burden of showing that these limitations are met. See Exhibit 1, Mayer-Patel Declaration, paragraph 40.

With respect to the limitation "A. determining the currently assigned network protocol address of the first process upon connection to the computer network," the Office Action again cites the GUI's of the workstation as meeting this limitation. Then, with respect to the limitation "D. establishing a point-to-point communication with another process over the computer network," the Office Action again states "voice datagrams are transmitted directly amont [sic; among] the participants, bypassing the control server." Thus, as discussed above with respect to claim 1, the Office Action appears to have overlooked that the Etherphone, not the workstation with the GUI, is receiving the voice datagrams, so the Etherphone reference does not teach limitations (A) and (D). The Office Action also has not alleged that RFC 1531 teaches this limitation missing from the Etherphone references. Thus, claim 5 and dependent claim 6 are not rendered obvious by the proposed combination. See Exhibit 1, Mayer-Patel Declaration, paragraph 41.

Claims 8, 9 and 14-18

Claim 8 recites "a method for establishing a point-to-point communication from a caller process to a callee process over a computer network, the caller process capable of generating a user interface and being operatively connected to the callee process and a server process over the computer network." That method includes "querying the server process to determine if the first callee process is accessible" and "establishing a point-to-point communication link from the caller process to the first callee process." See Exhibit 1, Mayer-Patel Declaration, paragraph 42.

With respect to the limitation of "establishing a point-to-point communication link from the caller process to the first callee process," the Office Action asserts that Swinehart and Zellweger teach "voice datagrams are transmitted directly among participants." However, it appears that the Office Action means that the Etherphone are the "participants." If this is the case, there is no indication that the combination meets the limitation of "the caller process capable of generating a user interface" as the Office Action has not alleged that the Etherphone has such a capability. The Office Action has also not alleged that the other references overcome this deficiency of the Etherphone references. Thus, claim 8 and its dependent claims are patentable over the applied combination of references. See Exhibit 1, Mayer-Patel Declaration, paragraph 43.

The rejection of claims 1-3 over the combination of the VocalChat references in view of RFC 1531

Claims 1-3, 5, 6, 8, 9 and 14-18 stand rejected under 35 U.S.C. § 103(a) as obvious over VocalChat User's Guide in view of VocalChat Readme, VocalChat Networking, VocalChat Help File and VocalChat Troubleshooting Help file (collectively the "VocalChat References") and further in view of RFC 1531 and Pinard. As a preliminary matter, the Office Action has not established that the VocalChat references constitute printed publications as required by statute. See 35 U.S.C. §§ 301 and 302.

The VocalChat References Are Not Printed Publications

The Office Action appears to rely on, but does not expressly reference, Exhibit L of the Request for Re-examination (i.e., the Declaration of Alon Cohen), to establish that the VocalChat references are, in fact, printed publications. As found by the Federal Circuit in *Carella v. Starlight Archery*, 804 F.2d 135, 139, 231 USPQ 644, 646-7 (Fed. Cir. 1986), "one who wishes to characterize the information, in whatever form it may be, as a 'printed publication' … should produce sufficient proof of its dissemination or that it has otherwise been available and accessible to persons concerned with the art to which the document relates and thus most likely to avail themselves of its contents." (Citing *In re Wyer*, 655 F.2d 221, 227, 210 USPQ 790, 795 (CCPA 1981) as quoting *Phillips Electronics & Pharmaceutical Industries Corp. v. Thermal & Electronic Industries, Inc.*, 450 F.2d 1164, 1171, 171 USPQ 641, 646 (3rd. Cir. 1971).

Mr. Cohen states in paragraph 3 of his declaration that "the first version of the VocalChat product was commercially released to the public in 1993." However, this provides no indication of what information was distributed with that version (or even what the version number was of that version).

In paragraph 4 of his declaration, Mr. Cohen alleged that VocalChat 1.01 Networking Information "was publicly distributed in 1994 as part of the VocalChat version 1.01 software, which was commercially released and on sale to the general public in 1994." Mr. Cohen did not, however, allege the facts necessary to show that the files are actually printed publications For example, to whom was the software distributed, if anyone, outside of VocalTec? Second, how many copies were distributed and under what conditions? For example, were the copies distributed under a confidentiality agreement such that the associated files were not available to the general public? Were they distributed in such a way as to have been sufficiently available to one of ordinary skill in the art that she/he could have found them when trying to solve a similar problem? Without evidence on these factors, the mere allegation that VocalChat 1.01 Networking Information "was publicly distributed in 1994 as part of the VocalChat version 1.01

software, which was commercially released and on sale to the general public in 1994" is insufficient to show that this reference constitutes a printed publication.

Similarly, with respect to the VocalChat Help File and the VocalChat Troubleshooting Help file, Mr. Cohen alleges in paragraph 6 of his declaration that "Electronic copies of these documents were publicly distributed in 1994 as part of the VocalChat version 2.02 software, which was commercially released and on sale to the general public as a boxed product in 1994." However, this too fails to provide the same relevant facts required to make a prima facie case that the VocalChat Help file and VocalChat Troubleshooting Help file constitute printed publications.

As also described in *Carella*, "Although in some circumstances unsupported oral testimony can be sufficient to prove prior knowledge or use, it must be regarded with suspicion and subject to close scrutiny." 804 F.2d at 138, 231 USQP at 646. Although not disclosed in the declaration, the declarant, Mr. Cohen, is a paid consultant for the Defendants in the litigation relating to the patent in re-examination. See Exhibit 3 where the Court found Mr. Cohen to be a "consultant[] who the defendant has paid, see Deposition of Alon Cohen…" Mr. Cohen also co-founded a company named BitWine that partners with Defendant Skype. See Exhibit 4 (from http://techaddress.wordpress.com/2006/12/06/interview-with-alon-cohen-co-founder-and-co-ceo-of-bitwine.). Mr. Cohen also offers personal services to the public through the BitWine-Skype partnership. See Exhibit 5 (from http://www.bitwine.com/search?query=alon+cohen&=). Moreover, Mr. Cohen's company, VocalTec, produced Internet Phone, and the original patentee, NetSpeak, produced a competing product called WebPhone, thereby creating a potential for bias -- especially when at least one person compared the two products and stated "WebPhone may well become the killer app that puts to shame similar offerings from VocalTec (Internet Phone) and Quarterdeck (WebTalk). See Exhibit 6 (N2P-001-00005919).

TheVocalChat References Do Not Teach All of the Claim Limitations

Even assuming that the VocalChat references constitute printed publications (which has not been established), the combination of references still does not render obvious the claims under re-examination.

Claims 1-3

Claim 1 recites "program code responsive to the currently assigned network protocol address of the first process, for establishing a communication connection with the server process and for forwarding the assigned network protocol address of the first process and a unique identifier of the first process to the server process upon establishing a communication connection with the server process." The Office Action admits that this limitation is not disclosed by the VocalChat references. However, the Office Action attempts to overcome this deficiency by combining the VocalChat references with RFC 1531. See Exhibit 1, Mayer-Patel Declaration, paragraph 45.

The assignee respectfully submits that the Office Action is mistaken. In the context of point-to-point communication, widespread use of dynamically assigned addresses is not the solution to a problem, it is the problem itself. See Exhibit 1, Mayer-Patel Declaration, paragraph 25. The assignee agrees that dynamically assigned addresses were known, and the patent in re-examination specifically states in that regard, "Due to the dynamic nature of temporary IP addresses of some devices accessing the Internet, point-to-point communications in realtime of voice and video have been generally difficult to attain." Col. 2, lines 35-38.

But it is not enough to prove that the cause of a problem existed. The Office Action must show by citation of prior art that the problem was recognized, and that the solution was either known or trivially apparent from the known art. See *Innogenetics, N.V. v. Abbott Laboratories*, 512 F.3d 1363, 1373 (Fed Cir. 2008). ("The district court was nevertheless correct that knowledge of a problem and motivation to solve it are entirely different from motivation to combine particular references to reach the particular claimed method.").

The development history of the VocalChat products indicates the opposite. See Exhibit 1, Mayer-Patel Declaration, paragraph 48. As the Examiner is aware, the Request cites a Generic version of the VocalChat client which, according to Mr. Cohen, was used on local area networks. See Cohen Declaration, paragraph 3. Absent from the Request, however, is any reference to the subsequent versions of VocalChat that were released by VocalTec to the public for use on the Internet. The first of those versions was relased in 1994, at least in beta, and was called VocalChat Gateway To Interent (or "VocalChat GTI"). This Internet version is believed to have required users to manually input callee addresses into static local address files. (See paragraph 393 of the Pre-Trial Order (filed with the IDS dated August 11, 2009) and Exhibit 7, SKYPE-N2P00286659.) Likewise, it is believed that VocalChat GTI did not utilize a server at all. See Pre-Trial Order at paragraph 390.

The use of manually input static addresses and the absence of a server suggests that the VocalTec designers—presumably software developers of at least ordinary skill in the art—did not consider the alleged combination of their own VocalChat references with RFC 1531, or it suggests that they did consider it but were unable to overcome the non-trivial obstacles to doing so. See Exhibit 1, Mayer-Patel Declaration, paragraph 50.

The next version of VocalChat was released soon thereafter and was also meant for use on the Internet. This version, again, did not combine the Request's disclosed versions of VocalChat with RFC 1531. Instead, it used the Internet Relay Chat (IRC) to help VocalChat clients with dynamically assigned IP addresses find one another. See Pre-Trial Order at paragraph 392 and Exhibit 7, SKYPE-N2P00286660. The development history of VocalChat—from the Generic version disclosed by the Request for use on local area networks to the GTI and IRC versions for use on the Interent—is strong, objective evidence of nonobviousness. If the designers of the VocalChat Generic implementation did not see fit to combine dynamic addressing with the implementation disclosed in the VocalChat references, it is respectfully submitted that one of ordinary skill in the art would not have done so either, *a fortiori*. See Exhibit 1, Mayer-Patel Declaration, paragraph 51.

Claim 1 also recites "forwarding the assigned network protocol address of the first process and a unique identifier of the first process to the server process upon establishing a communication connection with the server process." The VocalChat Generic implementation does not disclose such a limitation. In the VocalChat Generic implementation, a local process reads a "USERS" file or a Connections file in its entirety and writes it back in its entirety rather than "forwarding the assigned network protocol address of the first process and a unique identifier of the first process to the server process upon establishing a communication connection with the server process." This causes the VocalChat system to have to send an increasing amount of information as the number of users increases. Sending the whole file such that the new file replaces the old file also creates problems with consistency such that one user's changes could overwrite the changes of another user -- especially as networks got larger which would have increased the problem of inconsistent files being written. See Exhibit 1, Mayer-Patel Declaration, paragraph 47.

Accordingly, the subject matter of claim 1 is not rendered obvious by the combination of the VocalChat references and RFC 1531. Since claim 1 is not rendered obvious by the proposed combination, claims 2-3 are not rendered obvious as well. See Exhibit 1, Mayer-Patel Declaration, paragraph 52.

With respect to claim 3, claim 3 further recites "program code for transmitting, from the first process to the server process, a query as to whether the second process is connected to the computer network." As is discussed in greater detail below with respect to claim 8, the VocalChat references do not disclose querying whether processes are connected to the computer network. Thus, claim 3 is also separately patentable from claim 1. See Exhibit 1, Mayer-Patel Declaration, paragraph 53.

Claims 5 and 6

Claim 5 recites "A. determining the currently assigned network protocol address of the first process upon connection to the computer network" and "C. forwarding the assigned network protocol address of the first process to the server process upon establishing a communication connection with the server process." As was discussed above with respect to claim 1, the combination of the VocalChat references and RFC 1531 does not disclose either of those elements. Thus, claim 5 and its dependent claim 6 are not rendered obvious by the combination of the VocalChat references and RFC 1531. See Exhibit 1, Mayer-Patel Declaration, paragraph 54.

Claims 8, 9 and 14-18

Claim 8 recites "C. querying the server process to determine if the first callee process is accessible." The Office Action cites the Help file, pgs. 2 and 26, and Network information, page 10, and asserts that "a server can receive[] queries to determine status and information of users." However, the Office Action has not identified what portion of those references teach the claimed "querying." At best, the references teach that a local process reads a "USERS" file or a Connections file. As can be seen from page 4 of the VocalChat Network Information (reproduced below), when the VocalChat system uses the Generic mode, a USERS file is used. See Exhibit 1, Mayer-Patel Declaration, paragraph 55.

2.5. Network parameters in the VocalChat INI files

These are the network parameters in the VocalChat VOCLCHAT.INI and VCSETUP.INI files (under the NetWork section):

```
[NetWork]
NetWork=              / description of the selected network
NetWorkUsers=         / user services: NetWare / WinWorkgroups / Generic*
NetWorkProtocol=      / network protocol: IPX / NetBIOS
NetWorkType=          / name of the selected network, for future use
UsersFile=            / path name of users file (when Generic is set)
MyUserName=           / the name of the user (when Generic is set)**
```

* When Generic is set, a USERS file is used.

** This line appears only in the VOCALCHAT.INI file of each user.

The VOCLCHAT.INI files are in the windows directory of each user. The VCSETUP.INI file is in the VOCLCHAT directory, where VocalChat was installed, and is used only to supply default values for the different installations.

The USERS file configuration parameter includes a "UsersFile" entry that specifies the "path name of users file (when Generic is set)." However, it is also stated that "The VOCLCHAT.INI files are in the windows directory of each user." Thus, this "UsersFile" entry is a local configuration parameter such that the local VocalChat client reads and writes the USERS file on its own -- without performing the claimed query. See Exhibit 1, Mayer-Patel Declaration, paragraph 55.

Similarly, page 8 of the VocalChat Help file states "If your network type is not NetWare or Windows for Workgroups, the Setup program creates a Connection List file which is used to identify and access users." The Connection List file and the USERS file apparently have the same function. Thus, the identification and access enabled by the Connection List is performed by the local client reading and writing the file itself -- without performing the claimed query. Accordingly, claims 8, 9 and 14-18 are not rendered obvious by the applied combination of references. See Exhibit 1, Mayer-Patel Declaration, paragraph 56.

Objective Evidence of Non-Obviousness

In addition to the reasons set forth above showing that all of the elements of the claims under re-examination are not taught by the applied references, it is respectfully submitted that objective evidence supports a finding that the claims are non-obviousness. Objective indicia of non-obviousness, which include commercial success, licenses showing industry respect, and the failure of others, "provide evidence of how the patented device is viewed by the interested public: not the inventor, but persons concerned with the product in the objective arena of the marketplace." *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966); *WMS Gaming Inc. v. International Game Tech.*, 184 F.3d 1339, 1359 (Fed. Cir. 1999); *Arkie Lures, Inc. v. Gene Larew Tackle, Inc.*, 119 F.3d 953, 957 (Fed. Cir. 1997). Evidence supporting the objective indicia of non-obviousness is set out below.

Commercial Success

NetSpeak's WebPhone, an exemplary embodiment of the '469 patent (see, e.g., col. 4, ll. 44-49), was a commercial success as evidenced by the recognition it received in the industry. WebPhone's commercial success is attributable to the novelty and non-obviousness of the invention. *Demaco Corp. v. F. Von Langsdorff Licensing, Ltd.*, 851 F.2d 1387, 1393 (Fed. Cir. 1988) ("A prima facie case of nexus is generally made out when the patentee shows both that there is commercial success, and that the thing (product or method) that is commercially successful is the invention disclosed and claimed in the patent.").

NetSpeak's WebPhone won Internet Telephony's 1998 Product of the Year in the category of Internet Telephony Clients. Exhibit 8, page 6 (N2P-200-00012627).

NetSpeak's WebPhone product also won significant praise when compared to other products in the same timeframe. "WebPhone may well become the killer app that puts to shame similar offerings from VocalTec (Internet Phone) and Quarterdeck (WebTalk). See Exhibit 6 (N2P-001-00005919).

The importance of the claimed invention can also be seen in its praise by other companies in the industry. In a joint press release of NetSpeak and Durand Communications Network ("Durand"), Durand's president and CEO stated "NetSpeak's WebPhone is hands-down the best PC-voice communications package available in the market today. … We wanted to work with a company whose leading edge technology would add value to our existing MindWire NT CommunityServer by offering unique telephony services so integral to fostering growth within online communities." Exhibit 9, page 1.

NetSpeak's WebPhone was also praised in the Computer Telephony Magazine. The July 1996 Edition included an article on the WebPhone trial version and stated "You've gotta try this Internet telephony package. NetSpeak … makes WebPhone. … Does it work? Yes." Exhibit 10 (N2P-200-00012630).

