IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF VIRGINIA
NORFOLK DIVISION

INNOVATIVE COMMUNICATIONS TECHNOLOGIES, INC., Plaintiff,	)	C.A. No. 2:12-CV-7-RGD-FBS
	)	C.A. No. 2:12-CV-8-RGD-DEM
vs.	)	C.A. No. 2:12-CV-9-RGD-TEM
VIVOX, INC., OOVOO, LLC, & STALKER SOFTWARE, INC. Defendants.	)	

ICTI'S MARKMAN BRIEF

The Federal Circuit recently strengthened its view that in almost all patent cases a patent claim's plain language should control. To ensure that this is the case, the Federal Circuit has set a high bar for a party seeking to depart from this presumption. This is especially true here, where the terms at issue (*e.g.*, "query," "off-line message," and "computer usable medium") are straightforward and easy to understand. Rather than following this rule, and focusing this Court's attention on the one or two ***actual*** disputes, Defendants have elected to take a "shotgun" approach to claim construction, asking this Court to adopt overly-complicated definitions for ***twelve separate terms***,[1] in hopes that one of their numerous arguments sticks. The Federal Circuit has soundly rejected such arguments.

Defendants' efforts to create non-infringement arguments by claim construction are unsurprising, as they will have an exceedingly difficult time challenging the validity of these

[1] Just twenty-four hours before the parties' *Markman* briefs were due, and four minutes after this Court granted Defendants' motion to file an overlength brief (based in part on the number of terms at issue), Defendants notified ICTI that they no longer planned to seek construction of four (25%) of the terms (term numbers 7, 10, 11 and 13 in C.A. No. 2:12-cv-8, Dkt. 32-A) originally at issue. Ex. A at 2-3. When ICTI suggested that Defendants should apprise this Court that the facts underlying its grant of an overlength brief had changed, Defendants decided to re-add two terms (numbers 11 and 13, an offline message and online message) and nevertheless use the additional pages. Ex. A at 2. Defendants' gamesmanship on this point is proof that they have added terms to this Court's docket just to see what might stick. *See infra* Section III.1.

patents. The patents-in-suit have been initially examined and then fully reexamined by the Patent Office (where ***over a thousand*** prior art references were cited). Defendants' chances of invalidating these patents are remote, at best.

I. BACKGROUND OF THE INVENTION

The inventions described in the patents-in-suit solved a key problem in using the internet for communication—a user's "address" can change. Computers linked to the internet have what is known as an Internet Protocol ("IP") address. *See* Ex. B, '704 Patent col.1 ll.22-26. An IP address is analogous to the street address or phone number of a computer on the internet. Just as each street address directs us to a building and each phone number directs us to a telephone on the public telephone network, each IP address directs us to a computer on the internet. Thus, anyone wishing to initiate communication with a user must first get the IP address associated with that user's computer.

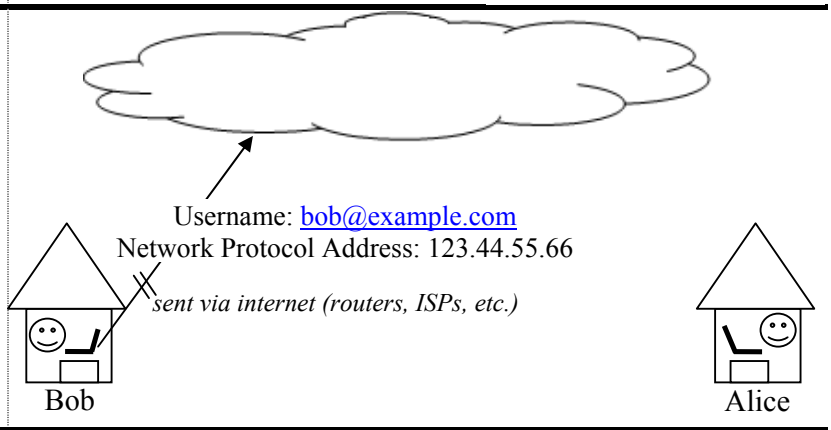
What makes this process uniquely difficult is that, unlike a street address or a phone number, an IP address may be "dynamic" and may change as often as every time a user connects to the internet.[2] *Id*. at col.1 ll.35-47. As the inventors explained during prosecution of the '704 Patent, "[o]ne of the major factors inhibiting dynamic communications over the Internet, and other computer networks, is the ***inability to obtain the current dynamically assigned network protocol address of a user*** process connected to the network. This problem is analogous to trying to call someone whose telephone number changes after each call." Ex. C, '704 Patent File History, Dec. 2, 1997 Amend. at p. 7-8 (emphasis added).

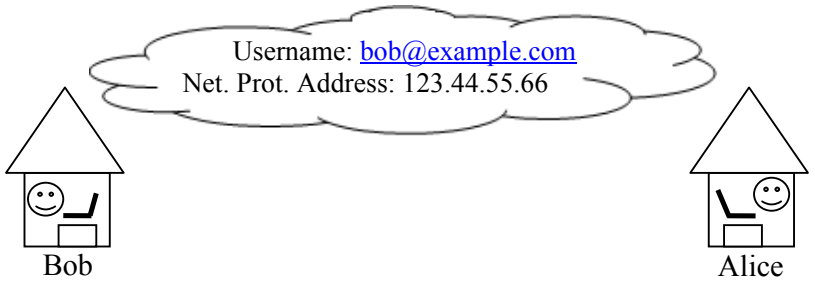
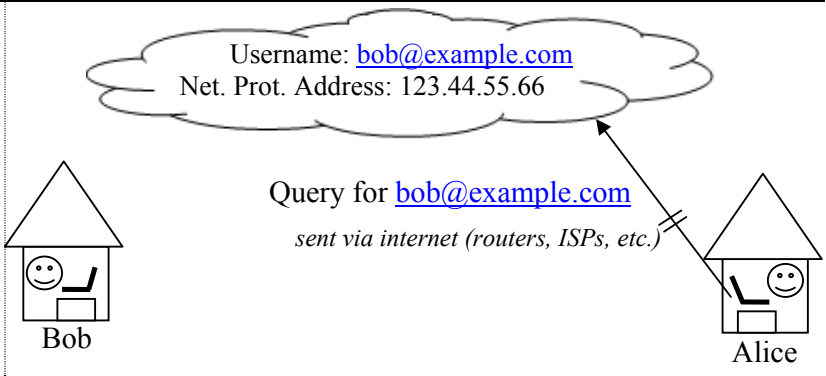
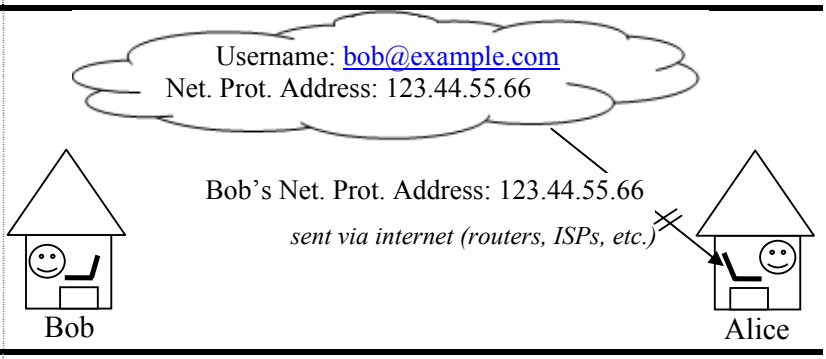
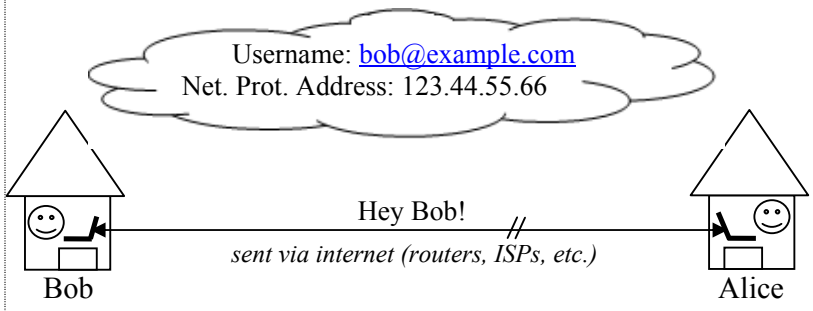
The patents-in-suit provide an elegant solution to this long-standing problem. If Bob wants to communicate on the internet, he creates a username (*e.g.*, bob@example.com). From

[2] For instance, Bob may log in from home then later log in from a local coffee shop.

that point forward, when Bob logs on to the claimed computer network, the software associates Bob's username (*e.g.*, bob@example.com) with his ***current*** IP address (*e.g.*, 123.45.67.89) and sends the username and/or the IP address to a server. Ex. B, '704 Patent col.5 ll.24-28.

If Alice wishes to call Bob, Alice's computer contacts the server. *Id*. at col.5 ll.55-67. The server checks to see whether Bob is on-line (via his username) and looks up the IP address that is currently assigned to Bob's computer. *Id*. at col.5 ll.55-67. Alice's computer uses the information from the server to locate Bob's computer. *Id*. Alice's computer then establishes a telephone-like connection over which Alice and Bob can communicate. *Id*. The crux of the invention is facilitating Alice and Bob's user-to-user communication, referred to as "point-to-point" in the patents-in-suit. The drawings below illustrate the essence of the invention:

Problem Bob has a "dynamic network protocol address" which may change from time to time. Alice does not know when Bob's address changes and so cannot contact him directly over the internet.	 Bob's Network Protocol Address: 123.44.55.66 "I wish I knew Bob's address so I could contact him directly"
Step 1 Bob logs on, ICTI's system associates his network protocol address (*e.g.*, his "IP address") with his username. The software then sends the associated username and IP address to a server.	

Step 2 The "server" stores Bob's information in its "database."	
Step 3 Alice wants to communicate with Bob online. Alice logs on, and Alice's software "queries" the "server" to determine if Bob is "on-line."	
Step 4 In response to Alice's request, if Bob is on-line, ICTI's system sends Bob's current IP address to Alice.	
Step 5 Alice may then establish a "point-to-point" connection with Bob, just like a traditional telephone line.	

II. BACKGROUND ON THE PATENTS-IN-SUIT

The patents at issue are U.S. Patent Nos. 6,108,704 ("'704 Patent") (Ex. B); 6,131,121 ("'121 Patent") (Ex. D); 6,009,469 ("'469 Patent") (Ex. E); 6,701,365 ("'365 Patent") (Ex. F); and 6,513,066 ("'066 Patent") (Ex. G). The original patent application describing Net2Phone's

invention was filed on September 25, 1995; it issued as the '704 Patent. The four remaining patents all issued from applications that claim priority to that original application. Two of them—the '066 and '365 Patents—have virtually identical written descriptions with the '704 Patent. The other two—the '121 and '469 Patents—are what is known as continuations-in-part of the '704 Patent, and contain not only the content of the original application that led to the '704 Patent, but also additional content that further describes the claimed inventions. A family tree of the patents is attached as Exhibit H. All of the asserted patents were reexamined and the Patent Office confirmed the validity of each of the asserted claims (with minor amendments to only one of those claims).

III. APPLICABLE LAW

Phillips v. AWH Corp. is the seminal case on claim construction. 415 F.3d 1303 (Fed. Cir. 2005) (en banc). Per *Phillips*, claims should be read as having "the meaning that the term would have to a person of ordinary skill in the art in question at the time of the . . . effective filing date of the patent application." *Id*. at 1313. Because a person of ordinary skill in the art is understood to have read the claims, specifications, and file histories of the patents at issue, *Phillips* holds that statements from such "intrinsic evidence" are given weight when construing claims. *Id*. Only where this Court is unable to determine the meaning of a claim term after considering the intrinsic evidence—the patent and its prosecution history—may it then look to extrinsic evidence to resolve any ambiguity. *Dow Chem. Co. v. Sumitomo Chem. Co., Ltd.*, 257 F.3d 1364, 1373 (Fed. Cir. 2005).

In construing the claims of a patent, the Federal Circuit has repeatedly held that each claim term should generally be given its "ordinary and customary meaning." *Phillips*, 415 F.3d at 1312. To remove ambiguity in this standard, the Federal Circuit earlier this year ruled that there is a "***stringent standard*** for narrowing a claim term beyond its plain and ordinary

meaning." *Aventis Pharm. S.A. v. Hospira, Inc.*, 675 F.3d 1324, 1330 (Fed. Cir. 2012) (emphasis added). Citing the significant case, *Thorner v. Sony Computer Entm't Am. L.L.C.*, 669 F.3d 1362 (Fed. Cir. 2012), the Federal Circuit stated it "will only interpret a claim term more narrowly than its ordinary meaning under ***two circumstances***: '(1) when a patentee ***sets out a definition*** and acts as [its] own lexicographer, or (2) when the patentee ***disavows the full scope of a claim term*** either in the specification or during prosecution.'" *Aventis*, 675 F.3d at 1330 (quoting *Thorner*, 669 F.3d at 1365) (emphasis added). This Court can ***only*** adopt Defendants' narrowed definitions if Defendants can meet one of the two *Thorner* limiting conditions.

Looking specifically at the first condition of the *Thorner* test, "[t]o be his own lexicographer, a patentee must use a special definition of the term [that] is clearly stated in the patent specification or file history." *Laryngeal Mask Co. Ltd. v. Ambu*, 618 F.3d 1367, 1372 (Fed. Cir. 2010) (citations omitted). As *Thorner* itself teaches, "[i]t is not enough for a patentee to simply disclose a single embodiment or use a word in the same manner in all embodiments, the patentee must clearly express an intent to redefine the term." 669 F.3d at 1365 (citations omitted); *see also Abraxis Bioscience, Inc. v. Maybe Pharm. (USA), Inc.*, 467 F.3d 1370, 1376 (Fed. Cir. 2006) (Patentee acted as lexicographer by stating "***by the term*** 'edetate,' ***we mean*** . . ." (emphasis added)).

Looking specifically at the second condition of the *Thorner* test, the patentee must unambiguously disavow claim scope. "A statement in the prosecution history can only amount to disclaimer if the applicant '***clearly and unambiguously***' disavowed claim scope." *Toshiba Corp. v. Imation Corp.*, 681 F.3d 1358, 1367 (Fed. Cir. 2012) (emphasis added and internal citation omitted). The patentee also cannot disavow claim scope in the specification absent a "clear intention to limit the claim scope using words or expressions of manifest exclusion or

restriction, which is necessary to further narrow the claim language." *Linear Tech. Corp. v. Int'l Trade Comm'n*, 566 F.3d 1049, 1058 (Fed. Cir. 2009) (citing cases); *see also Dealertrack, Inc. v. Huber*, 674 F. 3d 1315, 1327 (Fed. Cir. 2012) ("it is improper to read limitations from a preferred embodiment described in the specification—even if it is the only embodiment—into the claims absent a ***clear indication in the intrinsic record*** that the patentee intended the claims to be so limited" (emphasis added)).

1. Governing Federal Circuit law requires a Court to construe claim terms to have their plain and ordinary meaning in most circumstances.

ICTI's position is that most of the terms at issue have a plain and ordinary meaning.[3] This is true of the vast majority of claim terms in this case, to be sure. The parties agree that this Court need not further interpret even technical words such as "Internet Protocol (IP) address," "network interface" and "E-mail signal." Using the *Markman* procedure to put new words in place of the words the patentee chose is an aberration from how the words in patent claims are handled. As the Federal Circuit succinctly stated: "Courts do not rewrite claims; instead, ***we give effect to the terms chosen by the patentee***." *K-2 Corp. v. Salomon S.A.*, 191 F.3d 1356, 1364 (Fed. Cir. 1999) (emphasis added).

Recent Federal Circuit decisions reject the use of narrowed constructions where the plain and ordinary meaning of a term suffices. For instance, in *ActiveVideo Networks, Inc. v. Verizon Commc'ns, Inc.*, the Federal Circuit affirmed that the Eastern District of Virginia "did not err in concluding that these terms have plain meanings that do not require additional construction." Nos. 2011-1538, 2011-1567, 2012-1129, 2012-1201, 2012 WL 3636908, at *10 (Fed. Cir. Aug.

[3] All of the claim terms where the parties have not sought construction carry their plain and ordinary meaning. Additionally, just yesterday, Defendants "concluded that no construction is necessary and that no instruction on the plain and ordinary meaning" for "certain terms" where they were originally seeking construction. Ex. A at 1.

24, 2012).[4] The Federal Circuit ruled that rejecting the narrow construction offered by the accused infringer resolved the parties' dispute and eliminated the need for further construction. *Id*. ("ActiveVideo's proposed construction erroneously reads limitations into the claims and the district court properly rejected that construction and resolved the dispute between the parties.").

Similarly, in *Toshiba*, the patent holder (Toshiba) proposed that "each limitation should have been given its plain and ordinary meaning, as recited in the claim itself." 681 F.3d at 1367. The district court rejected Toshiba's construction and narrowly construed the claim terms. *Id*. The Federal Circuit reversed the district court in light of its holding in *Thorner*, because the defendant had not proved that either of the two limiting conditions (express definition or unambiguous surrender of claim scope) were met, and instructed the district court to follow the "plain language of the claim" on remand.[5] *Id*. at 1369.

2. Defendants' reliance on prior *Markman* briefing is a red herring.

Defendants stated in their motion for an extension of pages that they intend to rely on statements from Net2Phone's briefing in prior litigation involving these patents. Notably, for many terms, Net2Phone proposed constructions where ICTI simply proposes to use the terms' plain and ordinary meaning. In light of the Federal Circuit's recent caselaw (*Thorner*, *Aventis*,

[4] This was especially true because the construction proposed by the accused infringer (ActiveVideo) was "confusing, unhelpful, add[ed] no clarity to the claim language itself, and [were] erroneous to the extent [they] attempt[] to narrow the claims." *ActiveVideo*, 2012 WL 3636908, at *10.

[5] In addition to *Thorner*, *Aventis*, *Toshiba* and *ActiveVideo* discussed above, several times this year, the Federal Circuit has held that a claim term's plain and ordinary meaning controls. *See, e.g.*, *Smartmetric Inc. v. Am. Exp. Co.*, Nos. 22011-1473, 2011-1497, 2012 WL 1367398, at *2 (Fed. Cir. Apr. 11, 2012) (adopting the accused infringers' construction would "deviate from the term's plain and ordinary meaning, conflict with the specification, and erroneously rewrite the claims"); *Woods v. DeAngelo Marine Exhaust, Inc.*, Case No. 2010-1478, 2012 WL 3683536, at *8 (Fed. Cir. Aug. 28, 2012); *Meyer Intellectual Props. Ltd. v. Bodum, Inc.*, No. 2011-1329, 2012 WL 3329695, at *12 (Fed. Cir. Aug. 15, 2012) ("After careful review of the intrinsic evidence, we find that nothing in the claim language or the patent specification limits the 'providing' step to a specific party.")

Toshiba, *ActiveVideo*, etc.) strongly favoring a plain and ordinary meaning unless two specific conditions are met, ICTI simply proposes "plain and ordinary meaning" as a construction instead of using new words to articulate the plain and ordinary meaning.[6]

IV. TERMS IN DISPUTE

Defendants' scattershot arguments can not trump the careful effort the inventors put into describing their innovation. ICTI asks this Court to permit the claims to retain their plain and ordinary meaning.

1. "computer usable medium" ('704 & '365 Patents)

ICTI	DEFENDANTS	DEFENDANTS' PROBLEM(S)
No construction necessary as this term has a plain and ordinary meaning	"floppy disks, magnetic tapes, compact disks, or other storage media"	A "computer usable medium" is a medium that computers can use. Defendant's construction makes the term more ambiguous because it only discusses transferable storage media, and may[7] preclude media that computers can use that is not transferable and does more than store data—hard drives for example.

Defendants ask this Court to adopt an overly-complicated definition for a self-explanatory term. *See, e.g.*, *Bancorp Svcs., L.L.C. v. Sun Life Assur. Co. of Can. (U.S.)*, 687 F.3d 1266, 1274-75 (Fed. Cir. 2012) (noting the parties agreement that "computer readable media" should carry this plain and ordinary meaning). A computer usable medium is exactly what it

[6] Nor do any statements made in Net2Phone's litigation with Skype carry any estoppel effect; there was no final judgment in the matter, nor did that court issue any rulings construing the patents. *See Reed Elsevier, Inc. v. Muchnick*, 130 S.Ct. 1237, 1249 (2010) (noting that judicial estoppel "typically applies when, among other things, a party has succeeded in persuading a court to accept that party's earlier position, so that judicial acceptance of an inconsistent position in a later proceeding would create the perception that either the first or the second court was misled." (internal quotation omitted)); *see also New Hampshire v. Maine*, 532 U.S. 742, 748-49 (2001) (noting that doctrines of res judicata apply when a prior court reaches judgment on an issue or claim).

[7] ICTI says the construction "may" preclude other media because it is not clear what Defendants mean by "other storage media." This ambiguity is another reason to reject Defendants' construction.

sounds like—a medium having computer readable code. Defendants, however, propose that this Court replace this self-explanatory term with an open-ended list of media, all of which happen to be ***transferable*** storage media. Defendants' proposal appears to try and exclude ***non***-transferable media (such as hard drives), which are also usable by computers.

Applying *Thorner*, the patents ***do*** use the phrase "floppy disks, magnetic tapes, compact disks, or other storage media." They say:

> The processor 14 receives input commands and data from a first user associated … through the input device 18, which … ***may be transferable storage media***, such as floppy disks, magnetic tapes, compact disks, or other storage media ….

Ex. B, '704 Patent col.3 ll.55-62 (emphasis added) (emphasis added). The patents call these things ***transferable storage media***, not ***computer usable media***. *Id*. Thus, the patentee did not act as his own lexicographer for the term "computer usable media."

In the patent file histories, the examiner summarized computer usable medium to be:

> computer usable medium (one or more floppy disks, a CD-ROM, etc ...) having computer readable code means (executable code) embodied in the medium

Ex. I, '469 Patent File History, Apr. 20, 1998 Examiner's Rejection at p. 4.[8] Here, the patentee understood this term in its most basic way as "computer readable code means (executable code) embodied in the medium," and then provided an open-ended list. *Id*. Thus, the patentee did not limit or disavow scope of this claim.

Because Defendants cannot establish either limiting condition of the *Thorner* test, this Court should rule that this term has its plain and ordinary meaning.

[8] For this Court's convenience, ICTI has only provided relevant excerpts of file histories. ICTI will provide full file histories at this Court's request.

2. "dynamically assigned network protocol address" ('704 & '121 Patents)

ICTI	DEFENDANTS	DEFENDANTS' PROBLEM(S)
No construction necessary as this term has a plain and ordinary meaning.	"Network protocol address that is assigned on ***a temporary basis***"	"Dynamically" does not mean "on a temporary basis" by its ordinary meaning or as used in the patents.

Defendants propose that this Court effectively cross out the word "dynamically" in the claims and replace it with "on a temporary basis," even though "dynamically" is not a complicated word. "Dynamically" means changeable; it has nothing to do with how long (or how "temporarily") an address is assigned to a given computer. The plain and ordinary meaning of "dynamically" is ***not*** "on a temporary basis."

Applying *Thorner*, the patentee does not define "***dynamically*** assigned" to mean "assigned on a temporary basis." Quite the opposite—the specification of the '121 Patent suggests there is a ***difference*** between "temporary" and "dynamically assigned" by referring to them as alternatives. *See* Ex. D, '121 Patent col.2 ll.42-60 ("ability to locate users having temporary ***or*** dynamically assigned Internet Protocol address has been difficult…." (emphasis added)). And the patents use "dynamic" more broadly than "temporary." *Id*. at col.2 ll.37-39 ("Due to the dynamic nature of temporary IP addresses of some devices . . .").

Indeed, the patents are clear that a "dynamically assigned network protocol address" may actually be assigned on a long-term basis. The '704 Patent teaches that network protocol addresses are the "device addresses" for "devices interfacing to the internet." Ex. B, '704 Patent col.1 ll.21-26. As the patents teach, network protocol addresses include "IP addresses" that "may be permanent or dynamic." *Id*. at col.1 ll.35-56. The patents further explain that a dynamically assigned network protocol address (*e.g.*, an IP address) is often assigned to a computer by a connection service provider (a.k.a. an "internet service provider" or "ISP") when the computer logs onto the internet. *Id*. at col.5 ll.21-24. Because the internet service provider

assigns the dynamic IP addresses, the address ***can*** be changed as needed but there is no requirement that they ***must*** change regularly. Instead, internet service providers may assign so-called "sticky dynamic IP address" to their customers, which may not change for hours, days, or even months.[9] Thus, while dynamic addresses ***may*** change, there is no requirement that they ***must*** change regularly. In short, while the relative impermanence of these addresses might be considered "temporary" in some sense, importing that word into this claim is misleading since dynamic addresses may remain unaltered for significant periods of time.

Nor can Defendants meet the second prong of the *Thorner* test by showing that the patentee disavowed the full scope of the claim term. The phrase "temporary basis" does not appear in the prosecution history of the '704 or '121 Patents, and Defendants' construction therefore fails the *Thorner* test.

Finally, as a practical matter, Defendants' proposed construction raises questions as to how long an address can be used while still being "assigned on a temporary basis." Claim construction should add clarity, not ambiguity, to this Court's analysis, which is reason enough for this Court to reject Defendants' proposed construction. *See Terlep v. Brinkmann Corp.*, 418 F.3d 1379, 1382 (Fed. Cir. 2005) ("The construction of claims is simply a way of elaborating the normally terse claim language in order to understand and explain, but not to change, the scope of the claims.").

[9] This is, in fact, a requirement of the Dynamic Host Configuration Protocol ("DHCP") under which dynamically assigned network protocol addresses operate. This protocol "permit[s] addresses to be reused ***when a computer process disconnect[s]*** from the network." Ex. J, '066 Patent Reexamination History, Feb. 24, 2009 Response at p. 21 (emphasis added). When a user remains constantly connected to the internet (*e.g.*, a cable or DSL internet user) there is no need to reset or reuse his IP address since the user seldom, if ever, disconnects.

3. "assigned to the process upon connection to the computer network" ('704 and '121 Patents)

ICTI	DEFENDANTS	DEFENDANTS' PROBLEM(S)
No construction necessary as this term has a plain and ordinary meaning.	"***network protocol address*** that is assigned ***on a temporary basis each time*** that a connection is made to the computer network"	There is no basis to require that the claimed system only assign addresses on a "temporary basis each time." Defendants inject "network protocol address" into this phrase.

The term "assigned to the process upon connection to the computer network" is clear as shown in the following exemplary limitation:

> maintaining, in a computer memory, a network accessible compilation of entries, selected of the entries comprising a network protocol address and a corresponding identifier of a process connected to the computer network, the network protocol address of the corresponding process **assigned to the process upon connection to the computer network**

Ex. B, '704 Patent (Claim 33) (emphasis added) (confirmed on reexam). Simply put, when a user connects to the claimed communication system, the system registers a user's current address and associates it with their "corresponding identifier" (*e.g.* user name or email address). This enables the system to facilitate point-to-point communication between users by correlating a user's "identifier" with a user's most current network protocol address (*i.e.* the one utilized when the user logs on to the network).

Defendants' proposed construction again attempts to insert the ambiguous words "on a temporary basis" into an otherwise straightforward claim term. As discussed with respect to "dynamically assigned network protocol address," the intrinsic record provides no support for this construction. There is nothing suggesting the patentee defined "assigned to the process upon connection to the computer network" to require assignment "on a temporary basis," and no indication that the patentee disavowed claim scope as it relates to only the "non-temporary" associations.

Further, Defendants ask this Court to add "network protocol address" into this phrase even though those words never appear. This proposed construction renders parts of the claims superfluous. For example, Claim 33 of the '704 Patent (Ex. B), for instance, would read as follows: "the network protocol address of the corresponding process [*network protocol address that is assigned on a temporary basis each time that a connection is made to the computer network*]." The Federal Circuit regularly rejects any construction that renders claim terms superfluous. *Merck & Co. v. Teva Pharm. USA, Inc.*, 395 F.3d 1364, 1372 (Fed. Cir. 2005) ("A claim construction that gives meaning to all the terms of the claim is preferred over one that does not do so.").

Because Defendants cannot establish either limiting condition of the *Thorner* test, this Court should rule that this term has its plain and ordinary meaning.

4. "server process," "server" & "address server" ('469, '066, '365 & '121 Patents)

ICTI	DEFENDANTS	DEFENDANTS' PROBLEM(S)
No construction necessary as this term has a plain and ordinary meaning	"a computer system, or collection of coordinated computer systems, ***running software that retrieve and/or provide network address/information from a database***"	A "server" is simply a computer system, or collection of coordinated computer systems that serves the requests of others. Servers do not always "retrieve and/or provide network address/information from a database," as Defendants' construction requires.

Defendants seek to construe the "server" terms by adding several by inserting narrowing limitations that the server, for instance, (1) retrieves from a database and (2) retrieves specific network address/information from the database. The plain meaning of "server" is not limited in the way Defendants suggest. Servers are computers or collections of computers that serve the requests of others. Given the simplicity of these terms, this Court need not depart from their plain and ordinary meaning.

Applying *Thorner*, the patent holder neither defined "server" in the specification nor disavowed or otherwise limited the scope of this term. Instead, the patents use "server" in its plain and ordinary sense. For instance, the claims recite a "mail server" "for transmitting an E-mail signal." Ex. D, '121 Patent (claim 1) (not reexamined). Similarly, Figure 9 discusses "DELIVER[ING] THE E-MAIL SIGNAL THROUGH THE INTERNET USING A MAIL SERVER." Ex. G, '066 Patent, fig.9. The mail server doesn't "run software that retrieves specific network address/information from a database." Instead, unsurprisingly, a "mail server" carries its plain and ordinary meaning—it ***serves*** requests to deliver ***mail***. An another example, the "directory server process" handles "quer[ies] as to whether a second process is connected to the computer network." Ex. D, '121 Patent (claim 4) (not reexamined). Accordingly, as listed in the claims and specifications of the patents-in-suit, ***servers*** perform all sorts of functions other than those proposed by Defendants.

Because Defendants cannot establish either limiting condition of the *Thorner* test, this Court should rule that this term has its plain and ordinary meaning.