As set forth in the original Assignee's Amended S-1 Registration form (Exhibit 11), NetSpeak's technology was a commercial success as further evidenced by the investments made in the company. At least three different stock offerings were made which raised millions of dollars for the company. The Amended S-1 Registration form describes on numbered page 19:

> In January and February of 1996, the Company sold 1,204,000 shares of Common Stock at $2.50 per share in a private offering raising $2,992,028 ….
>
> In June 1996, the Company issued 207,679 shares of Common Stock to Creative at a price of $5.05 per share raising $943,698 ….
>
> In August 1996, the Company issued 769,853 shares of Common Stock and the Motorola Warrant to purchase up to an additional 452,855 shares of Common Stock at a price of $5.50 per share for a six year period expiring in August 2002 to Motorola raising $3,993,864….

Later, in 1998, Motorola took an even larger interest in NetSpeak by acquiring an additional 27% of the stock that it did not already own at a cost of $90 million. See Press Release, Exhibit 12 (N2P-200-00012891). See also March 30, 1998 article from Telephony online describing strategic alliance between Motorola and NetSpeak. See Exhibit 13 (N2P-102-00000048).

Also in 1998, the Company issued approximately 1.3 million shares of common stock to Bay Networks for $36.8 million. See Exhibit 14, NetSpeak Form 10-K for the Fiscal Year ending December 31, 1997.

See also, the 8-K related to the acquisition of NetSpeak by Net2Phone. Exhibit 15.

As more fully detailed in NetSpeak's 10-K for Fiscal Year 1997 (Exhibit 14), NetSpeak's communications technology was a commercial success as further evidenced by the strategic alliances it made with "with leaders in various segments of the telecommunications and networking industries," including Siemens (whereby Siemens agrees to market NetSpeak's "IP telephony server products"), Bay Networks (whereby the Company agrees "not to provide its source code to…competitors for a period of three years), Fujitsu and Rockwell International (whereby NetSpeak was "integrating its software into the[se] companies' proprietary hardware platforms"), MCI (see Exhibit 16 announcing that MCI signs contract with NetSpeak to incorporate WebPhone in networkMCI Click'NConnect Web-Based Service) and NTC (whereby NetSpeak would "supply IP telephony products and systems"), and others.

NetSpeak's WebPhone client software products were a commercial success as further evidenced by the number and extent of the channels through which they were sold, including "distribution agreements with over 900 ISPs worldwide." See Exhibit 14, 10-K cited above. Details of the operation of the WebPhone client can be found in Exhibits 17 and 18. For example, Exhibit 17 states "the CS [i.e., connection server] updates the user e-mail address, IP address, and online status fields, and uses them to perform IP address resolution and track account activation information. … When a user calls … using a WebPhone, the CS is used to resolve the target e-mail address to an IP address." Similarly, Exhibit 18 states "Connection and Information servers are the addresses here at NetSpeak that your WebPhone uses to find and call other parties. …Connection Server: is used when you dial someone by e-mail address. If you try to dial someone by e-mail address, the WebPhone, calls the connection server, matches the desired e-mail address to an IP address, disconnects from the Connection server, and dials the IP address."

Licenses Showing Industry Respect

In connection with Motorola's 1998 investment described above, and as set forth more fully in the NetSpeak Form 10-K for the Fiscal Year 1997 (Exhibit 14), NetSpeak and Motorola entered into a joint development and licensing agreement pursuant to which the two companies would seek to join their technologies to enable Internet Protocol multimedia communications on wireless networks. Under that agreement, Motorola obtained a license to develop RF products using NetSpeak's technology, to include NetSpeak's technology in wireless devices such as cellular phones, pagers, satellite phones and two way radios to support real-time multimedia communications (voice, audio, video, data, etc.), and to manufacture and sell NetSpeak products. See description of NetSpeak's technology at page 6 of Exhibit 14 under the header "NETSPEAK'S CORE COMMUNICATIONS TECHNOLOGY" (reciting, *inter alia*, "allows users to connect to other users in a point-to-point fashion, rather than through an intermediate routing mechanism."). NetSpeak's licenses included a license to the WebPhone product and network address resolution technology, see Exhibit 14, which are commercial embodiments of the patented claims. NetSpeak's success in licensing is attributable to the novelty and non-obviousness of the invention. *Demaco Corp.*, 851 F.2d at 1393.

Failure of Others

The inventions claimed in the '469 Patent resolved the problem of locating a computer process connected to a network, where the computer process was assigned a temporary network address. See, e.g., specification at col. 1, line 67 to col. 2, line 3. Each time a particular computer process connected to the network, it would have a different address. Such addresses were largely a by-product of the near-universal adoption of the Dynamic Host Configuration Protocol ("DHCP"), described in RFC 1531 (Exhibit x0012). DHCP disclosed the dynamic allocation of scarce network addresses and permitted addresses to be reused when a computer process disconnected from the network. As shown in Exhibit x0013 and as discussed above, others, including the developers of the VocalChat references cited by the Request, attempted to resolve the problem of locating a computer process with a dynamically assigned address and failed to suggest the claimed steps using querying.

Recognition in the Patent Literature

The Federal Circuit has left itself open to acknowledging that the patent citations of later patent applicants and examiners can be objective evidence of an earlier patent's nonobviousness. See *In re: Mettke*, 570 F.3d 1356, 1361 (Fed. Cir. 2009). This position is supported by the academic literature. See, e.g., Trajtenberg, Manuel , "A Penny for Your Quotes: Patent Citations and the Value of Innovations," The RAND Journal of Economics, Vol. 21, No. 1 (Spring 1990), pp. 172-187 at 174. ("Thus, if citations keep coming, it must be that the innovation originating in the cited patent had indeed proven to be valuable.") (Exhibit 19.) The '469 patent under re-examination is a divisional of U.S. Patent No. 6,108,704. As shown in Exhibit 20, according to the USPTO's own records, the '704 patent and its continuations and divisionals have been cited in 76 issued patents. This supports an inference that the '469 patent in re-examination advanced the art in a nonobvious way that was neither cumulative of the art that came before it nor predictable in its view.

This inference of nonobviousness is especially compelling over the NetBIOS references. Not one issued patent that cites the patent in re-examination (or one of its related patents) also cites a NetBIOS reference. See Exhibit 21 (including variations on the name for NetBIOS such that it includes RFC 1001 and RFC 1002). This phenomenon is especially significant given that NetBIOS is a well known piece of networking art that has been cited frequently in the patent literature -- 33 times according to the USPTO's records.[3] The assignee respectfully submits that there is a simple explanation for this otherwise highly improbably dichotomy: NetBIOS and the patent in re-examination do not overlap because the scope and content of what they disclose are distinct.

The assignee also notes in this regard that the cover page of U.S. Patent No. 6,389,127, assigned to ICQ Inc., an unrelated company, and entitled "Telephone Status Notification System," references U.S. Patent No. 6,108,704 (of which the patent in re-examination is a continuation-in-part), but does not cite to any of the references submitted in the Request. Their absence from the ICQ patent is especially significant since both NetBIOS and Etherphone are well known pieces of art, and each has been cited frequently in the patent literature—33 times and 135 times, respectively. The assignee respectfully submits that there is a simple explanation for this difference: the references in the Request were not cited by the ICQ patent because they did not teach anything plausibly related to "Status Notification," whereas 6,108,704 was cited because it (and its continuation-in-part, the patent in re-examination) plainly did.

[3] In fact, there are 43 references to NetBIOS if the search includes any of: NetBIOS, RFC 1001, RFC 1002, NBT and NetBT (excluding references to "NBT" in the medical field). See Exhibit 22.

Consequently, in light of the above discussions, the outstanding grounds for rejection are believed to have been overcome and the patentability of the claims subject to re-examination should be indicated as confirmed. An early and favorable action to that effect is respectfully requested.

CHARGE STATEMENT: Deposit Account No. 501860, order no. **2655-0185.**
The Commissioner is hereby authorized to charge any fee specifically authorized hereafter, or any missing or insufficient fee(s) filed, or asserted to be filed, or which should have been filed herewith or concerning any paper filed hereafter, and which may be required under Rules 16-18 (missing or insufficiencies only) now or hereafter relative to this application and the resulting Official Document under Rule 20, or credit any overpayment, to our Accounting/ Order Nos. shown above, for which purpose a duplicate copy of this sheet is attached.
This CHARGE STATEMENT does not authorize charge of the issue fee until/unless an issue fee transmittal sheet is filed.

CUSTOMER NUMBER 42624	Respectfully submitted, By: / Michael R. Casey / Michael R. Casey, Ph.D. Registration No.: 40,294

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

Exhibit 1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT APPLICATION OF:	Attorney Docket: 2655-0185
Net2Phone, Inc. (Patent No. 6,009,469)	Group Art Unit: 3992
Control No.: 90/010,422	Examiner: KOSOWSKI, Alexander
Issue Date: December 28, 1999	Confirmation No.: 6565

Title: **GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION**

DECLARATION OF KETAN MAYER-PATEL UNDER 37 C.F.R. 1.132

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

I. INTRODUCTION

1. I have been retained as an independent expert witness by Net2Phone, Inc., the assignee of the patent presently undergoing re-examination (i.e., U.S. Patent No. 6,009,469 (hereinafter "the '469 patent")).

2. I am an expert in the field of networking protocols including networking protocols supporting multimedia streams including digital audio data. See Curriculum Vitae attached as Exhibit 1.

3. I received Bachelors of Arts degrees in Computer Science and Economics in 1992, a Masters of Science in 1997 from the Department of Electrical Engineering and Computer Science and a Ph.D. in 1999 from the Department of Electrical Engineering and Computer Science, all from the University of California, Berkeley.

4. I received the National Science Foundation CAREER Award in 2003 while an Assistant Professor at the University of North Carolina, Chapel Hill.

5. I have had extensive experience in both industry and academia as it relates to the technical fields relevant here. For example, I have been a programmer, a visiting researcher, and an Assistant and Associate professor.

6. I am a co-author of numerous articles that have appeared in a number of refereed publications and proceedings.

7. Governmental agencies, such as the National Science Foundation and the Office of Naval Research, have provided funding for my research.

II. RETENTION AND COMPENSATION

8. I have been retained to offer an expert opinion on the prior art relevant to the '469 patent (and other patents currently under re-examination) and the validity of the claims undergoing re-examination.

9. My work on this case is being billed at a rate of $400 per hour, with reimbursement for actual expenses. My compensation is not contingent upon the outcome of the case.

III. BASIS OF MY OPINION AND MATERIALS CONSIDERED

10. In preparation for this report, I have considered and relied on data or other documents identified in this report. For example, I have reviewed the Office Action dated August 25, 2009 as well as the Request for Re-examination that was filed for the '469 patent including the Exhibits to the Request for Re-examination. I have also reviewed the file history of the '469 patent.

11. I have familiarized myself with the state of the art at the time the '469 patent was filed by reviewing both patent and non-patent references from prior to the filing date of the application that became the '469 patent.

12. My opinions are also based upon my education, training, research, knowledge, and experience in this technical field.

IV. SUMMARY OF MY OPINIONS

13. Based on my prior experience in the field of computer systems and networking, including network communication protocols, and based on my review of the documents relating to the

pending re-examination proceeding, I have developed an understanding of the '469 patent and the claimed inventions.

14. I have been asked to compare the claims of the '469 patent to the references applied in the outstanding Office Action. The results of my comparison are provided below.

15. In general, it is my opinion that all of the claims undergoing re-examination (i.e., claims 1-3, 5, 6, 8, 9 and 14-18) are patentable over the applied references for at least the reasons set forth below.

The rejection of claims 1-3, 5, 6, 8, 9, and 14-18 over NetBIOS, RFC 1531, Pinard and the VocalChat User's Guide

16. Claims 1-3, 5, 6, 8, 9, and 14-18 were rejected under 35 U.S.C. § 103(a) as being obvious in light of Protocols for X/Open PC Interworking SMB, Version 2, The Open Group (1992) (hereinafter "NetBIOS"), in view of RFC 1531, Pinard and the VocalChat User's Guide.

17. I understand that a rejection under 35 U.S.C. § 103(a) means that an examiner believes that although no single reference includes all of the claimed limitations, nonetheless the combination of references made by the examiner would have been obvious to one of ordinary skill in the art at the time the invention was made.

Claims 1-3

18. Claim 1 recites "a. program code for generating a user-interface enabling control of a first process executing on the computer system." With respect to the limitation of "program code for generating a user-interface enabling control of a first process executing on the computer system," the Office Action alleges that "computers executing NetBIOS ***may contain*** DOS operating systems or may operate on other operating systems, which examiner notes inherently contain at least text-based user interfaces." By stating that NetBIOS "may contain" DOS operating systems I believe the Examiner is indicating that NetBIOS need not actually contain or be running on a

DOS operating system. Since that is true, NetBIOS (or the computer running NetBIOS) does not inherently include text-based user interfaces.

19. Furthermore, the recitation of "other operating systems" also does not inherently mean that "text-based user interfaces" are provided. For example, embedded systems need not have a display or a text interface even though they may have operating systems. The Office Action also has not asserted that this limitation is taught by RFC 1531. Thus, I do not believe that limitation (a) has been shown to be taught by either applied reference.

20. Claim 1 also recites "b. program code for determining the currently assigned network protocol address of the first process upon connection to the computer network." The Office Action admits that NetBIOS does not teach this limitation. The Office Action alleges that such a limitation is taught by RFC 1531 because "RFC 1531 teaches dynamically assigning IP address on a TCP/IP network by an Internet access server." By looking at limitations (a) and (b) together, however, it can be seen that the Office Action has not shown that the currently assigned network protocol address is that of the first process which the Office Action alleged was the "text-based user interface." The Office Action also has not explained why the text-based interface would have to have its currently assigned network protocol address determined. Thus, I do not believe that limitation (b) is taught by either applied reference.

21. Claim 1 recites "c. program code responsive ... for forwarding the assigned network protocol address of the first process and a unique identifier of the first process to the server process upon establishing a communication connection with the server process." The Office Action has not shown that the assigned network protocol address of the first process is determined, so the Office Action also has not shown that the assigned network protocol address of the first process would be forwarded to the server upon establishing a communication connection with the server process. Similarly, the Office Action has not shown that the text-based user interfaces would have a unique identifier to be forwarded to the server. The Office Action further has not shown that such a limitation is taught by RFC 1531. Accordingly, I do not believe that limitation (c) is taught by either applied reference.

22. Claim 1 also recites "d. program code, responsive to user input commands, for establishing a point-to-point communications with another process over the computer network." The Office Action cites NetBIOS, pgs. 397-400, as teaching that "point-to-point communication is established upon initiation between nodes once target names and addresses have been found." However, the Office Action has not shown that the code is "responsive to user input commands" as no user input commands have been identified. Even assuming that text-based user interfaces were taught by NetBIOS, the Office Action still would not have shown that point-to-point communications are inherently established "responsive to user input commands." The text-based user interfaces could have been used for non-communicating functions or even functions that use non-point-to-point communications. The Office Action further has not shown that such a limitation is taught by RFC 1531. Accordingly, I do not believe that limitation (d) is taught by either applied reference.

23. Since none of the limitations of claim 1 have been shown to be taught by the applied combination of references, I do not believe that claim 1 and dependent claims 2 and 3 are obvious in light of the proposed combination.

24. The Office Action states that "it would have been obvious ... to determine the currently assigned network address of the first process upon connection to the computer network in the invention taught by NetBIOS above since this allows for automatic reuse of an address ... and since examiner notes the use of dynamic IP address assignment ... are old and well known ... and are useful to eliminate the burdensome task of manually assigning IP addresses for all networked computers." However, the Office Action does not acknowledge the problems that could arise in doing so or how those problems would be resolved by those of ordinary skill at the time the patent was filed.

25. In the context of point-to-point communication, widespread use of dynamically assigned addresses can create additional problems for a NetBIOS environment. For example, Section 15.1.7 of the NetBIOS reference (entitled "Consistency of the NBNS Data Base") recognizes that the association between a node, a registered name and an IP address is tenuous, even in an

environment that uses static IP addresses. "Even in a properly running NetBIOS scope the NBNS and its community of end-nodes may occasionally lose synchronization with respect to the true state of name registrations." To minimize the impact of this problem, the reference states, "Various approaches have been incorporated into the NetBIOS-over-TCP protocols" which it then proceeds to describe.

26. However, by incorporating DHCP and adopting of dynamic address allocation (e.g., as used by Internet access providers), the synchronization problem would become more disruptive, not less. Dynamic addressing introduced a new uncertainty to the relationships among the NBNS and its community of end-nodes and a new set of obstacles to NetBIOS synchronization that *are not addressed by the NetBIOS reference*. Consider the case of a node that is turned-off and then subsequently turned back on, or the case of a node that has simply lost its Internet connection for some technical reason or whose DHCP lease has expired which then re-establishes a connection. In such a dynamic addressing environment, such a node would most likely obtain a new IP address when it was turned back on that was different than the one it had when it registered its name. This change could lead to any number of node-name-IP address synchronization problems for the disclosed NetBIOS protocols.

27. For example, because the NBNS does not know the node's new address, the NBNS would be unable to send to the node a Name Release Request or a Name Conflict Demand or request that the node send it a Name Status Request. Because communication from the node would be originating at a new address that was not recognized by the NBNS, a node's response to a Name Query Request (assuming it somehow knew that its name had been challenged, perhaps from before it lost network connectivity) would not be recognized. A node would also be unable to confirm its association with registered names by sending Name Refresh Request packets to the NBNS. If a session between two NetBIOS applications were cut-off, re-establishing the communication would be especially difficult where the ability of a called entity to obtain both its associated name and its associated IP address were in doubt. As a result, the Office Action has not demonstrated that a solution to the problems created by exposure of

NetBIOS to DHCP and dynamic addressing has been addressed by any of the applied references.[1]

28. The Office Action also has not identified anything in the cited art that suggests how a person of ordinary skill is to go about the redesign of NetBIOS and the solving of obstacles to NetBIOS operation that are created by Internet access; problems that were recognized and left as warnings unresolved in the NetBIOS reference.[2]

29. Thus, I believe claims 1-3 are patentable over the combination of NetBIOS and RFC 1531.

Claims 5 and 6

30. Claim 5 recites "determining the currently assigned network protocol address of the first process upon connection to the computer network." The Office Action acknowledges that this limitation is not taught by NetBIOS but alleges that "RFC 1531 teaches dynamically assigning IP addresses on a TCP/IP network by an Internet access server." The Office Action further alleges that "it would have been obvious ... to determine the currently assigned network address of the first process upon connection to the computer network in the invention taught by NetBIOS above since this allows for automatic reuse of an address ... and since examiner notes the use of dynamic IP address assignment ... are old and well known ... and are useful to eliminate the burdensome task of manually assigning IP addresses for all networked computers." However, as described above with respect to claims 1-3, I do not believe that the Office Action has shown that in light of the problems that worsen by combining NetBIOS and RFC 1531, that a person of

[1] Besides dynamic addressing, Internet access would pose other challenges to a NetBIOS system. For example, because NetBIOS was designed for use on local area networks with small numbers of computers, trust among the network participants is assumed. That assumption cannot be transferred to a global Internet made up of unknown, and sometimes malevolent, entities. An implementation of NetBIOS on the public Internet would necessitate non-trivial adaptations to ensure that its services perform correctly and return accurate information. See Exhibit 2, from http://www.w3schools.com/Site/site_security.asp which instructs Microsoft Windows users whose computers access the Internet to disable NetBIOS over TCP/IP in order to solve their security problems.

[2] See Section 4.6 ("The proposed standard recognizes the need for NetBIOS operation across a set of networks interconnected by network (IP) level relays (gateways.) However, the standard assumes that this form of operation will be less frequent than on the local MAC bridged-LAN.")

ordinary skill in the art would have combined the two references as proposed. Thus, I believe that claims 5 and 6 are patentable over the applied NetBIOS and RFC 1531 references.

Claims 8, 9 and 14-18

31. Claim 8 recites "querying the server process to determine if the first callee process is accessible." The Office Action asserts that this limitation is taught by NetBIOS and cites pages 377, 388, 389 and 446 as supporting the proposition that "a query is sent to the NBNS to determine if another node is logged in and discover[s] the node[']s IP address." However, the Office Action has not shown how knowing that a name has been registered equates to "determin[ing] if the first callee process is accessible." While NetBIOS uses name entries with "active" statuses as part of its name management process, an analysis of how that "active" status is used shows that "an active name" is not synonymous with determining if the first callee process is accessible. An active name simply refers to a name that has been registered and that has not yet been de-registered, independent of whether the associated computer is or is not accessible. As shown on page 447 (and reproduced below), the Node_Name entries stored with respect to a NetBIOS Name Server contain a series of fields including the "ACT" field.

```
The NAME_FLAGS field:

                                          1   1   1   1   1   1
  0   1   2   3   4   5   6   7   8   9   0   1   2   3   4   5
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| G |  ONT  |DRG|CNF|ACT|PRM|          RESERVED                 |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

The NAME_FLAGS field is defined as:

Symbol     Bit(s)   Description:

RESERVED     7-15   Reserved for future use.  Must be zero (0).
PRM             6   Permanent Name Flag.  If one (1) then entry
                    is for the permanent node name.  Flag is zero
                    (0) for all other names.
ACT             5   Active Name Flag.  All entries have this flag
                    set to one (1).
CNF             4   Conflict Flag.  If one (1) then name on this
                    node is in conflict.
DRG             3   Deregister Flag.  If one (1) then this name
                    is in the process of being deleted.
ONT           1,2   Owner Node Type:
                       00 = B node
                       01 = P node
                       10 = M node
                       11 = Reserved for future use
G               0   Group Name Flag.
                    If one (1) then the name is a GROUP NetBIOS
                    name.
                    If zero (0) then it is a UNIQUE NetBIOS name.
```

32. The ACT field is a single bit field (in bit 5) that signifies an "Active Name Flag. ***All entries have this flag set to one (1).***" (Emphasis added.) If all name entries have this flag set to one (1), then the NetBIOS name server cannot be using the Active Name Flag as a means of separately tracking whether the entity that owns the name is "active," let alone what its "on-line" status might be.

33. The NetBIOS reference also does not teach that the active status of a name in the NetBIOS server is an indication of the active status of the owner of that name. To the contrary, when information about whether the owner of a name is "active" may be relevant, for example when a new entity seeks to register a name that has already been registered in the NetBIOS name server, the NetBIOS reference describes an elaborate set of interactions used to test whether the

existing owner of the registered name is active or inactive. It does not rely on the fact that the name is active in the NetBIOS name server (See Section 15.2.2.2 and 15.2.2.3 entitled "Existing Name and Owner is Inactive").

34. The NetBIOS reference also does not teach that an acquired IP address can be reasonably relied upon by a requesting end-node to confirm that an end-node associated with a sought name is, in fact, "accessible." The NetBIOS reference describes at least two different scenarios where a second end-node sends a rejection response to the first end-node notwithstanding the fact that an end-node is connected to the computer network and active with respect to the sought name. See Section 16.1.1 ("There exists a NetBIOS LISTEN compatible with the incoming call, but there are inadequate resources to permit establishment of a session...The called name does, in fact, exist on the called node, but there is no pending NetBIOS LISTEN compatible with the incoming call."). No distinction is made in the reference between the rejection response in these cases and the rejection response in cases where the called name does not exist on the called end-node. Section 16.1.1 also states "In all but the first case, a rejection response is sent back over the TCP connection to the caller."

35. The Office Action also has not alleged that any of the remaining references teach this limitation missing from the NetBIOS reference. As such, claim 8 and its dependent claims (claims 9 and 14-18) are not rendered obvious by the cited combination of references.

<u>The rejection of claims 1-3, 5, 6, 8, 9, and 14-18 over the combination of the Etherphone papers in view of Vin and further in view of RFC 1531, Pinard and the VocalChar User's Guide</u>

36. Claims 1-3 were rejected under 35 U.S.C. § 103(a) as obvious over Etherphone: Collected Papers 1987-1988 (May 1989) (hereinafter "Etherphone") in view of Harrick M. Vin, et al. *Multimedia Conferencing in the Etherphone* Environment, IEEE Computer Society (October 1991) (hereinafter "Vin") and further in view of RFC 1531, Pinard and VocalChat User's Guide. The Etherphone Collected Papers include *An Overview of the Etherphone System and its Applications* (hereinafter "Zellweger"), *Telephone Management in the Etherphone*

System (hereinafter "Swinehart"), and *Managing Stored Voice in the Etherphone System* (hereinafter "Terry").

37. Claim 1, as amended, recites "a. program code for generating a user-interface enabling control of a first process executing on the computer system" and "d. program code means, responsive to user input commands, for establishing a point-to-point communications with another process over the computer network." When read together, it can be seen that the Office Action has not shown that these limitations are taught by the applied combination of references.

38. With respect to the limitation "a. program code for generating a user-interface enabling control of a first process executing on the computer system," the Office Action cites Swinehart and Zellweger as teaching that "workstations include GUI's." Later, with respect to the limitation "d. program code means, responsive to user input commands, for establishing a point-to-point communications with another process over the computer network," the Office Action asserts that "after acquiring the network address of a callee, voice datagrams are transmitted directly amont [sic; among] the participants, bypassing the control server." However, by "participants" it appears that the Office Action is referring to Etherphones participating in a telephone call. As such, the Office Action has not shown that the datagrams are transmitted as part of a point-to-point communication from the workstation (which was alleged as having the first process) to one of the Etherphones. In fact, with respect to limitation (c), the Office Action confirms that its interpretation is that the "workstation address [is] transmitted to the Voice Control Server when connected" -- not the Etherphone's network address.

39. Similarly, looking at it from the opposite perspective, if the voice datagrams are actually going from one Etherphone to another, then the Office Action has not shown how the "currently assigned network protocol address of the first process" is the address of the Etherphone and how the Etherphone has a display or "a user-interface enabling control a first process" on that Etherphone. The Office Action also has not alleged that RFC 1531 teaches this limitation missing from the Etherphone references. Thus, claims 1-3 are not rendered obvious by the proposed combination.

Claims 5 and 6

40. Claim 5 recites "A. determining the currently assigned network protocol address of the first process upon connection to the computer network" and "D. establishing a point-to-point communication with another process over the computer network." As described above with respect to claim 1, when these two limitations are examined together, it can be seen that the Office Action has not shown that these limitations are met.

41. With respect to the limitation "A. determining the currently assigned network protocol address of the first process upon connection to the computer network," the Office Action again cites the GUI's of the workstation as meeting this limitation. Then, with respect to the limitation "D. establishing a point-to-point communication with another process over the computer network," the Office Action again states "voice datagrams are transmitted directly amont [sic; among] the participants, bypassing the control server." Thus, as discussed above with respect to claim 1, the Office Action appears to have overlooked that the Etherphone, not the workstation with the GUI, is receiving the voice datagrams, so the Etherphone reference does not teach limitations (A) and (D). The Office Action also has not alleged that RFC 1531 teaches this limitation missing from the Etherphone references. Thus, claims 5 and 6 are not rendered obvious by the proposed combination.

Claims 8, 9 and 14-18

42. Claim 8 recites "a method for establishing a point-to-point communication from a caller process to a callee process over a computer network, the caller process capable of generating a user interface and being operatively connected to the callee process and a server process over the computer network." That method includes "querying the server process to determine if the first callee process is accessible" and "establishing a point-to-point communication link from the caller process to the first callee process."

43. With respect to the limitation of "establishing a point-to-point communication link from the caller process to the first callee process," the Office Action asserts that Swinehart and Zellweger teach "voice datagrams are transmitted directly among participants." However, it appears that the Office Action means that the Etherphone are the "participants." If this is the case, there is no indication that the combination meets the limitation of "the caller process capable of generating a user interface" as the Office Action has not alleged that the Etherphone has such a capability. The Office Action has also not alleged that the other references overcome this deficiency of the Etherphone references. Thus, claim 8 and its dependent claims are patentable over the applied combination of references.

<u>The rejection of claims 1-3, 5, 6, 8, 9, and 14-18 over the combination of the VocalChat references in view of RFC 1531 and Pinard</u>

44. Claims 1-3, 5, 6, 8, 9 and 14-18 were rejected under 35 U.S.C. § 103(a) as obvious over VocalChat User's Guide in view of VocalChat Readme, VocalChat Networking, VocalChat Help File and VocalChat Troubleshooting Help file (collectively the "VocalChat References") and further in view of RFC 1531 and Pinard.

<u>Claims 1-3</u>

45. Claim 1 recites "program code responsive to the currently assigned network protocol address of the first process, for establishing a communication connection with the server process and for forwarding the assigned network protocol address of the first process and a unique identifier of the first process to the server process upon establishing a communication connection with the server process." The Office Action admits that this limitation is not disclosed by the VocalChat references. However, the Office Action attempts to overcome this deficiency by combining the VocalChat references with RFC 1531.

46. However, the Office Action does not acknowledge the problems that could arise in doing so or how those problems would be resolved by those of ordinary skill at the time the patent was

filed. Thus, I do not believe that the Office Action has proven that one of ordinary skill at the time the patent was filed would have made the proposed combination.

47. Claim 1 also recites "forwarding the assigned network protocol address of the first process and a unique identifier of the first process to the server process upon establishing a communication connection with the server process." The VocalChat Generic implementation does not disclose such a limitation. In the VocalChat Generic implementation, a local process reads a "USERS" file or a Connections file in its entirety and writes it back in its entirety rather than "forwarding the assigned network protocol address of the first process and a unique identifier of the first process to the server process upon establishing a communication connection with the server process." This causes the VocalChat system to have to send an increasing amount of information as the number of users increases. Sending the whole file such that the new file replaces the old file also creates problems with consistency such that one user's changes could overwrite the changes of another user -- especially as networks got larger which would have increased the problem of inconsistent files being written.

48. The Office Action also has not shown that one of ordinary skill in the art would have made the proposed combination. The Office Action proposes a modification to the VocalChat References by incorporating the teachings of RFC 1531 because it allegedly "would have been obvious to utilize dynamically assigned IP addresses from Internet access servers in the invention taught by VocalChat ... since this allows for automatic reuse of an address that is no longer needed by the host to which it is assigned." Such an allegation ignores the development history of the VocalChat products themselves.

49. The Request cites a Generic version of the VocalChat client which, according to Mr. Cohen, was used on local area networks. See Cohen Declaration, paragraph 3. There apparently was a subsequent version of VocalChat that was also released by VocalTec to the public in 1994, at least in beta. This version, called VocalChat Gateway To Interent (or "VocalChat GTI") was designed for use on the Internet, and I have been informed that Net2Phone believes that VocalChat GTI used static local address files into which static callee addresses were manually

input. I have also been informed that Net2Phone believes that VocalChat GTI did not utilize a server at all.

50. Based on the above, I believe the use of manual inputting of static addresses and the absence of a server suggests that the VocalTec designers—presumably software developers of at least ordinary skill in the art—did not consider the alleged combination of their own VocalChat references with RFC 1531, or it suggests that they did consider it but were unable to overcome the non-trivial obstacles to doing so.

51. I have also been informed that Net2Phone believes that soon after the release of the VocalChat GTI version, VocalTec released another VocalChat version that used Internet Relay Chat (IRC) to help VocalChat clients with dynamically assigned IP addresses find one another. This change from VocalChat GTI to VocalChat IRC appears to be further objective evidence that even the VocalChat designers recognized that the "improvement" to the Generic VocalChat implementation was still deficient. If the designers of the VocalChat Generic implementation did not see fit to combine dynamic addressing with the Generic implementation disclosed in the VocalChat references, then I do not believe that one of ordinary skill in the art would not have done so either.

52. Accordingly, I do not believe that the Office Action has shown that claim 1 is rendered obvious by the combination of the VocalChat references and RFC 1531. Since claim 1 is not rendered obvious by the proposed combination, claims 2-3 are not rendered obvious as well.

53. With respect to claim 3, claim 3 further recites "program code for transmitting, from the first process to the server process, a query as to whether the second process is connected to the computer network." As is discussed in greater detail below with respect to claim 8, the VocalChat references do not disclose querying whether processes are connected to the computer network. Thus, claim 3 is also separately patentable from claim 1.

Claims 5 and 6

54. Claim 5 recites "A. determining the currently assigned network protocol address of the first process upon connection to the computer network" and "C. forwarding the assigned network protocol address of the first process to the server process upon establishing a communication connection with the server process." As was discussed above with respect to claim 1, the combination of the VocalChat references and RFC 1531 does not disclose either of those elements. Thus, I believe claim 5 and its dependent claim 6 are not rendered obvious by the combination of the VocalChat references and RFC 1531.

Claims 8, 9 and 14-18

55. Claim 8 recites "C. querying the server process to determine if the first callee process is accessible." The Office Action cites the Help file, pgs. 2 and 26, and Network information, page 10, and asserts that "a server can receive[] queries to determine status and information of users." However, the Office Action has not identified what portion of those references teach the claimed "querying." At best, the references teach that a local process reads a "USERS" file or a Connections file. As can be seen from page 4 of the VocalChat Network Information (reproduced below), when the VocalChat system uses the Generic mode, a USERS file is used.

2.5. Network parameters in the VocalChat INI files

These are the network parameters in the VocalChat VOCLCHAT.INI and VCSETUP.INI files (under the `NetWork` section):

```
[NetWork]
NetWork=             / description of the selected network
NetWorkUsers=        / user services: NetWare / WinWorkgroups / Generic*
NetWorkProtocol=     / network protocol: IPX / NetBIOS
NetWorkType=         / name of the selected network, for future use
UsersFile=           / path name of users file (when Generic is set)
MyUserName=          / the name of the user (when Generic is set)**
```

* When `Generic` is set, a USERS file is used.

** This line appears only in the VOCALCHAT.INI file of each user.

The VOCLCHAT.INI files are in the windows directory of each user. The VCSETUP.INI file is in the VOCLCHAT directory, where VocalChat was installed, and is used only to supply default values for the different installations.