5. "database" ('066 Patent)

ICTI	DEFENDANTS	DEFENDANTS' PROBLEM(S)
No construction necessary as this term has a plain and ordinary meaning.	"a ***dedicated storage*** medium for retaining a ***centralized collection*** of ***network protocol addresses***"	The plain and ordinary meaning of "database" does not require a computer that is (1) "dedicated" to just storing this information, (2) "centralized" on one system, and (3) committed to just storing "network protocol addresses."

"Database" is an entirely straightforward term that refers to a collection of (usually organized) data. Defendants' proposed claim construction of the simple term "database" is just an effort to manufacture a non-infringement position by requiring the network protocol addresses, and nothing else, be stored in a "dedicated storage medium" as part of a "centralized collection." Under Defendants' construction, if one were to store any additional information on

a storage medium that also contained information regarding the current dynamic address of a given user, the system would suddenly be rendered non-infringing (even if it met each and every limitation of the patents-in-suit) because the storage would not be "dedicated." Similarly, storing the same information on two networked hard drives located in remote locations would invoke the same result because the storage would not be "centralized." This Court should reject this attempt to further limit the straightforward term "database."

Defendants' proposed construction is insupportable under the *Thorner* test because the patentee never defined the term "database" in the '066 Patent and there is no discussion of "dedicated" and "centralized" servers in the claims or specification of the '066 Patent.[10] The '066 Patent's guidance on the meaning of this term indicates that a database may be, but is not limited to, a device capable of "storing . . . E-mail and Internet Protocol (IP) Addresses." Ex. G, '066 Patent col.3 ll.39-55. The specification of the '066 Patent refers to certain exemplary databases, including "an SQL database," but places no limitations on how or where identifiers and addresses must be stored. *Id*. Also, the specification discusses storing more than network protocol addresses—it discusses storing email addresses as well. *Id*. Similarly, there is no disavowal of the applicability of non-dedicated or decentralized storage media in the patents-in-suit. Accordingly, under *Thorner* there is no basis for this Court to depart from the default position advocated by the Federal Circuit that this term be "given [its] ordinary and customary meaning as understood by a person of ordinary skill in the art." *Thorner*, 669 F.3d at 1365.

[10] *See, e.g.*, *MBO Labs, Inc. v. Becton, Dickinson & Co.*, 474 F.3d 1323, 1330-31 (Fed. Cir. 2007) ("[W]e cannot endorse a construction analysis that ***does not identify a textual reference in the actual language of the claim*** with which to associate a proffered claim construction.") (emphasis added).

6. "query" (all patents)

ICTI	DEFENDANTS	DEFENDANTS' PROBLEM(S)
No construction necessary as this term has a plain and ordinary meaning	"question(s)"	A "query" need not be in "question" form, but can be any request.

Defendants ask this Court to narrow the term "query" to those requests ending with a question mark. But the ordinary English word "query" is not so limited, and the claims use the term query in a broader sense.

Applying *Thorner*, there are no instances in which the patentee (a) acted as its own lexicographer and defined "query" or (b) disavowed the full scope of "query" either in the specifications or during prosecution. Instead, the patents confirm that queries are ***not*** limited to questions. Claim 3 of the '365 Patent, for example, recites "receiving a query for one of the network protocol address and the associated identifier …." Ex. F, '365 Patent (claim 3) (confirmed on reexam). Here, the query is simply a specific request for either the "network protocol address" or "the associated identifier"—not a question. Likewise, Table 9 of the '121 Patent, discusses a "query" (request) for "firstName, lastName, company, city, state, country" data. Ex. D, '121 Patent, Table 9. This Court should decline Defendants' invitation to depart from the plain meaning of this term.

7. "an offline message"/"the off-line message"& "online message" ('066 Patent)

ICTI	DEFENDANTS	DEFENDANTS' PROBLEM(S)
No construction necessary as this term has a plain and ordinary meaning.	**Offline Message**: "message indicating that a ***process*** is not online" **Online Message**: "message indicating that a ***process*** is online"	Off-line and on-line messages indicate the status of something (which is specified in the claims at issue). Defendants attempt to inject "process" into an online and offline message flatly contradicts the claims and specification.

This Court should reject Defendants' proposed construction of the terms "an offline message" and "the off-line message" because they vary significantly from the terms' plain meaning. The plain and ordinary meanings of online and offline messages are messages indicating a certain status, namely whether something is "online" or "offline." "Offline message" and "online message" say nothing about ***what*** is online or offline.

Defendants' construction of "offline message" and "online message" as relating solely to a "***process***" is far too narrow, and contradicts the language of the patents. The claims themselves specify many different types of things other than a "process" that can be online or offline, leading to the generation of online or offline messages. In claim 6, for example, a ***second processing unit*** must be online—not a ***process***. Ex. G, '066 Patent (claim 6) ("a connection server, responsive to the query, for determining the on-line status of a second processing unit by searching the database, and for transmitting an online message" (emphasis added)). The '066 Patent specification discusses generating an offline message if a server determines that a ***callee*** is offline—not a ***process***. *Id*. at col.6 ll.43-46 ("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." (emphasis added)); *id*. at col.11 ll.11-16 ("determining if

the connection server 26 is operative to perform the point-to-point internet protocol in step 58 by receiving, at the first processing unit 12, an on-line status signal from the connection server 26, which may include the IP address of the callee or a 'Callee Off-Line' message" (emphasis added)). The patents also discuss a ***user*** being offline when they log off—not a ***process***. *Id*. at col.6 ll.48-51 ("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 …."). By substituting "process," Defendants contradict the claim language and specifications.

In short, the intrinsic record identifies a myriad of things that can be "online" or "offline," including but not limited to, processing units, callees, and users. When any of those entities are "online" or "offline," the patented system will generate corresponding messages. Defendants' effort to limit the construction of these terms to include only "processes" improperly attempts to narrow the scope of this claim term in contravention of the plain language of the patents-in-suit and the Federal Circuit's guidance in *Thorner*.

Because Defendants cannot establish either limiting condition of the *Thorner* test, this Court should rule that this term has its plain and ordinary meaning.

8. "providing one of the network protocol address and the associated identifier of said one process" ('365 Patent)

ICTI	DEFENDANTS	DEFENDANTS' PROBLEM(S)
No construction necessary as this term has a plain and ordinary meaning.	"the server retrieves the network protocol address and identifiers from its database and sends it to the another process"	The claim term clearly requires at least "one of" two pieces of information to be sent while Defendants' construction requires *both* to be sent. Defendants' construction is also nonsensical.

There is nothing complicated about the phrase "providing one of the network protocol address and the associated identifier of said one process." Simply put, the claimed system will provide at least "one of" two available pieces of information (*i.e.* a "network protocol address" or the "identifier" currently associated with that address) for a given user. The plain and ordinary meaning of this term could not be clearer.

Defendants propose a construction that is indefensible for at least two reasons. ***First***, the plain language of the claims indicates that the system need only provide "***one of*** the network protocol and the associated identifier." There is nothing in the '365 Patent to suggest that the patentee intended to define the term "***one of***" to mean "***both***," and such an interpretation would contradict this unambiguous term. Because all that is required is that at least one of two pieces of information be "provided" to a user, Defendants' construction is wrong.

Second, construing this claim term to mean "the server retrieves the network protocol address and identifiers from its database and sends it to the another process" is plainly inappropriate because it renders the claims of the '365 Patent redundant. *Merck*, 395 F.3d at 1372 ("A claim construction that gives meaning to all the terms of the claim is preferred over one that does not do so."). Prior to importing Defendants' construction, the relevant limitation of claim 3 of the '365 Patent reads:

> *providing one of the network protocol address and the associated identifier of said one process* to a said another process over the computer network

Ex. F, '365 Patent (Claim 3) (confirmed on re-exam). But when Defendants' construction is inserted into this limitation, the meaning of this claim term becomes indecipherable:

> [the server retrieves the network protocol address and identifiers from its database and sends it to the another process] to a said another process over the computer network

Id. Reading this limitation in light of Defendants' proposed construction: (1) a servers retrieves ***both*** a network protocol address ***and*** "identifiers" from its database;[11] (2) sends "it" to another process; and (3) sends "it" ***again*** to "a said another process." Moreover, the use of the singular "it" is confounding since Defendants' proposed construction implies that two, not one, pieces of information are "sent." This Court should reject the confusion that would follow from adopting this improper construction.

Because Defendants cannot establish either limiting condition of the *Thorner* test, this Court should rule that this term has its plain and ordinary meaning.

9. "point-to-point" (all patents)

ICTI	DEFENDANTS	DEFENDANTS' PROBLEM(S)
"communications between two processes over a computer network that are not intermediated by a connection server or an address server"	"***direct*** communication, ***initiated solely by one of the processes***, and not intermediated by a connection server, ***gateway, or similar device***"	Defendants' construction requires communication that is "initiated solely by one of the processes" even though the term "point-to-point" has nothing to do with "initiating" communication. Defendants' construction requires point-to-point communication that is not intermediated by a "gateway, or similar device" even though this directly contradicts the patents.

This Court should adopt ICTI's construction because it is consistent with the asserted patents and their prosecution history. In addition, even though Defendants largely agree with ICTI's construction, they seek to import additional limitations and improperly narrow the claims in violation of *Thorner*.

The patents make clear what a "point-to-point" connection is. The '121 Patent describes point-to-point communications as follows: "The primary and secondary point-to-point Internet protocols previously described enable users ***to establish real-time direct communication links***

[11] As discussed above, the '365 Patent only requires "***one of***" these to be retrieved and sent.

over the Internet or other computer networks without the need for any interaction with connection server 26." Ex. D, '121 Patent at col.12 ll.41-45 (emphasis added). ICTI and Defendants agree that, once established, the point-to-point communications are not intermediated by a connection server. And, as the patents explain in the preferred embodiment, a connection server "provides directory information service to WebPhone client processes currently on-line." *Id*. at col.18 ll.19-20 (in section entitled "Connection Server").

The prosecution history of the '365 Patent also supports ICTI's use of "address server" in its construction. The patentee summarized the invention in the prosecution history as follows:

> A second process, wishing to establish communications with the first process, connects to the server and request the network protocol address under which the first process is currently operating. Upon receipt of the network protocol address of the first process, the second process establishes communications with the first process directly, ***without any intervention from the address/information server***.

Ex. K, '365 Patent File History, Apr. 19, 2002 Amend. at p. 4 (emphasis added). ICTI's construction incorporates this explanation by requiring that point-to-point communications are "not intermediated by … an address server."[12] Again, Defendants do not dispute this additional requirement and, in fact, concede that "connection server" and "address server" are synonymous by proposing a single construction for both terms.[13] Thus, Defendants agree with ICTI that point-to-point communications are not intermediated by a connection server or an address server. Defendants, however, attempt to further narrow the term "point-to-point" from the agreed construction in three incorrect ways.

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[12] Defendants do not disagree that every embodiment of the patents in suit involves a point-to-point connection that does not use the connection server. As the patents make clear, the goal of the patented invention is that "users [] establish real-time direct communication links over the Internet or other computer networks without the need for any interaction with connection server 26, ***the connection server providing only directory and information related services***." Ex. E, '469 Patent col.12 ll.51-53.

[13] *See* Defendants' construction "server process," "server" and "address server" in Section IV.4 of this brief.

First, Defendants wish to narrow the term "point-to-point" by incorporating a requirement relating to ***how*** communication is initiated and ***what*** initiates the communication. But that construction changes the scope of the claims, which do not require any specific "initiation" of communication. For example, claim 1 of the '704 Patent discloses "establishing a point-to-point communication link," as do claim 6 of the '066 Patent and claim 12 of the '121 Patent. Exs. B, D & G. The other asserted patents include similar language about establishing point-to-point communications. ***None*** of these claims include a requirement that any one process be "solely" responsible for initiating communications. In fact, claim 6 of the '066 Patent illustrates the ***opposite***, as it describes interactions among a database, a connection server, and a processing unit to support establishing a point-to-point communications link. Ex. G, '066 Patent (claim 6) ("a connection server, responsive to the query, for determining the on-line status of a second processing unit by searching the database, and for transmitting an online message to the first processing unit for establishing a point-to-point communication link"). In sum, the invention enables the establishment of point-to-point communication but says nothing about how to initiate communication.

Second, Defendants seek to further restrict the term "point-to-point" by requiring that point-to-point communications are "not intermediated by a … gateway or similar device." This, however, contradicts the patents. The patents leave no doubt that point-to-point communication happens over the internet. Ex. D, '121 Patent col.12 ll.35-40 ("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.") & fig.9 box 88. The patents further explain that devices may be "connected to the Internet" in a variety of ways,

including "by communication devices and software known in the art, such as an Internet Service Provider (ISP) or ***an Internet gateway***." *Id*. at col.4 ll.42-46 (emphasis added). Defendants' construction would ***exclude*** what the patentee expressly ***included***—using an "Internet gateway" to access the internet.[14] *Primos, Inc. v. Hunter's Specialties, Inc.*, 451 F.3d 841, 849 (Fed. Cir. 2006) (Courts "should not normally interpret a claim term to exclude a preferred embodiment."); *accord Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1583 (Fed. Cir. 1996) ("[A]n interpretation [that reads out a preferred embodiment] is rarely, if ever, correct and would require highly persuasive evidentiary support.").

Third, Defendants' construction also requires "direct communication." But this adds no value. To be sure, when the patents-in-suit refer to "point-to-point" they do not mean literally a ***direct*** connection between Alice and Bob (*e.g.*, two tin cans and a string). Using telephones as an example, a "point-to-point" telephone connection between Alice and Bob (at work) does not go ***directly*** from Alice to Bob—it goes over the telephone system. This means the connection may go through Bob's phone, his office's routing system, his local phone company, his long distance carrier, etc. Similarly here, a "point-to-point" internet connection does not go ***directly*** from Alice to Bob—it must go over the internet. This may mean a router, internet service provider, etc. are involved. *See* Ex. D, '121 Patent figs.15A-B & col.17 ll.34-37. In short, "point-to-point" as used in the patents does not mean a direct line between callees.

To be sure, in the Net2Phone litigation involving these patents, the patent holder proposed a construction of "point-to-point" that meant communication without a "gateway." Defendants will likely argue that ICTI is running from that construction now. Defendants are

[14] The patents also include devices "similar" to a gateway, and state that connections to the internet may be intermediated by an internet service provider: "a first processing unit executing the WebPhone application, hereafter referred to as WebPhone 1536, is coupled to Internet 1530 through an Internet service provider 1532." *See* Ex. D, '121 Patent col.17 ll.28-31.

wrong. The "gateway" at issue in the Net2Phone litigation was based on a statement in the prosecution of a related application, U.S. Patent No. 6,829,645, and was a "global gateway." Ex. L, '645 Patent File History, Jul. 12, 2002 Amend. at p. 4 ("Therefore, a plurality of IP addresses are allocated to a global gateway 18."). Defendants' construction here is not limited to a "global gateway"—Defendants' construction excludes from point-to-point and communication that is through a **"**gateway, or similar device." This means, per Defendants, communication through an "internet gateway" (a box in your house that allows you to connect to the internet) would not be point-to-point. As shown above, Defendants' construction contradicts the patents—the patents expressly ***include*** point-to-point communication over an "Internet gateway."[15] Ex. D, '121 Patent col.4 ll.42-46.

Construing claims is simply a way of clarifying normally terse claim language in order to understand and explain, but not to change, the scope of the claims. *Terlep*, 418 F.3d at 1382. ICTI's construction should be adopted because it does not change the scope of the claims. Defendants' construction, however, should be rejected for narrowing the scope of the claims in violation *Terlep* and *Thorner*.

[15] Because of this confusion surrounding "gateway," ICTI did not include "gateway" in its construction.

10. "establishing a *point-to-point* communication …" & "to allow the establishment of a packet-based *point-to-point* communication …" (all patents)

ICTI	DEFENDANTS	DEFENDANTS' PROBLEM(S)
See proposed construction of "point-to-point" above; no further construction necessary, as the remainder of the phrase has a plain and ordinary meaning.	"using the network protocol address retrieved by the server from its database to create a direct communication, initiated solely by one of the processes, and not intermediated by a connection server, gateway, or similar device"	The italicized portion of Defendants' proposed construction is discussed in "point-to-point" above. The remaining words in this claim term—for instance, "establishing a … communication"—are simple. These words simply do not specify (a) how a network protocol address is retrieved, (b) what retrieves it, or (c) where it is retrieved from.

Defendants' construction for this term incorporates their flawed construction for "point-to-point." This Court should reject the Defendants' construction for at least for the reasons provided above regarding "point-to-point."

The remaining words of this claim term—"establishing a … communication" and "to allow establishment of a packet-based… communication"—are simple and do not need construction. Once again, Defendants' construction asks this Court to narrow the claims by specifying a particular ***manner*** of establishing a communication. For example, the Defendants inject "database" into the construction of a phrase that does not even mention databases and into claims that do not require any database, such as claim 1 of the '704 Patent. Defendants also seek to specify a host of limitations about "a network protocol address" (that a server retrieves it, that it comes from a database, and that it must be used to establish communication) even though "a network protocol address" is never even used in this claim term. Nor can Defendants point to the patentee acting as his own lexicographer or disavowing claim scope; the meaning of words such as "establishing a … communication" is self-evident.

Because Defendants cannot establish either limiting condition of the *Thorner* test, this Court should rule that this term has its plain and ordinary meaning.

11. "program code configured to…" [*ooVoo only*] ('365 Patent)

ICTI	DEFENDANTS	DEFENDANTS' PROBLEM(S)
No construction necessary as this term has a plain and ordinary meaning, and is not a means-plus function claim.	Clauses (a)-(c) above must be construed pursuant to 35 U.S.C. § 112, ¶ 6	Absence of the word "means" creates a "strong" presumption that § 112, ¶ 6 does not apply. Courts have rejected attempts to infer "means-plus-function" claiming from use of the terms "code" and "program code."

Defendant ooVoo also argues that claim terms reciting "program code" are means-plus-function claims, though the remaining defendants have not joined this argument.[16] The notion that the term "program code" requires any construction at all strains credulity. It is self-evident that a patent dealing with computer technology will involve computer programs, which are comprised of code.

ooVoo faces a very high bar to support its argument. Means-plus-function claims are different from typical patent claims because they are more closely tied to the embodiments disclosed in the specification of a patent than typical claims. 35 U.S.C. § 112, ¶ 6 (2000) ("An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure . . . in support thereof, and such claim shall be construed to cover the corresponding structure . . . described in the specification and equivalents thereof."). Means-plus-function claims are typically identified, unsurprisingly, by the use of the word "means," and it is well-settled that the use of "a claim term that does not use 'means' will trigger the rebuttable presumption that § 112 does not apply." *Lighting World, Inc. v. Birchwood Lighting, Inc.*, 382 F.3d 1354, 1358 (Fed. Cir. 2004). The Federal Circuit has clearly indicated

[16] *See* C.A. No. 2:12-cv-8, Dkt. 32-A at p.3 n.1.

that "the presumption flowing from the absence of the term 'means' is a ***strong one that is not readily overcome***." *Id.* (emphasis added). Because the word "means" does not appear the claim at issue (Ex. F, '365 Patent (claim 1)),[17] ooVoo can only overcome this "strong" presumption by showing either "the claim term fails to 'recite sufficiently definite structure' or else recites function without 'reciting sufficient structure for performing that function.'" *Id.* (internal citation omitted).

ooVoo's argument that the "program code" claimed by the '365 Patent lacks a sufficiently precise structure has been soundly rejected by other courts that have addressed it. *See Trading Techs. Int'l, Inc. v. eSpeed, Inc.*, Nos. 04c5312, 05c4088, 05c4088, 05c4120, 05c4811, 05c5164, 2006 WL 3147697 (N.D. Ill. Oct. 31, 2006). *eSpeed* involved a claim term virtually identical to the term at issue here—a "computer readable medium having program code recorded thereon"—that did not use the magic word "means." *Id.* at *11. In accordance with *Lighting World*, the Court held this term was not a means-plus-function claim. *Id.* at *13. Specifically, the Court noted that the term "program code" is regularly "used in common parlance or by persons of skill in the pertinent art to designate structure, even if the term covers a broad class of structures and even if the term identifies structures by their function." *Id.* at *12. Indeed, the Court found that "code" was a term with a plain and ordinary meaning to computer scientists, namely "computer instructions and data definitions expressed in a programming language or in a

[17] The omission of the term "means" is no accident. During the prosecution of related patents, patentee ***explicitly amended its claims to omit the term "means."*** *See, e.g.*, Ex. M, '704 File History, Mar. 1, 1999 Amend. at p.15 ("Applicants have made global amendments to the claims . . . . *Specifically, the term 'means' has been eliminated from the remaining pending claims*.") (emphasis added); Ex. N, '121 File History, Sept. 10, 1999 Amend. at p.18 ("[T]he term 'means' has been eliminated from the remaining pending claims.").

form output by an assembler, compiler, or other translator." *Id.*[18] Thus, the Court found the term "program code" provided a sufficiently precise structure to support the functionality performed by that code.

eSpeed is identical to this case. The claims at issue in both cases are virtually identical. *Compare id.* at *11 ("computer readable medium having program code recorded thereon") *with* Ex. F, '365 Patent (claim 1) ("computer usable medium having program code embodied thereon") (confirmed on re-exam). Both involve a structure ("program code") configured to perform precise functions. *Compare eSpeed*, 2006 WL 3147697, at *11 (program code can, *inter alia*, "set[] a preset parameter for the trade order") *with* Ex. F, '365 Patent (claim 1) (program code can, *inter alia*, "receive the current network protocol address of one of the processes coupled to the network") (confirmed on re-exam). There is simply no basis for ooVoo to overcome the "strong" presumption that §112 ¶ 6 is inapplicable since its arguments have been soundly rejected by Courts considering claims that use virtually identical claims language (*i.e.* "program code"). This is nothing more than an invitation for this Court to commit reversible error.

V. CONCLUSION

For the reasons discussed above, ICTI requests this Court adopt its constructions.

[18] This finding is consistent with the weight of authority from other district courts. *See, e.g.*, *Affymetrix, Inc. v. Hyseq, Inc.*, 132 F. Supp. 2d 1212, 1232 (N.D. Cal. 2001) (holding that "computer code" is not a generic term); *see also Convolve, Inc. v. Dell, Inc.,* No. 2:08-cv-244-CE, 2011 WL 31792, at *18 (E.D. Tex. Jan. 5, 2011) (holding that "code" and "software" followed by description of their operation was sufficient to avoid means-plus-function treatment).

Dated: September 14, 2012

Respectfully submitted:

/s/

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Counsel for Plaintiff Innovative Communications Technologies, Inc.

CERTIFICATE OF SERVICE

I hereby certify that on the 14th day of September, 2012, I will electronically file the foregoing with the Clerk of Court using the CM/ECF system, which will then send a notification of such filing to all counsel of record.

/s/

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EXHIBIT A

From: Macaluso, Avani [Amacaluso@mwe.com]
Sent: Thursday, September 13, 2012 11:52 AM
To: Shah, Alicia L.
Cc: Callahan, David K.; Bond, Daniel; Shah, Archit P.; bvannorman@hunton.com; Brongiel, Sheryl A.; Bisbikis, John; Ondrick, Christina; Jacobs, Blair; Parikh, Amol; Phelan, Ryan; Dissen, Gayle; khessler@wileyrein.com; KAnderson@wileyrein.com; 'Neil.Rubin@lw.com'; Mark.Koehn@lw.com
Subject: RE: ICTI v. Stalker, ooVoo & Vivox - Markman Brief

Alicia,

I am certain the Court would agree with us that there is nothing prejudicial about Defendants' decision to agree with ICTI's position on certain terms. Defendants, upon recent further consideration and analysis, merely have concluded that no construction is necessary and that no instruction on the plain and ordinary meaning of certain terms is necessary. We promptly informed ICTI of this decision. Thus, your assertions of prejudice are baseless and unproductive rhetoric.

I further apologize as there has been a miscommunication. There are only **two** terms Defendants **are no** longer pursuing in claim construction:

- 7 - “in response to an identification of one of the entries by a requesting process providing one of the identifier and the network protocol address to the requesting process”
- 10 - “retrieving the IP address of the second unit from the database using the connection server” and “retrieving the IP address of the second processing unit in response to the positive on-line status of the second processing unit”

Defendants **are** briefing the following terms:

- 11 - “an off-line message” / “the off-line message"
- 13 - “online message”

Defendants require the 36 pages. We have no intention of burdening the Court with additional briefing on the issue of page enlargement, particularly in view of Magistrate Miller's express order this morning.

Thank you,
Avani

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From: Shah, Alicia L. [mailto:alicia.shah@kirkland.com]
Sent: Thursday, September 13, 2012 10:39 AM
To: Macaluso, Avani

Cc: Callahan, David K.; Bond, Daniel; Shah, Archit P.; bvannorman@hunton.com; Brongiel, Sheryl A.; Bisbikis, John; Ondrick, Christina; Jacobs, Blair; Parikh, Amol; Phelan, Ryan; Dissen, Gayle; khessler@wileyrein.com; kanderson@wileyrein.com; 'Neil.Rubin@lw.com'; Mark.Koehn@lw.com
Subject: RE: ICTI v. Stalker, ooVoo & Vivox - Markman Brief

Avani,

Obviously your timing for alerting us that you intend to drop these terms is prejudicial. But we will not plan to address these terms in our brief.

Do you intend to notify the Magistrate Judge this morning that you no longer need a six-page extension of your brief? And do you now intend to abide by the 30-page limit?

Thank you,
Alicia

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From: Macaluso, Avani [mailto:Amacaluso@mwe.com]
Sent: Thursday, September 13, 2012 10:19 AM
To: Shah, Alicia L.
Cc: Callahan, David K.; Bond, Daniel; Shah, Archit P.; bvannorman@hunton.com; Brongiel, Sheryl A.; Bisbikis, John; Ondrick, Christina; Jacobs, Blair; Parikh, Amol; Phelan, Ryan; Dissen, Gayle; khessler@wileyrein.com; KAnderson@wileyrein.com; 'Neil.Rubin@lw.com'; Mark.Koehn@lw.com
Subject: ICTI v. Stalker, ooVoo & Vivox - Markman Brief

Alicia:

Please be advised that Defendants are dropping terms 7, 10, 11 and 13 which were previously identified in the Proposed Terms for *Markman* [Dkt. No. 32]. To be clear, Defendants are dropping the following terms for construction:

- 7 - “in response to an identification of one of the entries by a requesting process providing one of the identifier and the network protocol address to the requesting process”
- 10 - “retrieving the IP address of the second unit from the database using the connection server” and “retrieving the IP address of the second processing unit in response to the positive on-line status of the second processing unit”
- 11 - “an off-line message” / “the off-line message"
- 13 - “online message”

Thank you,
Avani

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EXHIBIT B

US006108704A

United States Patent [19]

Hutton et al.

[11] Patent Number: 6,108,704

[45] Date of Patent: Aug. 22, 2000

[54] **POINT-TO-POINT INTERNET PROTOCOL**

[75] Inventors: **Glenn W. Hutton**, Miami; **Shane D. Mattaway**, Boca Raton; **Craig B. Strickland**, Tamarac, all of Fla.

[73] Assignee: **NetSpeak Corporation**, Boca Raton, Fla.

[21] Appl. No.: **08/533,115**

[22] Filed: **Sep. 25, 1995**

[51] **Int. Cl.**[7] **G06F 13/38**; G06F 15/17

[52] **U.S. Cl.** **709/227**; 709/204

[58] **Field of Search** 395/200.01, 200.02, 395/200.09, 200.11, 200.15, 200.34, 200.35, 200.47, 200.48, 200.57, 200.58, 200.75; 709/204, 205, 217, 218, 227, 228, 235

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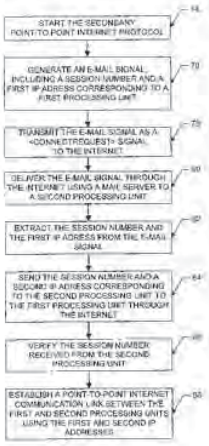
Primary Examiner—Mark H. Rinehart
Attorney, Agent, or Firm—Kudirka & Jobse, LLP

[57] **ABSTRACT**

A point-to-point Internet protocol exchanges Internet Protocol (IP) addresses between processing units to establish a point-to-point communication link between the processing units through the Internet. A first point-to-point Internet protocol includes the steps of (a) storing in a database a respective IP address of a set of processing units that have an on-line status with respect to the Internet; (b) transmitting a query from a first processing unit to a connection server to determine the on-line status of a second processing unit; and (c) retrieving the IP address of the second unit from the database using the connection server, in response to the determination of a positive on-line status of the second processing unit, for establishing a point-to-point communication link between the first and second processing units through the Internet. A second point-to-point Internet protocol includes the steps of (a) transmitting an E-mail signal, including a first IP address, from a first processing unit; (b) processing the E-mail signal through the Internet to deliver the E-mail signal to a second processing unit; 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.