The USERS file configuration parameter includes a "UsersFile" entry that specifies the "path name of users file (when Generic is set)." However, it is also stated that "The VOCLCHAT.INI files are in the windows directory of each user." Thus, this "UsersFile" entry is a local configuration parameter such that the local VocalChat client reads and writes the USERS file on its own -- without performing the claimed query.

56. Similarly, page 8 of the VocalChat Help file states "If your network type is not NetWare or Windows for Workgroups, the Setup program creates a Connection List file which is used to identify and access users." The Connection List file and the USERS file apparently have the same function. Thus, the identification and access enabled by the Connection List is performed by the local client reading and writing the file itself -- without performing the claimed query. Accordingly, I do not believe that claims 8, 9 and 14-18 are obvious over the applied combination of references.

57. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Dated: November 25, 2009

Ketan Mayer-Patel, Ph.D.

EXHIBIT 1 TO MAYER-PATEL DECLARATION

Ketan Mayer-Patel

154 Fred Brooks Building
Department of Computer Science, CB #3175
University of North Carolina, Chapel Hill

kmp@cs.unc.edu
http://www.cs.unc.edu/~kmp

Education

Ph.D. University of California, Berkeley, 1999
Parallel Software-only Video Effects Processing

M.S. University of California, Berkeley, 1997
Design and Performance of the Berkeley Continuous Media Toolkit

B.A. University of California, Berkeley, 1992
Majors: Computer Science and Economics

Professional Experience

Associate Professor
University of North Carolina, Chapel Hill, NC (August 2005 – present)

Assistant Professor
University of North Carolina, Chapel Hill, NC. (January 2000 – August 2005)

Visiting Researcher
Microsoft Bay Area Research Center (BARC), San Francisco, CA. (June 2003 – December 2003)

Graduate Student Researcher
University of California, Berkeley, CA. (June 1993 – November 1999)

Graduate Student Instructor
University of California, Berkeley, CA. (August 1997 – December 1997)

Programmer
University of California, Berkeley, CA. (June 1992 – June 1993)

Programmer
United States Department of Agriculture, Albany, CA. (May 1991 – June 1992)

Honors and Notables

- National Science Foundation CAREER Award, 2003
- Computer Science Student Association Teaching Award, 2003
- Invited to three major meetings (one domestic and two international) of top multimedia researchers to discuss future directions for the field.
- In the sixteen-year history of the ACM SIGMultimedia Conference, considered to be the premier conference in the field of multimedia, I have published twelve papers in ten different years.

Publications

Refereed Journals

K. Mayer-Patel and D. Gotz, "Scalable, Adaptive Streaming for Nonlinear Media," *IEEE Multimedia,* vol. 14, no. 3 (15 pages).

D. Ott and K. Mayer-Patel, "An open architecture for transport-level protocol coordination for distributed multimedia applications," *ACM Transactions on Multimedia Computing, Communications, and Applications*, vol. 3, no. 3 (22 pages).

D. Gotz and K. Mayer-Patel, "GAL: A middleware library for multidimensional adaptation," under review for *ACM Transactions on Multimedia Computing, Communications, and Applications* (21 pages).

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N. Kelshikar, X. Zabulis, J. Mulligan, K. Daniilidis, V. Sawant, S. Sinha, T. Sparks, S. Larsen, H. Towles, K. Mayer-Patel, H. Fuchs, J. Urbanic, K. Benninger, R. Reddy and G. Huntoon, "Real-time terascale implementation of tele-immersion," *Proceedings of the International Conference on Computation Science*, Melbourne, Australia, 2003, Springer-Verlag Lecture Notes in Computer Science vol. 2660, pp. 33-42.

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D. Gotz and K. Mayer-Patel, "IRW: an incremental representation for image-based walkthroughs," *Proceedings of the 10th International ACM Conference on Multimedia*, Juan-les-Prins, France, 2002, pp. 67-76.

D. Ott and K. Mayer-Patel, "A mechanism for TCP-friendly transport-level protocol coordination," *Proceedings of the USENIX Technical Conference*, Monterrey, CA, 2002 (14 pages).

A. Wilson, K. Mayer-Patel and D. Manocha, "Spatially-encoded far-field representations for interactive walkthroughs," *Proceedings of the 9th International ACM Conference on Multimedia*, Ottawa, Canada, 2001, pp. 348-357.

D. Ott and K. Mayer-Patel, "Transport-level protocol coordination in cluster-to-cluster applications," *Proceedings of the 8th International Workshop on Interactive Distributed Multimedia Systems (Lecture Notes in Computer Science)*, vol. 2158, Springer, 2001, pp. 10-22.

D. Yu, D. Wu, K. Mayer-Patel and L.A. Rowe, "dc: a live webcast control system," *Proceedings of the SPIE Conference on Multimedia Computing and Networking*, vol. 4312, San Jose, CA, 2001, pp. 111-122.

K. Mayer-Patel, "Incorporating application-level knowledge into the MPEG-2 coding model," *Proceedings of the Workshop on Network and Operating System Support for Digital Audio and Video (NOSSDAV)*, Chapel Hill, CA, 2000, (6 pages).

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K. Mayer-Patel and L.A. Rowe, "A multicast control scheme for parallel software-only video effects processing," *Proceedings of the 7th International ACM Conference on Multimedia*, Orlando, FL, 1999, pp. 409-418.

K. Mayer-Patel and L.A. Rowe, "Exploiting temporal parallelism for software-only video effects processing," *Proceedings of the 6th International ACM Conference on Multimedia*, Bristol, England, 1998, pp. 161-169.

T.H. Wong, K. Mayer-Patel and L.A. Rowe, "A software-only video production switcher for the Internet MBone," *Proceedings of the SPIE conference on Multimedia Computing and Networking*, vol. 3310, San Jose, CA, 1998, pp. 28-41.

K. Mayer-Patel and L.A. Rowe, "Design and performance of the Berkeley Continuous Media Toolkit," *Proceedings of the SPIE conference on Multimedia Computing and Networking*, vol. 3020, San Jose, CA, 1997, pp. 194-206.

K. Mayer-Patel, D. Simpson, D. Wu, and L.A. Rowe, "Synchronized continuous media playback through the World Wide Web," *Proceedings of the 4th International ACM Conference on Multimedia,* Boston, MA, 1997, pp. 435-436.

L.A. Rowe, K. Patel, and B. Smith, "MPEG video in software: representation, transmission, and playback," *Proceedings of the SPIE conference on High-Speed Networking and Multimedia Computing*, vol. 2188, San Jose, CA, 1994, pp. 134-144.

K. Patel, B. Smith, and L.A. Rowe, "Performance of a software MPEG video decoder," *Proceedings of the 1st International ACM Conference on Multimedia,* Los Angeles, CA, 1993, pp. 75-82.

Software Artifacts

mpeg_play

The first publicly available MPEG-1 video decoder originally released in 1993. Over 1,000,000 copies of this program have been downloaded. It has been used as a code base for innumerable research and open source systems. Mayer-Patel was the architect of the original code that was later refactored and maintained by a number of other individuals.

The Berkeley Continuous Media Toolkit

The Berkeley CMT provided a framework within which to develop experimental multimedia tools and applications. Although primarily used by researchers at UC Berkeley, it was employed by a number of different research groups world-wide. Development of CMT ended in approximately 1998.

MPEG2Event

This recently released C# library allows researchers to rapidly develop MPEG-2 analysis tools that are interested in the details of bit-level coding elements. Although currently in use by only a small number of researchers, it is freely available at http://www.cs.unc.edu/~kmp/mpeg2event. Further development of the library is on-going.

Teaching

COMP 416: Introduction to Web Programming
My goal with this course is to pique student interest for more detailed upper-division courses in operating systems, networking, databases, security, etc. while satisfying their practical interest in developing web programming skills.

COMP 426: Advanced Web Programming
A follow-on course to COMP 416, this course expands on client-server programming concepts and concentrates more attention to the design and use of databases and XML-related technologies.

COMP 249: Multimedia Computing and Networking
This course is an advanced graduate-level course that covers the fundamental concepts in multimedia computing and networking. Students are expected to complete an extensive final project, some of which have led to publications in refereed conferences and workshops.

COMP 249-080: Topics in Multimedia Systems
This seminar course provides students with an opportunity to read and present the most research literature in multimedia systems.

Research Areas

Coordinated Multistreaming
In this project, we are developing mechanisms to address the needs of distributed multimedia applications that employ many (i.e., 10's or 100's) of different media flows with complex inter-stream semantics and adaptation requirements. This project addresses fundamental problems in protocol coordination and aggregate congestion control.

Multidimensional Adaptation
We are developing a framework for compactly expressing and evaluating adaptation policies that must negotiate tradeoffs in real-time within very large multiresolutional datasets with high dimensionality.

StrandCast
StrandCast is an application-layer multicast protocol intended for latency-insensitive multimedia applications such as receiver-driven layered multicast and pyramid broadcasting. The design and implementation of StrandCast exploits the lax latency requirements of these applications to optimize for link stress, rapid joins and leaves, and robustness in the face of node failure.

Encoding and Transmission of 3D Scenes from Multiple Cameras
The project explores ways to efficiently transmit video data from a set of cameras viewing the same scene. This problem is at the heart of most tele-immersion applications. Our hypothesis is that it is possible to exploit depth information (even if imperfect) derived from stereo correlation between cameras to more efficiently encode the original color information.

Recoverable Video Adaptation
Existing video adaptation techniques generally lead to irreversibly loss of video quality. In this project, we are exploring adaptation techniques that can be used to recover high (or at least higher) quality video from a set of independently constructed lower quality representations.

Funding

CAREER: Enabling Futuristic Distributed Applications with Integrative Multistream Networking
PI's: K. Mayer-Patel
Agency: National Science Foundation (ANI-0238260)
Amount: $404,387
Duration: 8/15/2003 – 8/14/2008

ITR: Protocol Coordination for Multi-Stream Applications
PI's: K. Mayer-Patel
Agency: National Science Foundation (ANI-0219780)
Amount: $368, 047
Duration: 10/1/2002 – 9/30/2005

RI: Tera-Pixels - Using High-Resolution Pervasive Displays to Transform Collaboration and Teaching
PI's: K. Jeffay, A. Lastra, F.D. Smith, K. Mayer-Patel and L. McMillan
Agency: National Science Foundation (EIA-0303590)
Amount: $590,986
Duration: 8/15/2003 – 8/14/2008

3D Telepresence for Medical Consultation: Extending Medical Expertise Throughout, Between, and Beyond Hospitals
PI's: H. Fuchs, B. Cairns, K. Mayer-Patel, D. Sonnenwald, G. Welch
Agency: National Library of Medicine
Amount: $2,549,980
Duration: 09/30/2003-09/29/2006

Video-Based Representation and Rendering of Large Real and Synthetic Environments
PI's: D. Manocha and K. Mayer-Patel
Agency: Office of Naval Research
Amount: $112,384
Duration: 01/01/2001-12/31/2003

Video Quality Metric Oracle

PI's: K. Mayer-Patel
Agency: North Carolina Networking Initiative Fellowship Program
Amount: $20,000
Duration: 08/15/2001 – 5/15/2002

SCOUT: An On-Line Network Path Measurement and Characterization Tool

PI's: K. Mayer-Patel
Agency: North Carolina Networking Initiative Fellowship Program
Amount: $20,000
Duration: 08/15/2000 – 5/15/2001

Professional Activities

Editorships

- Associate Editor, ACM Transactions on Multimedia Communications, Computing, and Applications (TOMCCAP)
- Associate Editor, IEEE Multimedia Magazine

Executive Committees

- Co-Chair, International Workshop on Network and Operating System Support for Digital Audio and Video (NOSSDAV)

Organizing Committees

- Program Chair, ACM Multimedia Systems 2010
- General Co-Chair, Multimedia Networking and Computing 2009
- Program Co-Chair, Multimedia Modeling (MMM) 2009
- General Co-Chair, NOSSDAV 2005
- Program Co-Chair, ACM Multimedia, 2006
- Open Source Software Competition Chair, ACM Multimedia (2004, 2005)
- Tutorial Program Chair, ACM Multimedia (2003)
- Doctoral Symposium Chair, ACM Multimedia (2000, 2001)

Program Committees

- ACM Multimedia
- NOSSDAV
- Multimedia Computing and Networking (MMCN)
- Multimedia Interactive Protocols and Systems Workshop
- IFIP Networking Conference
- Multimedia Information Systems Conference
- International World Wide Web Conference
- SPIE Conference on Multimedia Computing and Networking
- IEEE International Conference on Distributed Computing Systems
- Interactive Distributed Multimedia Systems Workshop
- Global Internet Symposium

Other Professional Service

- Guest Editor, Special Issue of Multimedia Systems Journal featuring expanded papers from the SPIE Conference on Multimedia Computing and Networking, 2003.
- In 2004, participated in a by invitation-only meeting of leaders within ACM SIGMultimedia. A report of the meeting outlining important directions for multimedia research will appear in Transactions on Multimedia Computing, Communications, and Applications.
- Invited to an international meeting of leading multimedia researchers being organized for Spring 2005 in Dagstuhl, Germany to discuss the future of multimedia research.

Past Ph.D. Students

- David Gotz, *Supporting adaptive scalable access to multiresolutional multidimensional data,* May 2005.
- David Ott, *Coordination mechanisms for distributed multistream applications*, November 2005.
- Sang-Uok Kum, *Encoding and transmission of 3D depth streams*, November 2008.

University Service

University Committees

- Tar Heel Bus Tour Advisory Committee (Fall 2001).

Department Service

- Chair of Undergraduate Curriculum Committee (Fall 2009 – present).
- Chair of Graduate Admissions Committee (Spring 2005 – Fall 2009).
- Member of Graduate Admissions Committee (Spring 2001 – Spring 2005).

Other Service

- Project UPLIFT participant (recruitment of minority high school students)
- Co-coach of the UNC ACM Programming Competition team (Fall 2000 – present).

EXHIBIT 2 TO MAYER-PATEL DECLARATION

Web Building Security

« Previous Next Chapter »

You are offering your IP address to the entire world at this very moment.

Make sure you are not offering access to your private data at the same time.

YOUR IP ADDRESS IS PUBLIC

Accessing the Internet is a security risk.

When you are connected to the Internet, an IP address is used to identify your computer. If you don't protect yourself, this IP address can be used to access your computer from the outside world.

A fixed IP address is a larger security risk.

If you're using a modem with a dial-up connection, you will get a new IP address every time you connect to Internet.

With an ADSL or cable connection users sometimes keep the same IP address for several months, this represents an increased security risk.

If you have a fixed IP address, you give Internet hackers all the time they need to search for entrances on your computer, and to store and share (with other hackers) information they find on your computer.

Your Network Shares

Personal computers are often connected to a shared network. Personal computers in large companies are connected to large corporate networks. Personal computers in small companies are connected to a small local network, and computers in private homes often share a network between family members.

Most often networks are used to share resources like printers, files and disk storage.

When you are connected to the Internet, your shared resources can be accessed by the rest of the world.

A Common Windows Security Problem

Unfortunately, many Microsoft Windows users are unaware of a common security leak in their network settings.

This is a common setup for network computers in Microsoft Windows:

- Client for Microsoft Networks
- File and Printer Sharing for Microsoft Networks
- NetBEUI Protocol
- Internet Protocol TCP/IP

If your setup allows NetBIOS over TCP/IP, you have a security problem:

- Your files can be shared all over the Internet
- Your logon-name, computer-name, and workgroup-name are visible to others

If your setup allows File and Printer Sharing over TCP/IP, you also have a problem:

- Your files can be shared all over the Internet

Computers that are not connected to any network can also have unsecure network settings, because the settings were changed when Internet was installed.

Solving the Problem

For Windows 2000 users:

You can solve your security problem by **disabling NetBIOS over TCP/IP**:

- Open Windows Explorer
- Right-click on My Network Places
- Select: Properties
- Right-click on Local Area Network
- Select: Properties

- Select: Internet Protocol TCP/IP
- Click on Properties
- Click on Advanced
- Select the WINS tab
- Select Disable NetBIOS over TCP/IP
- Click OK

If you get the message: "This connection has an empty......", ignore the message and click on YES to continue, and click OK to close the other setup windows.

You should restart your computer after the changes.

For Windows 95, 98, or ME users:

You can solve your security problem by **disabling NetBIOS over TCP/IP**:

- Open Windows Explorer
- Right-click on My Network Places
- Select: Properties
- Select: Internet Protocol TCP/IP
- Click on Properties
- Select the NetBIOS tab
- Uncheck: Enable NetBIOS over TCP/IP
- Click OK

You must also **disable the TCP/IP Bindings** to Client for Microsoft Networks and File and Printer Sharing:

- Open Windows Explorer
- Right-click on My Network Places
- Select: Properties
- Select: Internet Protocol TCP/IP
- Click on Properties
- Select the Bindings tab
- Uncheck: Client for Microsoft Networks
- Uncheck: File and Printer Sharing
- Click OK

If you get a message with something like: "You must select a driver.........", ignore the message and click on YES to continue, and click OK to close the other setup windows.

If you still want to **share your Files and Printer** over the network, you must use the NetBEUI protocol instead of the TCP/IP protocol. Make sure you have enabled it for your local network:

- Open Windows Explorer
- Right-click on My Network Places
- Select: Properties
- Select: NetBEUI
- Click on Properties
- Select the Bindings tab
- Check: Client for Microsoft Networks
- Check: File and Printer Sharing
- Click OK

You should restart your computer after the changes.

Protect Your Server

« Previous Next Chapter »

CERTIFICATE OF SERVICE

The undersigned hereby certifies that, on November 25, 2009, the RESPONSE TO NON-FINAL REJECTION IN A RE-EXAMINATION filed in Re-examination Control No. 90/010,422 was served by U.S. First Class Express Mail on Requestor as follows:

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

Michael R. Casey, Ph.D.

Electronic Acknowledgement Receipt

EFS ID:	6531013
Application Number:	90010422
International Application Number:	
Confirmation Number:	6565
Title of Invention:	Graphic User Interface For Internet Telephony Application
First Named Inventor/Applicant Name:	6,009,469
Customer Number:	42624
Filer:	Michael Raymond Casey
Filer Authorized By:	
Attorney Docket Number:	2655-0185
Receipt Date:	25-NOV-2009
Filing Date:	26-FEB-2009
Time Stamp:	21:13:52
Application Type:	Reexam (Third Party)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment/Req. Reconsideration-After Non-Final Reject	20091125_469_Response_As_Filed_cover.pdf	72351 8fe9fc2d0f16545e879c0027271c6947cb1f340f	no	1

Warnings:

Information:

2	Claims	20091125_469_Response_As_Filed_Claims.pdf	49052 554cde8b966bdf85e925d7e6f40faf802a3d23e0	no	1
Warnings:					
Information:					
3	Applicant Arguments/Remarks Made in an Amendment	20091125_469_Response_As_Filed_Remarks.pdf	275418 db92ee0dcea55c87110254988ab46861f2b441a5	no	27
Warnings:					
Information:					
4	Rule 130, 131 or 132 Affidavits	Exhibit_01_Ketan_132_469.pdf	4434010 a459c47fc34ddba00be1a4673686e80969590c29	no	32
Warnings:					
Information:					
5	NPL Documents	Exhibit_02_Web_Security.pdf	556594 4bd74423389a55af9ac258de7e54aa5b64f82a6d	no	4
Warnings:					
Information:					
6	NPL Documents	Exhibit_03_ALONCOHEN.pdf	580490 94578c7fd6d923478abb785d39ae17761d08296b	no	6
Warnings:					
Information:					
7	NPL Documents	Exhibit_04_Alon_Cohen_Interview.pdf	228810 be6d458709bfb99e535798ef246de67d832430f0	no	6
Warnings:					
Information:					
8	NPL Documents	Exhibit_05_Alon_Cohen_Bio.pdf	146074 99bf6aa049b59daabb4e9a5b5d2e50284e6db580	no	2
Warnings:					
Information:					
9	NPL Documents	Exhibit_06_WebPhoneKillerApp.pdf	456394 4848fd08e2b060256d3efd20838c7f3a4b5dcd38	no	5
Warnings:					
Information:					
10	NPL Documents	Exhibit_07_VocalChatHistory.pdf	556244 1f2972379c1ff1f97726a600fb7cb1acb8b03767	no	16
Warnings:					
Information:					

11	NPL Documents	Exhibit_08_InternetTelephony_POTYear.pdf	373169 c6f517edf4328aba54c24f7335ac1aeca3d852c5	no	9
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Information:					
12	NPL Documents	Exhibit_09_Durand_PressRelease.pdf	159588 cadcdd5dd535e29b0f018f001bdc3f5f90926a5d	no	4
Warnings:					
Information:					
13	NPL Documents	Exhibit_10_Computer_Telephony.pdf	67848 73983ba053354169aed612bd4c5c16bedc588635	no	2
Warnings:					
Information:					
14	NPL Documents	Exhibit_11_NetSpeak_S-1A.pdf	533615 d519038515799365915b09680239d470ebd3dfb7	no	119
Warnings:					
Information:					
15	NPL Documents	Exhibit_12_Motorola_PressRelease.pdf	143729 5be5574cb711e71e2236ba7fe0266926c8dfe28d	no	3
Warnings:					
Information:					
16	NPL Documents	Exhibit_13_Motorola2.pdf	404162 3dadaf91670273b74a64265b6c264a024c3a89ba	no	4
Warnings:					
Information:					
17	NPL Documents	Exhibit_14_NetSpeak_10K.pdf	144246 11cf8d3b11ba77c1aba129d0742ee1ba3e5653f3	no	37
Warnings:					
Information:					
18	NPL Documents	Exhibit_15_Net2Phone_8-K.pdf	170814 0aca9a1a4c1076a5d6763cd2431ec48a3ecf24be	no	40
Warnings:					
Information:					
19	NPL Documents	Exhibit_16_MCI.pdf	362841 0a897704787d9f249e440324fb2a62e452b7cf76	no	3
Warnings:					
Information:					

20	NPL Documents	Exhibit_17_NetSpeak_CS.pdf	1107085 32c9865c4181a0280e3d93dcb9a48bf545c33343	no	7
Warnings:					
Information:					
21	NPL Documents	Exhibit_18_How_do_I.pdf	2719628 6d1ba9f24834940f8748db648a9ec88e8bd26694	no	16
Warnings:					
Information:					
22	NPL Documents	Exhibit_19_Penny.pdf	3498198 41fb5202c9ecf9a1e3ccecd93c7d6bfe32ce37bc	no	18
Warnings:					
Information:					
23	NPL Documents	Exhibit_20_704_and_family_results.pdf	531202 7616363ed3875788f07fbf116e3afbd8929f72d8	no	4
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Information:					
24	NPL Documents	Exhibit_21_NetBIOS_ReferencesWith_704.pdf	111308 b48c9c979e6ad1cff00d337072b8ce2e2e8448cc	no	2
Warnings:					
Information:					
25	NPL Documents	Exhibit_22_NetBIOS_References.pdf	425223 36870b9db80692a5b18003d908348732fd145f6f	no	3
Warnings:					
Information:					
26	Reexam Certificate of Service	20091125_469_COS.pdf	61430 0da9765456598ce8e399e83f87227cdaa8d523f3	no	1
Warnings:					
Information:					
		Total Files Size (in bytes):	18169523		

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

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

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

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

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
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Michael R Casey : (For Patent Owner)
DAVIDSON BERQUIST JACKSON :
& GOWDEY LLP :
4300 WILSON BLVD., 7TH FLOOR :
ARLINGTON VA 22203 :

MAILED

OCT 23 2009

CENTRAL REEXAMINATION UNIT

Edwin H Taylor : (For Third Party Requester)
BLAKELY SOKOLOFF TAYLOR :
& ZAFMAN LLP :
1279 OAKMEAD PARKWAY :
SUNNYVALE, CA 94085-4040 :

In re: Mattaway *et alia* : DECISION
Ex Parte Reexamination Proceeding : GRANTING
Control No. 90/010,422 : PETITION FOR EXTENSION
Deposited: 26 February 2009 : OF TIME
For: US Patent No. 6,009,469 : [37 CFR §§ 1.550(c) & 1.181]

This is a decision on the 19 October 2009, "Request for Extension of Time in a Re-Examination" pursuant to 37 CFR § 1.550(c) requesting that the time for responding to the non-final Office action mailed 25 August 2009, be extended by one (1) month extension of time. The petition was timely filed on 19 October 2009. The petition included the required petition fee pursuant to 37 CFR § 1.17(g) and certificate of service.

The petition is before the Director of the Central Reexamination Unit for consideration.

The petition is granted for the reasons set forth below.

DISCUSSION

The Patent Owner requests the period of time to be extended in which to file a response to the non-final Office action mailed 25 August 2009. The petition for extension of time was timely filed on 19 October 2009 with appropriate fee according to 37 CFR § 1.17(g).

The extension of time is granted

37 CFR § 1.550 (c) states:

> (c) The time for taking any action by a patent owner in an *ex parte* reexamination proceeding will be extended only for sufficient cause and for a reasonable time specified. Any request for such extension must be filed on or before the day on which action by the patent owner is due, but in no case will the mere filing of a request effect any extension. Any request for such extension must be accompanied by the petition fee set forth in § 1.17(g). See § 1.304(a) for extensions of time for filing a notice of appeal to the U.S. Court of Appeals for the Federal Circuit or for commencing a civil action.

Addressing the requirement of 37 CFR § 1.550 (c) to make a showing of "sufficient cause" to grant an extension of time request, MPEP 2265 states, in pertinent part:

> Evaluation of whether sufficient cause has been shown for an extension must be made in the context of providing the patent owner with a fair opportunity to present an argument against any attack on the patent, and the requirement of the statute (35 U.S.C. § 305) that the proceedings be conducted with special dispatch. ...
>
> Any request for an extension of time in a reexamination proceeding must fully state the reasons therefor. ...

MPEP 2265 (in-part)

> Any request for an extension of time in a reexamination proceeding must fully state the reasons therefor. The reasons must include (A) a statement of what action the patent owner has taken to provide a response, to date as of the date the request for extension is submitted, and (B) why, in spite of the action taken thus far, the requested additional time is needed. The statement of (A) must provide a factual accounting of reasonably diligent behavior by all those responsible for preparing a response to the outstanding Office action within the statutory time period.

ANALYSIS AND FINDINGS

The patent owner's representative petitions to extend the period for response by adding one (1) month to the period for response. The decision to extend the period for response is evaluated based upon a showing of "sufficient cause." There is always the consideration to balance the need for the patent owner to have a fair opportunity to respond to the Office action between the need for special dispatch.

The petitioner has demonstrated "sufficient cause" for granting the extension of time. The petitioner articulates, extensive number of pages made a part of the outstanding rejections of the claims, location of a technical expert and need for declarations to support "sufficient cause" for granting the extension of time.

The petition request to extend the response time is hereby granted.

CONCLUSION

1. The patent owner's petition for extension of time is hereby **granted.**

2. The time for response is extended by one (1) month.

3. The Patent Owner's response is due **25 November 2009.**

4. Response and/or submissions to the Office should be addressed as follows:

By Mail to: Mail Stop *Ex Parte* Reexam
Central Reexamination Unit
Commissioner for Patents
United States Patent & Trademark Office
P. O. Box 1450
Alexandria, VA 22313-1450

By Fax to: (571) 273-9900
Central Reexamination Unit

By Hand: Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314

By EFS: Registered users of EFS-Web may alternatively submit such correspondence via the electronic filing system EFS-Web, at https://sportal.uspto.gov/authenticate/authenticateuserlocalepf.html. EFS-Web offers the benefit of quick submission to the particular area of the Office that needs to act on the correspondence. Also, EFS-Web submissions are "soft scanned" (i.e., electronically uploaded) directly into the official file for the reexamination proceeding, which offers parties the opportunity to review the content of their submissions after the "soft scanning" process is complete.

5. Telephone inquiries with regard to this decision should be directed to Mark Reinhart, at (571) 272-1611, in the event that Mark Reinhart is unavailable Eric Keasel at (571) 272-4929, or Jessica Harrison at (571) 272-4449; all are Supervisory Patent Examiners in the Central Reexamination Unit, Art Unit 3992 may also be contacted..

/Mark Reinhart/
for

Gregory Morse
Director,
Central Reexamination Unit 3999

Electronic Patent Application Fee Transmittal

Application Number:	90010422
Filing Date:	26-Feb-2009
Title of Invention:	Graphic User Interface For Internet Telephony Application
First Named Inventor/Applicant Name:	6,009,469
Filer:	Michael Raymond Casey
Attorney Docket Number:	2655-0185

Filed as Large Entity

ex parte reexam Filing Fees

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

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

Electronic Acknowledgement Receipt

EFS ID:	6284260
Application Number:	90010422
International Application Number:	
Confirmation Number:	6565
Title of Invention:	Graphic User Interface For Internet Telephony Application
First Named Inventor/Applicant Name:	6,009,469
Customer Number:	42624
Filer:	Michael Raymond Casey
Filer Authorized By:	
Attorney Docket Number:	2655-0185
Receipt Date:	19-OCT-2009
Filing Date:	26-FEB-2009
Time Stamp:	13:46:24
Application Type:	Reexam (Third Party)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$200
RAM confirmation Number	9
Deposit Account	501860
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Reexam Request for Extension of Time	90010422_EOT_Request.pdf	386725 126e63198d7aeed2404a399f3d176874919 16d73	no	3
Warnings:					
Information:					
2	Reexam Certificate of Service	90010422_COS.pdf	51851 d55820db945b58970d729e0e8f9c6819983 76c0a	no	1
Warnings:					
Information:					
3	Fee Worksheet (PTO-875)	fee-info.pdf	29792 5467a9820f88e7745c47eb922e38e9c6f808 254a	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	468368	

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

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

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

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

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 1 of 1		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

NON-PATENT REFERENCES

Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
	1-1	Civ Action No. 06-2469 Plaintiff Net2Phone, Inc.'s Opening Claim Construction Brief (part 1 of 3) (N2PIDS_02100-2166)	
	1-2	Civ Action No. 06-2469 Plaintiff Net2Phone, Inc.'s Opening Claim Construction Brief (part 2 of 3) (N2PIDS_02166-2232)	
	1-3	Civ Action No. 06-2469 Plaintiff Net2Phone, Inc.'s Opening Claim Construction Brief (part 3 of 3) (N2PIDS_02233-2292)	
	1-4		
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Examiner Signature	/Alexander Kosowski/	Date Considered	08/14/2009

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N2PIDS_02065

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 1 of 5	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

NON-PATENT REFERENCES

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

Examiner Signature	/Alexander Kosowski/	Date Considered	08/12/2009

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N2PIDS_02002

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 2 of 5	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

NON-PATENT REFERENCES

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

Examiner Signature	/Alexander Kosowski/	Date Considered	08/12/2009

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

N2PIDS_02003

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 3 of 5		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

NON-PATENT REFERENCES

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

Examiner Signature	/Alexander Kosowski/	Date Considered	08/12/2009

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

N2PIDS_02004

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 4 of 5		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

NON-PATENT REFERENCES

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

Examiner Signature	/Alexander Kosowski/	Date Considered	08/12/2009

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

N2PIDS_02005

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 5 of 5	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

NON-PATENT REFERENCES

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

Examiner Signature	/Alexander Kosowski/	Date Considered	08/12/2009

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

N2PIDS_02006

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 1 of 67	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document No.	Publication/ Issue Date	Name of Patentee or Applicant of Cited Document
	1-1	US-4313035	1982/01/26	Jordan et al.
	1-2	US-4423414	1983/12/27	Bryant et al.
	1-3	US-4491693	1985/01/01	Sano et al.
	1-4	US-4602132	1986/07/22	Nagatomi et al.
	1-5	US-4653090	1987/03/24	Hayden, C.
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	1-22	US-5113499	1992/05	Ankney et al.
	1-23	US-5127001	1992/30/06	Steagall, et al.
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Examiner Signature	/Alexander Kosowski/	Date Considered	08/12/2009

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N2P-IDS00026

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /AK/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 2 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document No.	Publication/ Issue Date	Name of Patentee or Applicant of Cited Document
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	2-2	US-5153908	1992/10/06	Kakizawa et al.
	2-3	US-5159592	1992/10	Perkins
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Examiner Signature		Date Considered	

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N2P-IDS00027

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /AK/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 3 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document No.	Publication/ Issue Date	Name of Patentee or Applicant of Cited Document
	3-1	US-5499295	1996/12/03	Cooper
	3-2	US-5502727	1996/03/26	Catanzaro et al.
	3-3	US-5515508	1996/05/07	Pettus et al.
	3-4	US-5533110	1996/02/07	Pinard et al.
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Examiner Signature		Date Considered	

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

N2P-IDS00028

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /AK/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified)	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
Sheet 4 of 67	Confirmation No.	6565

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document No.	Publication/ Issue Date	Name of Patentee or Applicant of Cited Document
	4-1	US-5956485	1999/09/21	Perlman
	4-2	US-6009469	1999/12	Mattaway et al.
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Examiner Signature		Date Considered	

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N2P-IDS00029

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /AK/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 5 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document No.	Publication Date	Name of Patentee or Applicant of Cited Document	Notes
	5-1	EP-0455402-A2	11-06-1991	Hewlett-Packard Company	
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Examiner Signature		Date Considered	

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

N2P-IDS00030

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /AK/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 6 of 67	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

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Examiner Signature		Date Considered	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 7 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

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Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
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N2P-IDS00032