44 Claims, 6 Drawing Sheets



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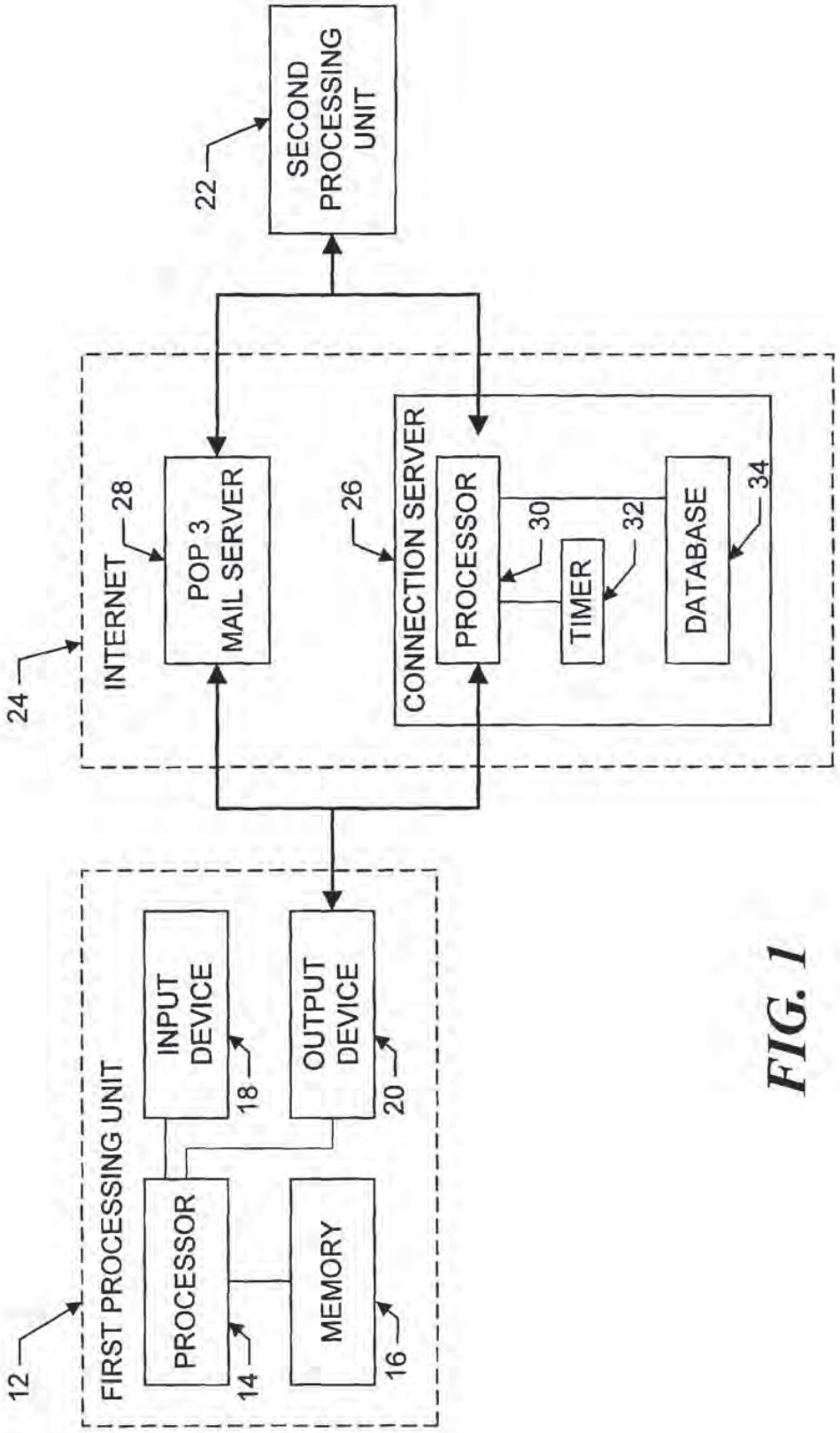
SECOND PROCESSING UNIT
22
INTERNET
24
POP 3 MAIL SERVER
28
CONNECTION SERVER
26
PROCESSOR
30
TIMER
32
DATABASE
34
FIRST PROCESSING UNIT
12
INPUT DEVICE
18
OUTPUT DEVICE
20
PROCESSOR
14
MEMORY
16

FIG. 1

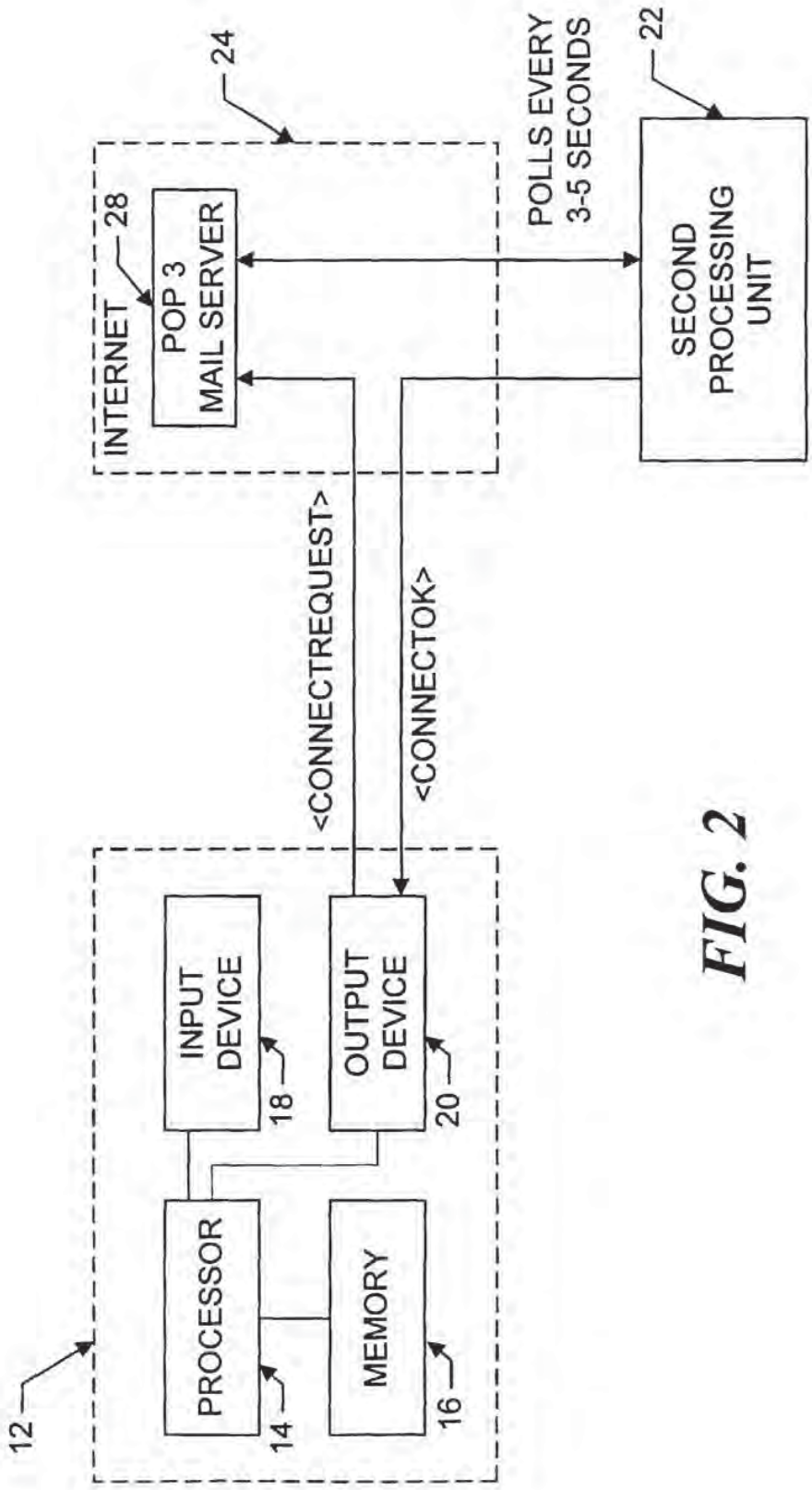
24
22
POLLS EVERY
3-5 SECONDS
INTERNET
28
POP 3
MAIL SERVER
SECOND
PROCESSING
UNIT
<CONNECTREQUEST>
<CONNECTOK>
INPUT
DEVICE
18
OUTPUT
DEVICE
20
PROCESSOR
14
MEMORY
16
12

FIG. 2

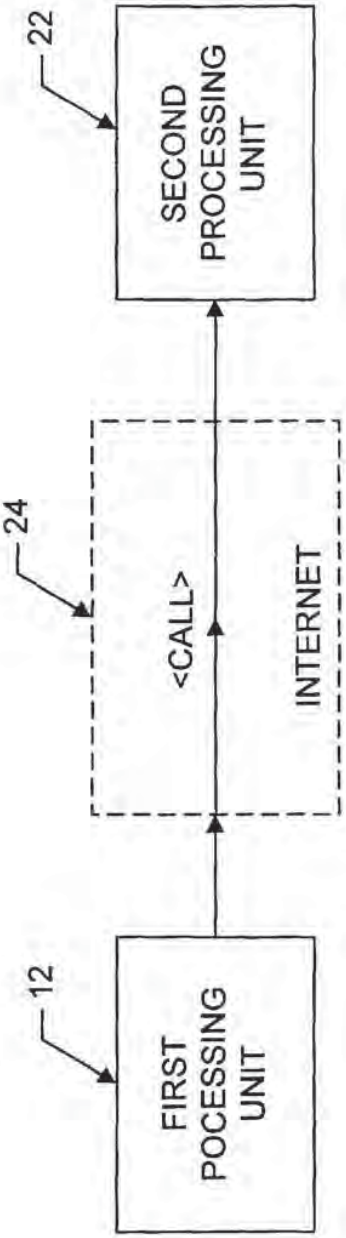
22
SECOND PROCESSING UNIT
24
<CALL>
INTERNET
12
FIRST POCESSING UNIT

FIG. 3

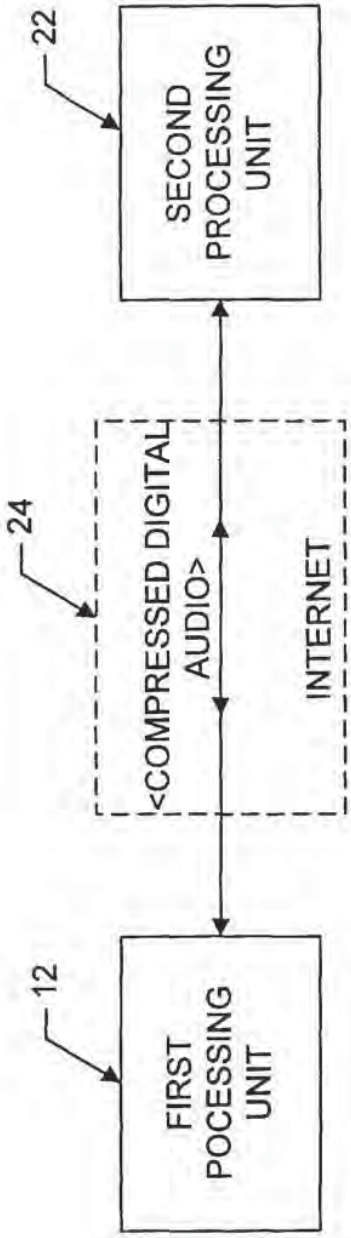
22
SECOND PROCESSING UNIT
24
<COMPRESSED DIGITAL AUDIO>
INTERNET
12
FIRST POCESSING UNIT

FIG. 4

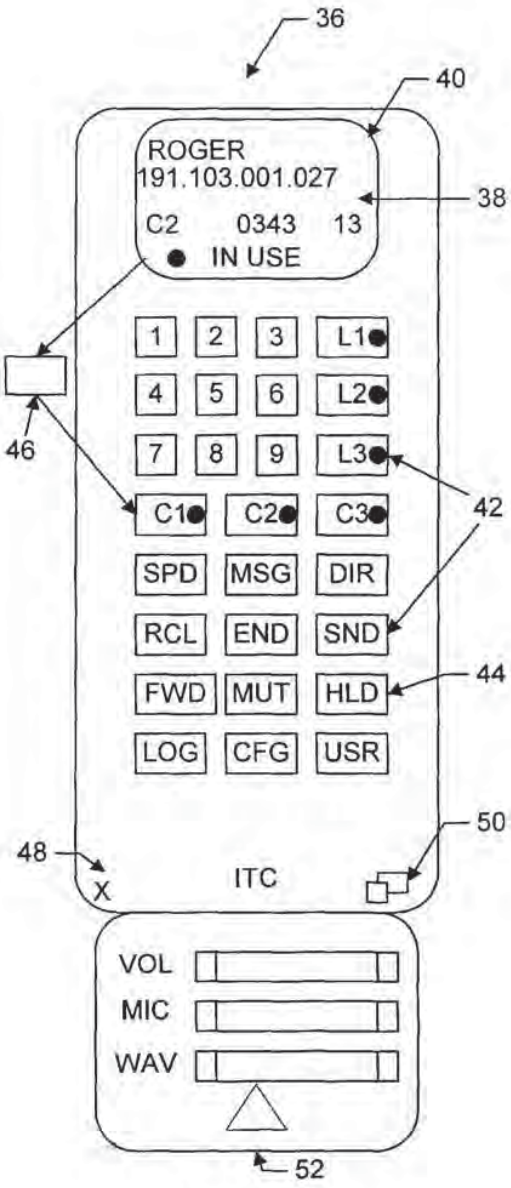
36
40
ROGER
191.103.001.027
C2 0343 13
IN USE
38
1 2 3 L1
4 5 6 L2
7 8 9 L3
46
C1 C2 C3
42
SPD MSG DIR
RCL END SND
44
FWD MUT HLD
LOG CFG USR
48
X
ITC
50
VOL
MIC
WAV
52

FIG. 5

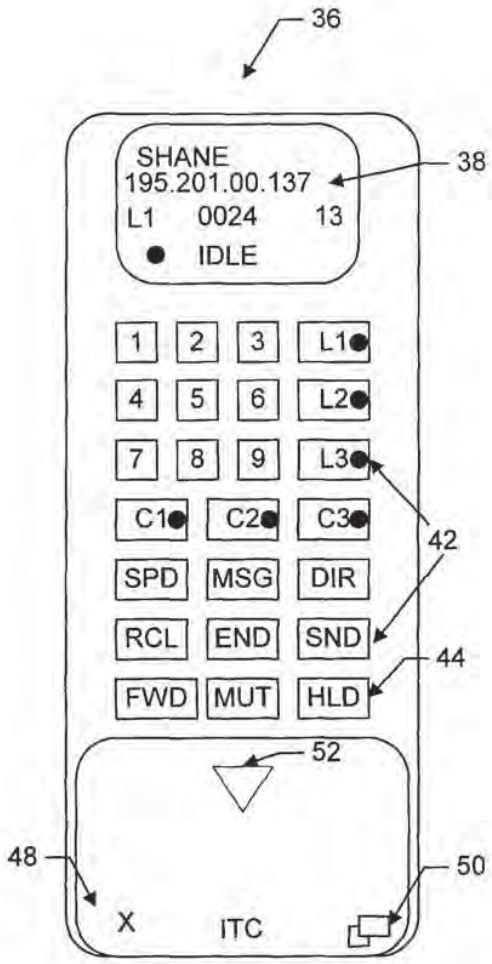
36
SHANE
195.201.00.137
L1 0024 13
IDLE
38
1 2 3 L1
4 5 6 L2
7 8 9 L3
C1 C2 C3
42
SPD MSG DIR
RCL END SND
44
FWD MUT HLD
52
48
X
ITC
50

FIG. 6

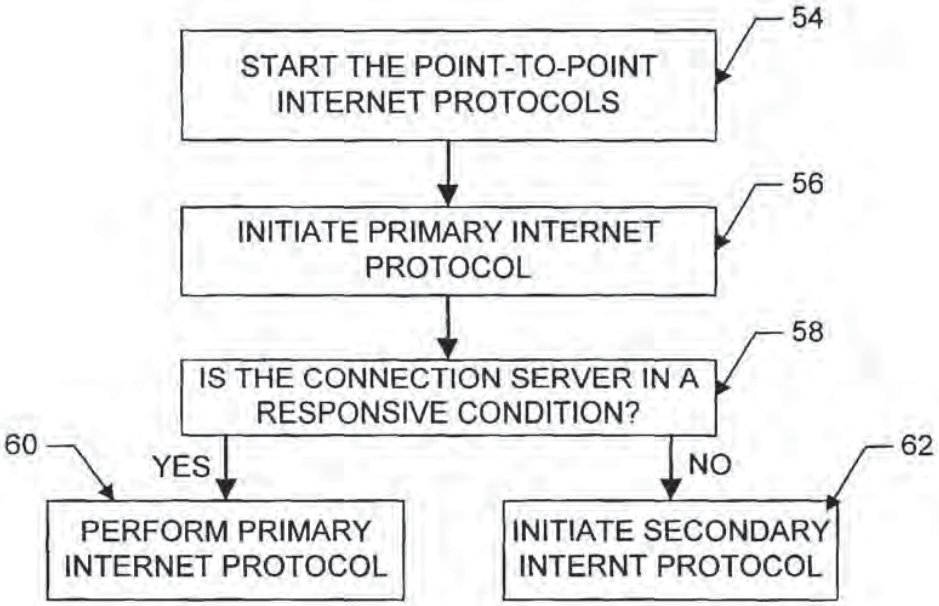
START THE POINT-TO-POINT INTERNET PROTOCOLS
54
INITIATE PRIMARY INTERNET PROTOCOL
56
IS THE CONNECTION SERVER IN A RESPONSIVE CONDITION?
58
YES
NO
60
62
PERFORM PRIMARY INTERNET PROTOCOL
INITIATE SECONDARY INTERNT PROTOCOL

FIG. 7

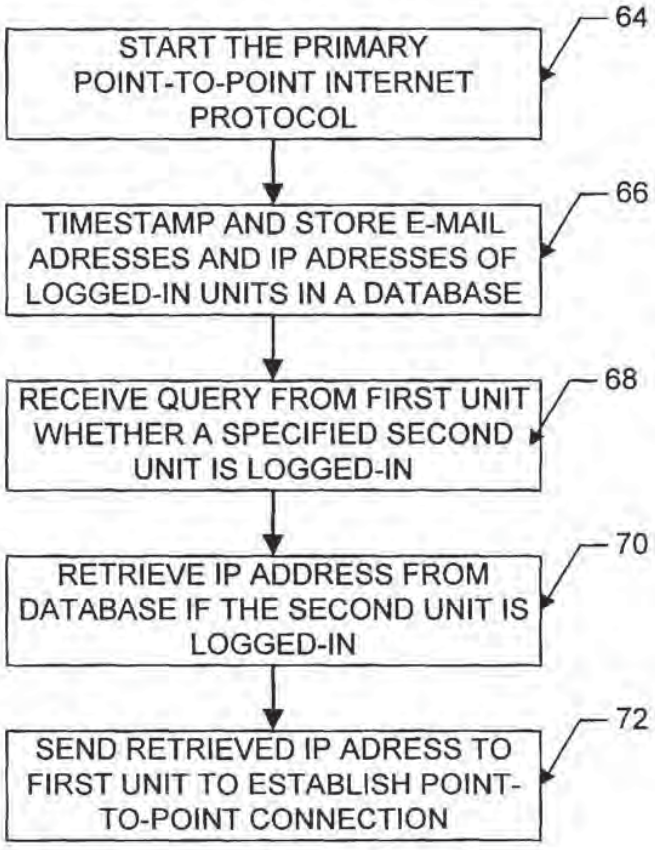
START THE PRIMARY POINT-TO-POINT INTERNET PROTOCOL
64
TIMESTAMP AND STORE E-MAIL ADRESSES AND IP ADRESSES OF LOGGED-IN UNITS IN A DATABASE
66
RECEIVE QUERY FROM FIRST UNIT WHETHER A SPECIFIED SECOND UNIT IS LOGGED-IN
68
RETRIEVE IP ADDRESS FROM DATABASE IF THE SECOND UNIT IS LOGGED-IN
70
SEND RETRIEVED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

FIG. 8

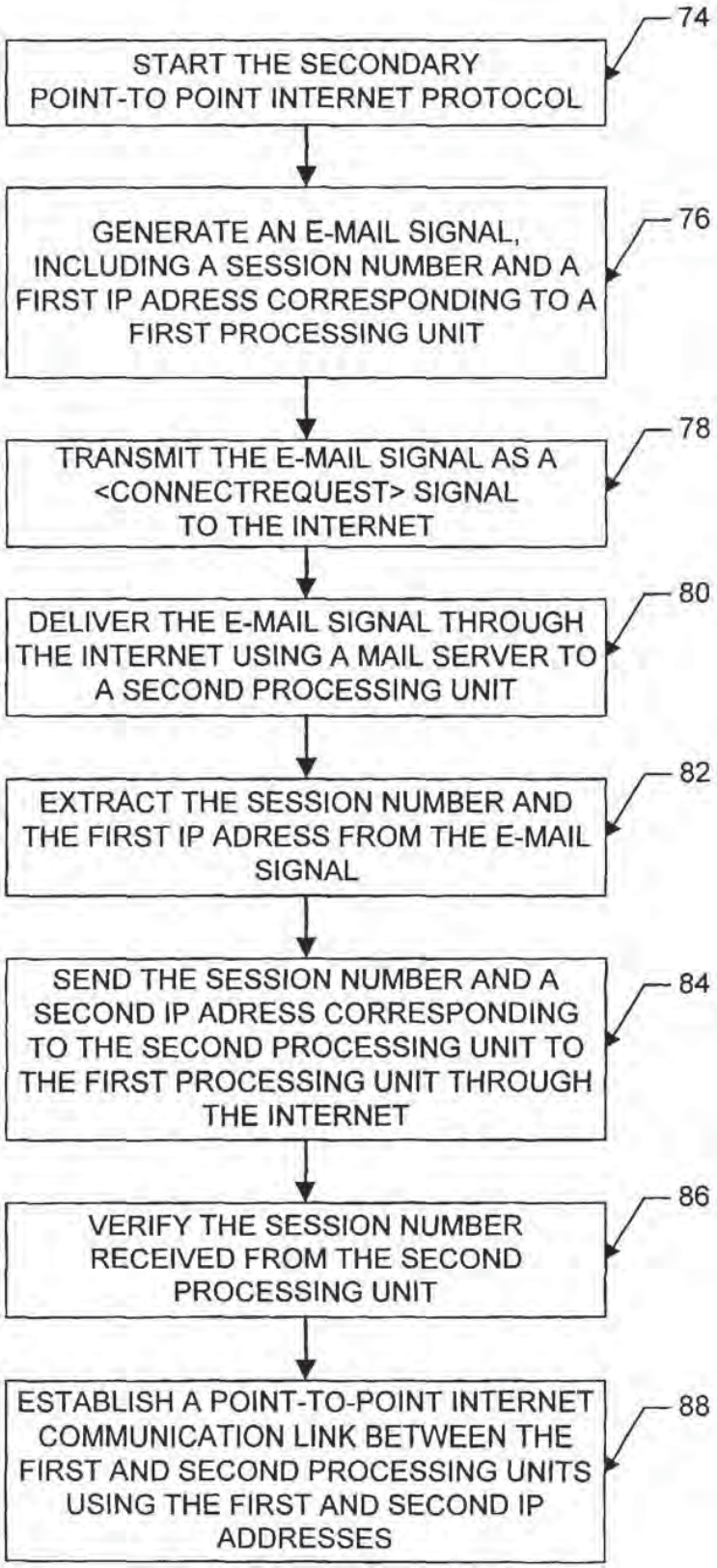
74
START THE SECONDARY POINT-TO POINT INTERNET PROTOCOL
76
GENERATE AN E-MAIL SIGNAL, INCLUDING A SESSION NUMBER AND A FIRST IP ADRESS CORRESPONDING TO A FIRST PROCESSING UNIT
78
TRANSMIT THE E-MAIL SIGNAL AS A <CONNECTREQUEST> SIGNAL TO THE INTERNET
80
DELIVER THE E-MAIL SIGNAL THROUGH THE INTERNET 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

POINT-TO-POINT INTERNET PROTOCOL

BACKGROUND OF THE INVENTION

1. Field of the Invention

This disclosure relates to network communication protocols, and in particular to a point-to-point protocol for use with the Internet.

2. Description of the Related Art

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 the to 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

A point-to-point Internet protocol is disclosed which exchanges Internet Protocol (IP) addresses between processing units to establish a point-to-point communication link between the processing units through the Internet.

A first point-to-point Internet protocol is disclosed which includes the steps of:

(a) storing in a database a respective IP address of a set of processing units that have an on-line status with respect to the Internet;

(b) transmitting a query from a first processing unit to a connection server to determine the on-line status of a second processing unit; and

(c) retrieving the IP address of the second unit from the database using the connection server, in response to the determination of a positive on-line status of the second processing unit, for establishing a point-to-point communication link between the first and second processing units through the Internet.

A second point-to-point Internet protocol is disclosed, which includes the steps of:

(a) transmitting an E-mail signal, including a first IP address, from a first processing unit;

(b) processing the E-mail signal through the Internet to deliver the E-mail signal to a second processing unit; 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.

BRIEF DESCRIPTION OF THE DRAWINGS

The features of the disclosed point-to-point Internet protocol and system 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, where:

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.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

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 Internet 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. 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 be a WEBPHONE™ unit, available from NetSpeak Corporation, Boca Raton, Fla. capable of operating 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. 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 timestamps, 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 Veiw, Calif. having a central processing unit (CPU) as processor **30** operating an operating system (OS) such as UNIX and 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 INFOMIX.

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 Internet protocol and system **10**.

The processor **14** receives input commands and data from a first user associated with the first processing unit **12** through 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 as the output device **20** for use in conjunction with the input device **18** and embodied as one of the screens illustrated by the examples shown in FIGS. **5–6** and discussed below. It is also understood that alternative input devices may be used in conjunction with alternative output devices to receive commands and data from the user, such as keyboards, mouse devices, and graphical user interfaces (GUI) such as WINDOWS™ 3.1 available from MICROSOFT™ Corporation Redmond, Was. executed by the processor **14** using, for example, DOS 5.0. One skilled in the art would understand that other operating systems and GUIs, such as OS/2 and OS/2 WARP, available from IBM CORPORATION, Boca Raton, Fla. may be used. Other alternative input devices may include microphones and/or telephone handsets for receiving audio voice data and commands, with the first processing unit **12** including 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 interaction or for touch-screen activation as shown, for example, in FIGS. **4–5**, 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 labelled 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 fall 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 <ConnectRequest> signal, and to allow for multiplexing and demultiplexing of inbound and outbound conversations on conference lines.

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 caller 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 a connection service provider.

Upon the first user initiating the point-to-point Internet protocol when the first user is logged on to 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 timestamps 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 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 timestamps 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 labelled [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.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 labelled 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 username 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 units **12, 22**. For example, the second processing unit **22** may process 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.

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 <ConnectOK> 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** may 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 labelled 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 labelled 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 labelled C2 indicates that the function corresponding to C2 is active, as additionally indicated in the status area **38**, while darkly shaded circles of icons labelled 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 initiated at a first processing unit **12** for point-to-point Internet communications by starting the point-to-point Internet protocols in step **54**; initiating the primary point-to-point Internet protocol in step **56** by sending a query from the first processing unit **12** to the connection server **26**; determining if the connection server **26** is operative to perform the point-to-point Internet protocol in step **58** by receiving, at the first processing unit **12**, an on-line status signal from the connection server **26**, which may include the IP address of the callee or a "Callee Off-Line" message; performing 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; and initiating and performing 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** operates using the connection server **26** to perform step **60** in FIG. **7** by starting the point-to-point Internet protocol in step **64**; timestamping and storing E-mail and IP addresses of logged-in users and processing units in the database **34** in step **66**; receiving a query at the connection server **26** 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 **649-2** specified, for example, by an E-mail address; retrieving 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 sending the retrieved IP address to the first processing unit in step **72** to establish point-to-point Internet communications with the specified user.

Referring to FIG. **9** in conjunction with FIGS. **2–4**, the disclosed secondary point-to-point Internet protocol and system **10** operates at the first processing unit **12** to perform step **62** of FIG. **7**. The disclosed secondary point-to-point Internet protocol operates as shown in FIG. **9** by starting the secondary point-to-point Internet protocol in step **74**; generating an E-mail signal, including a session number and a first IP address corresponding to a first processing unit in step **76** using the first processing unit **12**; transmitting the E-mail signal as a <ConnectRequest> signal to the Internet **24** in step **78**; delivering the E-mail signal through the Internet **24** using a mail server **28** to a second processing unit **22** in step **80**; extracting the session number and the first IP address from the E-mail signal in step **82**; transmitting or sending the session number and a second IP address corresponding to the second processing unit **22** to the first processing unit **12** through the Internet **24** in step **84**; verifying the session number received from the second processing unit **22** in step **86**; and establishing 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 computer program product for use with a computer system, the computer system executing a first process and operatively connectable to a second process and a server over a computer network, the computer program product comprising:

a computer usable medium having program code embodied in the medium, the program code comprising:

program code for transmitting to the server a network protocol address received by the first process following connection to the computer network;

program code for transmitting, to the server, a query as to whether the second process is connected to the computer network;

program code for receiving a network protocol address of the second process from the server, when the second process is connected to the computer network; and

program code, responsive to the network protocol address of the second process, for establishing a point-to-point communication link between the first process and the second process over the computer network.

2. An apparatus for enabling point-to-point communications between a first and a second process over a computer network, the apparatus comprising:

a processor;

a network interface, operatively coupled to the processor, for connecting the apparatus to the computer network;

a memory, operatively coupled to the processor, for storing a network protocol address for selected of a plurality of processes, each network protocol address stored in the memory following connection of a respective process to the computer network;

means, responsive to a query from the first process, for determining the on-line status of the second process and for transmitting a network protocol address of the second process to the first process in response to a positive determination of the on-line status of the second process.

3. The computer server apparatus of claim 2 further comprising a timer, operatively coupled to the processor, for time stamping the network protocol addresses stored in the memory.

4. A method for enabling point-to-point communication between a first process and a second process over a computer network, the method comprising the steps of:

A. receiving and storing into a computer memory a respective network protocol address for selected of a plurality of processes that have an on-line status with respect to the computer network, each of the network protocol addresses received following connection of the respective process to the computer network;

B. receiving a query from the first process to determine the on-line status of the second process;

C. determining the on-line status of the second process; and

D. transmitting an indication of the on-line status of the second process to the first process over the computer network.

5. The method of claim 4 wherein step C further comprises the steps of:

c.1 searching the computer memory for an entry relating the second process; and

c.2 retrieving a network protocol address of the second process in response to a positive determination of the on-line status of the second process.

6. The method of claim 4 wherein step D further comprises the steps of:

d.1 transmitting the network protocol address of the second process to the first process when the second process is determined in step C to have a positive on-line status with respect to the computer network.

7. The method of claim 4 wherein step D further comprises the steps of:

d.1 generating an off-line message when the second process is determined in step C to have a negative on-line status with respect to the computer network; and

d.2 transmitting the off-line message to the first process.

8. The method of claim 4 further comprising the steps of:

E. receiving an E-mail signal comprising a first network protocol address from the first process; and

F. transmitting the E-mail signal over the computer network to the second process.

9. The method of claim 8 wherein the E-mail signal further comprises a session number and wherein step F further comprises the step of:

f.1 transmitting the session number and network protocol address over the computer network to the second process.

10. In a computer system, a method for establishing a point-to-point communication link from a caller process to a callee process over a computer network, the caller process having a user interface and being operatively connectable to the callee process and a server over the computer network, the method comprising the steps of:

A. providing a user interface element representing a first communication line;

B. providing a user interface element representing a first callee process; and

C. establishing a point-to-point communication link from the caller process to the first callee process, in response to a user associating the element representing the first callee process with the element representing the first communication line.