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 8 of 67	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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N2P-IDS00033

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 9 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
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	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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N2P-IDS00034

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified)	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
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N2P-IDS00035

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified)	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
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	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
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N2P-IDS00038

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 14 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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N2P-IDS00039

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 15 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 16 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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N2P-IDS00041

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /AK/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified)	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
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	Examiner Name	KOSOWSKI, ALEXANDER J
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N2P-IDS00042

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 18 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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N2P-IDS00043

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 19 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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N2P-IDS00044

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 20 of 67	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
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	Attorney Docket No.	2655-0185
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 21 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
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N2P-IDS00046

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified)	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 23 of 67	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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	First Named Inventor	Mattaway et al.
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	Reexam number	90/010,422
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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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N2P-IDS00051

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	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
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	Examiner Name	KOSOWSKI, ALEXANDER J
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	First Named Inventor	Mattaway et al.
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 30 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 31 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
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N2P-IDS00056

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 32 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified)	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
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	Reexam number	90/010,422
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified)	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
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N2P-IDS00060

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified)	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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N2P-IDS00061

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /AK/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 37 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

N2P-IDS00062

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /AK/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified)		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 39 of 67	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
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	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /AK/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 40 of 67	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
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N2P-IDS00065

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 41 of 67	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

NON-PATENT REFERENCES

Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
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Examiner Signature		Date Considered	

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

N2P-IDS00066

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 42 of 67	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

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

N2P-IDS00067

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /AK/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 43 of 67	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

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Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
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N2P-IDS00068

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /AK/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 44 of 67	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

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Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
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*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

N2P-IDS00069

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 45 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

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Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
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*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

N2P-IDS00070

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /AK/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 46 of 67	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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NON-PATENT REFERENCES

Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
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N2P-IDS00071

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /AK/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified)	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
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*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

N2P-IDS00072

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /AK/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified)	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
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	Examiner Name	KOSOWSKI, ALEXANDER J
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*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

N2P-IDS00073

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /AK/

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	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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Examiner Signature		Date Considered	

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N2P-IDS00074

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /AK/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified)	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
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NON-PATENT REFERENCES

Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
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	50-2	PowWow For Microsoft Windows User's Guide, Version 1.7 beta 1, Documentation by Aryeh Goretsky (dated 1995)	
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N2P-IDS00075

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /AK/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 51 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

NON-PATENT REFERENCES

Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
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*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 52 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 53 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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N2P-IDS00078

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 54 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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N2P-IDS00079

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified)	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
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N2P-IDS00080

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified)		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
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*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

N2P-IDS00081

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	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

N2P-IDS00082

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified)	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

N2P-IDS00083

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 59 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 60 of 67	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 61 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /AK/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 62 of 67	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
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	Examiner Name	KOSOWSKI, ALEXANDER J
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N2P-IDS00087

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /AK/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 63 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
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	Examiner Name	KOSOWSKI, ALEXANDER J
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Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
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	First Named Inventor	Mattaway et al.
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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
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	Attorney Docket No.	2655-0185
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	66-7	Welch, Nathalie "Vendors Ring in New Telephony Options" MacWeek, April 10, 1995, pg 18.	

Examiner Signature		Date Considered	

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

N2P-IDS00091

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /AK/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified)	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
Sheet 67 of 67	Confirmation No.	6565

NON-PATENT REFERENCES

Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
	67-1	Wendy Woods, Newsbytes Daily Summary, NEWSBYTES (June 10, 1994).	
	67-2	William M. Bulkeley, On-line: Hello, world. Audible Chats on the Internet, WALL STREET JOURNAL (Feb. 10, 1995).	
	67-3	Winther, Mark. "The World Wide Web Phones Home: Internet Telephony Market Assessment, 1996-1999", International Data Corporation White Paper (dated 1996)	
	67-4	Xerox System Integration Standard Clearinghouse Protocol (April 1984).	
	67-5	Yakov Rekhter, et al., Dynamic Updates in the Domain Name System (DNS):Architecture and Mechanism, Internet-Draft, DNSIND Working Group (July 15, 1994).	
	67-6		
	67-7		

Examiner Signature	/Alexander Kosowski/	Date Considered	08/12/2009

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

N2P-IDS00092

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /AK/

Reexamination	Application/Control No. 90010422	Applicant(s)/Patent Under Reexamination 6,009,469
	Certificate Date	**Certificate Number**

Requester Correspondence Address:	☐ **Patent Owner**	☒ **Third Party**

BLAKELY SOKOLOFF TAYLOR & ZAFMAN LLP
1279 OAKMEAD PARKWAY
SUNNYVALE, CA 94085-4040

LITIGATION REVIEW ☒	AJK (examiner initials)	08/17/2009 (date)
Case Name		Director Initials
OPEN: 2:06cv2469 Net2phone v. Ebay		Eric Keasel for GM

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

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90010422	6,009,469
	Examiner	**Art Unit**
	ALEXANDER J KOSOWSKI	3992

SEARCHED

Class	Subclass	Date	Examiner

SEARCH NOTES

Search Notes	Date	Examiner
Reviewed proposed prior art and prosecution history	8/17/09	AJK

INTERFERENCE SEARCH

Class	Subclass	Date	Examiner

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
90/010,422	02/26/2009	6,009,469	2655-0185	6565

42624 7590 08/25/2009

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

EXAMINER	

ART UNIT	PAPER NUMBER

DATE MAILED: 08/25/2009

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

PTO-90C (Rev. 10/03)

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BLAKELY SOKOLOFF TAYLOR & ZAFMAN LLP

1279 OAKMEAD PARKWAY

SUNNYVALE, CA 94085-4040

MAILED

AUG 25 2009

CENTRAL REEXAMINATION UNIT

EX PARTE REEXAMINATION COMMUNICATION TRANSMITTAL FORM

REEXAMINATION CONTROL NO. 90/010,422.

PATENT NO. 6,009,469.

ART UNIT 3992.

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

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

PTOL-465 (Rev.07-04)

Office Action in Ex Parte Reexamination	**Control No.** 90/010,422	**Patent Under Reexamination** 6,009,469	
	Examiner ALEXANDER J. KOSOWSKI	**Art Unit** 3992	

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

a☒ Responsive to the communication(s) filed on *26 February 2009* . b☐ This action is made FINAL.
c☒ A statement under 37 CFR 1.530 has not been received from the patent owner.

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

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

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

Part II SUMMARY OF ACTION

1a. ☒ Claims *1-3,5,6,8,9 and 14-18* are subject to reexamination.

1b. ☒ Claims *4,7 and 10-13* are not subject to reexamination.

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

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

4. ☒ Claims *1-3, 5-6, 8-9, 14-18* are rejected.

5. ☐ Claims ___ are objected to.

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

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

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

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

   1☐ been received.

   2☐ not been received.

   3☐ been filed in Application No. ___

   4☐ been filed in reexamination Control No. ___

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

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

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

10. ☐ Other: ___

cc: Requester (if third party requester)

DETAILED ACTION

1) This Office action addresses claims 1-3, 5-6, 8-9, 14-18 of United States Patent Number 6,009,469 (Mattaway et al), for which it has been determined in the Order Granting Ex Parte Reexamination (hereafter the "Order") mailed 3/13/09 that a substantial new question of patentability was raised in the Request for *Ex Parte* reexamination filed on 2/26/09 (hereafter the "Request"). Claims 4, 7, 10-13 are not subject to reexamination.

IDS

2) With regard to the IDS filed 6/11/09:

Where the IDS citations are submitted but not described, the examiner is only responsible for cursorily reviewing the references. The initials of the examiner on the PTO-1449 indicate only that degree of review unless the reference is either applied against the claims, or discussed by the examiner as pertinent art of interest, in a subsequent office action. See Guidelines for Reexamination of Cases in View of In re Portola Packaging, Inc., 110 F.3d 786, 42 USPQ2d 1295 (Fed. Cir. 1997), 64 FR at 15347, 1223 Off. Gaz. Pat. Office at 125 (response to comment 6).

Consideration by the examiner of the information submitted in an IDS means that the examiner will consider the documents in the same manner as other documents in Office search files are considered by the examiner while conducting a search of the prior art in a proper field of search. The initials of the examiner placed adjacent to the citations on the PTO-1449 or PTO/SB/08A and 08B or its equivalent mean that the information has been considered by the examiner to the extent noted above. MPEP § 609 (Eighth Edition, Rev. 5, August 2006).

Regarding IDS submissions MPEP 2256 recites the following: "Where patents, publications, and other such items of information are submitted by a party (patent owner or requester) in compliance with the requirements of the rules, the requisite degree of consideration to be given to such information will be normally limited by the degree to which the party filing the information citation has explained the content and relevance of the information."

Accordingly, the IDS submissions have been considered by the Examiner only with the scope required by MPEP 2256.

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

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

Rejections

3) The following three rejections are utilized by the examiner below, referencing the proposed prior art listed on pages 4-6 of the Request:

Issue 1: Claims 1-3, 5-6, 8-9, 14-18 in view of NetBIOS, RFC 1531, Pinard and VocalChat User's Guide.

Issue 2: Claims 1-3, 5-6, 8-9, 14-18 in view of Etherphone, Vin, RFC 1531, Pinard and VocalChat User's Guide.

Issue 3: Claims 1-3, 5-6, 8-9, 14-18 in view of VocalChat, RFC 1531 and Pinard.

Claim Rejection Paragraphs

4) ***Claim Rejections - 35 USC § 103***

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

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

Issue 1

5) Claims 1-3 and 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable by NetBIOS, further in view of RFC 1531.

Referring to **(Claim 1)**, NetBIOS teaches a computer program product for use with a computer system having a display, the computer system capable of executing a first process and connecting to other processes and a server process over a computer network (NetBIOS, pg. 356, 357, whereby the system is run on personal computers over TCP/IP networks, personal computers inherently containing a display), the computer program product comprising a computer usable medium having computer readable code means embodied in the medium comprising:

a. program code for generating a user-interface enabling control a first process executing on the computer system (NetBIOS, pg. 356, 359, whereby computers executing NetBIOS may contain DOS operating systems or may operate on other operating systems, which examiner notes inherently contain at least text-based user interfaces);

c. program code responsive to the currently assigned network protocol address of the first process, for establishing a communication connection with the server process and for forwarding the assigned network protocol address of the first process and a unique identifier of the first process to the server process upon establishing a communication connection with the server process (NetBIOS, pg. 358, 431, 367, 388, 480-482, whereby network nodes forward IP addresses and unique names to NetBIOS Name Server); and

d. program code, responsive to user input commands, for establishing a point-to-point communications with another process over the computer network (NetBIOS, pg. 397-400, whereby point-to-point communication is established upon initiation between nodes once target names and addresses have been found).

In addition, NetBIOS teaches the use of TCP/IP (NetBIOS, pg. 356-357). However, NetBIOS does not explicitly teach b. program code for determining the currently assigned network protocol address of the first process upon connection to the computer network.

RFC 1531 teaches dynamically assigning IP addresses on a TCP/IP network by an Internet access server (RFC 1531, Section 2.2).

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to determine the currently assigned network protocol address of the first process upon connection to the computer network in the invention taught by NetBIOS above since this allows for automatic reuse of an address that is no longer needed by the host to which it was assigned (RFC 1531, Pg. 2), and since examiner notes the use of dynamic IP address assignment in a TCP/IP network are old and well known in the art, and are useful to eliminate the burdensome task of manually assigning IP addresses for all networked computers.

Referring to **(Claim 2)**, NetBIOS teaches the computer program product of claim 1 wherein the program code for establishing a point-to-point communication link further comprises program code, responsive to the network protocol address of a second process, for establishing a point-to-point communication link between the first process and the second process over the computer network (NetBIOS, pg. 397-401, whereby point-to-point communication is established once the IP address of the node is found).

Referring to **(Claim 3)**, NetBIOS teaches the computer program product of claim 2 wherein the program code for establishing a point-to-point communication link further comprise: program code for transmitting, from the first process to the server process, a query as to whether the second process is connected to the computer network (NetBIOS, pg. 377, 388-389, 446, 393-394, whereby name queries are used to discover if a node is connected and active); and program code for receiving a network protocol address of the second process from the server process, when the second process is connected to the computer network (NetBIOS, pg. 389, 440, 464-465, whereby the NBNS answers queries with a list of IP addresses of connected nodes).

Referring to **(Claim 5)**, NetBIOS teaches in a computer system having a display, the computer system capable of executing a first process and communicating with other processes and a server process over a computer network (NetBIOS, pg. 356, 357, whereby the system is run on personal computers over TCP/IP networks, personal computers inherently containing a display), a method for establishing point-to-point communications with other processes comprising: B. establishing a communication connection with the server process once the assigned network protocol of the first process is known and C. forwarding the assigned network protocol address of the first process to the server process upon establishing a communication connection with the server process (NetBIOS, pg. 358, 431, 367, 388, 480-482, whereby network nodes forward IP addresses and unique names to NetBIOS Name Server); and D. establishing a point-to-point communication with another process over the computer network (NetBIOS, pg. 397-400, whereby point-to-point communication is established upon initiation between nodes once target names and addresses have been found).

In addition, NetBIOS teaches the use of TCP/IP (NetBIOS, pg. 356-357). However, NetBIOS does not explicitly teach A. determining the currently assigned network protocol address of the first process upon connection to the computer network.

RFC 1531 teaches dynamically assigning IP addresses on a TCP/IP network by an Internet access server (RFC 1531, Section 2.2).

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to determine the currently assigned network protocol address of the first process upon connection to the computer network in the invention taught by NetBIOS above since this allows for automatic reuse of an address that is no longer needed by the host to which it was assigned (RFC 1531, Pg. 2), and since examiner notes the use of dynamic IP address assignment in a TCP/IP network are old and well known in the art, and are useful to eliminate the burdensome task of manually assigning IP addresses for all networked computers.

Referring to **(Claim 6)**, NetBIOS teaches the method of claim 5 wherein the program step D comprises transmitting, from the first process to the server process, a query as to whether a second process is connected to the computer network (NetBIOS, pg. 377, 388-389, 446, 393-394, whereby name queries are used to discover if a node is connected and active); and receiving a network protocol address of the second process from the server process, when the second process is connected to the computer network (NetBIOS, pg. 389, 440, 464-465, whereby the NBNS answers queries with a list of IP addresses of connected nodes).

6) Claims 8-9, 14-15, and 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable by NetBIOS, further in view of Pinard.

Referring to **(Claim 8)**, NetBIOS teaches in a computer system having a display and capable of executing a process, a method for establishing a point-to-point communication from a caller process to a callee process over a computer network, the caller process capable of generating a user interface and being operatively connected to the callee process and a server process over the computer network (NetBIOS, pg. 356, 357, whereby the system is run on personal computers over TCP/IP networks, personal computers inherently containing a display), the method comprising the steps of: querying the server process to determine if the first callee process is accessible (NetBIOS, pg. 377, 388-389, 446, whereby a query is sent to the NBNS to determine if another node is logged in and discover the nodes IP address); and establishing a point-to-point communication link from the caller process to the first callee process (NetBIOS, pg. 397-400, whereby a point-point communication link is established between end nodes).

However, NetBIOS does not explicitly teach generating a user-interface element representing a first communication line, generating a user interface element representing a first callee process, and establishing the link in response to a user associating the element representing the first callee process with the element representing the first communication line

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

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to utilizing the user-interface elements and interactions taught by Pinard in the invention taught by NetBIOS since Pinard teaches that the invention can be used with any system in which a personal computer in conjunction with a server operates (Pinard, col. 2 lines 43-46), since NetBIOS teaches that it can be implemented using different operating systems

(NetBIOS, pg. 359), and since examiner notes that both NetBIOS and Pinard relate to communications between at least two users implemented in a computerized environment.

Referring to **(Claim 9)**, NetBIOS teaches the method of claim 8 wherein step C further comprises the steps of: querying the server process as to the on-line status of the first callee process (NetBIOS, pg. 377, 388-389, 446, 393-394, whereby name queries are used to discover if a node is connected and active); and receiving a network protocol address of the first callee process over the computer network from the server process (NetBIOS, pg. 389, 440, 464-465, whereby the NBNS answers queries with a list of IP addresses of connected nodes).

Referring to **(Claims 14-15 and 17-18)**, NetBIOS teaches the above. However, NetBIOS does not explicitly teach generating a user interface element representing a communication line having a temporarily disabled status; and temporarily disabling the point-to-point communication between the caller process and the first callee process, in response to the user associating the element representing the first callee process with the element representing the communication line having a temporarily disabled status, wherein the element generated represents a communication line on hold status, wherein the display further comprises a visual display, and wherein the user interface is a graphic user interface and the user-interface elements generated in steps A and B are graphic elements.

Pinard teaches a “hard hold” icon to which saller/callees may be dragged to be put on hold status (Pinard, Figure 12, col. 6 lines 36-53), teaches a visual display (Pinard, col. 4 lines

10-11, Figure 2), and teaches a graphical user interface in which the elements are graphic elements (Pinard, Figures 2-16).