11. The method of claim 10 wherein step C further comprises the steps of:

c.1 querying the server as to the on-line status of the first callee process process; and

c.2 receiving a network protocol address of the first callee process over the computer network from the server.

12. The method of claim 10 further comprising the step of:

D. providing an element representing a second communication line.

13. The method of claim 12 further comprising the steps of:

E. terminating the point-to-point communication link from the caller process to the first callee process, in response to the user disassociating the element representing the first callee process from the element representing the first communication line; and

F. establishing a different point-to-point communication link from the caller process to the first callee process, in response to the user associating the element representing the first callee process with the element representing the second communication line.

14. The method of claim 10 further comprising the steps of:

D. providing a user interface element representing a second callee process; and

E. establishing a conference point-to-point communication link between the caller process and the first and second callee process, in response to the user associating the element representing the second callee process with the element representing the first communication line.

15. The method of claim **10** further comprising the step of:

F. removing the second callee process from the conference point-to-point communication link in response to the user disassociating the element representing the second callee process from the element representing the first communication line.

16. The method of claim **10** further comprising the steps of:

D. providing a user interface element representing a communication line having a temporarily disabled status; and

E. temporarily disabling a point-to-point communication link between the caller process and the first callee process, in response to the user associating the element representing the first callee process with the element representing the communication line having a temporarily disabled status.

17. The method of claim **16** wherein the element provided in step D represents a communication line on hold status.

18. The method of claim **17** wherein the element provided in step D represents a communication line on mute status.

19. The method of claim **10** wherein the caller process further comprises a visual display and the user interface comprises a graphic user interface.

20. The method of claim **19** wherein the steps of establishing a point-to-point link as described in step C is performed in response to manipulation of the graphic elements on the graphic user interface.

21. A computer program product for use with a computer system comprising:

a computer usable medium having program code embodied in the medium for establishing a point-to-point communication link from a caller process to a callee process over a computer network, the caller process having a user interface and being operatively connectable to the callee process and a server over the computer network, the medium further comprising:

program code for generating an element representing a first communication line;

program code for generating an element representing a first callee process;

program code, responsive to a user associating the element representing the first callee process with the element representing the first communication line, for establishing a point-to-point communication link from the caller process to the first callee process.

22. The computer program product of claim **21** wherein the program code for establishing a point-to-point communication link further comprises:

program code for querying the server as to the on-line status of the first callee process; and

program code for receiving a network protocol address of the first callee process over the computer network from the server.

23. A computer program product of claim **21** further comprising:

program code for generating an element representing a second communication line.

24. The computer program product of claim **23** further comprising:

program code, responsive to the user disassociating the element representing the first callee process from the element representing the first communication line, for terminating the point-to-point communication link from the caller process to the first callee process; and

program code responsive to the user associating the element representing the first callee process with the element presenting the second communication line, for establishing a different point-to-point communication link from the caller process to the first callee process.

25. The computer program product of claim **21** further comprising:

program code for generating an element representing a second callee process; and

program code means, responsive to the user associating the element representing the second callee process with the element representing the first communication line, for establishing a conference communication link between the caller process and the first and second callee process.

26. The computer program product of claim **25** further comprising:

program code, responsive to the user disassociating the element representing the second callee process from the element representing the first communication line, for removing the second callee process from the conference communication link.

27. The computer program product of claim **21** further comprising:

program code for generating an element representing a communication line having a temporarily disabled status; and

program code, responsive association of the element representing the first callee process with the element representing the communication line having a temporarily disabled status, for temporarily disabling the point-to-point communication link between the caller process and the first callee process.

28. The computer program product of claim **27** wherein the communication line having a temporarily disabled status comprises a communication line on hold status.

29. The computer program product of claim **27** wherein the communication line having a temporarily disabled status comprises a communication line on mute status.

30. A computer program product of claim **21** wherein the computer system further comprises a visual display and the user interface comprises a graphic user interface.

31. The computer program product of claim **30** wherein the element representing the first communication line and the element representing the first callee process are graphic elements and wherein the program code for establishing a point-to-point communication link from the caller process to the first callee process further comprises:

program code, responsive to manipulation of the graphic elements on the graphic user interface, for establishing the point-to-point communication link from the caller process to the first callee process.

32. A method of locating a process over a computer network comprising the steps of:

a. maintaining an Internet accessible list having a plurality of selected entries, each entry comprising an identifier and a corresponding Internet protocol address of a process currently connected to the Internet, the Internet Protocol address added to the list following connection of the process to the computer network; and

b. in response to identification of one of the list entries by a requesting process, providing one of the identifier and

the corresponding Internet protocol address of the identified entry to the requesting process.

33. A method for locating processes having dynamically assigned network protocol addresses over a computer network, the method comprising the steps of:

a. maintaining, in a computer memory, a network accessible compilation of entries, selected of the entries comprising a network protocol address and a corresponding identifier of a process connected to the computer network, the network protocol address of the corresponding process assigned to the process upon connection to the computer network; and

b. in response to identification of one of the entries by a requesting process providing one of the identifier and the network protocol address to the requesting process.

34. The method of claim **33** further comprising the step of:

c. modifying the compilation of entries.

35. The method of claim **34** wherein step c further comprises:

c.1 adding an entry to the compilation upon the occurrence of a predetermined event.

36. The method of claim **35** wherein the predetermined event comprises notification by a user process of an assigned network protocol address.

37. The method of claim **34** wherein step c further comprises:

c.1 deleting an entry from the compilation upon the occurrence of a predetermined event.

38. A computer program product for use with a computer system having a memory and being operatively connectable over a computer network to one or more computer processes, the computer program product comprising a computer usable medium having program code embodied in the medium the program code comprising:

a. program code configured to maintain, in the computer memory, a network accessible compilation of entries, selected of the entries comprising a network protocol address and a corresponding identifier of a process connected to the computer network, the network protocol address of the corresponding process assigned to the process upon connection to the computer network; and

b. program code responsive to identification of one of the entries by a requesting process and configured to provide one of the identifier and the network protocol address to the requesting process.

39. The computer program product of claim **38** further comprising:

c. program code configured to modify the compilation of entries.

40. The computer program product of claim **39** wherein program code configured to modify comprises:

c.1 program code configured to add an entry to the compilation upon the occurrence of a predetermined event.

41. The computer program product of claim **40** wherein the predetermined event comprises notification by a process of an assigned network protocol address.

42. The computer program product of claim **38** wherein step c further comprises:

c.1 program code configured to delete an entry from the compilation upon the occurrence of a predetermined event.

43. A computer program product for use with a computer system, the computer system executing a first process operatively coupled over a computer network to a second process and a server process, the computer program product comprising a computer usable medium having computer readable program code embodied therein, the program code comprising:

a. program code configured to access a directory database, the database having a network protocol address for a selected plurality of processes having on-line status with respect to the computer network, the network protocol address of each respective process forwarded to the database following connection to the computer network; and

b. program code responsive to one of the network protocol addresses and configured to establish a point-to-point communication link from the first process to the second process over the computer network.

44. In a first computer process operatively coupled over a computer network to a second process and an address server, a method of establishing a point-to-point communication between the first and second processes comprising the steps of:

A. following connection of the first process to the computer network forwarding to the address server a network protocol address at which the first process is connected to the computer network;

B. querying the address server as to whether the second process is connected to the computer network;

C. receiving a network protocol address of the second process from the address server, when the second process is connected to the computer network; and

D. in response to the network protocol address of the second process, establishing a point-to-point communication link with the second process over the computer network.

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(54) **POINT-TO-POINT INTERNET PROTOCOL**

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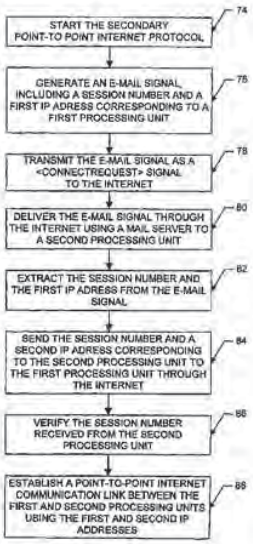
(57) **ABSTRACT**

A point-to-point Internet protocol exchanges Internet Protocol (IP) addresses between processing units to establish a point-to-point communication link between the processing units through the Internet. A first point-to-point Internet protocol includes the steps of (a) storing in a database a respective IP address of a set of processing units that have an on-line status with respect to the Internet; (b) transmitting a query from a first processing unit to a connection server to determine the on-line status of a second processing unit; and (c) retrieving the IP address of the second unit from the database using the connection server, in response to the determination of a positive on-line status of the second processing unit, for establishing a point-to-point communication link between the first and second processing units through the Internet. A second point-to-point Internet protocol includes the steps of (a) transmitting an E-mail signal, including a first IP address, from a first processing unit; (b) processing the E-mail signal through the Internet to deliver the E-mail signal to a second processing unit; 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 unit through the Internet.



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EX PARTE REEXAMINATION CERTIFICATE ISSUED UNDER 35 U.S.C. 307

THE PATENT IS HEREBY AMENDED AS INDICATED BELOW.

Matter enclosed in heavy brackets [ ] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in italics indicates additions made to the patent.

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

The patentability of claims **1-7** and **32-42** is confirmed.

Claims **10**, **21**, **43** and **44** are cancelled.

Claims **11**, **12**, **14**, **15**, **16**, **19**, **22**, **23**, **25**, **27** and **30** are determined to be patentable as amended.

Claims **13**, **17**, **18**, **20**, **24**, **26**, **28**, **29** and **31**, dependent on an amended claim, are determined to be patentable.

Claims **8-9** were not reexamined.

11. **[**The method of claim **10]** *In a computer system, a method for establishing a point-to-point communication link from a caller process to a callee process over a computer network, the caller process having a user interface and being operatively connectable to the callee process and a server over the computer network, the method comprising the steps of:*

A. providing a user interface element representing a first communication line;

B. providing a user interface element representing a first callee process; and

C. establishing a point-to-point communication link from the caller process to the first callee process, in response to a user associating the element representing the first callee process with the element representing the first communication line, wherein step C further comprises the steps of:

c.**1** querying the server as to the on-line status of the first called **[**process**]** process; and

c.**2** receiving a network protocol address of the first callee process over the computer network from the server.

12. The method of claim **[10]** *11* further comprising the step of:

D. providing an element representing a second communication line.

14. The method of claim **[10]** *11* further comprising the step of:

D. providing a user interface element representing a second callee process; and

E. establishing a conference point-to-point communication link between the caller process and the first and second callee process, in response to the user associating the element representing the second callee process with the element representing the first communication line.

15. The method of claim **[10]** *11* further comprising the step of:

F. removing the second callee process from the conference point-to-point communication link in response to the user disassociating the element representing the second callee process from the element representing the first communication line.

16. The method of claim **[10]** *11* further comprising the steps of:

D. providing a user interface element representing a communication line having a temporarily disabled status; and

E. temporarily disabling a point-to-point communication link between the caller process and the first callee process, in response to the user associating the element representing the first calle process with the element representing the communication line having a temporarily disabled status.

19. The method of claim **[10]** *11* wherein the caller process further comprises a visual display and the user interface comprises a graphic user interface.

22. **[**The computer program product of claim **21]** *A computer program product for use with a computer system comprising:*

a computer usable medium having program code embodied in the medium for establishing a point-to-point communication link from a caller process to a callee process over a computer network, the caller process having a user interface and being operatively connectable to the callee process and a server over the computer network, the medium further comprising:

program code for generating an element representing a first communication line;

program code for generating an element representing a first callee process;

*program code, responsive to a user associating the element representing the first callee process with the element representing the first communication line, for establishing a point-to-point communication link from the caller process to the first callee process,]*wherein the program code for establishing a point-to-point communication link further comprises:

program code for querying the server as to the on-line status of the first callee process; and

program code for receiving a network protocol address of the first callee process over the computer network from the server.

23. A computer program product of claim **[21]** *22* further comprising: program code for generating an element representing a second communication line.

25. The computer program product of claim **[21]** *22* further comprising: program code for generating an element representing a second callee process; and program code means, responsive to the user associating the element representing the second callee process with the element representing the first communication line, for establishing a conference communication link between the caller process and the first and second callee process.

27. The computer program product of claim **[21]** *22* further comprising:

program code for generating an element representing a communication line having a temporarily disabled status; and

program code, responsive association of the element representing the first callee process with the element representing the communication line having a temporarily disabled status, for temporarily disabling the point-to-point communication link between the caller process and the first callee process.

30. A computer program product of claim **[21]** *22* wherein the computer system further comprises a visual display and the user interface comprises a graphic user interface.

* * * * *

EXHIBIT C

#17 B 1/8/98

ATTORNEY DOCKET NO. N0003/7000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Glenn W. Hutton
Serial No.: 08/533,115
Filed: September 25, 1995
For: POINT-TO-POINT INTERNET PROTOCOL
Examiner: Richard J. Gregson, Esq.
Art Unit: 2302

CERTIFICATE OF MAILING

I hereby certify that the following correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231 on December 2, 1997.

Bruce D. Jobse

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

AMENDMENT

In the Title

Please delete the title as filed and insert -- Method and Apparatus for Establishing Point-to-Point Communications Over a Computer Network --.

In the Specification

Page 1, line 20, after "interfacing" insert --to--.

Page 6, line 18, change "by" to --to--.

Page 7, line 6, change "read-only" to --random access--;

line 14, change "other" to --another--.

Page 12, line 17, change "the connection server 26" to --a connection service

B B

provider--.

Page 13, line 6, change "the connection server 26" to --a connection service provider--.

In the Claims

Please amend the claims as follows:

22. (Amended) A computer program product for use with a computer system, the computer system having first processor operatively coupled to a second processor [and second processors] and a server [operatively coupled] over a computer network, the computer program product comprising:

a computer useable medium having program code means embodied in the medium for establishing a point-to-point communications link between the first processor and a second processor over a computer network, the medium further comprising:

program code means for transmitting an E-mail signal comprising a network protocol address [from] of the first processor to the second processor [server] over the computer network;

program code means for receiving a second network protocol address from the second processor over the computer network; and

program code means, responsive to the second network protocol address, for establishing a point-to-point communication link between the first processor and the second processor over a computer network.

42. (Amended) The method of claim 41 wherein [the elements generated in steps A and B are graphic elements and] the step of establishing a [point-to-communication] point-to-point link as described in step C is performed in response to a user manipulating the graphic elements on the graphic user interface.

Please add the following claims:

54. A method of locating a user over a computer network comprising the steps of :

a. maintaining an Internet accessible list having a plurality of entries, each entry comprising an electronic mail address and a corresponding Internet protocol address for a process currently connected to the Internet; and

b. in response to identification of one of the list entries by a requesting process, providing one of the electronic mail address and the corresponding Internet protocol address of the identified entry to the requesting process.

55. 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 network accessible compilation of entries, each entry comprising a network protocol address and a corresponding identifier for a user connected to the computer network;

b. in response to identification of one of the entries by a requesting process providing one of the identifier and the network protocol address to the requesting process.

56. The method of claim 55 further comprising the step of:

c. modifying the compilation of entries.

57. The method of claim 56 wherein step c further comprises:

c.1 adding an entry to the compilation upon the occurrence of a predetermined event.

58. The method of claim 57 wherein the predetermined event comprises notification by a user process of an assigned network protocol address.

59. The method of claim 56 wherein step c further comprises:

c.1 deleting an entry from the compilation upon the occurrence of a predetermined event.

60. A computer program product for use with a server apparatus operatively coupled over a computer network to one or more computer processes, the computer program product comprising a computer usable medium having program code embodied in the medium the program code comprising:

a. program code configured to maintain, in a computer memory, a network accessible compilation of entries, each entry comprising a network protocol address and a corresponding identifier for a process connected to the computer network; and

b. program code responsive to identification of one of the entries by a requesting process and configured to provide one of the identifier and the network protocol address to the requesting process.

61. The computer program product of claim 60 further comprising:

c. program code configured to modify the compilation of entries.

62. The computer program product of claim 61 wherein program code configured to modify comprises:

c.1 program code configured to add an entry to the compilation upon the occurrence of a predetermined event.

63. The computer program product of claim 62 wherein the predetermined event comprises notification by a process of an assigned network protocol address.

64. The computer program product of claim 60 wherein step c further

comprises:

c.1 program code configured to delete an entry from the compilation upon the occurrence of a predetermined event.

65. A computer program product for use with a server operatively coupled over a computer network to a plurality of processes, the computer program product comprising a computer usable medium having program code embodied thereon the program code comprising:

a. program code configured to receive the current network protocol address of one of the processes coupled to the network;

b. program code configured to receive an identifier associated with said one process, and

c. program code configured to receive queries for one of the network protocol address and the associated identifier of said one process from other processes over the computer network.

66. A computer program product for use with a computer system, the computer system including a first process operatively coupled over a computer network to a second process and a server process , the computer program product comprising a computer usable medium having computer readable program code embodied therein, the program code means comprising:

a. program code configured to access a directory database, the database having a network protocol address for a plurality of processes having on-line status with respect to the computer network; and

b. program code responsive to one of the network protocol addresses and configured to establish a point-to-point communication link from the first process to the second process over the computer network.

67. In a first computer process operatively coupled over a computer network to a second process and an address server, a method of establishing a point-to-point communication between the first and second processes comprising the steps of:

A. querying the address server as to whether the second process is connected to the computer network;

B. receiving a network protocol address of the second process from the address server, when the second process is connected to the computer network; and

C. in responsive to the network protocol address of the second process, establishing a point-to-point communication link with the second process over the computer network.

68. In a first computer process operatively coupled over a computer network to a second process and an E-mail server, a method of establishing a point-to-point communication between the first and second processes comprising the steps of:

A. transmitting an E-mail signal comprising a network protocol address of the first process to the second process over the computer network;

B. receiving a second network protocol address from the second process over the computer network; and

C. in responsive to the second network protocol address, establishing a point-to-point communication link between the first process and the second process over a computer network.

REMARKS

Applicant has considered carefully the Office Action dated June 2, 1997 and the references cited therein. In response, the title, specification, and claims have been amended. Applicant respectfully requests reexamination of the application.

The title of the application has now been changed to "METHOD AND APPARATUS FOR ESTABLISHING POINT-TO-POINT COMMUNICATIONS OVER A

COMPUTER NETWORK. Applicant asserts that the title as amended is indicative of the invention to which the claims are directed.

Regarding the multiple information disclosures submitted prior to examination, many of the submitted references were located during patentability searches not performed by applicant's current counsel. Applicant's current counsel submitted such references under the continuing duty of candor under 37 C.F.R. §§56, 1.97, 1.98. The Applicant is relying on the Examiner's expertise to determine the relevance of the references to the claimed subject matter.

As requested by the Examiner, the applicant has checked the specification for minor errors and has, in response, amended the specification as set forth herein. No new matter is believed to be added by these changes to the specification.

Claim 22 has been amended to conform the claim language with the specification. Such amendments are not required to distinguish the claimed subject matter over any of the cited references, whether considered singularly or in combination.

Claim 42 has been amended to correct a grammatical error and any potential problems under 37 C.F.R. §112, second paragraph. Such amendment is not required to distinguish the claimed subject matter over any of the cited references, whether considered singularly or in combination.

Applicant submits herewith a declaration of prior invention under 37 CFR 1.131 to overcome the rejection of all claims under 35 U.S.C. §103 as being unpatentable over Civanlar et al. in view of Morgan et al. and/or further in view of December et al. The declaration is submitted with a facsimile signature of the declarant inventor. The original signed declaration will be submitted as soon as it becomes available. In light of the declaration and acconpanying exhibits, all rejections based on the Civanlar et al. reference are deemed moot.

In addition, Applicant has the following remarks. One of the major factors

inhibiting dynamic communications over the Internet, and other computer networks, is the inability to obtain the current dynamically assigned network protocal address of a user process connected to the network. This problem is analogous to trying to call someone whose telephone number changes after each call. Applicant's invention provides techniques for determining the current dynamically assigned network protocal address of a user process connected to the network. The first technique utilizes a dedicated server which acts as a network address/information directory from which calling processes can obtain information. When a first process connects to the network, the process logs-on to the server and provides the server with the network protocal address under which the first process is currently operating. A second process wishing to establish communications with the first process, connects to the server and request the network protocal address under which the first process is currently operating. Upon receipt of the network protocal address of the first process, the second process establishes communications with the first process directly, without any intervenion from the address/ information server.

The Examiner has repeatedly indicated that Civanlar et al. in view of Morgan et al. teach an address server and database utilized to initiate communications between two nodes. Conversly, in the present invention, communications between two nodes, e.g. processes, are initiated by soley by one of the processes. The address server may have optionally supplied address information to one of the processes, but the address server does not establish the point-to-point communication connection between the nodes. Applicant has reviewed Civanlar et al. in view of Morgan et al. and has found no disclosure or suggestion of this first claimed technique whether the references are considered singularly or in combination.

Applicant's invention provides a second techniques for determining the current dynamically assigned network protocal address of a user process connected to the network. In the second technique, a first process wishing to establish communications with a second process, sends, via E-mail, the network protocal address under which

the first process is currently operating to the second process. Upon receipt of the E-mail message, the second process sends to the first process, via E-mail, the network protocal address under which the second process is currently operating. Upon receipt of the network protocal address of the second process, the first process establishes communications with the second process directly, without any intervenion from the address/ information server. This second technique may be used in addition to or in place of the first technique. As with the first technique, communications between two nodes, e.g. processes, are initiated by soley by one of the processes. The address server does not establish the point-to-point communication connection between the nodes. Applicant has reviewed Civanlar et al. in view of Morgan et al. and further in view of December et al. and has found no disclosure or suggestion of this second claimed technique whether the references are considered singularly or in combination.

Applicant respectfully traverses the rejection of claims 32-42 and 43-53 under 35 U.S.C. §103 as being unpatentable over Civanlar et al. in view of Morgan et al. and further in view of December et al. Claims 32-42 are directed to a method for establishing a point-to-point communication link from a caller processor to a callee processor over a computer network by associating graphic elements representing communication line and a first callee processor. Claims 43-53 essentially comprise a computer program product claim counterparts to claims 32-42. Applicant has reviewed the cited references in detail and can find no suggestion or disclosure of generating graphic elements representing a communication line or a callee processor or establishment of a point-to-point communication link by associating the graphic element.

Applicant submits herewith new claims 54-68 to more particularly point out and distinctly claim the subject matter which the Applicant regards as the invention. All claims are believed allowable over any of the references cited by the Applicant, whether considered singularly or in combination. Accordingly, Applicant believes this application is in condition for allowance and a notice to that effect is respectfully requested. If the

Examiner has any questions regarding this amendment or the application in general he is invited to call the Applicant's attorney at the number listed below.

The Commissioner is hereby authorized to charge any other fees under 37 C.F.R. §1.16 and 1.17 that may be required, or credit any overpayment, to our Deposit Account No. 20-0065.

Respectfully submitted,

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EXHIBIT D

US006131121A

United States Patent [19]

Mattaway et al.

[11] Patent Number: 6,131,121

[45] Date of Patent: *Oct. 10, 2000

[54] **POINT-TO-POINT COMPUTER NETWORK COMMUNICATION UTILITY UTILIZING DYNAMICALLY ASSIGNED NETWORK PROTOCOL ADDRESSES**

[75] Inventors: **Shane D. Mattaway**, Boca Raton; **Glenn W. Hutton**, Miami; **Craig B. Strickland**, Tamarac, all of Fla.

[73] Assignee: **NetSpeak Corporation**, Boca Raton, Fla.

[*] Notice: This patent is subject to a terminal disclaimer.

[21] Appl. No.: **08/719,554**

[22] Filed: **Sep. 25, 1996**

Related U.S. Application Data

[63] Continuation-in-part of application No. 08/533,115, Sep. 25, 1995.

[51] **Int. Cl.**[7] **G06F 15/16**

[52] **U.S. Cl.** **709/227**

[58] **Field of Search** 370/260, 259, 370/351–357; 379/212, 221, 222, 89, 90, 93–100, 88; 395/200.54, 200.57, 200.58, 200.34, 200.35; 709/227, 228, 229

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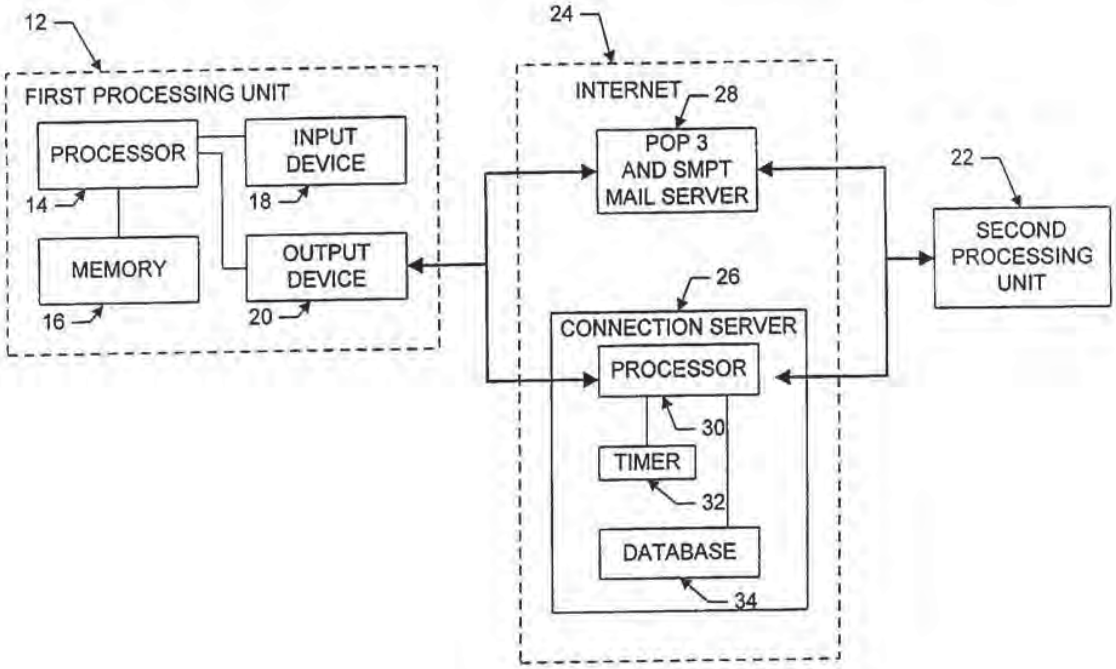
Primary Examiner—Ajit Patel

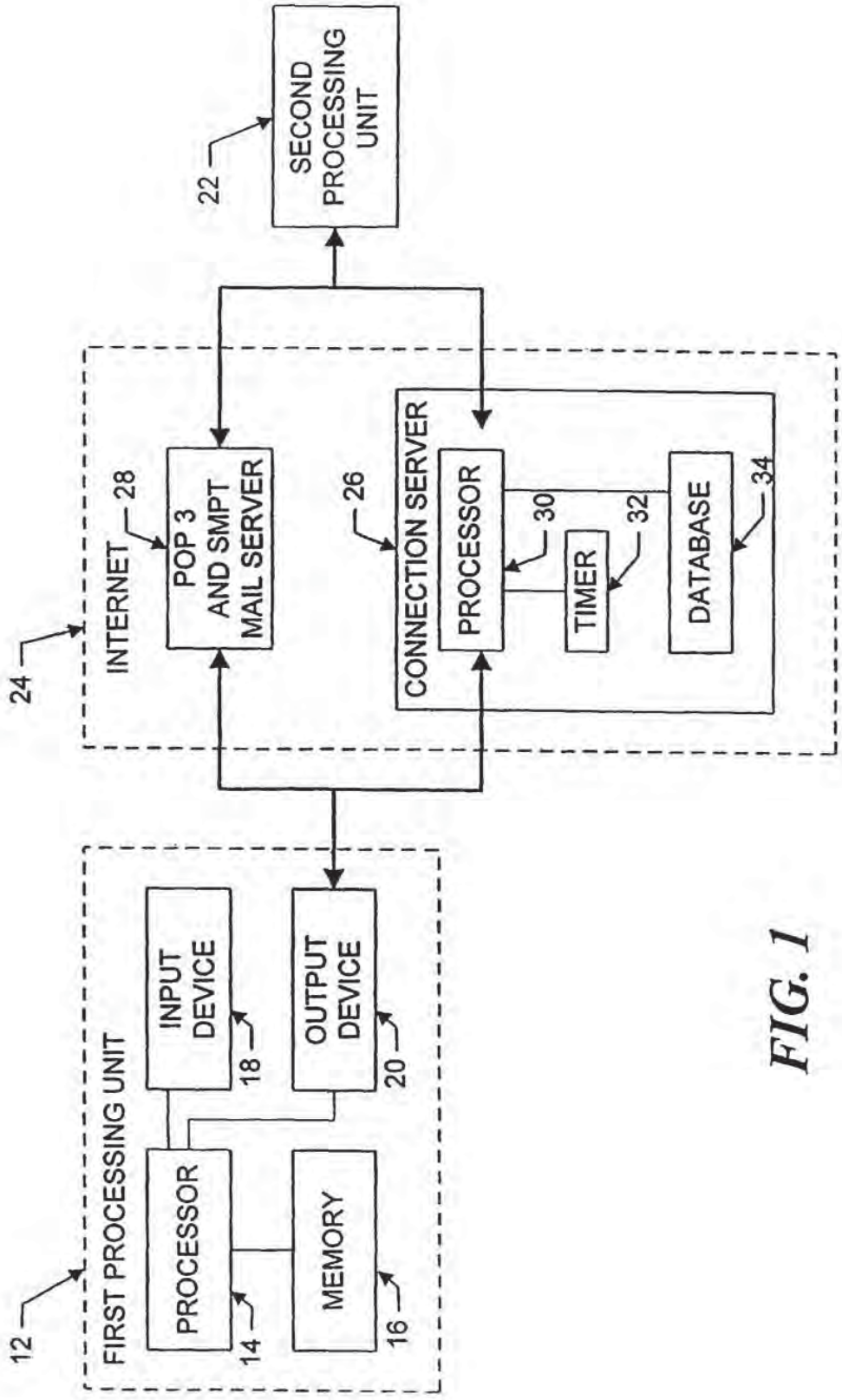
Attorney, Agent, or Firm—Kudirka & Jobse, LLP

[57] **ABSTRACT**

A communication utility for establishing real-time, point-to-point communications between processes over a computer network includes apparatus for querying a server as to the network protocol address of another client process, and apparatus for directly establishing a communication link with the client process upon receipt of the network protocol address from the server. In one embodiment, the utility includes a sophisticated user interface having features similar to typical telephony hardware but implementing greater flexibility with software.