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

7) Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable by NetBIOS, further in view of Pinard, further in view of VocalChat User's Guide.

Referring to **(Claim 16)**, NetBIOS teaches the above. However, NetBIOS does not explicitly teach wherein the element generated represents a communication line on mute status.

VocalChat User's Guide teaches the use of a MUTE option on a phone so that a user can talk without being heard by the other user's system (VocalChat User's Guide, pg. 57).

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to utilize an element representing a communication line on MUTE status in the invention taught by NetBIOS and Pinard above since all three references relate to the field of communications over a computer network, since VocalChat and Pinard utilize a computer system for telephony features specifically, and since examiner notes that the use of a MUTE feature in telephone conversations is old and well known in the art.

Issue 2

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

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

"Swinehart": Telephone Management in the Etherphone System

"Terry": Managing Stored Voice in the Etherphone System

9) Claims 1-3 and 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable by Etherphone, further in view of Vin, further in view of RFC 1531.

Referring to **(Claim 1)**, Etherphone teaches a computer program product for use with a computer system having a display, the computer system capable of executing a first process and connecting to other processes and a server process over a computer network (Zellweger, pg. 1, 3; Terry, pg. 4, whereby a computer program product connects first and second processes over a network using a server), the computer program product comprising a computer usable medium having computer readable code means embodied in the medium comprising:

a. program code for generating a user-interface enabling control a first process executing on the computer system (Swinehart Figures –10, Zellweger Figures 3-4, whereby workstations include GUI's);

c. program code responsive to the currently assigned network protocol address of the first process, for establishing a communication connection with the server process and for forwarding the assigned network protocol address of the first process and a unique identifier of the first process to the server process upon establishing a communication connection with the server process (Swinehart, pg. 2, 4, Zelleger, pg. 5, whereby user identity and workstation address are transmitted to the Voice Control Server when connected); and

d. program code, responsive to user input commands, for establishing a point-to-point communications with another process over the computer network (Swinehart, pg. 4, whereby after acquiring the network address of a callee, voice datagrams are transmitted directly amont the participants, bypassing the control server).

However, Etherphone does not explicitly teach that the network protocol address is received by said one of the processes from an Internet access server.

Vin teaches an Etherphone implementation whereby Internet communications and IP addresses are used (Vin, page 77 and Figure 5).

RFC 1531 teaches dynamically assigning IP addresses on a TCP/IP network by an Internet access server (RFC 1531, Section 2.2).

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

Referring to **(Claim 2)**, Etherphone teaches the computer program product of claim 1 wherein the program code for establishing a point-to-point communication link further comprises program code, responsive to the network protocol address of a second process, for establishing a point-to-point communication link between the first process and the second process over the computer network (Swinehart, pg. 4, whereby voice datagram are transmitted directly among participants once network addresses of both processes have been received).

Referring to **(Claim 3)**, Etherphone teaches the computer program product of claim 2 wherein the program code for establishing a point-to-point communication link further comprise: program code for transmitting, from the first process to the server process, a query as to whether the second process is connected to the computer network (Swinehart, pg. 2, 4, Zellweger, pg. 5, whereby queries are transmitted to Voice Control Server); and program code for receiving a network protocol address of the second process from the server process, when the second process is connected to the computer network (Swinehart, pg. 2, whereby the server sends the network protocol address of the logged in user to caller process on request).

Referring to **(Claim 5)**, Etherphone teaches in a computer system having a display, the computer system capable of executing a first process and communicating with other processes and a server process over a computer network (Zellweger, pg. 1, 3, Terry, pg. 4, whereby a computer program product connects first and second processes over a network using a server), a method for establishing point-to-point communications with other processes comprising: B. establishing a communication connection with the server process once the assigned network protocol of the first process is known and C. forwarding the assigned network protocol address of the first process to the server process upon establishing a communication connection with the server process (Swinehart, pg. 2, 4, Zelleger, pg. 5, whereby user identity and workstation address are transmitted to the Voice Control Server when connected); and D. establishing a point-to-point communication with another process over the computer network (Swinehart, pg. 4, whereby after acquiring the network address of a callee, voice datagrams are transmitted directly amont the participants, bypassing the control server).

However, Etherphone does not explicitly teach A. determining the currently assigned network protocol address of the first process upon connection to the computer network.

Vin teaches an Etherphone implementation whereby Internet communications and IP addresses are used (Vin, page 77 and Figure 5).

RFC 1531 teaches dynamically assigning IP addresses on a TCP/IP network by an Internet access server (RFC 1531, Section 2.2).

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

Referring to **(Claim 6)**, Etherphone teaches the method of claim 5 wherein the program step D comprises transmitting, from the first process to the server process, a query as to whether a second process is connected to the computer network (Swinehart, pg. 2, 4, Zellweger, pg. 5, whereby queries are transmitted to Voice Control Server); and receiving a network protocol address of the second process from the server process, when the second process is connected to the computer network (Swinehart, pg. 2, whereby the server sends the network protocol address of the logged in user to caller process on request).

10) Claims 8-9, 14-15, and 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable by Etherphone, further in view of Pinard.

Referring to **(Claim 8)**, Etherphone teaches in a computer system having a display and capable of executing a process, a method for establishing a point-to-point communication from a caller process to a callee process over a computer network, the caller process capable of generating a user interface and being operatively connected to the callee process and a server process over the computer network (Zellweger, pg. 1, 3, Figure 1, Swinehart Figures 1-10), the method comprising the steps of: querying the server process to determine if the first callee process is accessible (Swinehart, pg. 2, 4, Zellweger, pg. 5, whereby a query is transmitted to determine the location of a second Etherphone by contacting a server); and establishing a point-to-point communication link from the caller process to the first callee process (Swinehart, pg. 2, Zellweger, Figure 4, whereby voice datagrams are transmitted directly among participants).

However, Etherphone does not explicitly teach generating a user-interface element representing a first communication line, generating a user interface element representing a first callee process, and establishing the link in response to a user associating the element representing the first callee process with the element representing the first communication line

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

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to utilizing the user-interface elements and interactions taught by Pinard in the invention taught by Etherphone since Pinard teaches that the invention can be used with any system in which a personal computer in conjunction with a server operates (Pinard, col. 2 lines

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

Referring to **(Claim 9)**, Etherphone teaches the method of claim 8 wherein step C further comprises the steps of: querying the server process as to the on-line status of the first callee process (Swinehart, pg. 2, 4, Zellweger, pg. 5, whereby queries are transmitted to Voice Control Server); and receiving a network protocol address of the first callee process over the computer network from the server process (Swinehart, pg. 2, whereby the server sends the network protocol address of the logged in user to caller process on request).

Referring to **(Claims 14-15)**, Etherphone teaches the above. However, Etherphone does not explicitly teach generating a user interface element representing a communication line having a temporarily disabled status; and temporarily disabling the point-to-point communication between the caller process and the first callee process, in response to the user associating the element representing the first callee process with the element representing the communication line having a temporarily disabled status, and wherein the element generated represents a communication line on hold status.

Pinard teaches a "hard hold" icon to which saller/callees may be dragged to be put on hold status (Pinard, Figure 12, col. 6 lines 36-53).

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

Referring to **(Claims 17-18)**, Etherphone teaches_wherein the display further comprises a visual display (Swinehart, Fig. 1-10, Zellweger, Fig. 3-4, whereby computer displays are considered visual displays), and wherein the user interface is a graphic user interface and the user-interface elements generated in steps A and B are graphic elements (Swinehart, Fig. 1-10, Zellweger, Fig. 3-4, whereby a GUI is used showing graphic elements of call display).

11) Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable by Etherphone, further in view of Pinard, further in view of VocalChat User's Guide.

Referring to **(Claim 16)**, Etherphone teaches the above. However, Etherphone does not explicitly teach wherein the element generated represents a communication line on mute status.

VocalChat User's Guide teaches the use of a MUTE option on a phone so that a user can talk without being heard by the other user's system (VocalChat User's Guide, pg. 57).

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to utilize an element representing a communication line on MUTE status in the invention taught by Etherphone and Pinard above since all three references relate to the field of communications over a computer network, since VocalChat and Pinard utilize a computer system for telephony features specifically, and since examiner notes that the use of a MUTE feature in telephone conversations is old and well known in the art.

Issue 3

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

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

"Readme": VocalChat Readme File, Version 2.02

"Networking Information": VocalChat 1.01 Networking Information

"Help File": VocalChat Information, Version 2.02

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

13) Claims 1-3 and 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable by the combination of all five VocalChat references listed above (hereafter "VocalChat References"), further in view of RFC 1531.

Referring to **(Claim 1)**, VocalChat teaches a computer program product for use with a computer system having a display, the computer system capable of executing a first process and connecting to other processes and a server process over a computer network (User's Guide, pg. 8, 11, Network Information, pg. 10, whereby users connect via a network through data received from a server), the computer program product comprising a computer usable medium having computer readable code means embodied in the medium comprising:

a. program code for generating a user-interface enabling control a first process executing on the computer system (User's Guide, pg. 11, whereby a GUI is used);

c. program code responsive to the currently assigned network protocol address of the first process, for establishing a communication connection with the server process and for forwarding the assigned network protocol address of the first process and a unique identifier of the first process to the server process upon establishing a communication connection with the server process (Network Information, pg. 10, Troubleshooting Help File, pg. 28, Help File, pg. 2, Readme File, pg. 2, whereby clients transmit name and address to be stored on a server Post Office); and

d. program code, responsive to user input commands, for establishing a point-to-point communications with another process over the computer network (Help File, pg. 17, User Guide, pg. 2, whereby communication between users is established).

In addition, VocalChat teaches the use of TCP/IP (Troubleshooting Help File, pg. 28). However, VocalChat does not explicitly teach b. program code for determining the currently assigned network protocol address of the first process upon connection to the computer network.

RFC 1531 teaches dynamically assigning IP addresses on a TCP/IP network by an Internet access server (RFC 1531, Section 2.2).

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

Referring to **(Claim 2)**, VocalChat teaches the computer program product of claim 1 wherein the program code for establishing a point-to-point communication link further comprises program code, responsive to the network protocol address of a second process, for establishing a point-to-point communication link between the first process and the second process over the computer network (Help File, Pg. 17, User Guide, pg. 2, whereby users connected to each other over a network utilizing addresses received from a server).

Referring to **(Claim 3)**, VocalChat teaches the computer program product of claim 2 wherein the program code for establishing a point-to-point communication link further comprise: program code for transmitting, from the first process to the server process, a query as to whether the second process is connected to the computer network (Help File, pg. 8, 22, whereby an IP address is provided in response to a query if a callee is connected); and program code for receiving a network protocol address of the second process from the server process, when the second process is connected to the computer network (Help File, pg. 22, whereby network addresses are received in response to queries).

Referring to **(Claim 5)**, VocalChat teaches in a computer system having a display, the computer system capable of executing a first process and communicating with other processes and a server process over a computer network (User's Guide, pg. 8, 11, Network Information, pg. 10, whereby users connect via a network through data received from a server), a method for establishing point-to-point communications with other processes comprising: B. establishing a communication connection with the server process once the assigned network protocol of the first process is known and C. forwarding the assigned network protocol address of the first process to the server process upon establishing a communication connection with the server process (Network Information, pg. 10, Troubleshooting Help File, pg. 28, Help File, pg. 2, Readme File, pg. 2, whereby clients transmit name and address to be stored on a server Post Office); and D. establishing a point-to-point communication with another process over the computer network (Help File, pg. 17, User Guide, pg. 2, whereby communication between users is established).

In addition, VocalChat teaches the use of TCP/IP (Troubleshooting Help File, pg. 28). However, VocalChat does not explicitly teach A. determining the currently assigned network protocol address of the first process upon connection to the computer network.

RFC 1531 teaches dynamically assigning IP addresses on a TCP/IP network by an Internet access server (RFC 1531, Section 2.2).

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

Referring to **(Claim 6)**, VocalChat teaches the method of claim 5 wherein the program step D comprises transmitting, from the first process to the server process, a query as to whether a second process is connected to the computer network (Help File, pg. 8, 22, whereby an IP address is provided in response to a query if a callee is connected); and receiving a network protocol address of the second process from the server process, when the second process is connected to the computer network (Help File, pg. 22, whereby network addresses are received in response to queries).

14) Claims 8-9, 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable by VocalChat, further in view of Pinard.

Referring to **(Claim 8)**, VocalChat teaches in a computer system having a display and capable of executing a process, a method for establishing a point-to-point communication from a caller process to a callee process over a computer network, the caller process capable of generating a user interface and being operatively connected to the callee process and a server process over the computer network (Help File, pg. 17, User Guide, pg. 2), the method comprising the steps of: querying the server process to determine if the first callee process is accessible (Help File, pg. 2, 26, Network Information, pg. 10, whereby a server can receiver queries to determine status and information of users); and establishing a point-to-point communication link from the caller process to the first callee process (Help File, pg. 14, 20-22, whereby calls are made between users via network address).

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

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

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

Referring to **(Claim 9)**, VocalChat teaches the method of claim 8 wherein step C further comprises the steps of: querying the server process as to the on-line status of the first callee process (Help File, pg. 8, 22, whereby an IP address is provided in response to a query if a callee is connected); and receiving a network protocol address of the first callee process over the computer network from the server process (Help File, pg. 22, whereby network addresses are received in response to queries).

Referring to **(Claims 14-15)**, VocalChat teaches the above. However, VocalChat does not explicitly teach generating a user interface element representing a communication line having a temporarily disabled status; and temporarily disabling the point-to-point communication between the caller process and the first callee process, in response to the user associating the element representing the first callee process with the element representing the communication line having a temporarily disabled status, wherein the element generated represents a communication line on hold status.

Pinard teaches a "hard hold" icon to which saller/callees may be dragged to be put on hold status (Pinard, Figure 12, col. 6 lines 36-53).

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

Referring to **(Claim 16)**, VocalChat teaches wherein the element generated represents a communication line on mute status (VocalChat User's Guide, pg. 57, whereby a MUTE option can be used so a user can talk without being heard by the other user's system).

Referring to **(Claims 17-18)**, VocalChat teaches_wherein the display further comprises a visual display (User's Guide, pg. 11, whereby computer displays are considered visual displays), and wherein the user interface is a graphic user interface and the user-interface elements generated in steps A and B are graphic elements (User's Guide, pg. 11-26, whereby a GUI is used showing graphic elements of call display).

Conclusion

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

By U.S. Postal Service Mail to:

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

By FAX to:

(571) 273-9900
Central Reexamination Unit

By hand to:

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

By EFS-Web:

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

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

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

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

/Alexander J Kosowski/

Primary Examiner, Art Unit 3992

CML
ESK

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 1 of 1	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

NON-PATENT REFERENCES

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

Examiner Signature		Date Considered	

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

Electronic Acknowledgement Receipt

EFS ID:	5873861
Application Number:	90010422
International Application Number:	
Confirmation Number:	6565
Title of Invention:	Graphic User Interface For Internet Telephony Application
First Named Inventor/Applicant Name:	6,009,469
Customer Number:	42624
Filer:	Michael Raymond Casey
Filer Authorized By:	
Attorney Docket Number:	2655-0185
Receipt Date:	12-AUG-2009
Filing Date:	26-FEB-2009
Time Stamp:	13:52:55
Application Type:	Reexam (Third Party)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	N2PIDS_02063.pdf	257079 9077c94fc8f614df35da9f7f213079fb742610d7	no	2

Warnings:

Information:

2	Information Disclosure Statement (IDS) Filed (SB/08)	N2PIDS_02065.pdf	135592 6e5d8d42ad1bf741500657bc2dcf4594147efbac	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	NPL Documents	N2PIDS_02100.pdf	7508718 5746764fc5941ad1219fab6873a3f311ed436bf0	no	66
Warnings:					
Information:					
4	NPL Documents	N2PIDS_02166.pdf	6806160 e5f84cd3022bf393d6052237c341fc4a78616503	no	67
Warnings:					
Information:					
5	NPL Documents	N2PIDS_02233.pdf	6987289 25ba8ceecec040367e21e1fdfb5f5a6fcd50c600	no	60
Warnings:					
Information:					
6	Reexam Certificate of Service	N2PIDS_02078_COS.pdf	21706 1a8b052cea43fd90e6f3de54729dca4e47d2bd7a	no	1
Warnings:					
Information:					
			Total Files Size (in bytes):	21716544	

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

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

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

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

In The United States Patent And Trademark Office

In re PATENT APPLICATION OF:	Attorney Docket: 2655-0185
Net2Phone, Inc.	Group Art Unit: 3992
Control No.: 90/010,422	Examiner: KOSOWSKI, Alexander J.
Issue Date: December 28, 1999	Date: August 12, 2009
Title: **GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION**	Confirmation No.: 6565

Information Disclosure Statement

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

Sir:

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

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

☐ The Examiner's attention is directed to co-pending U.S. Patent Control Nos. 90/010,424, 90/010,421, 90/010,416 and 90/010,423 which are involved in the same litigation as the patent corresponding to the present re-examination. The identification of this U.S. Patent Application is not to be construed as a waiver of secrecy as to that application now or upon issuance of the present application as a patent. The Examiner is respectfully requested to consider the cited application and the art cited therein during examination.