14 Claims, 27 Drawing Sheets

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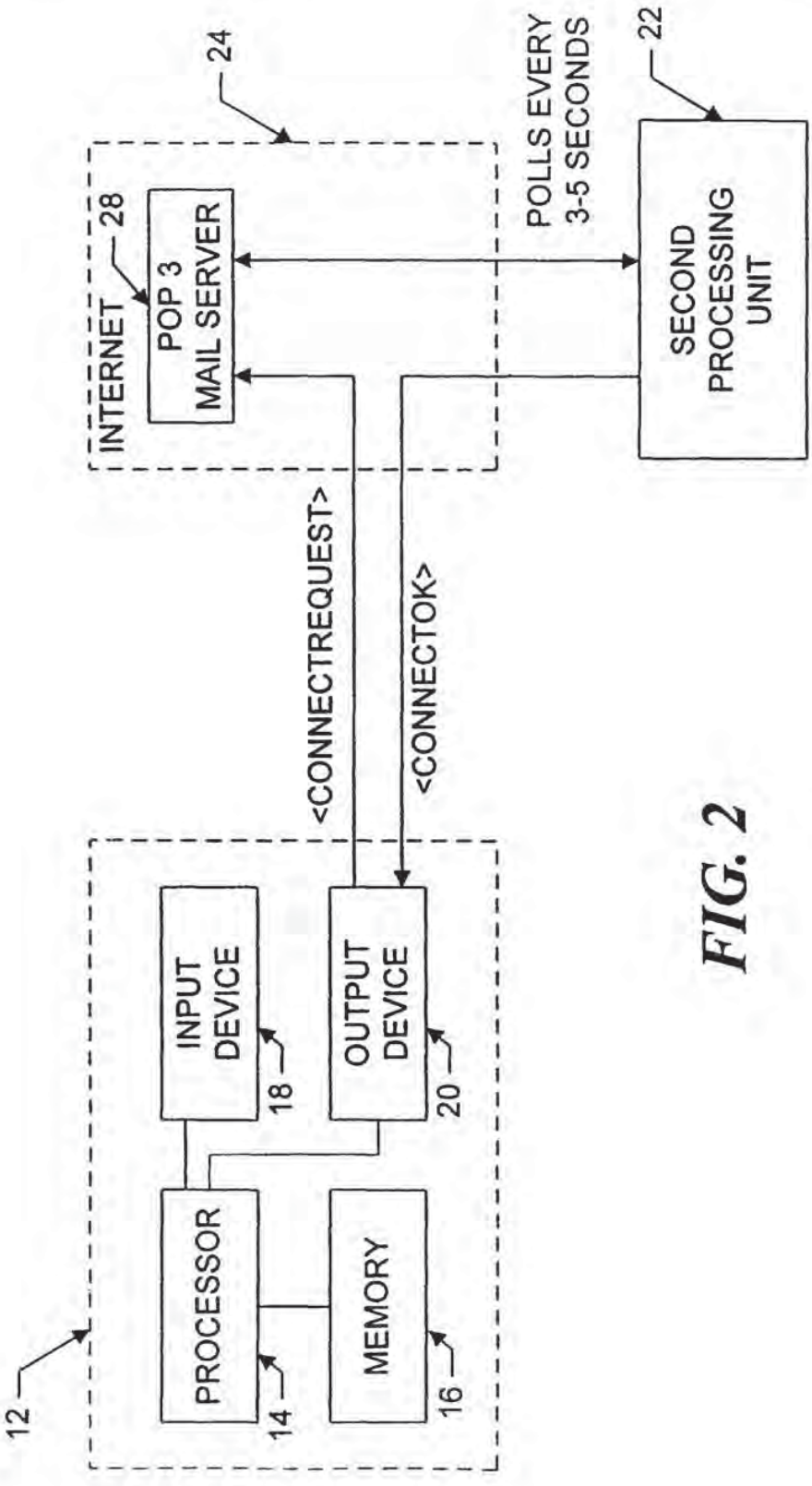
INPUT DEVICE
18
OUTPUT DEVICE
20
PROCESSOR
14
MEMORY
16

FIG. 1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22
POLLS EVERY 3-5 SECONDS
INTERNET
28
POP 3 MAIL SERVER
SECOND PROCESSING UNIT
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18
OUTPUT DEVICE
20
PROCESSOR
14
MEMORY
16
12

FIG. 2

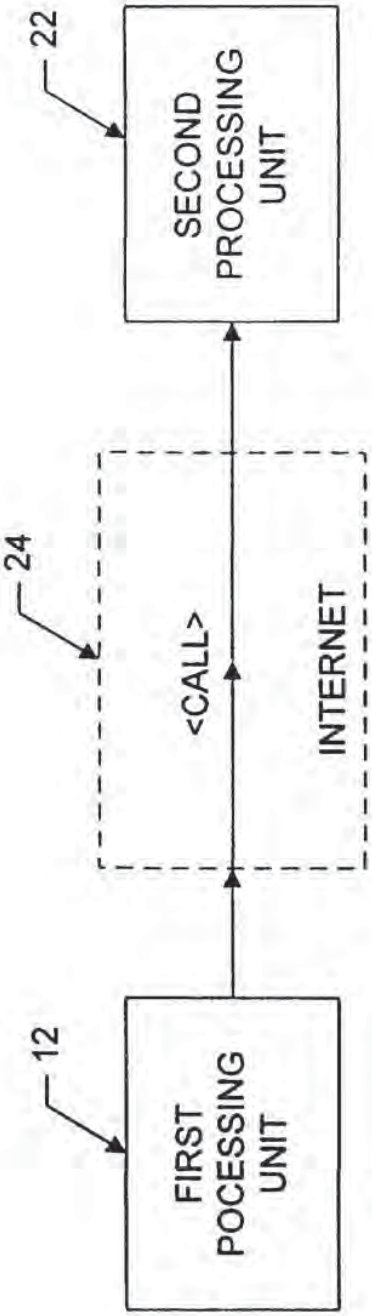
22
SECOND PROCESSING UNIT
24
<CALL>
INTERNET
12
FIRST POCESSING UNIT

FIG. 3

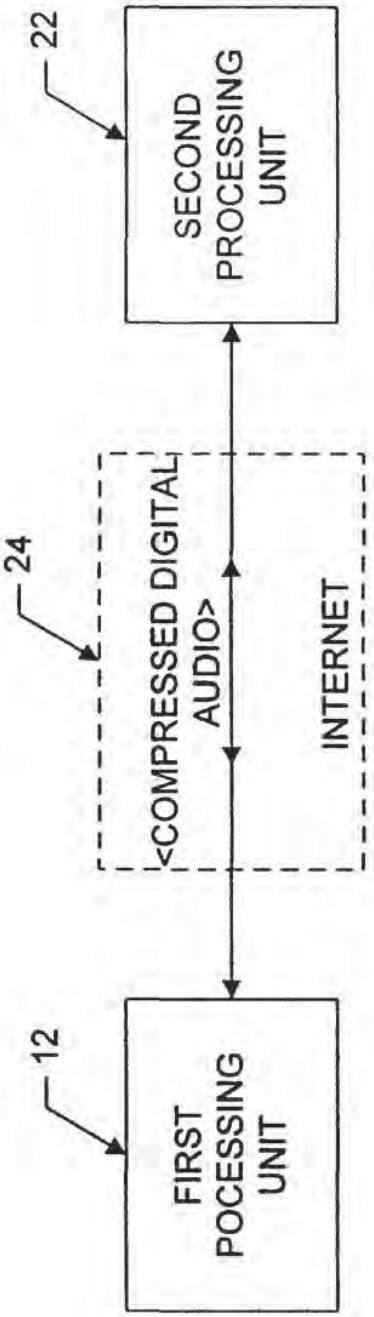
22
SECOND PROCESSING UNIT
24
<COMPRESSED DIGITAL AUDIO>
INTERNET
12
FIRST POCESSING UNIT

FIG. 4

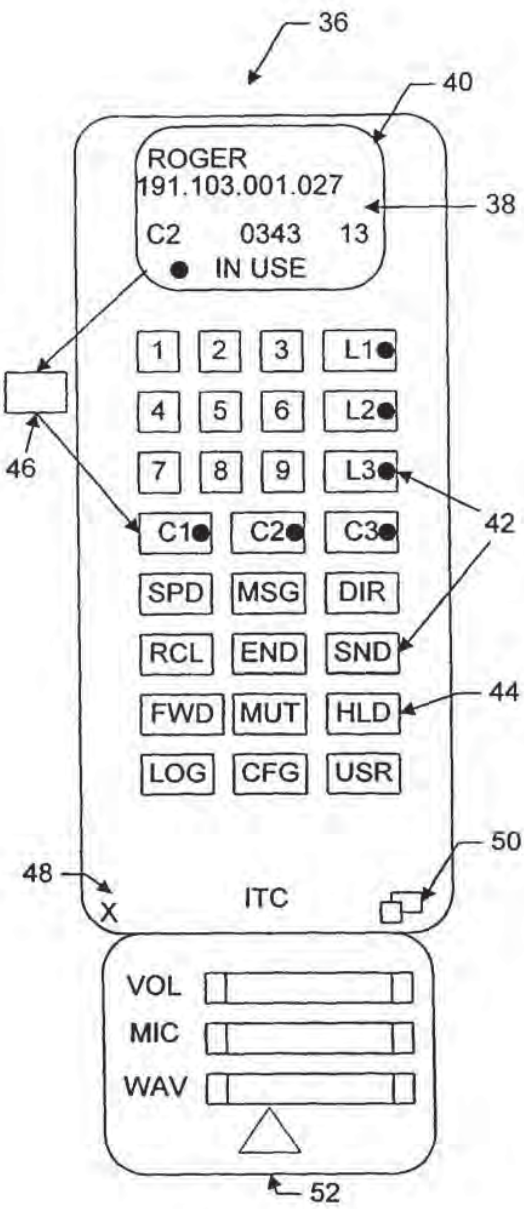
36
40
ROGER
191.103.001.027
38
C2 0343 13
IN USE
1 2 3 L1
4 5 6 L2
7 8 9 L3
46
C1 C2 C3
42
SPD MSG DIR
RCL END SND
44
FWD MUT HLD
LOG CFG USR
48
50
X
ITC
VOL
MIC
WAV
52

FIG. 5

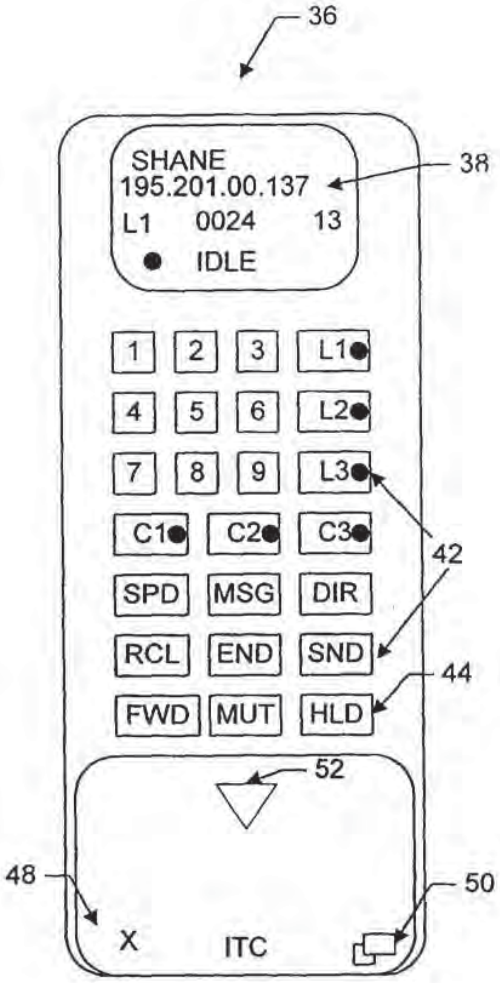
36
SHANE
195.201.00.137
38
L1 0024 13
IDLE
1 2 3 L1
4 5 6 L2
7 8 9 L3
C1 C2 C3
42
SPD MSG DIR
RCL END SND
44
FWD MUT HLD
52
48
50
X
ITC

FIG. 6

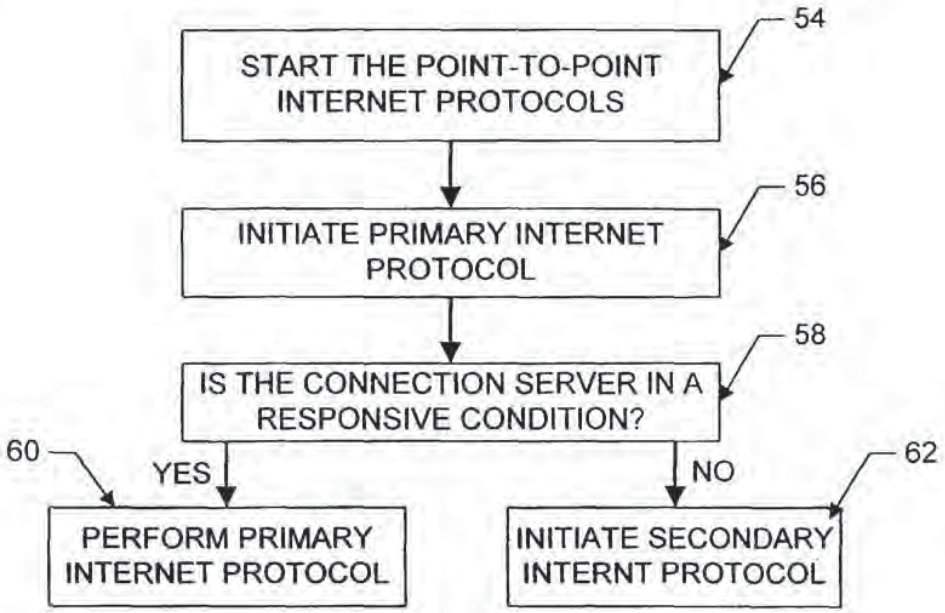
START THE POINT-TO-POINT INTERNET PROTOCOLS
54
INITIATE PRIMARY INTERNET PROTOCOL
56
IS THE CONNECTION SERVER IN A RESPONSIVE CONDITION?
58
60
YES
NO
62
PERFORM PRIMARY INTERNET PROTOCOL
INITIATE SECONDARY INTERNT PROTOCOL

FIG. 7

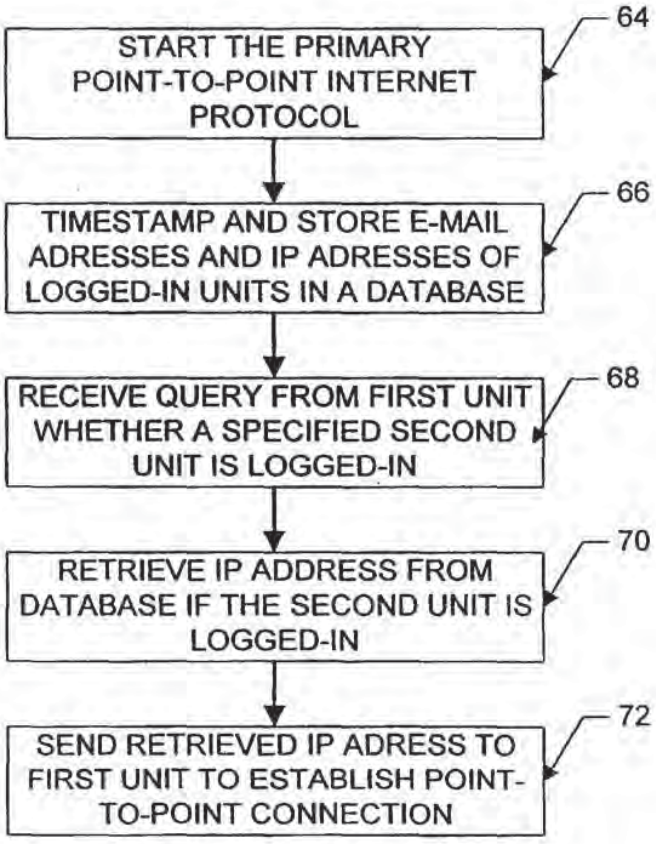
START THE PRIMARY POINT-TO-POINT INTERNET PROTOCOL
64
TIMESTAMP AND STORE E-MAIL ADRESSES AND IP ADRESSES OF LOGGED-IN UNITS IN A DATABASE
66
RECEIVE QUERY FROM FIRST UNIT WHETHER A SPECIFIED SECOND UNIT IS LOGGED-IN
68
RETRIEVE IP ADDRESS FROM DATABASE IF THE SECOND UNIT IS LOGGED-IN
70
SEND RETRIEVED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

FIG. 8

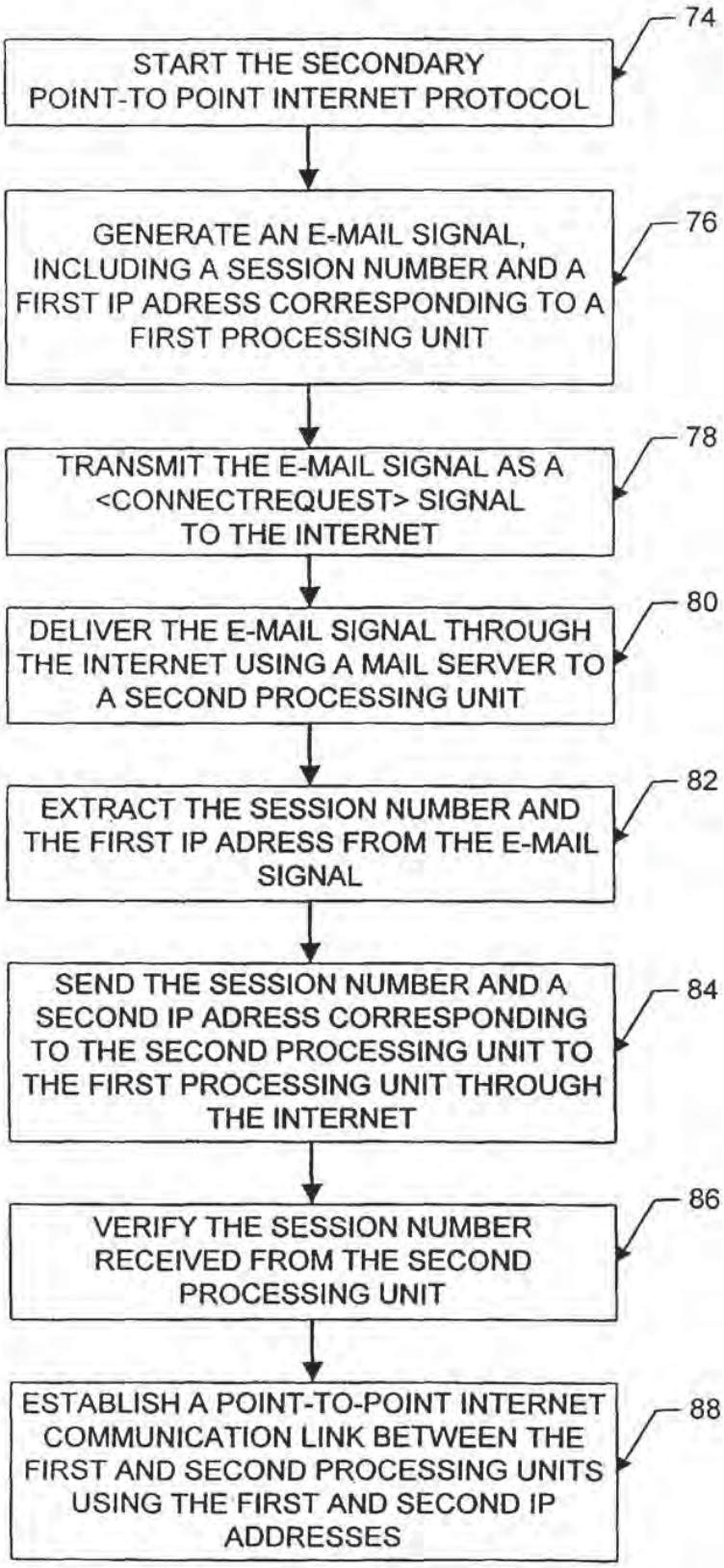
START THE SECONDARY POINT-TO POINT INTERNET PROTOCOL
74
GENERATE AN E-MAIL SIGNAL, INCLUDING A SESSION NUMBER AND A FIRST IP ADRESS CORRESPONDING TO A FIRST PROCESSING UNIT
76
TRANSMIT THE E-MAIL SIGNAL AS A <CONNECTREQUEST> SIGNAL TO THE INTERNET
78
DELIVER THE E-MAIL SIGNAL THROUGH THE INTERNET USING A MAIL SERVER TO A SECOND PROCESSING UNIT
80
EXTRACT THE SESSION NUMBER AND THE FIRST IP ADRESS FROM THE E-MAIL SIGNAL
82
SEND THE SESSION NUMBER AND A SECOND IP ADRESS 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

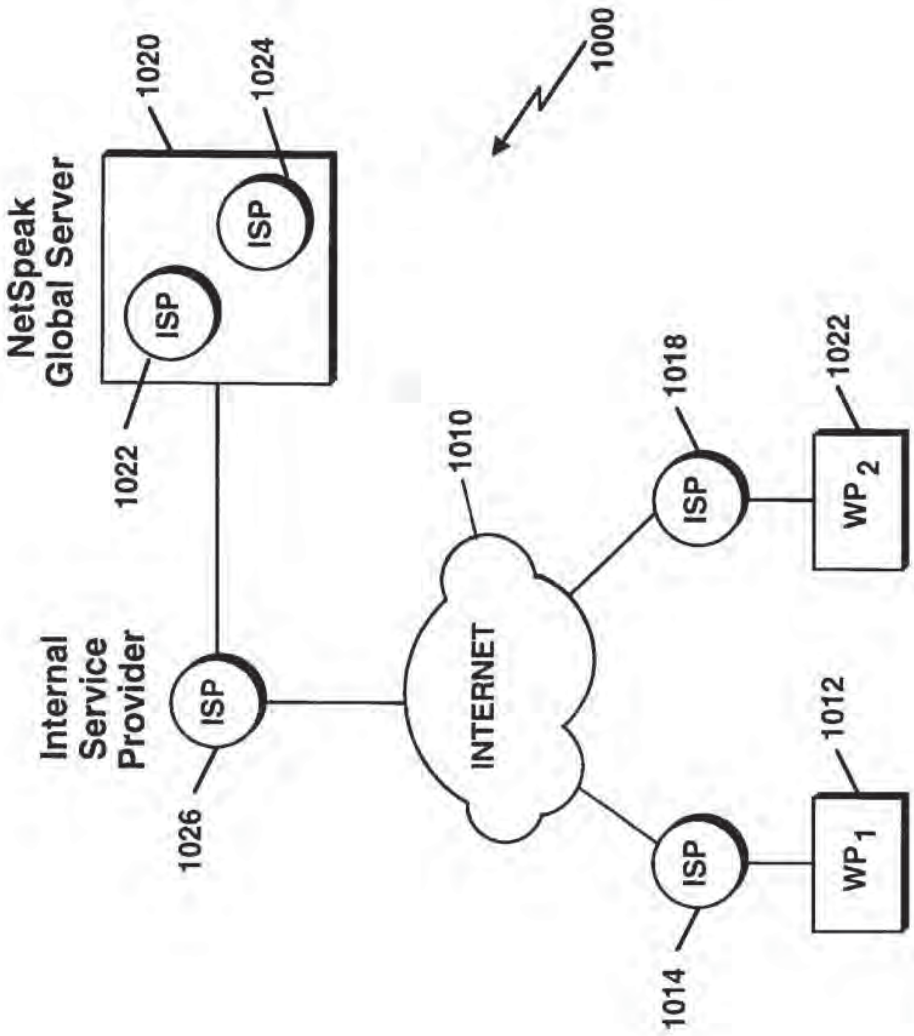
1000
NetSpeak Global Server
1020
1024
ISP
ISP
1022
Internal Service Provider
ISP
1026
INTERNET
1010
ISP
1018
WP 2
1022
ISP
1014
WP 1
1012

Figure 10

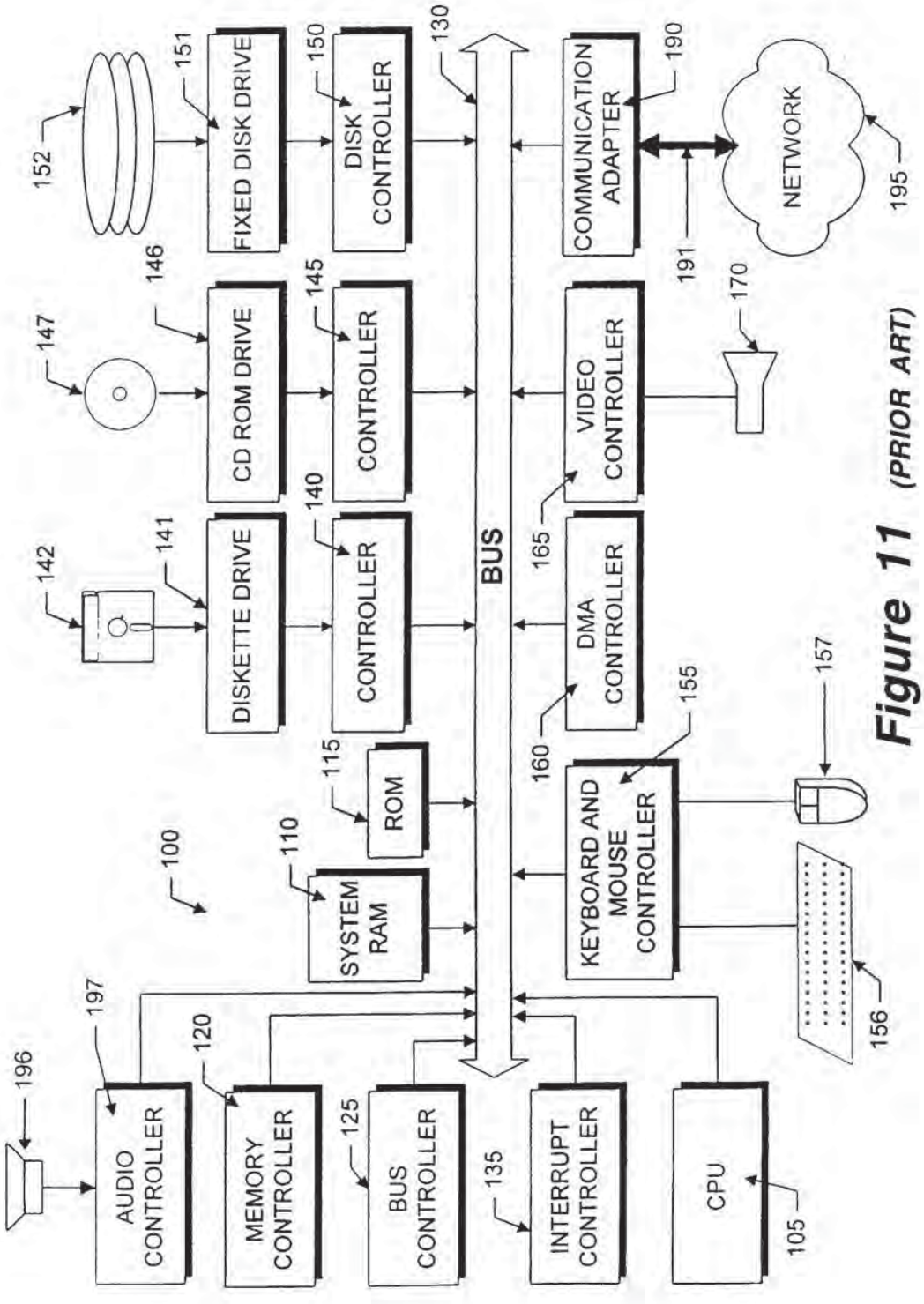

Figure 11 *(PRIOR ART)*

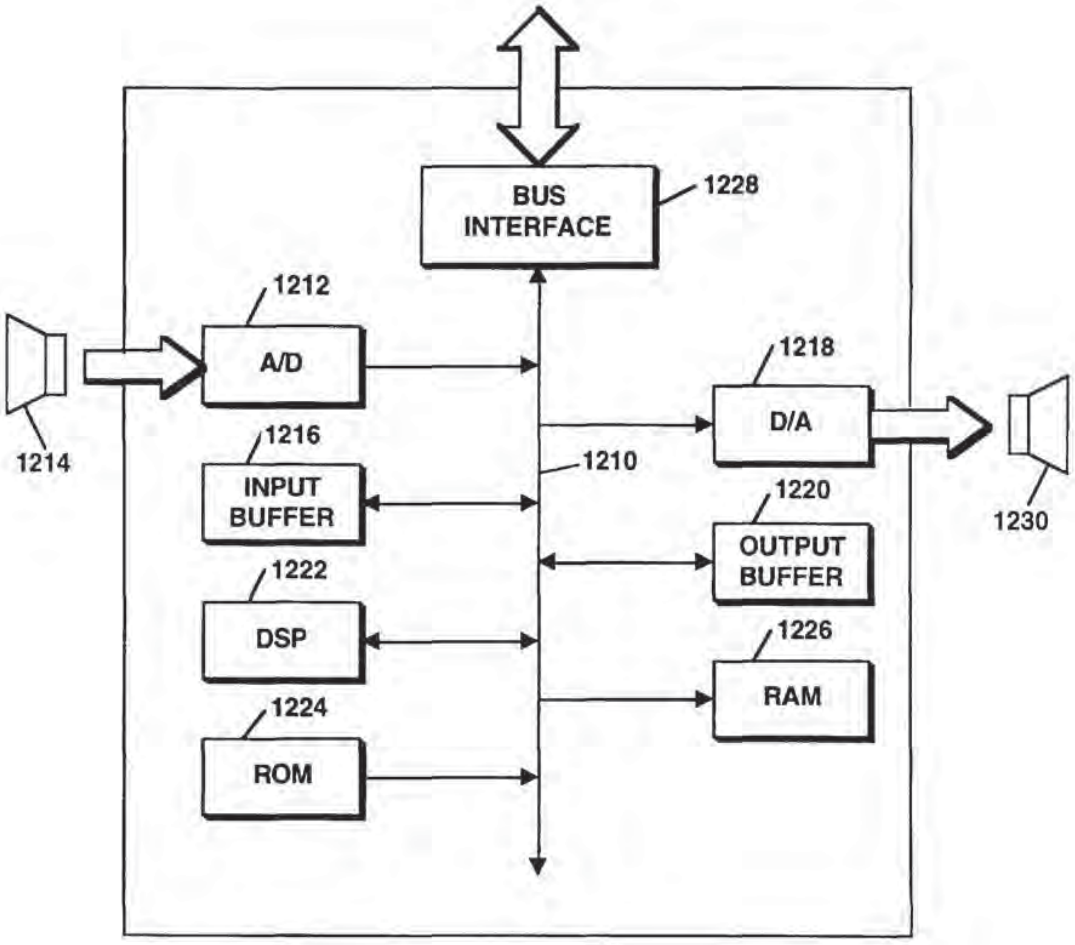

FIGURE 12 (PRIOR ART)

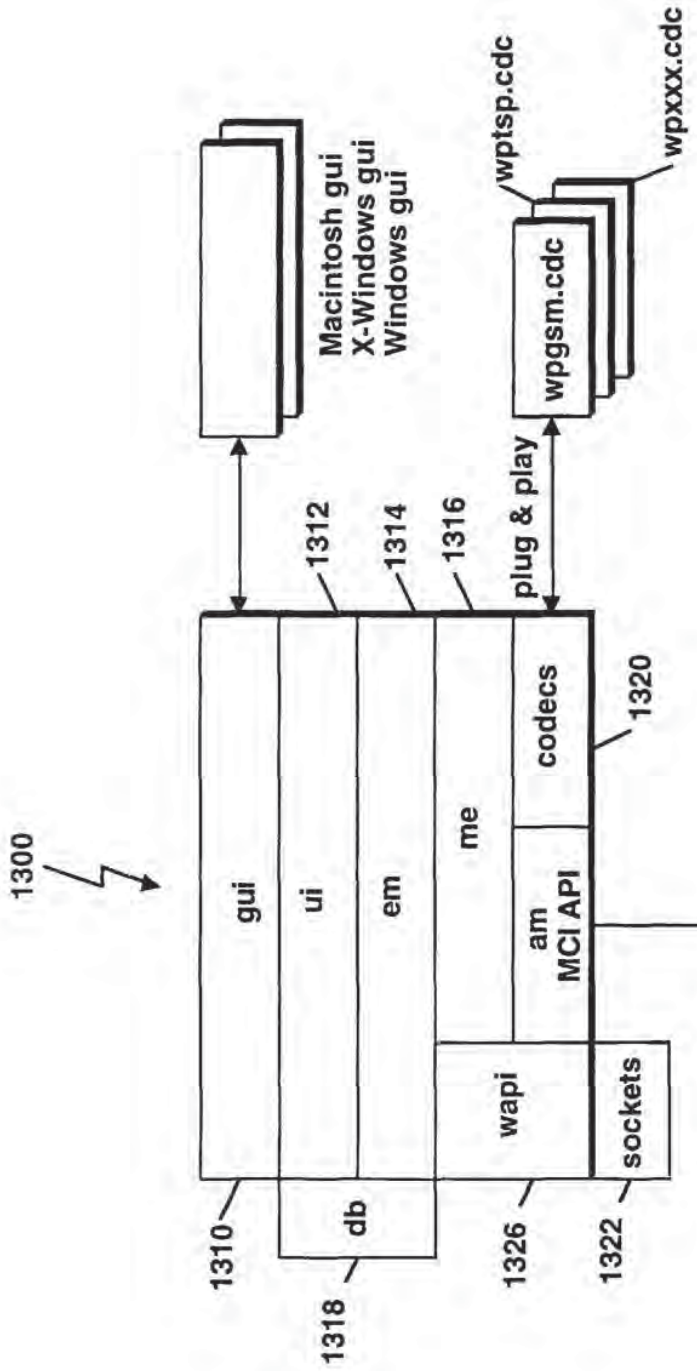
1300
gui
ui
em
me
am
MCI API
codecs
wapi
sockets
db
1310
1312
1314
1316
1318
1320
1322
1324
1326
Macintosh gui
X-Windows gui
Windows gui
plug & play
wpgsm.cdc
wptsp.cdc
wpxxx.cdc
Macintosh
UNIX
Windows

Figure 13 A

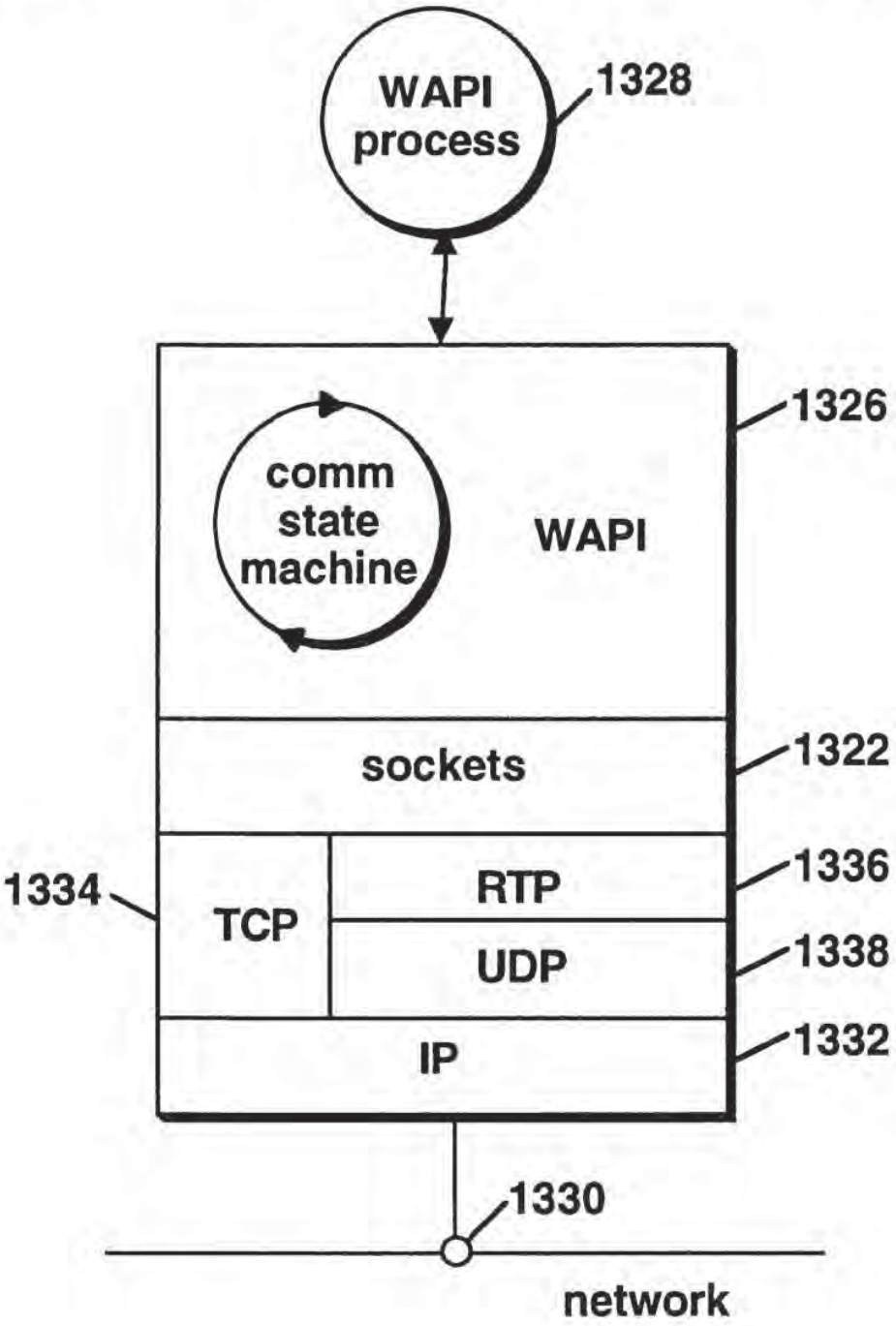
WAPI process
1328
1326
comm state machine
WAPI
sockets
1322
1334
TCP
RTP
1336
UDP
1338
IP
1332
1330
network

FIGURE 13 B

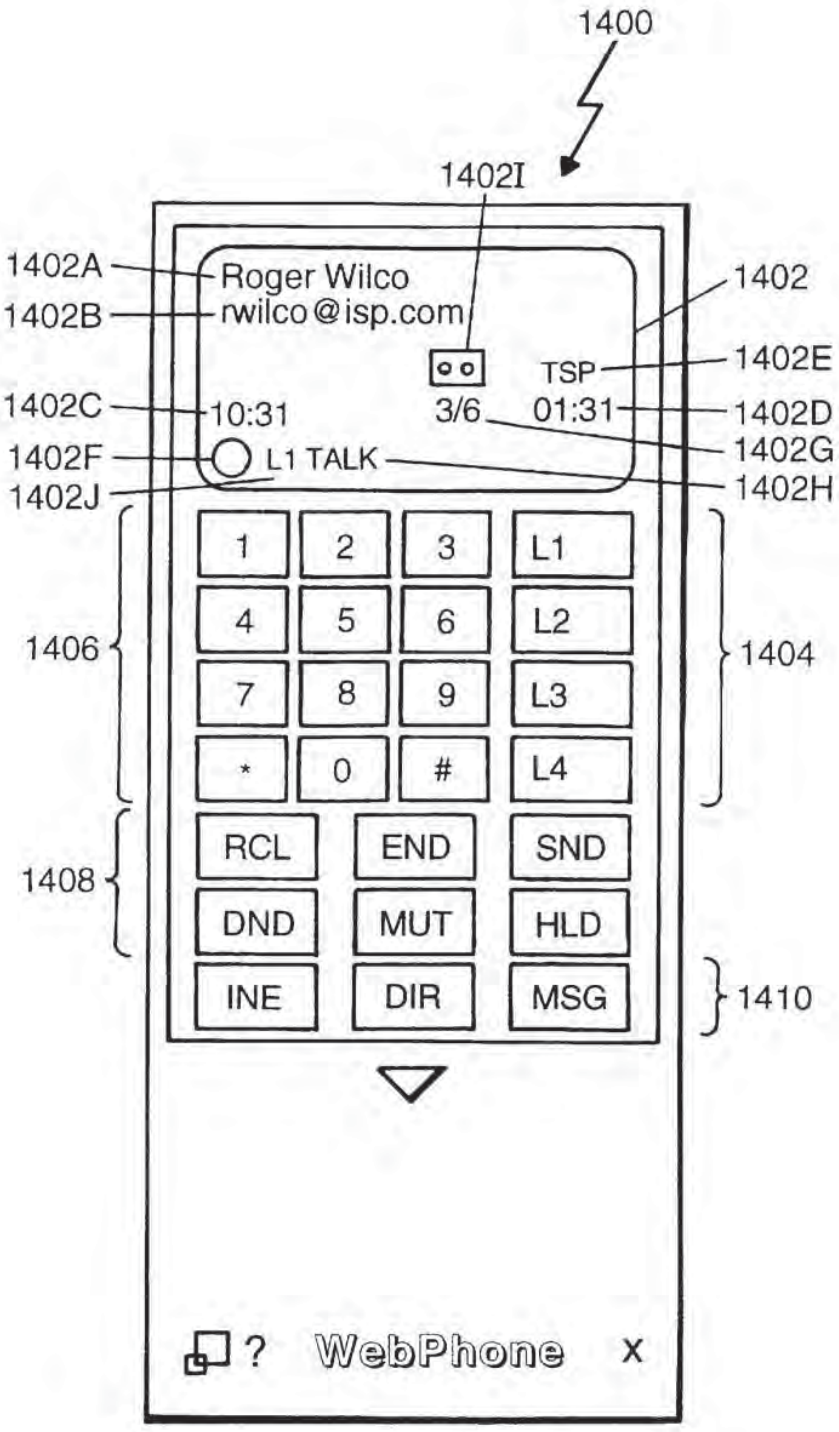
1400
1402I
1402A
Roger Wilco
1402B
rwilco@isp.com
1402
1402E
TSP
1402C
10:31
3/6
01:31
1402D
1402F
L1 TALK
1402G
1402J
1402H
1
2
3
L1
4
5
6
L2
1406
1404
7
8
9
L3
*
0
#
L4
RCL
END
SND
1408
DND
MUT
HLD
INE
DIR
MSG
1410
?
WebPhone
X

Figure 14

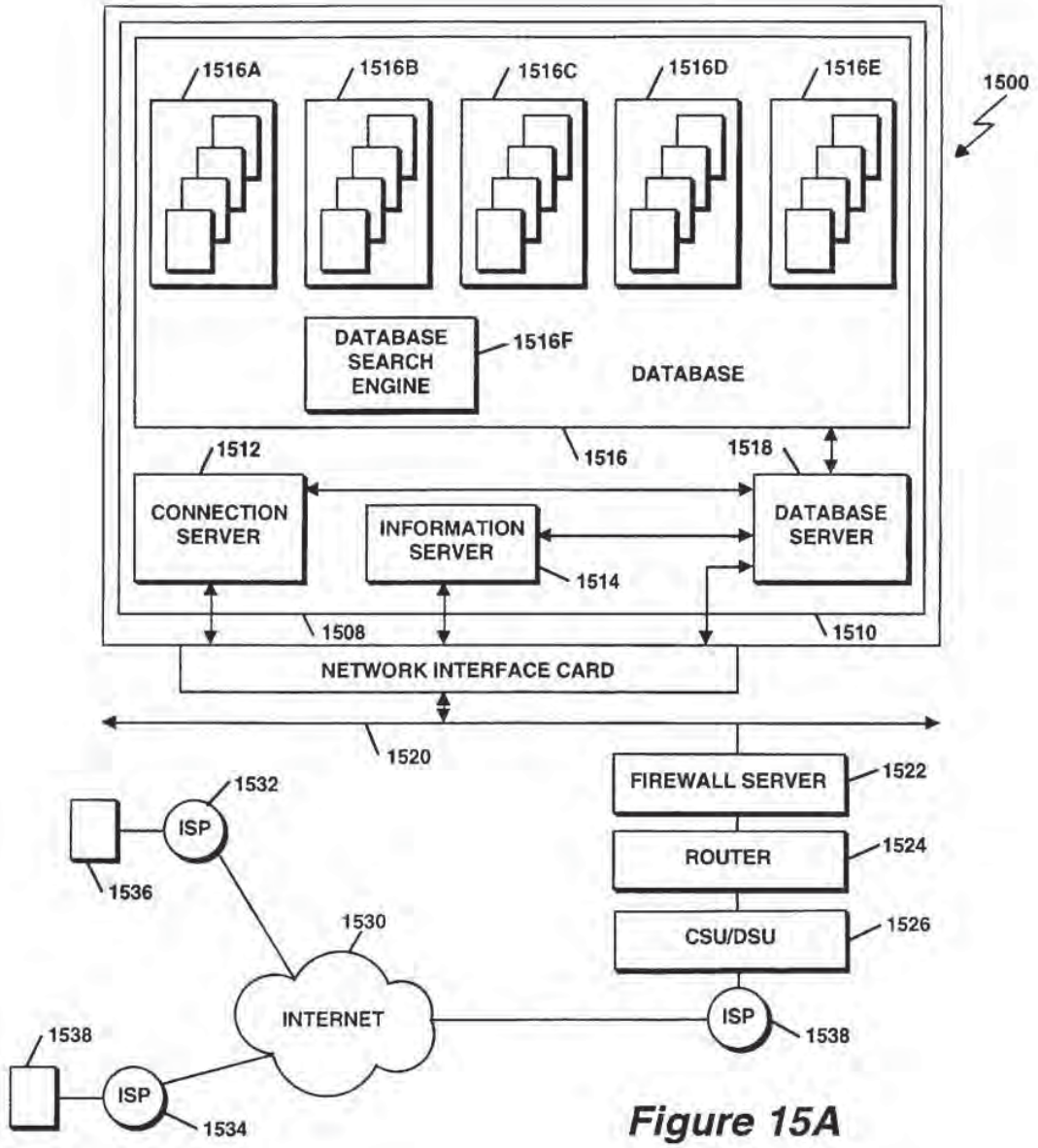
1516A
1516B
1516C
1516D
1516E
1500
DATABASE SEARCH ENGINE
1516F
DATABASE
1512
1516
1518
CONNECTION SERVER
INFORMATION SERVER
DATABASE SERVER
1514
1508
1510
NETWORK INTERFACE CARD
1520
FIREWALL SERVER
1522
1532
ISP
ROUTER
1524
1536
1530
CSU/DSU
1526
INTERNET
ISP
1538
1538
ISP
1534

Figure 15A

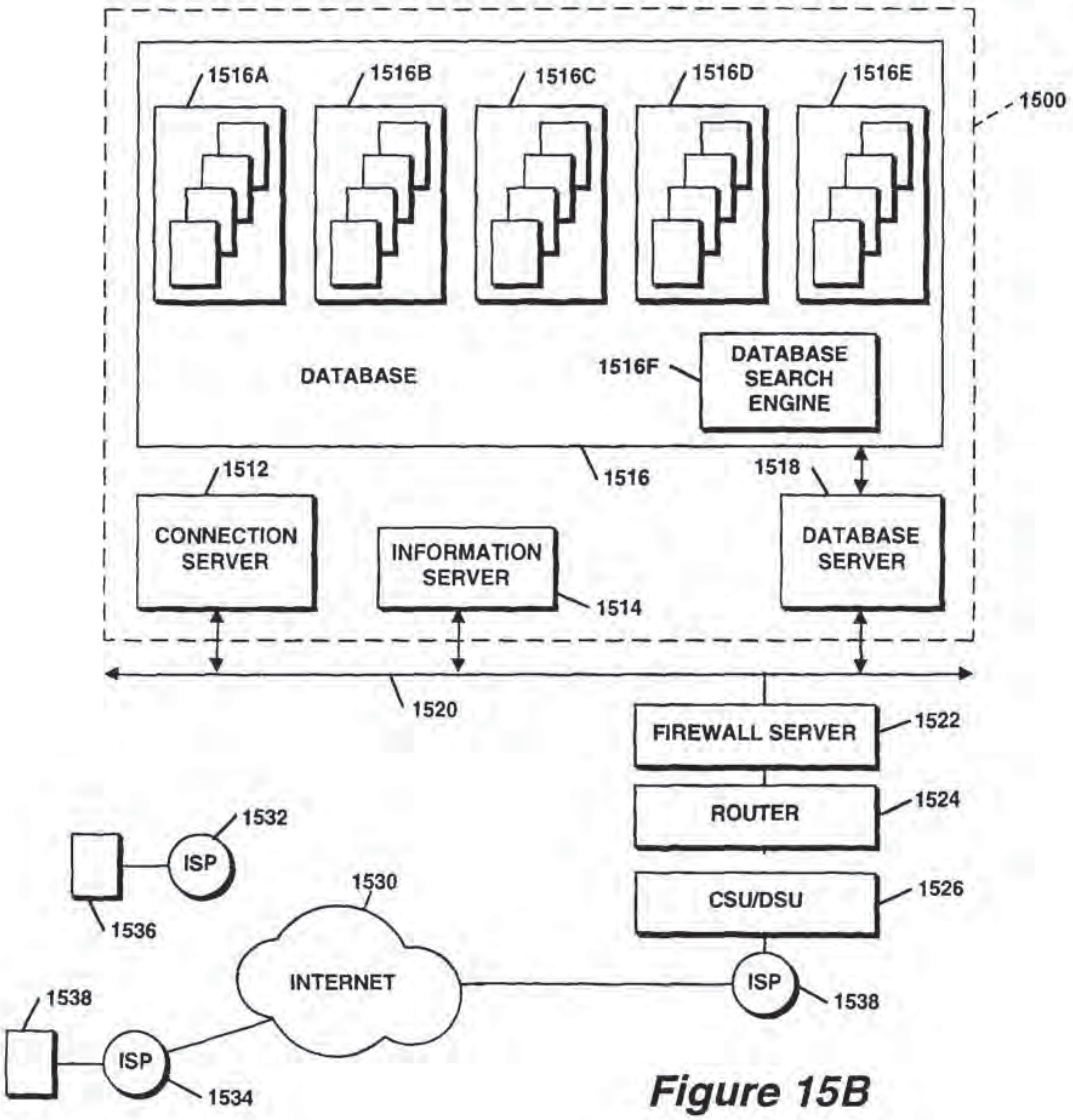
1516A
1516B
1516C
1516D
1516E
1500
DATABASE
1516F
DATABASE SEARCH ENGINE
1516
1512
1518
CONNECTION SERVER
INFORMATION SERVER
1514
DATABASE SERVER
1520
FIREWALL SERVER
1522
ROUTER
1524
CSU/DSU
1526
1532
ISP
1536
1530
INTERNET
ISP
1538
1538
ISP
1534

Figure 15B

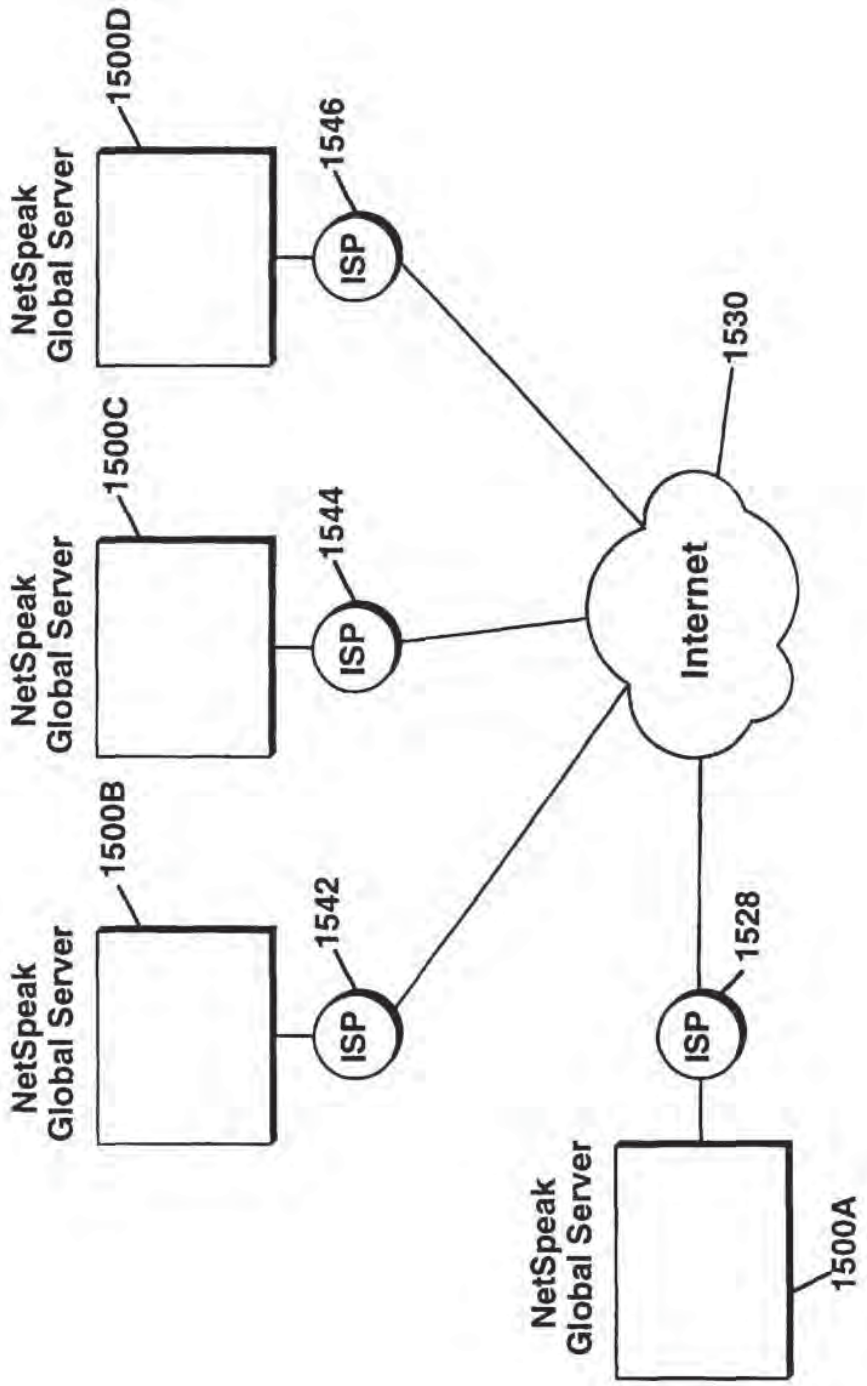
NetSpeak Global Server
1500D
1546
ISP
NetSpeak Global Server
1500C
1544
ISP
NetSpeak Global Server
1500B
1542
ISP
Internet
1530
ISP
1528
NetSpeak Global Server
1500A

Figure 15C

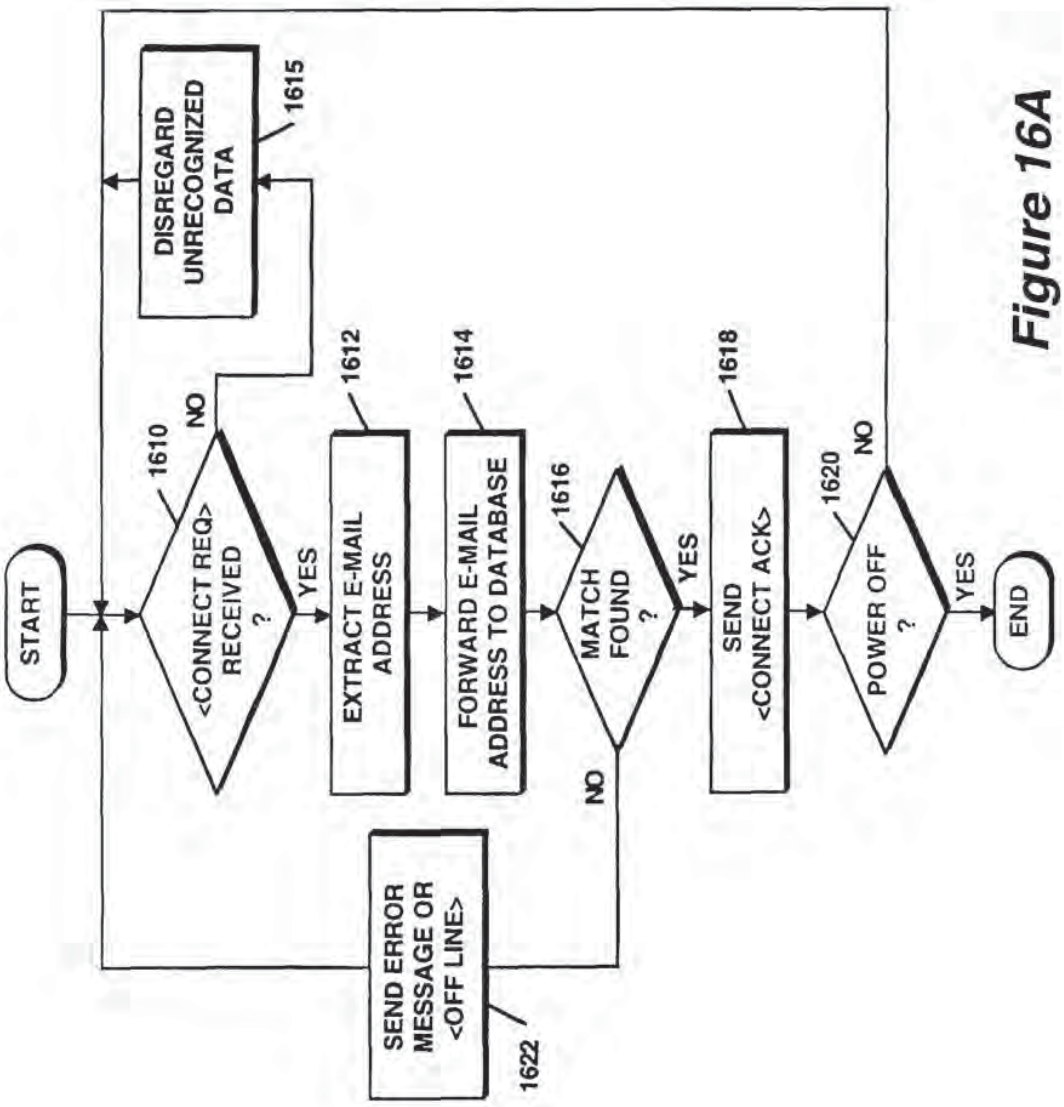
START
<CONNECT REQ> RECEIVED ?
1610
NO
YES
DISREGARD UNRECOGNIZED DATA
1615
EXTRACT E-MAIL ADDRESS
1612
FORWARD E-MAIL ADDRESS TO DATABASE
1614
MATCH FOUND ?
1616
NO
YES
SEND ERROR MESSAGE OR <OFF LINE>
1622
SEND <CONNECT ACK>
1618
POWER OFF ?
1620
NO
YES
END