CHARGE STATEMENT: Deposit Account No. 501860, order no. **2655-0185**.

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

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

CUSTOMER NUMBER

42624

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

Respectfully submitted,

By: /Michael R. Casey /

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

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified)	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
Sheet 1 of 5	Confirmation No.	6565

NON-PATENT REFERENCES

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

Examiner Signature		Date Considered	

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

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 2 of 5		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

NON-PATENT REFERENCES

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

Examiner Signature		Date Considered	

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

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 3 of 5		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

NON-PATENT REFERENCES

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

Examiner Signature		Date Considered	

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

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 4 of 5	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

NON-PATENT REFERENCES

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

Examiner Signature		Date Considered	

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

N2PIDS_02005

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified)	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
Sheet 5 of 5	Confirmation No.	6565

NON-PATENT REFERENCES

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

Examiner Signature		Date Considered	

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

N2PIDS_02006

Electronic Acknowledgement Receipt

EFS ID:	5869609
Application Number:	90010422
International Application Number:	
Confirmation Number:	6565
Title of Invention:	Graphic User Interface For Internet Telephony Application
First Named Inventor/Applicant Name:	6,009,469
Customer Number:	42624
Filer:	Michael Raymond Casey
Filer Authorized By:	
Attorney Docket Number:	2655-0185
Receipt Date:	11-AUG-2009
Filing Date:	26-FEB-2009
Time Stamp:	18:06:49
Application Type:	Reexam (Third Party)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	26550185Xmittal.pdf	251587 e38895e1779000ed5dbfda946618b791c4eef4ac	no	2

Warnings:

Information:

2	Information Disclosure Statement (IDS) Filed (SB/08)	26550185_1449.pdf	798432 ea92a9ed4bfc4793db8c20aa6a3934b16383c3a0	no	5
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Information:					
This is not an USPTO supplied IDS fillable form					
3	NPL Documents	N2PIDS_00387.pdf	1248303 103f829551fe55b548a541d669beda6cad272089	no	25
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4	NPL Documents	N2PIDS_00412.pdf	3962848 1af848ed034593c08abb73fe5d189f1e6f7f5298	no	45
Warnings:					
Information:					
5	NPL Documents	N2PIDS_00457.pdf	2698601 ce8f9d9f9808e5c59d3b34fab8c77ca89aeb825f	no	50
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6	NPL Documents	N2PIDS_00507.pdf	1838285 37c19558ce807b15bbead7b7636c9d0f18f07a6f	no	50
Warnings:					
Information:					
7	NPL Documents	N2PIDS_00557.pdf	1953095 3a1ccc92e0a0e581163917ecdc9acc66de6c098f	no	50
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8	NPL Documents	N2PIDS_00607.pdf	3476450 b193aab143feb3aa818b3e418060396134387793	no	50
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9	NPL Documents	N2PIDS_00657.pdf	3241310 70cbfb7c1eb6c50d82b67074772470e507b91cde	no	77
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11	NPL Documents	N2PIDS_00769.pdf	4202699 b4c92116877442bcd04bd6debf7d14595fb9a731	no	34
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12	NPL Documents	N2PIDS_00803.pdf	4152068 7b3a2e2ddcdeffd164f8a1cfc96d610e8b846617	no	42
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13	NPL Documents	N2PIDS_00845.pdf	4330148 c432255361158b4e81c3b1bb0d51e0574242a578	no	69
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14	NPL Documents	N2PIDS_00914.pdf	2944261 080bb981dd8437b6157018b86fc3befc6ea75db8	no	50
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15	NPL Documents	N2PIDS_00964.pdf	4490177 7d1ee36dc21fea4ded879265154bb7945a02315d	no	50
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16	NPL Documents	N2PIDS_01014.pdf	4260549 3cdd0ff0c98cae3e3cae281b22424495215e177f	no	50
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17	NPL Documents	N2PIDS_01064.pdf	3030407 4ac0890d3df0b3d2e76bc806eea54f876a6dad9c	no	50
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Information:					
18	NPL Documents	N2PIDS_01114.pdf	2797371 1aa57c3ffc28f68e2b72007b078334fd902a037f	no	50
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19	NPL Documents	N2PIDS_01164.pdf	2757821 7b7842735401ba137dd0536afd9e0833119a0e19	no	50

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20	NPL Documents	N2PIDS_01214.pdf	2751710 ef893e52560ecd5e62dcd743fb915147bde65a5b	no	50
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21	NPL Documents	N2PIDS_01264.pdf	2069106 df95a3266f4b04540ff5230cbf06f520e2a80bd1	no	47
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22	NPL Documents	N2PIDS_01311.pdf	4119057 b220edcf06eed135dc679c8358b50fad44b347d2	no	83
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23	NPL Documents	N2PIDS_01394.pdf	3968881 4af783e9b0d04ff379bba2fc7dfcfa52b9b1d311	no	58
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24	NPL Documents	N2PIDS_01452.pdf	1920359 3b013b03ee0d9b44a7aad1c6e1d3b56344860c7d	no	39
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25	NPL Documents	N2PIDS_01491.pdf	3401591 364aed57efd1a9a5a36c818e1e65dc90a11abd54	no	56
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26	NPL Documents	N2PIDS_01547.pdf	4441250 15d16abc2d22fc670e1b3af1890142dbe41d6c87	no	71
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27	NPL Documents	N2PIDS_01618.pdf	2566762 26a8065e8fe33d88e2ed93572052aa6e784b30cc	no	40
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28	NPL Documents	N2PIDS_01658.pdf	2270928 14e4e22968011b9eda59be02c0cc42a7d30cbef4	no	36

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29	NPL Documents	N2PIDS_01694.pdf	1540394 6ec7be7e68a603a25c0fafd57a479064eac8d23f	no	23
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30	NPL Documents	N2PIDS_01717.pdf	1150239 05ae46089b0835e058ab04f346c73aa6ea6ca128	no	24
Warnings:					
Information:					
31	NPL Documents	N2PIDS_01741.pdf	2620699 8878a7f238582ef777bb48052fa32342df91bc16	no	50
Warnings:					
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32	NPL Documents	N2PIDS_01791.pdf	1800489 59e0d76f3e3f44657ef083de4d41a22e7ff852f2	no	35
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33	Reexam Certificate of Service	20090811COS.pdf	58475 3e0d0b295f06538e5b37ee165c7654d83165ba4a	no	1
Warnings:					
Information:					
		Total Files Size (in bytes):	90841291		

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

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

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT APPLICATION OF:
Net2Phone, Inc.
Control No.: 90/010,422
Issue Date: December 28, 1999
Title: **GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION**

Attorney Docket: 2655-0185
Group Art Unit: 3992
Examiner: KOSOWSKI, Alexander J.
Date: August 11, 2009
Confirmation No.: 6565

INFORMATION DISCLOSURE STATEMENT

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

Sir:

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

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

☒ The Examiner's attention is directed to co-pending U.S. Patent Control Nos. 90/010,424, 90/010,421, 90/010,416 and 90/010,423 which are involved in the same litigation as the patent corresponding to the present re-examination. The identification of this U.S. Patent Application is not to be construed as a waiver of secrecy as to that application now or upon issuance of the present application as a patent. The Examiner is respectfully requested to consider the cited application and the art cited therein during examination.

CHARGE STATEMENT: Deposit Account No. 501860, order no. **2655-0185**.

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

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

CUSTOMER NUMBER

42624

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

Respectfully submitted,

By: /Michael R. Casey /

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

Re-exam

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT APPLICATION OF:
Net2Phone, Inc.
Control No.: 90/010,422
Issue Date: December 28, 1999
Title: **GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION**

Attorney Docket: 2655-0185
Group Art Unit: 3992
Examiner: KOSOWSKI, Alexander J.
Date: June 11, 2009
Confirmation No.: 6565

INFORMATION DISCLOSURE STATEMENT

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

Sir:

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

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

☒ This Information Disclosure Statement is being filed within three (3) months of the U.S. filing date OR before the mailing date of a first Office Action on the merits. No certification or fee is required.

☐ This Information Disclosure Statement is being filed more than three (3) 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.

> ☐ I hereby certify 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 (3) months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(1).
>
> ☐ I hereby certify 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 or, to my knowledge after making reasonable inquiry, was known to any individual designated in 37 C.F.R. § 1.56(c) more than three (3) months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(2).
>
> ☐ Attached is our check no. _____ in the amount required under 37 C.F.R. § 1.17(p). Please credit or debit Deposit Account No. 501860 as needed to ensure consideration of the disclosed information. A duplicate copy of this paper is attached.

☐ This Information Disclosure Statement is being filed more than three (3) 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. Applicant(s) hereby requests that the Information Disclosure Statement be considered. Attached is our check in the amount required under 37 C.F.R. § 1.17(p). Please credit or debit

Deposit Account No. 501860 as needed to ensure consideration of the disclosed information. A duplicate copy of this paper is attached.

☐ I hereby certify 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 (3) months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(1).

☐ I hereby certify 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 (3) months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(2).

☐ Relevance of the non-English language reference(s) is/are discussed in the present specification.

☐ The reference(s) was/were cited in a counterpart foreign application. An English language version of the foreign search report is attached for the Examiner's information.

☐ A concise explanation of the relevance of the non-English language reference(s) appear(s) in the Appendix hereto.

☐ 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.

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

CHARGE STATEMENT: Deposit Account No. 501860, order no. **2655-0185**.

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

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

CUSTOMER NUMBER

42624

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

Respectfully submitted,

By: Michael R. Casey

Michael R. Casey, Ph.D.
Registration No.: 40,294

N2P-IDS00364

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 1 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document No.	Publication/ Issue Date	Name of Patentee or Applicant of Cited Document
	1-1	US-4313035	1982/01/26	Jordan et al.
	1-2	US-4423414	1983/12/27	Bryant et al.
	1-3	US-4491693	1985/01/01	Sano et al.
	1-4	US-4602132	1986/07/22	Nagatomi et al.
	1-5	US-4653090	1987/03/24	Hayden, C.
	1-6	US-4658093	1987/14/04	Hellman
	1-7	US-4706274	1987/11/10	Baker et al.
	1-8	US-4754479	1988/06/28	Bicknell et al.
	1-9	US-4755985	1988/07/05	Jayapalan et al.
	1-10	US-4756020	1988/07/05	Fodale
	1-11	US-4759056	1988/07/19	Akiyama
	1-12	US-4800488	1989/24/01	Agrawal et al.
	1-13	US-4823374	1989/04/18	Verlohr
	1-14	US-4827411	1989/05/02	Arrowood
	1-15	US-4899333	1990/06/02	Roediger
	1-16	US-4899373	1990/02/06	Lee et al.
	1-17	US-4914571	1990/04/03	Baratz et al.
	1-18	US-4928306	1990/05/22	Biswas et al.
	1-19	US-4953159	1990/08/28	Hayden, C.
	1-20	US-4962449	1990/10	Schlesinger
	1-21	US-5109403	1992/04/28	Sutphin
	1-22	US-5113499	1992/05	Ankney et al.
	1-23	US-5127001	1992/30/06	Steagall, et al.
	1-24	US-5134648	1992/07/28	Hochfield et al.

Examiner Signature		Date Considered	

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

N2P-IDS00026

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 2 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document No.	Publication/ Issue Date	Name of Patentee or Applicant of Cited Document
	2-1	US-5136716	1992/08/04	Harvey et al.
	2-2	US-5153908	1992/10/06	Kakizawa et al.
	2-3	US-5159592	1992/10	Perkins
	2-4	US-5164988	1992/11/17	Matyas et al.
	2-5	US-5185860	1993/02/09	Wu
	2-6	US-5195086	1993/03/16	Baumgartner et al.
	2-7	US-5301324	1994/04	Dewey et al.
	2-8	US-5315705	1994/24/05	Iwami Naoko et al
	2-9	US-5319705	1994/07/06	Halter et al.
	2-10	US-5325524	1994/06/28	Black et al.
	2-11	US-5329619	1994/07/12	Page et al.
	2-12	US-5388213	1995/02/07	Oppenheimer et al.
	2-13	US-5402477	1995/03/28	McMahan et al.
	2-14	US-5402528	1995/03/28	Christopher et al.
	2-15	US-5408526	1995/04/18	McFarland et al.
	2-16	US-5408619	1995/04/18	Oran
	2-17	US-5425028	1995/13/06	Britton et al.
	2-18	US-5434913	1995/07	Tung et al.
	2-19	US-5440632	1995/08/08	Bacon et al.
	2-20	US-5452289	1995/09/19	Sharma et al.
	2-21	US-5461668	1995/10/24	Zdenek et al.
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	2-23	US-5475819	1995/12	Miller et al.
	2-24	US-5481720	1996/02/01	Loucks et al.

Examiner Signature		Date Considered	

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

N2P-IDS00027

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 3 of 67	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document No.	Publication/ Issue Date	Name of Patentee or Applicant of Cited Document
	3-1	US-5499295	1996/12/03	Cooper
	3-2	US-5502727	1996/03/26	Catanzaro et al.
	3-3	US-5515508	1996/05/07	Pettus et al.
	3-4	US-5533110	1996/02/07	Pinard et al.
	3-5	US-5555290	1996/09/10	McLeod et al.
	3-6	US-5608786	1997/04/03	Gordon
	3-7	US-5615257	1997/03/25	Pezzullo et al.
	3-8	US-5621789	1997/04/15	McCalmont et al.
	3-9	US-5627978	1997/05/06	Altom et al.
	3-10	US-5649194	1997/07	Miller et al.
	3-11	US-5671412	1997/09/23	Christiano
	3-12	US-5684951	1997/04/11	Goldman et al.
	3-13	US-5689641	1997/11/18	Ludwig et al.
	3-14	US-5692180	1997/11	Lee
	3-15	US-5724648	1998/03/03	Shaughnessy et al.
	3-16	US-5734828	1998/31/03	Pendse et al.
	3-17	US-5774656	1998/06/30	Hattori et al.
	3-18	US-5790803	1998/04/08	Kinoshita et al.
	3-19	US-5815665	1998/29/09	Teper et al.
	3-20	US-5819084	1998/10/08	Shapiro, E.
	3-21	US-5825865	1998/20/10	Oberlander et al.
	3-22	US-5844978	1998/12/01	Reuss et al.
	3-23	US-5883956	1999/03/16	Le et al.
	3-24	US-5953350	1999/09	Higgins

Examiner Signature		Date Considered	

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

N2P-IDS00028

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified)	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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	4-2	US-6009469	1999/12	Mattaway et al.
	4-3	US-6031836	2000/02	Haserodt
	4-4	US-6047054	2000/04	Bayless et al.
	4-5	US-6067350	2000/05/23	Gordon, A.
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Examiner Signature		Date Considered	

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N2P-IDS00029

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	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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Examiner Initials*	Cite No.	Document No.	Publication Date	Name of Patentee or Applicant of Cited Document	Notes
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Examiner Signature		Date Considered	

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

N2P-IDS00030

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 6 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

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	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

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Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
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	Attorney Docket No.	2655-0185
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Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
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N2P-IDS00033

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified)		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
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*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

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	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified)	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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	First Named Inventor	Mattaway et al.
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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

NON-PATENT REFERENCES

Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
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	Reexam number	90/010,422
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	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

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Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
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*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 18 of 67		
	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

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Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
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*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 19 of 67	Reexam number	90/010,422
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	Confirmation No.	6565

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

INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified)	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

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

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified)	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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	First Named Inventor	Mattaway et al.
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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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	Reexam number	90/010,422
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	Patent Under Re-Exam	6009469
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Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
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	Reexam number	90/010,422
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*Examiner: Initial if reference was considered, whether or not citation is in conformance with MPEP 609. Draw a line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant. Notes: If identified, the following is provided: EA = English Abtract, T = Translation, PF = Patent Family.

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	Reexam number	90/010,422
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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
	Confirmation No.	6565

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Examiner Initials*	Cite No.	Non-patent Reference bibliographic information, where available	Notes
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	Reexam number	90/010,422
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	Examiner Name	KOSOWSKI, ALEXANDER J
	Attorney Docket No.	2655-0185
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	Attorney Docket No.	2655-0185
	Confirmation No.	6565

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT FORM PTO-1449 (modified) Sheet 31 of 67	Reexam number	90/010,422
	First Named Inventor	Mattaway et al.
	Patent Under Re-Exam	6009469
	Issue Date	1999/12/28
	Group Art Unit	3992
	Examiner Name	KOSOWSKI, ALEXANDER J
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N2P-IDS00056