Figure 16A

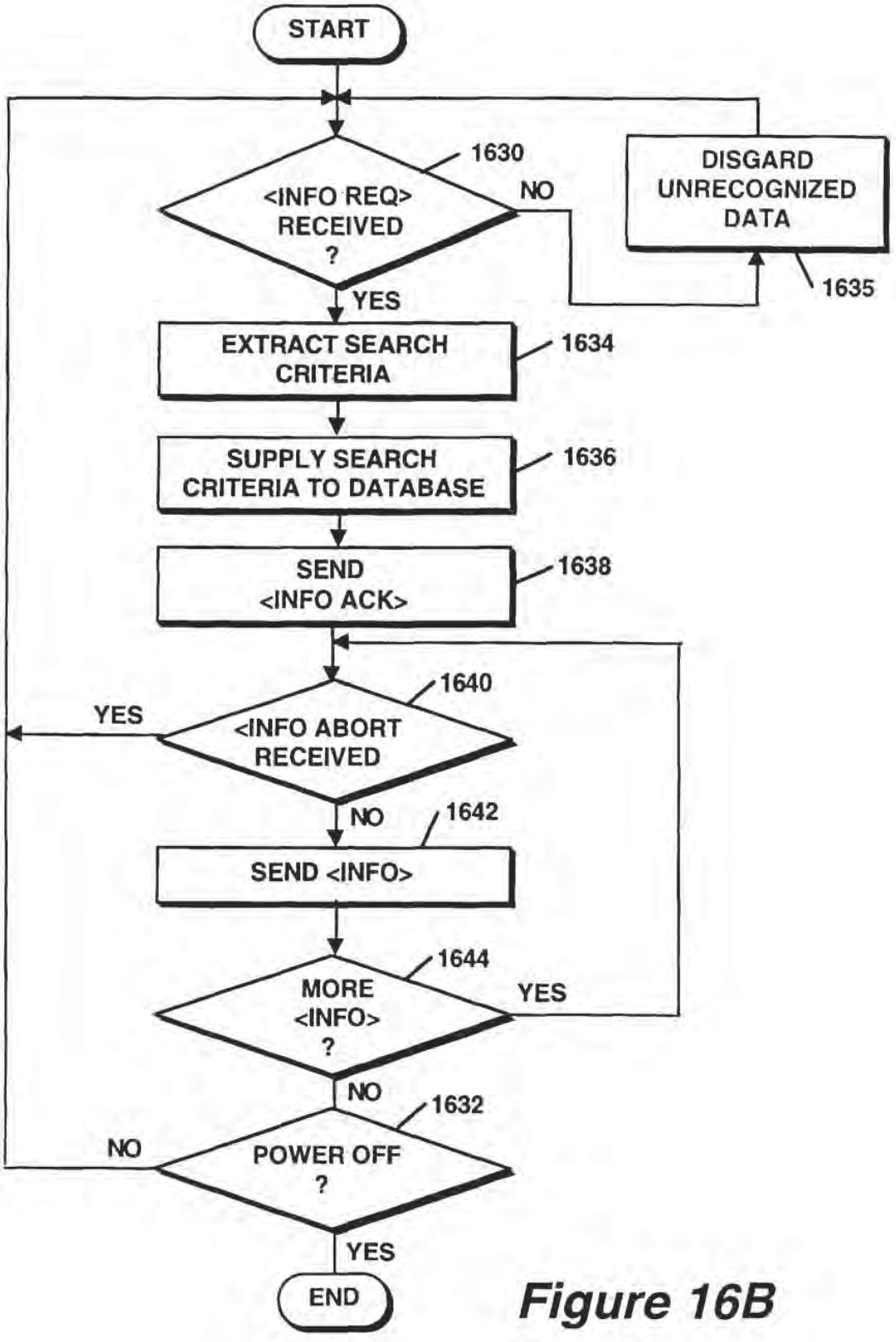
START
1630
<INFO REQ> RECEIVED ?
NO
DISGARD UNRECOGNIZED DATA
1635
YES
EXTRACT SEARCH CRITERIA
1634
SUPPLY SEARCH CRITERIA TO DATABASE
1636
SEND <INFO ACK>
1638
1640
YES
<INFO ABORT RECEIVED
NO
1642
SEND <INFO>
1644
MORE <INFO> ?
YES
NO
1632
NO
POWER OFF ?
YES
END

Figure 16B

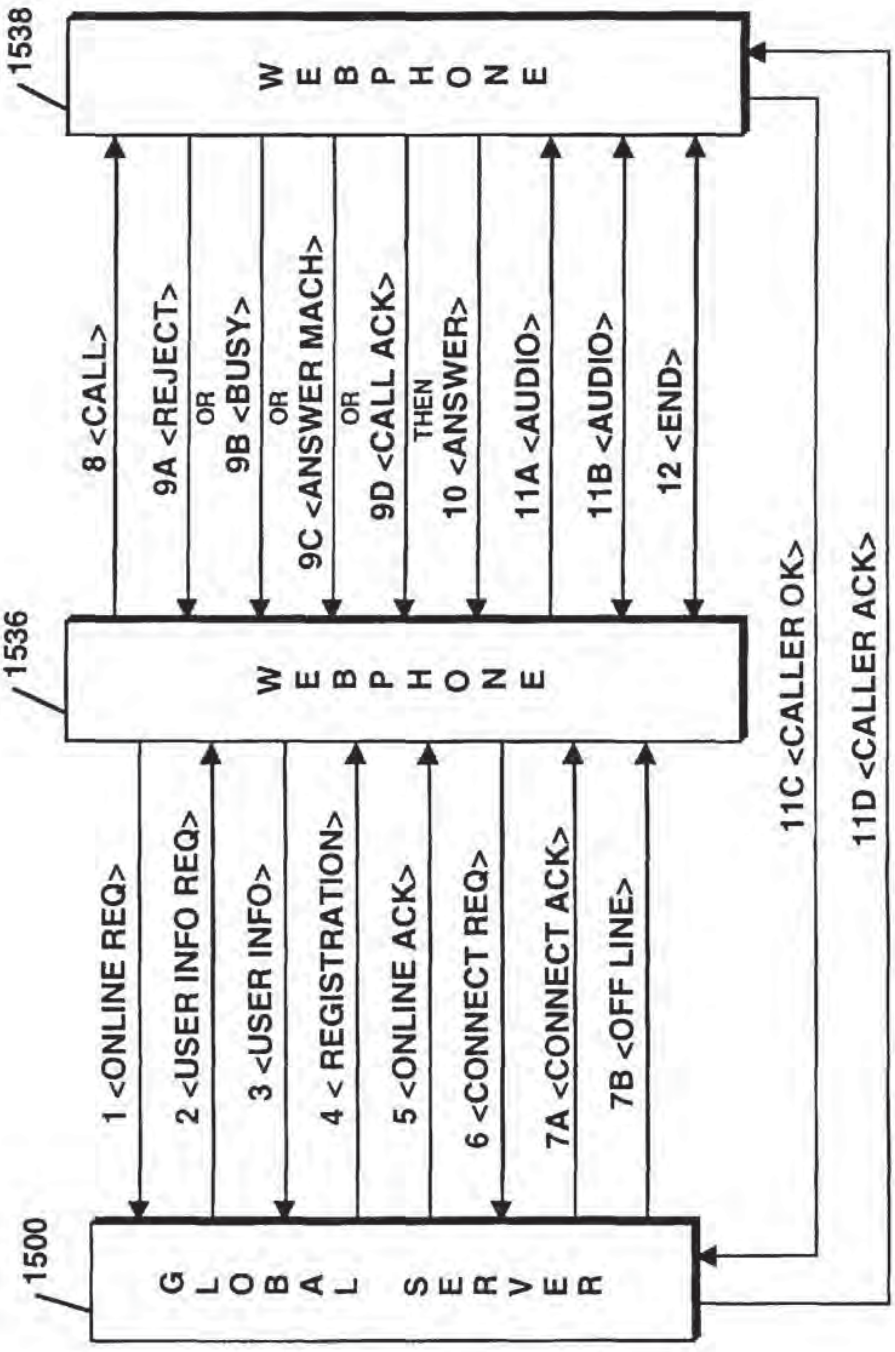
1538
WEB PHONE
1536
WEB PHONE
1500
GLOBAL SERVER
8 <CALL>
9A <REJECT>
OR
9B <BUSY>
OR
9C <ANSWER MACH>
OR
9D <CALL ACK>
THEN
10 <ANSWER>
11A <AUDIO>
11B <AUDIO>
12 <END>
1 <ONLINE REQ>
2 <USER INFO REQ>
3 <USER INFO>
4 < REGISTRATION>
5 <ONLINE ACK>
6 <CONNECT REQ>
7A <CONNECT ACK>
7B <OFF LINE>
11C <CALLER OK>
11D <CALLER ACK>

Figure 17A

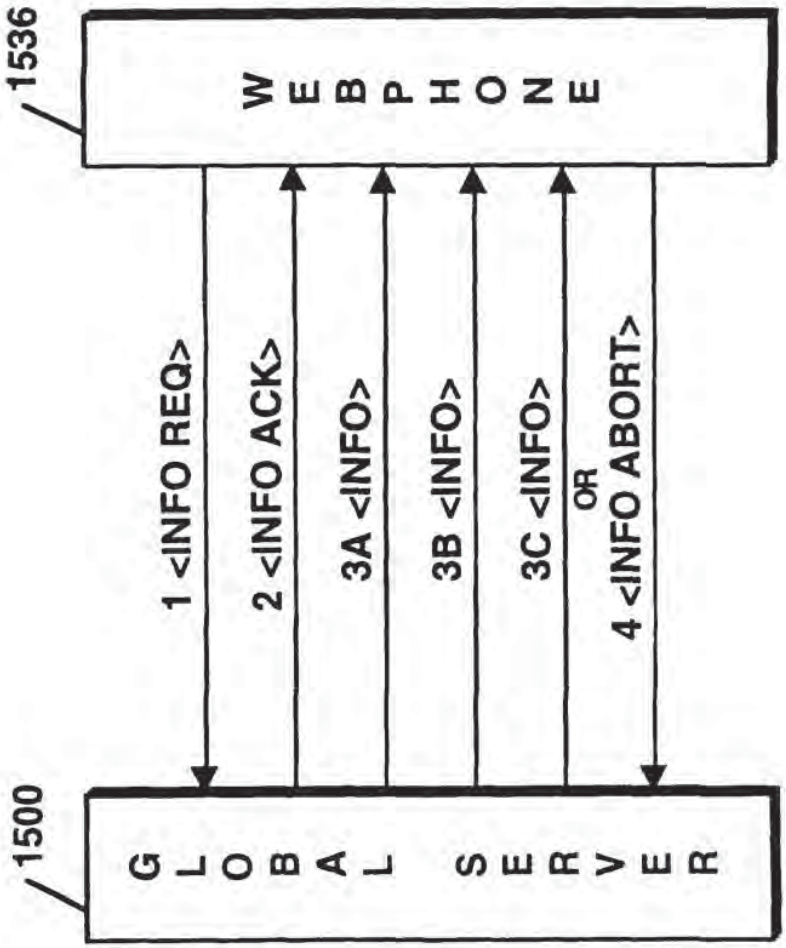
1536
WEB PHONE
1 <INFO REQ>
2 <INFO ACK>
3A <INFO>
3B <INFO>
3C <INFO>
OR
4 <INFO ABORT>
1500
GLOBAL SERVER

Figure 17B

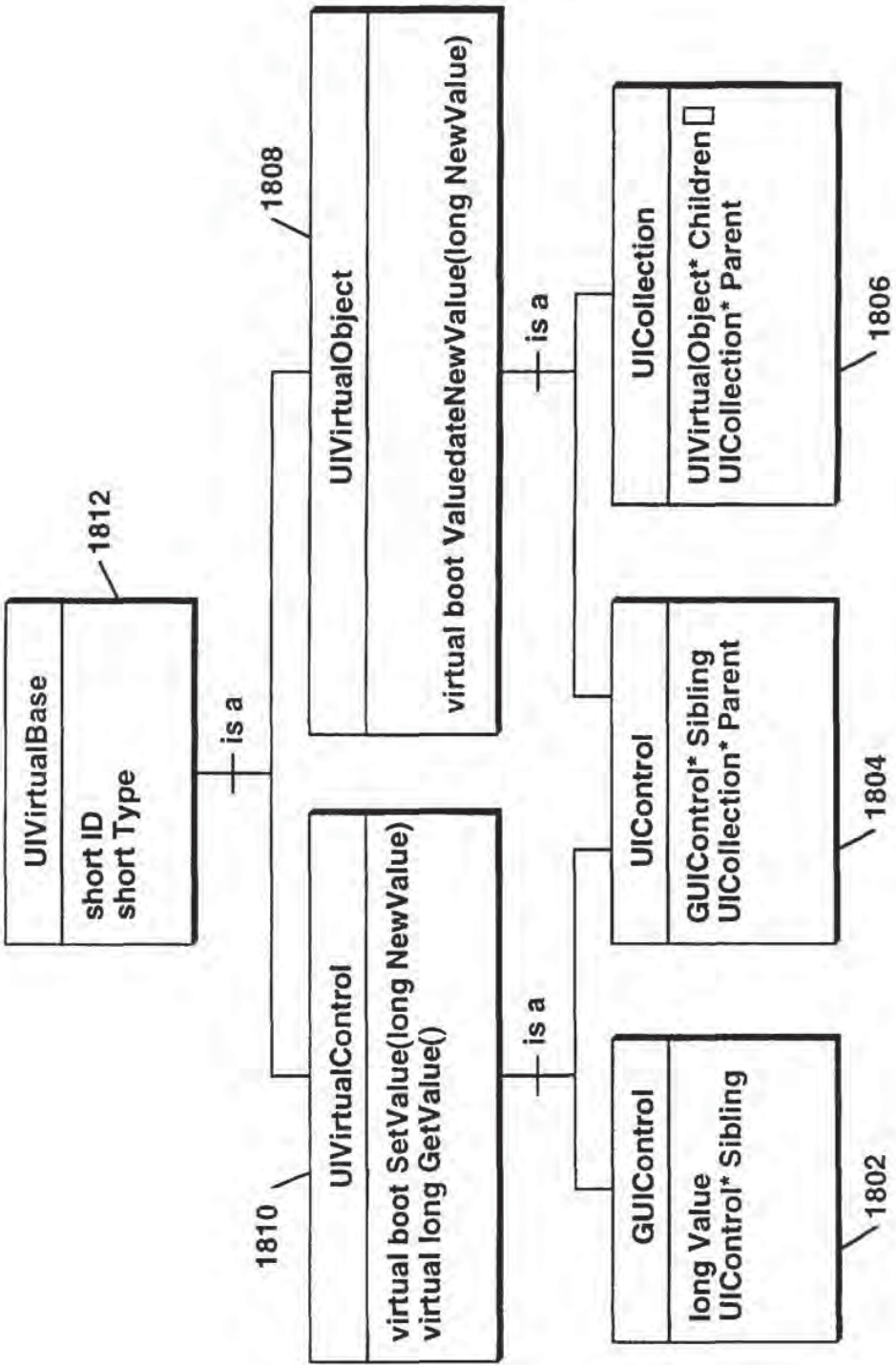
UIVirtualBase
short ID
short Type
1812
is a
UIVirtualObject
virtual boot ValuedateNewValue(long NewValue)
1808
UIVirtualControl
virtual boot SetValue(long NewValue)
virtual long GetValue()
1810
is a
UIControl
GUIControl* Sibling
UICollection* Parent
1804
GUIControl
long Value
UIControl* Sibling
1802
is a
UICollection
UIVirtualObject* Children[]
UICollection* Parent
1806

Figure 18A

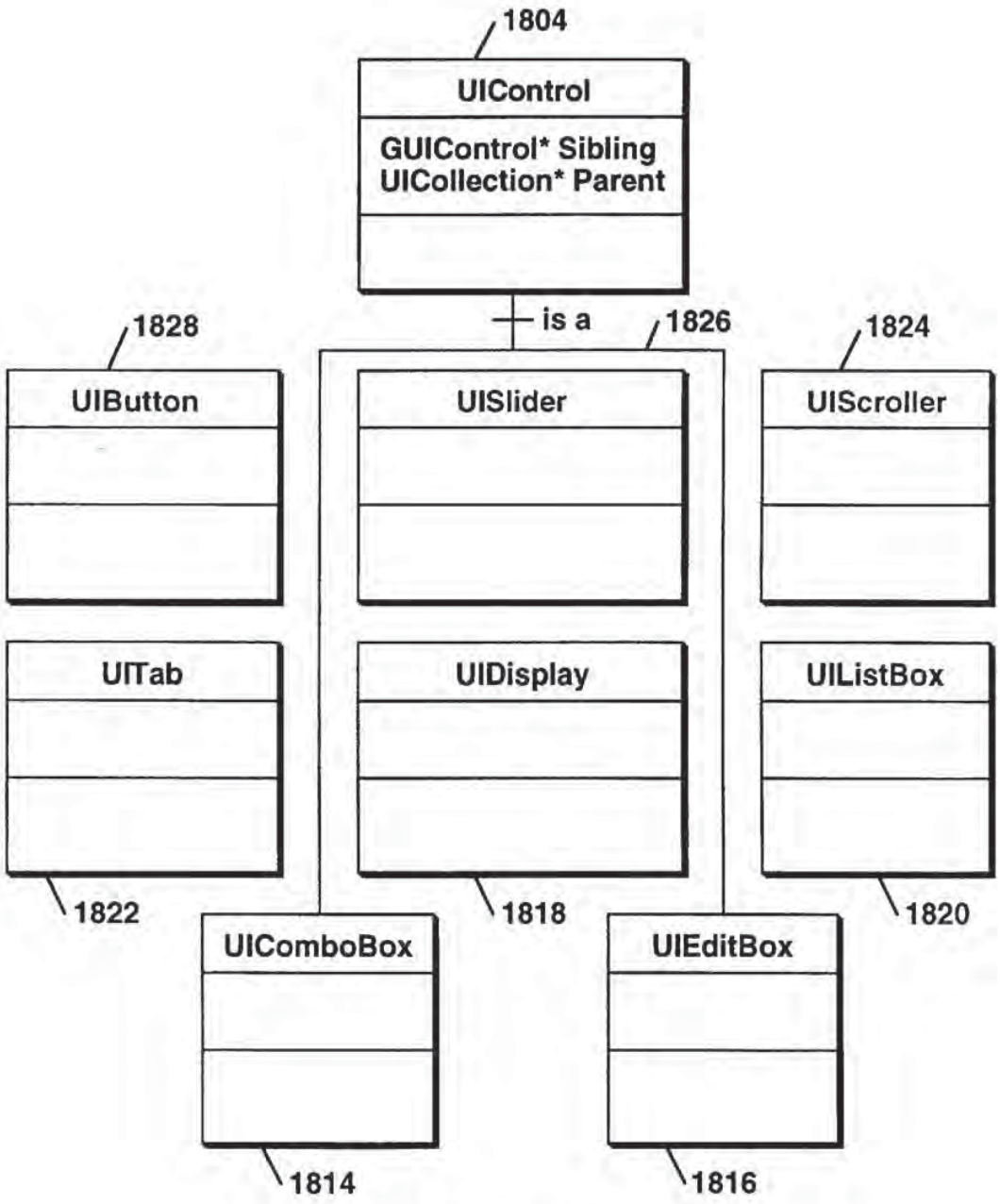
1804
UIControl
GUIControl* Sibling
UICollection* Parent
is a
1828
1826
1824
UIButton
UISlider
UIScroller
UITab
UIDisplay
UIListBox
1822
1818
1820
UIComboBox
UIEditBox
1814
1816

Figure 18B

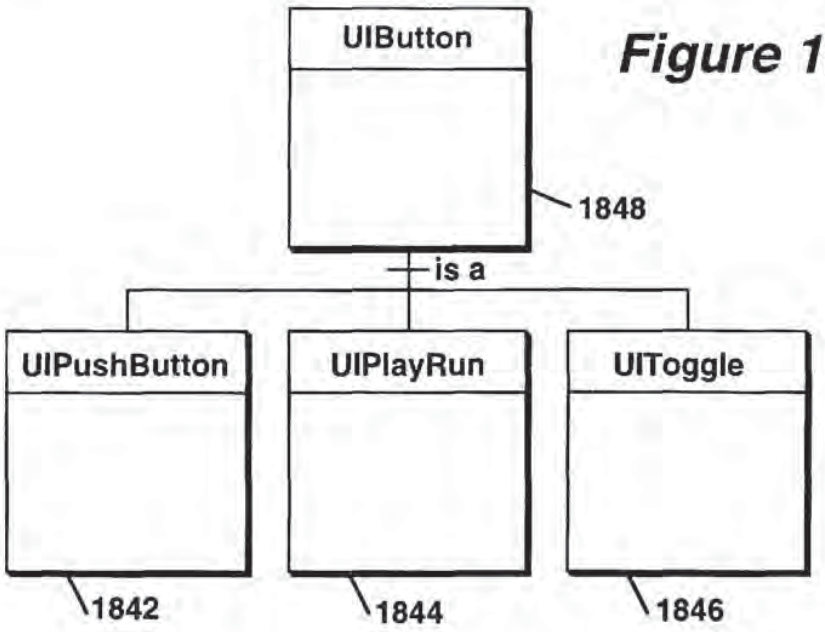

Figure 18C

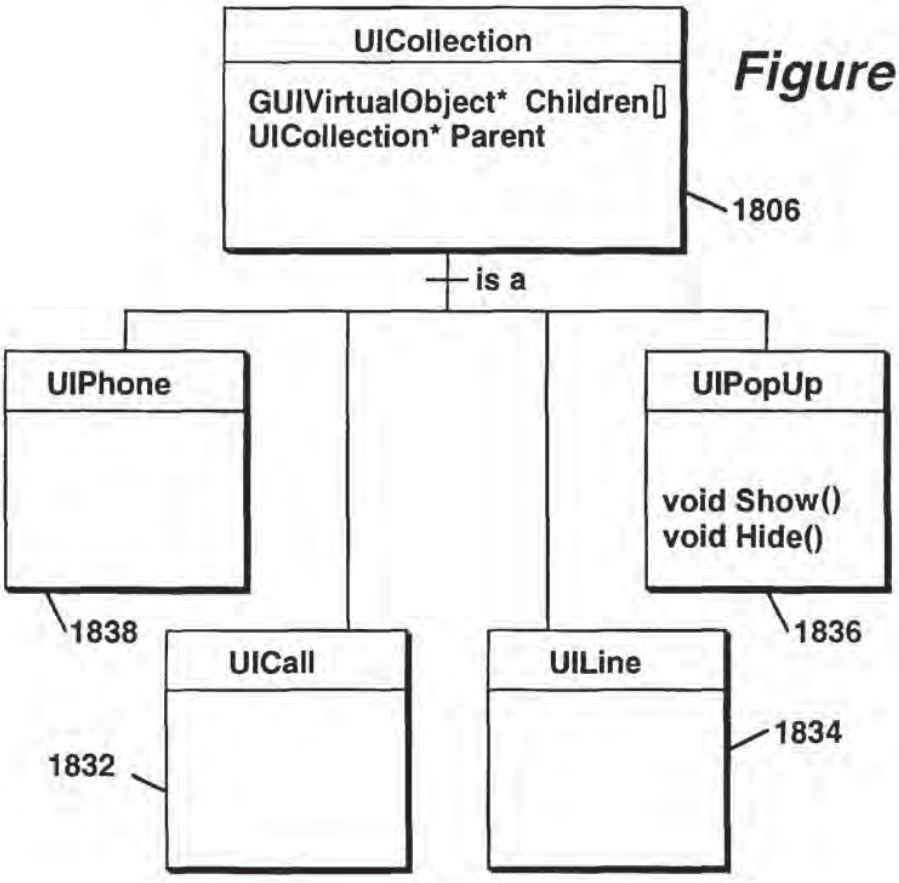

Figure 18D

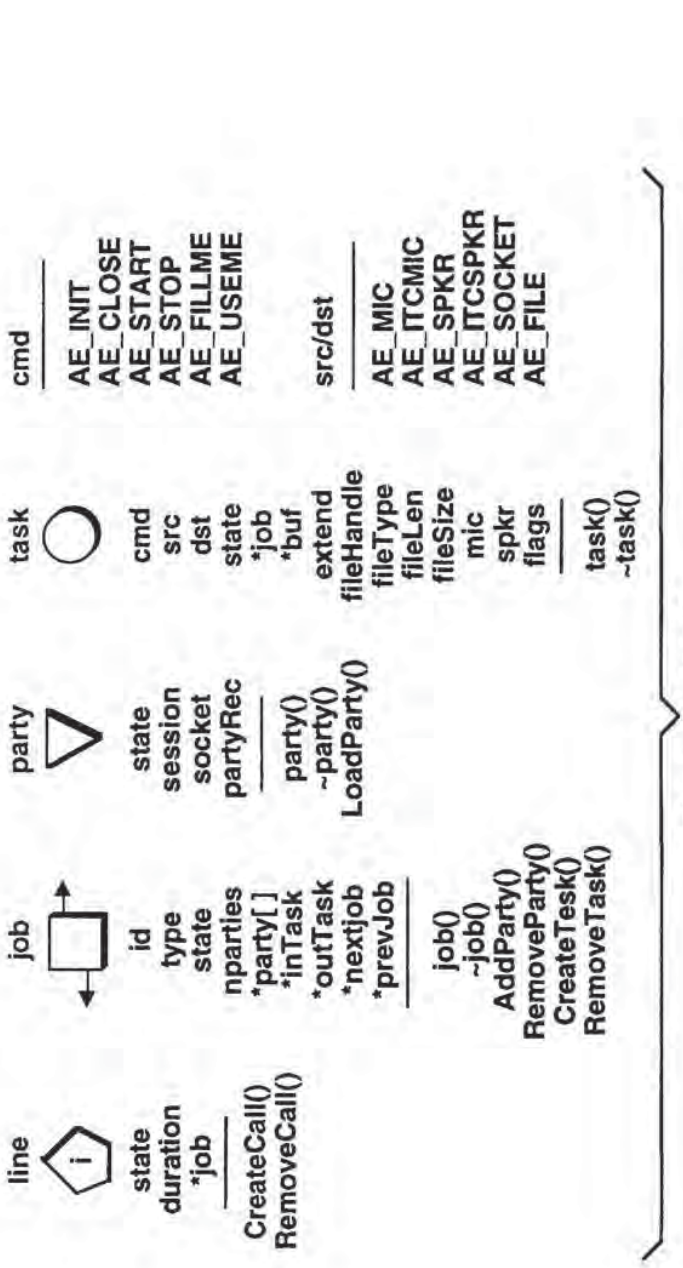

Figure 19A

Figure 19B

Figure 19C

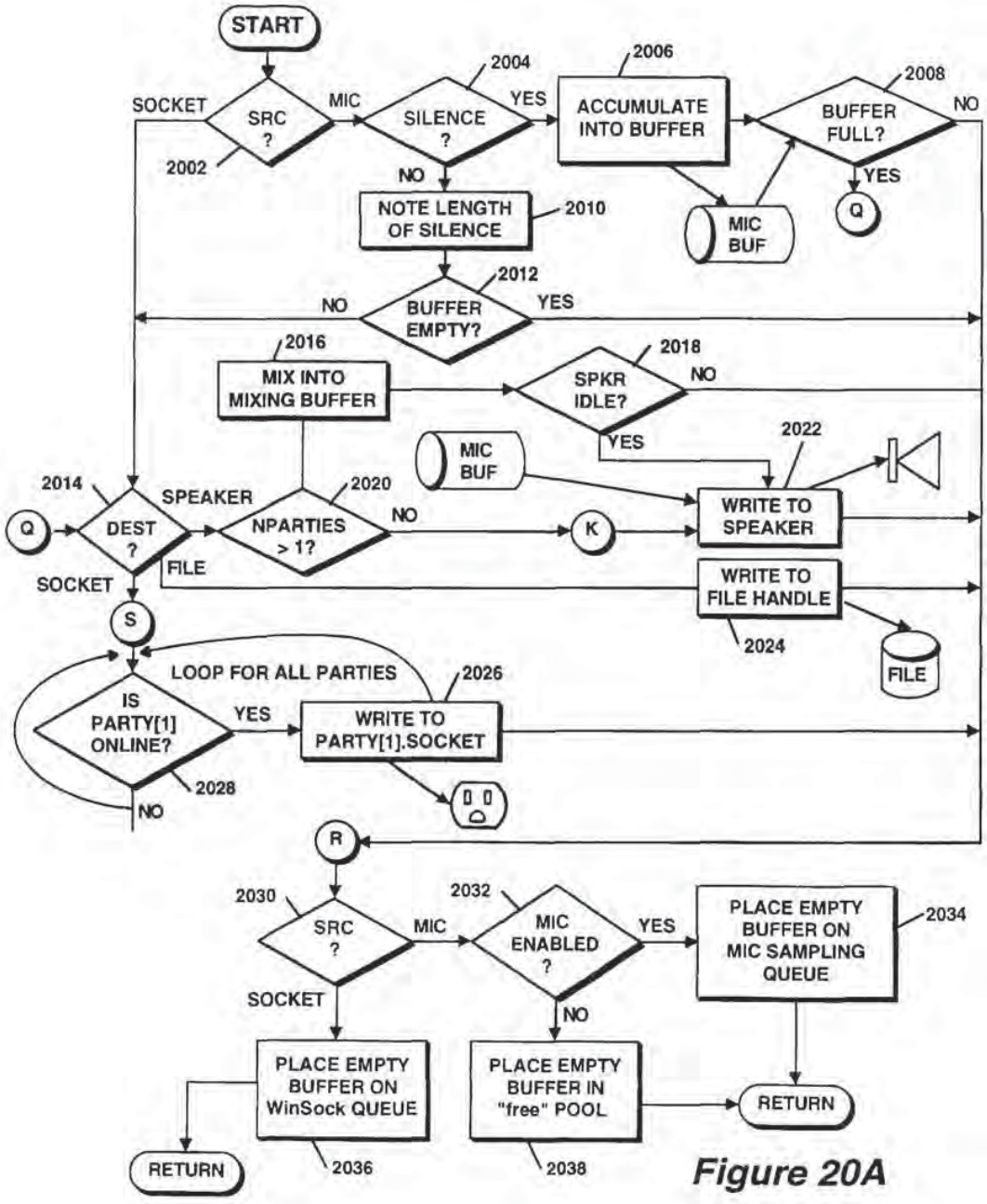
START
SRC ?
SOCKET
MIC
2002
SILENCE ?
2004
YES
NO
ACCUMULATE INTO BUFFER
2006
BUFFER FULL?
2008
NO
YES
Q
MIC BUF
NOTE LENGTH OF SILENCE
2010
BUFFER EMPTY?
2012
NO
YES
MIX INTO MIXING BUFFER
2016
SPKR IDLE?
2018
NO
YES
MIC BUF
2022
WRITE TO SPEAKER
Q
DEST ?
2014
SPEAKER
FILE
SOCKET
NPARTIES > 1?
2020
NO
K
WRITE TO FILE HANDLE
2024
FILE
S
LOOP FOR ALL PARTIES
2026
IS PARTY[1] ONLINE?
YES
NO
2028
WRITE TO PARTY[1].SOCKET
R
SRC ?
2030
MIC
SOCKET
MIC ENABLED ?
2032
YES
NO
PLACE EMPTY BUFFER ON MIC SAMPLING QUEUE
2034
PLACE EMPTY BUFFER ON WinSock QUEUE
2036
PLACE EMPTY BUFFER IN "free" POOL
2038
RETURN
RETURN

Figure 20A

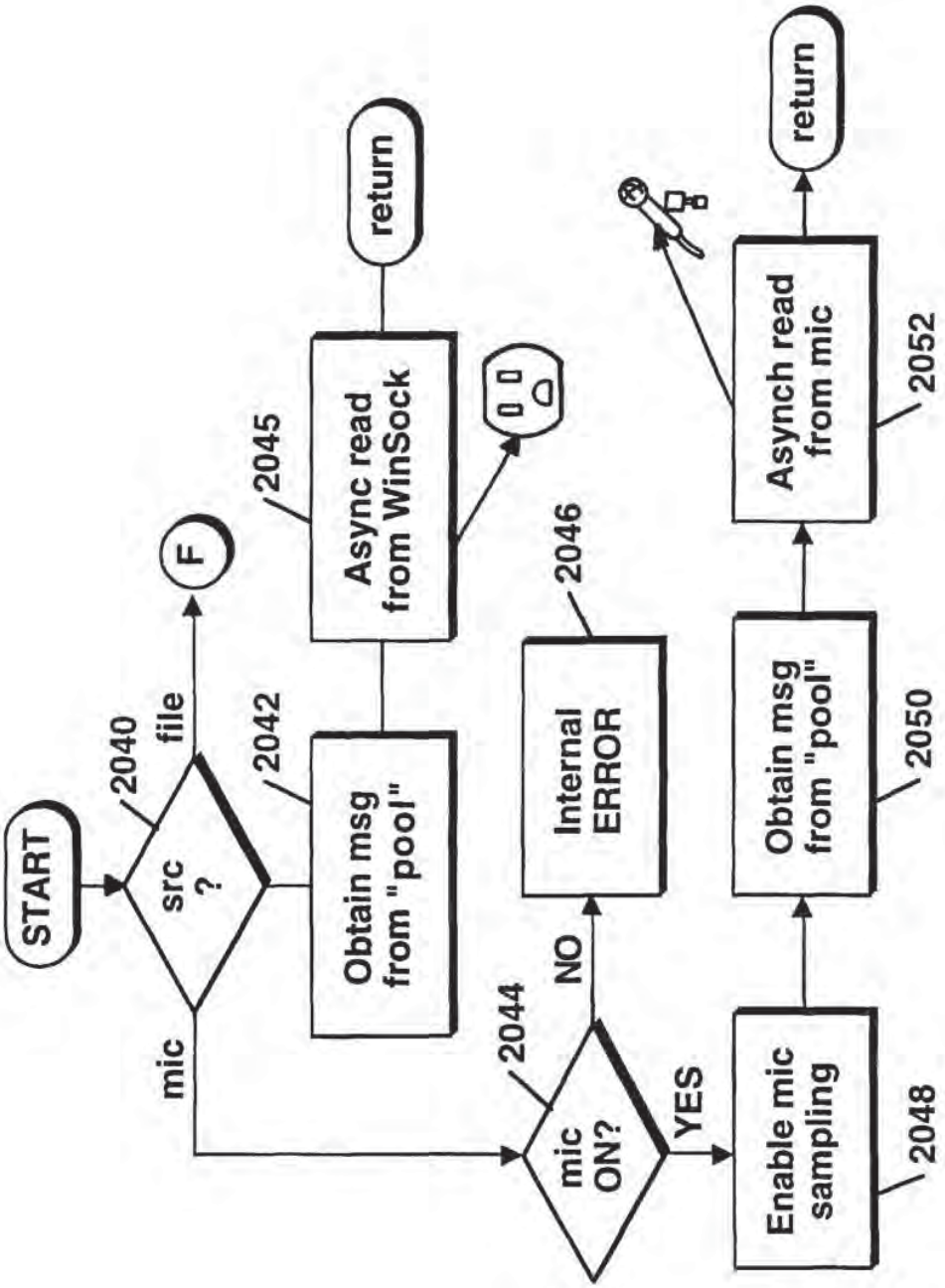
START
2040
src ?
file
F
mic
2042
Obtain msg from "pool"
2045
Async read from WinSock
return
2044
mic ON?
NO
2046
Internal ERROR
YES
Enable mic sampling
2048
Obtain msg from "pool"
2050
Asynch read from mic
2052
return

Figure 20B

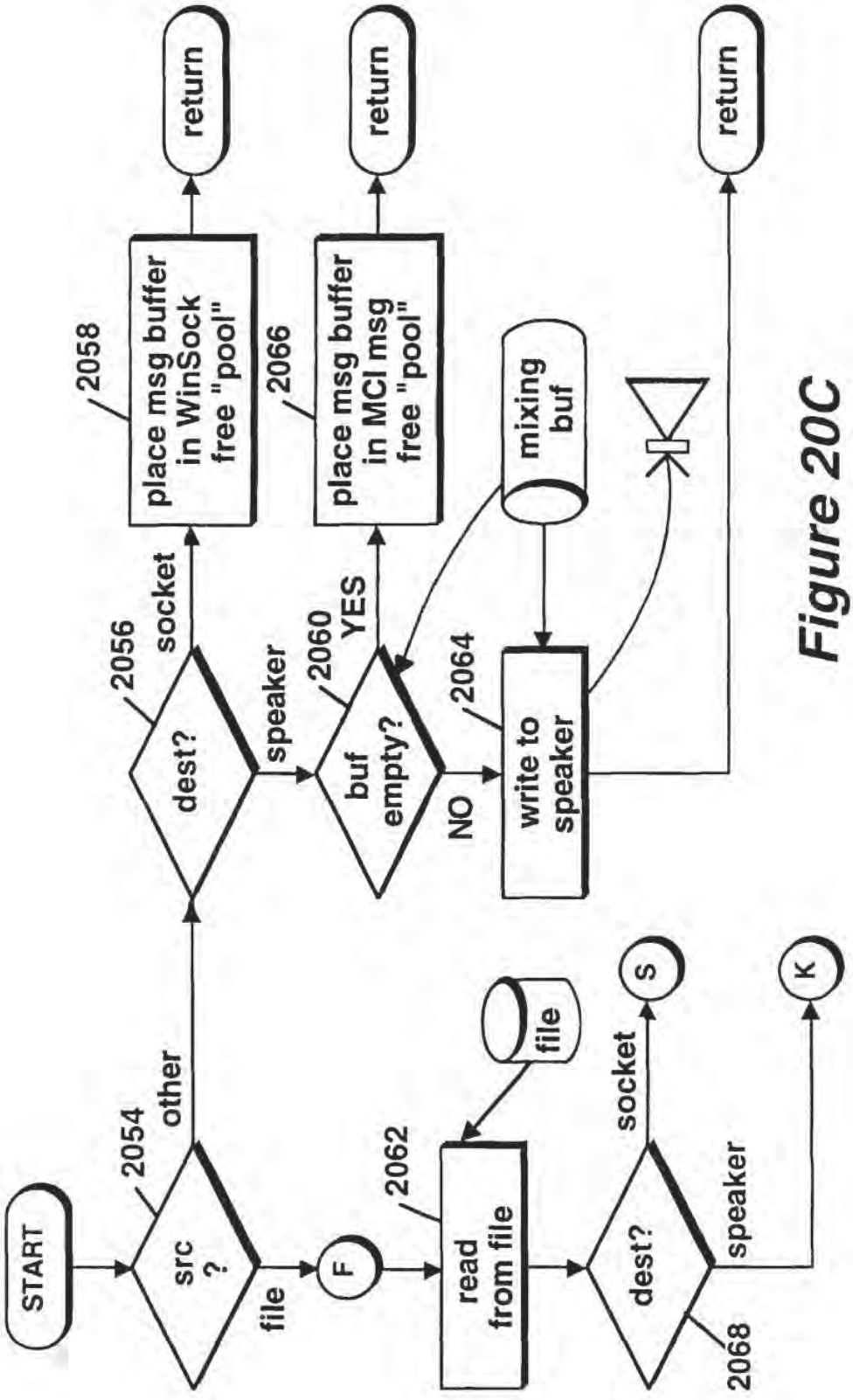
START
src ?
2054
other
file
F
read from file
2062
file
socket
S
dest?
2068
speaker
K
dest?
2056
socket
speaker
buf empty?
2060
YES
NO
write to speaker
2064
mixing buf
place msg buffer in WinSock free "pool"
2058
place msg buffer in MCI msg free "pool"
2066
return
return
return

Figure 20C

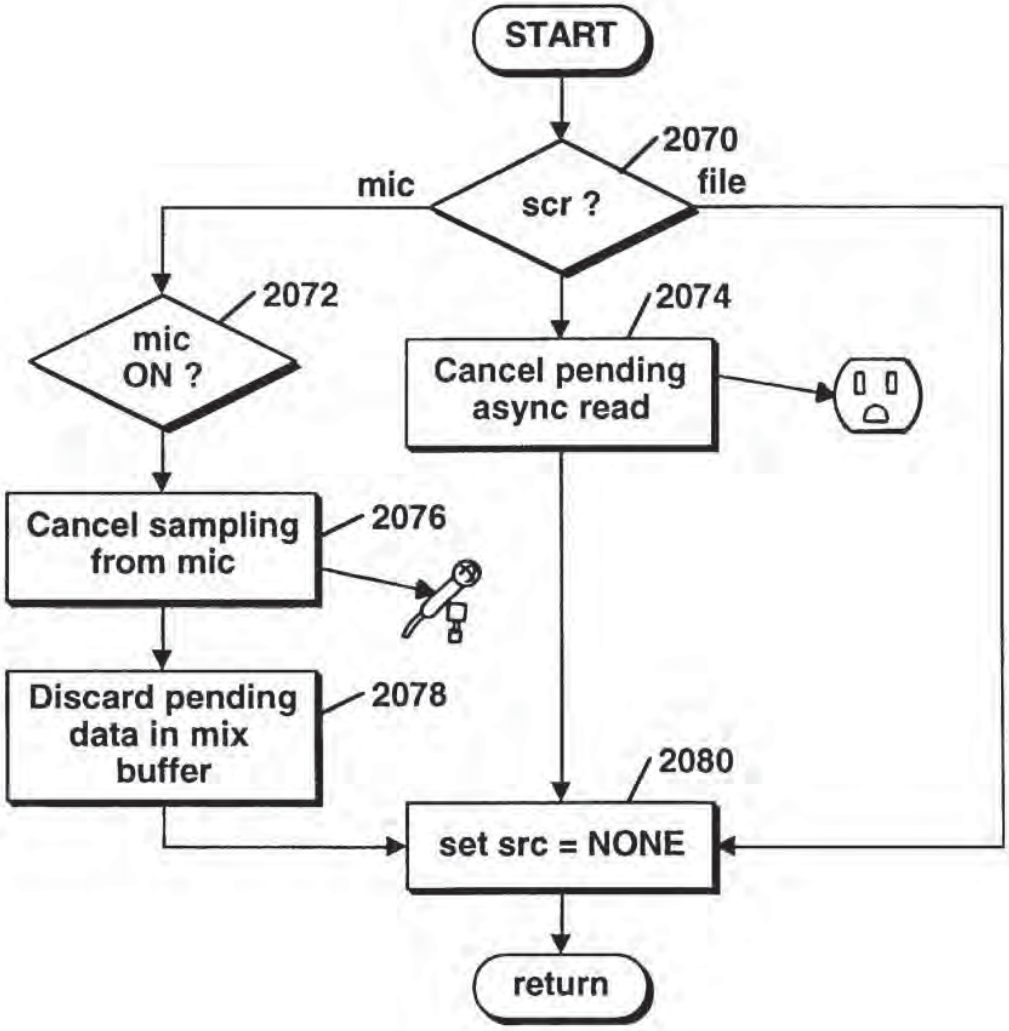
START
2070
scr ?
mic
file
2072
mic
ON ?
2074
Cancel pending
async read
Cancel sampling
from mic
2076
Discard pending
data in mix
buffer
2078
2080
set src = NONE
return

Figure 20D

POINT-TO-POINT COMPUTER NETWORK COMMUNICATION UTILITY UTILIZING DYNAMICALLY ASSIGNED NETWORK PROTOCOL ADDRESSES

RELATED APPLICATIONS

This application is a continuation-in-part of U.S. patent application Ser. No. 08/533,115 entitled Point-to-Point Internet Protocol, by Glenn W. Hutton, filed Sep. 25, 1995, commonly assigned, the subject matter of which is incorporated herein by reference.

To the extent that any matter contained herein is not already disclosed in the above-identified parent application, this application claims priority to U.S. provisional patent application Ser. No. 60/025,415, entitled Internet Telephony Apparatus and Method by Mattaway et al., filed Sep. 4, 1996, and U.S. provisional patent application Ser. No. 60/024,251, entitled System and Methods for Point-To-Point Communications Over a Computer Network, by Mattaway et al., filed Aug. 21, 1996.

In addition, this application is one of a number of related applications filed on an even date herewith and commonly assigned, the subject matters of which are incorporated herein by reference, including the following:

- U.S. patent application Ser. No. 08/719,894, entitled Directory Server For Providing Dynamically Assigned Network Protocol Addresses, by Mattaway et al.;
- U.S. patent application Ser. No. 08/721,316, entitled Graphic User Interface for Internet Telephony Application, by Mattaway et al.;
- U.S. patent application Ser. No. 08/719,640, entitled Method And Apparatus For Dynamically Defining Data Communication Utilities, by Mattaway et al.;
- U.S. patent application Ser. No. 08/719,891, entitled Method And Apparatus For Distribution And Presentation Of Multimedia Data Over A Computer Network, by Mattaway et al.;
- U.S. patent application Ser. No. 08/719,898, entitled Method And Apparatus For Providing Caller Identification Based Outgoing Messages In A Computer Telephony Environment, by Mattaway et al.;
- U.S. patent application Ser. No. 08/718,911, entitled Method And Apparatus For Providing Caller Identification Based Call Blocking In A Computer Telephony Environment, by Mattaway et al.; and
- U.S. patent application Ser. No. 08/719,639, entitled Method And Apparatus For Providing Caller Identification Responses In A Computer Telephony Environment, by Mattaway et al.

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 on-line 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, real-time 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 real-time of voice and video have been generally difficult to attain.

The ability to locate users having temporary or dynamically assigned Internet Protocol address has been difficult without the user manually initiating the communication. Accordingly, spontaneous, real-time communications with such users over computer networks have been impractical. Further, it is desirable to have a communication utility which contains familiar features and functions to current communication utility such as telephones and cellular telephones. It is even further desirable to utilize the current graphic user interface technology associated with computer software in a manner to achieve a more flexible interface to a such a communication utility, without the limitations associated with hardware.

Accordingly, a need exists for a way to determine whether computer users are actively connected to a computer network.

A further need exists for a way to obtain the dynamically assigned Internet Protocol address of a user having on-line status with respect to a computer network, particularly the Internet.

An even further need exists for a method and apparatus by which to establish real-time, point-to-point communications over a computer network using a communication utility having an interface which combines the familiar aspects of current hardware communication utilities but which allows for the flexibility associated with graphic user interfaces.

SUMMARY OF THE INVENTION

The above deficiencies in the prior art and previously described needs are fulfilled by the present invention which provides a virtual communications utility displayable on computer system interfaces which enables real-time, point-to-point communications over computer networks.

According to another embodiment of the present invention, a computer program product for use with a computer system comprises a computer usable medium having computer readable program code means embodied thereon comprising code means for transmitting from a client process to a server a query as to whether a second client process is connected to the computer network, program code means for receiving the network protocol address of the second process from the server, and program code means responsive to the network protocol address of the second client process for establishing a point-to-point communication link between the first client process and the second client process.

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;

FIG. **9** illustrates a flowchart of the performance of the secondary point-to-point Internet protocol;

FIG. **10** illustrates schematically a computer network over which the present invention may be utilized;

FIG. **11** is a block diagram of a computer system suitable for use with the present invention;

FIG. **12** is a block diagram of an audio processing card suitable for use with the computer system of FIG. **10**;

FIG. **13**A–B are schematic block diagrams of the elements comprising the inventive computer network telephony mechanism of the present invention;

FIG. **14** is a screen capture illustrating an exemplary user interface of the present invention;

FIG. **15** is a schematic diagram illustrating the architecture of the connection server apparatus suitable for use with the present invention;

FIG. **16**A is a flowchart illustrating the process steps performed by the connection server in accordance with the present invention;

FIG. **16**B is a flowchart illustrating the process steps performed in accordance with the information server of the present invention;

FIGS. **17**A–B are schematic block diagrams illustrating of the packet transfer sequence in accordance with the communication protocol of the present invention;

FIG. **18**A–D are conceptual block diagrams illustrating user interface and graphic user interface objects utilized by the communication utility of the present invention;

FIG. **19**A–C are conceptual block diagrams illustrating the event manager and media engine objects utilized by the communication utility of the present invention; and

FIGS. **20**A–D illustrate process steps performed by the media engine function of the communication utility in accordance with the present invention.

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 Kilobit-per-second 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, Fla., 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, Calif., 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 implemented with a Post Office Protocol (POP) Version 3

mail server and the Simple Mail Transfer Protocol (SMTP), 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**.

In the illustrative embodiment, the POP protocol is utilized to retrieve E-mail messages from mail server **28** while the SMTP protocol is used to submit E-mail message to 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 of available memory. 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, Wash., and other operating systems and GUIs, such as OS/2 and OS/2 WARP, available from IBM CORPORATION, Boca Raton, Fla. 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 touch-screen 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 fall 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 caller 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 callee 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 an Internet 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 an Internet 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 NTH 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 NTH 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, unreachable, 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 <ConnectReq> message via E-mail over the Internet **24** to the mail server **28**. The E-mail including the <ConnectReq> 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.

The following E-mail messages are transmitted to a remote users post office protocol server via simple mail transport protocol using MIME by the event manager, as explained hereinafter.

<ConnectRequest>

<CampRequest>

<VoiceMail>

<FileTransfer>

<E-mail>

The following E-mail messages are received from a local WebPhone users POP server via the POP protocol using MIME by the event manager, as explained hereinafter.

<Connect Request>

<Camp Request>

<Voice Mail>

<File Transfer>

<E-mail>

<Registration>

As described above, the first processing unit **12** may send the <ConnectReq> 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 <ConnectReq> 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.

Second processing unit **22** polls mail server **28** at an interval, for example, once a minute, to check for incoming E-mail. Generally, second processing unit **22** checks the messages stored on mail server **28** at regular intervals to wait for and detect incoming E-mail indicating a <CONNECT REQ> message from first processing unit **12**.

Typically, for sending E-mail to user's 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 Internet **24** and directed to the permanent IP address of the mail server providing the target user's mail services. The E-mail is transported by a standard protocol, for example, SMTP, and stored into memory (not shown in FIG. **1**) associated with mail server **28**.

The E-mail may subsequently be retrieved by processing unit **22** on behalf of the user with another standard protocol, for example POP **3**. The actual IP address utilized by the user's processing unit is immaterial to the retrieval of E-mail, as the mail server **28** can, for example, be polled or queried from any point on the network.

Upon 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**.

Real-time 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 <ConnectOK> 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 <ConnectReq> 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 C**2**; 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 L**1**–L**4** may be mapped to function keys F**1**–F**4** on standard PC keyboards, and icons C**1**–C**3** may be mapped to perform as combinations of function keys, such as CTRL-F**1**, CTRL-F**2**, and CTRL-F**3**, respectively. In addition, the icons labeled L**1**–L**4** and C**1**–C**3** may include circular regions which may simulate lamps or light emitting diodes (LEDs) which indicate that the function or element represented by the respective icon is active or being performed.

Icons L**1**–L**4** may represent each of **4** lines available to the caller, and icons C**1**–C**3** may represent conference calls using at least one line to connect, for example, two or more parties in a conference call. The icons L**1**–L**4** and C**1**–C**3** may indicate the activity of each respective line or conference line. For example, as illustrated in FIG. **5**, icons L**1**–L**2** 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 L**3**–L**4** 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 connection server **26** is not operable.

Referring to FIG. **8**, in conjunction with FIGS. **1** and **3–4**, the disclosed point-to-point Internet protocol and system **10** are illustrated. Connection server **26** starts the primary 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**.

The primary and secondary point-to-point Internet protocols previously described enable users to establish real-time direct communication links over the Internet or other computer networks without the need for any interaction with connection server **26**, the connection server providing only directory and information related services. FIG. **10** illustrates an exemplary computer network **1000** over which the invention may operate. A first processing unit **1012** is coupled to a computer network, illustrated here as the Internet **1010**, through an Internet service provider **1014**. Similarly, a second processing unit **1022** is coupled to Internet **1010** through Internet service provider **1018**. The inventive directory server **1020** is similarly coupled to Internet **1010** through Internet service provider **1026**. Directory server **1020** further comprises a connection server **1022** and information server **1024**, as will be explained hereinafter. The first processing unit **1012**, second processing unit **1022** and directory server **1020** are operatively coupled to each other via the Internet **1010**. It will be obvious to those reasonably skilled in the art that network **1000** is not restricted to implementation over the Internet **1010** but may comprise other network configurations such as a local area network (LAN), a wide area network (WAN), a global area network or any number of private networks currently referred to as an Intranet. Such networks may be implemented with any number of hardware and software components, transmission media and network protocols.

Exemplary Computer Architecture

FIG. **11** illustrates the system architecture for a computer system **1100** such as an IBM PS/2®, suitable for implementing first and second processing units **1012** and **1022**, respectively, of FIG. **10**, as well as global server **1020**. The exemplary computer system of FIG. **11** is for descriptive purposes only. Although the description may refer to terms commonly used in describing particular computer systems, such as in IBM PS/2 computer, the description and concepts equally apply to other computer systems ranging from personal digital assistants (PDAs) to workstations to mainframe systems.

Computer system **1100** includes a central processing unit (CPU) **1105**, which may be implemented with a conventional microprocessor. System **1100** further includes a random access memory (RAM) **1110** for temporary storage of information, and a read only memory (ROM) **1115** for permanent storage of information. A memory controller **1120** is provided for controlling RAM **1110**. A bus **1130** interconnects the components of computer system **1100**. A bus controller **1125** is provided for controlling bus **1130**. An interrupt controller **1135** is used for receiving and processing various interrupt signals from the system components.

Mass storage may be provided by diskette **1142**, CD ROM **1147**, or hard drive **1152**. Data and software may be exchanged with computer system **1100** via removable media such as diskette **1142** and CD ROM **1147**. Diskette **1142** is insertable into diskette drive **1141** which is, in turn, connected to bus **1130** by a controller **1140**. Similarly, CD ROM **1147** is insertable into CD ROM drive **1146** which is, in turn, connected to bus **1130** by controller **1145**. Hard disk **1152** is part of a fixed disk drive **1151** which is connected to bus **1130** by controller **1150**.

User input to computer system **100** may be provided by a number of devices. For example, a keyboard **1156** and mouse **1157** are connected to bus **1130** by controller **1155**. An audio transducer **1196**, which may act as both a microphone and a speaker, is connected to bus **1130** by audio controller **1197**, as illustrated. It will be obvious to those reasonably skilled in the art that other input devices, such as a pen and/or tablet may be connected to bus **1130** with an appropriate controller and software, as required. DMA controller **1160** is provided for performing direct memory access to RAM **1110**. A visual display is generated by video controller **1165** which controls video display **1170**. Computer system **1100** also includes a communications adaptor **1190** which allows the system to be interconnected to a network such as a local area network (LAN), a wide area network (WAN), or the Internet, schematically illustrated by transmission medium **1191** and network **1195**.

In the illustrative embodiment, computer system **1100** may include an Intel microprocessor such as the 80486DX-33 MHz, or faster, a 14.4 Kb communication modem or faster, and a sound card, as further described with reference to FIG. **12**.

Operation of computer system **1100** is generally controlled and coordinated by operating system software, such as the OS/2® operating system, available from International Business Machines Corporation, Boca Raton, Fla., or Windows® DOS-based operating system available from Microsoft Corp., Redmond, Wash. The operating system controls allocation of system resources and performs tasks such as process scheduling, memory management, networking, and I/O services, among other things.

FIG. **12** illustrates schematically an audio sound card **1200** which may be used to implement audio controller **1197** of FIG. **11**. Specifically, sound card **1200** may comprise, in the exemplary embodiment, an analog-to-digital (A/D) converter **1212**, an input buffer **1216**, a digital signal processor (DSP) **1222**, ROM **1224**, RAM **1226**, an output buffer **1220**, and an analog-to-digital (D/A) converter **1218**, all of which may be interconnected over a bus **1210**. Bus **1210** is in turn coupled to a bus interface **1228** which, in turn, is coupled to bus controller **1125** of computer system **1100** of FIG. **11**.

As illustrated in FIG. **12**, A/D converter **1212** is coupled to audio transducer **1214** which is typically a microphone. Conversely, D/A converter **1218** is coupled to audio transducer **1230**, typically a speaker. It will be obvious to those reasonably skilled in the art that audio transducers **1214** and **1230**, may be combined into a single element which serves as both a transmitter and receiver of audio signal.

In operation, A/D converter **1212** samples the audio signals supplied to it by transducer **1214** and stores the digital samples in buffer **1216**. The digital sampling occurs under control of a program typically stored in ROM **1224**, or, alternatively, under the control of digital signal processor **1222**. The digital samples stored in input buffer **1216** are forwarded periodically, typically when the buffer reaches near capacity, over bus **1210** to bus **1130** of FIG. **11**, for further processing by computer system **1100**. The device driver for audio sound card **1200** generates system interrupts which will cause the digital samples stored in input buffer **1216** to be retrieved for processing. In the exemplary embodiment, the digital samples are uncompressed as supplied to computer system **1100**. However, compression of the digital samples may occur using DSP **1222** executing an appropriate compression algorithm, if desired.

Digital audio samples from computer system **1100** are also be converted to analog signals by sound card **1200**. The digital samples are supplied to bus **1210** and temporarily stored into output buffer **1220**. The digital samples are then converted by D/A converter **1218** into an analog signals which are then supplied to audio transducer **1230**, i.e., a speaker, or to further amplification and processing devices.

Sound card **1200** contemplated for use with the present invention may be implemented with any number of Windows compliant sound cards, such as the Sound Blaster sound card, commercially available from Creative Technologies Ltd., Singapore. Such Window compliant sound cards have a Windows compliant software interface allowing a standardized mechanism for software programs to operate the sound card device, such as Winsoc 1.1.

WebPhone Application

In the exemplary embodiment of the present invention, each of first processing unit **1012** and second processing unit **1022** of FIG. **10** are executing a software application capable of enabling point-to-point communication over network **1000**, such as an Internet telephone application. One such application suitable for use with the present invention is the WebPhone Version 1.0 or higher, software, hereafter referred as the "WebPhone," commercially available from NetSpeak Corporation, Boca Raton, Fla. A description of the architecture and operation of the WebPhone is provided herein with reference to FIGS. **5–6**, **13**A–B and **14**. An extensive detailed description of the architecture, application program interface, graphic user interface, and operation of the WebPhone can be found in copending U.S. patent application Ser. No. XX/XXX, XXX entitled "Point-to-Point Computer Network Communication Utility Utilizing Dynamically Assigned Internet Protocol Addresses" by Mattaway et al. filed on an even date herewith and commonly assigned, the complete subject matter of which is incorporated herein by reference.

Referring to FIGS. **13**A–B, schematic block diagrams of the WebPhone architecture are illustrated. The WebPhone is

an end-user software application which enables users to send real-time audio data to other WebPhone users over the Internet or any public or private TCP/IP based computer networks. The WebPhone application and architecture may be designed to run on any number of operating systems or computer architectures. In the illustrative embodiment, the WebPhone application is implemented as a Windows compatible application executable on an IBM PC architecture or a clone thereof.

Referring to FIG. **13**A, the WebPhone **1300** comprises a set of object modules, written in a programming language such as C++, which work together in a concerted fashion to provide real-time, multitasking, network-based media transmission and reception. WebPhone **1300** comprises a graphic user interface (GUI) **1310**, a user interface (UI) **1312**, an event manager **1314**, a media engine **1316**, a database dynamic link library **1318**, one or more audio compression/decompression (codecs) **1320**, an audio manager **1324**, a WebPhone application program interface (API) **1326**, and a network interface **1322**.

WebPhone GUI **1310** comprises the visual objects seen on a computer display by the user, as illustrated by the screen capture of FIG. **14** discussed hereinafter. WebPhone GUI **1310** serves only to display the artwork associated with the underlying objects of WebPhone UI **1312**. WebPhone GUI **1310** may be implemented in a modular fashion distinct from the WebPhone UI for rapid portability. In this manner, other graphic user interface environments such as those compatible with the Macintosh, X-Windows or OS/2 operating systems, may be substituted via the Plug and Play protocol, as would be understood by those reasonably skilled in the arts.

The WebPhone UI **1312** objects maintain the state of the WebPhone GUI and provide feedback to the WebPhone GUI objects from events originating from either the user or the event manager **1314**. When WebPhone changes a state that requires user notification, WebPhone UI objects notify associated WebPhone GUI objects to display the appropriate art work to the user. WebPhone UI objects also interface with the database dynamic link library **1318** to maintain the WebPhone database information, e.g. configuration information, phone directory information, etc.

The WebPhone event manager **1314** processes all the events originating from the user, via WebPhone UI **1312**, the media engine **1316**, and WebPhone API **1326**. Event manager **1314** may be implemented as a table-driven state machine that processes the above-identified events and performs the functions necessary to bring the WebPhone from one state to another. For example, event manager **1314** interacts with media engine **1316** to create, control and remove concurrently executing jobs managed by media engine **1316**. Event manager **1314** also interfaces with the WebPhone API **1326** to provide communications with other WebPhones and connection servers, as described in more detail hereinafter. WebPhone database **1318** is a dynamic link library of tree-based subroutines that provide fast database access to the WebPhone configuration information, personal phone directory, etc.

WebPhone media engine **1316** manages the allocation of associated resources to provide a multitasking environment and controls the flow of real-time data streams, e.g., conversations, outgoing messages, etc., and non-real-time data streams, e.g., voice mail, graphic images, files, etc., to and from a user network connection. The objects representing tasks are created by event manager **1314**, thereby freeing media engine **1316** to manage resource routing. Specifically, the media engine routes data streams from sources such as a microphone, file or network socket, to destinations such as speaker, destination file or other network socket. To perform such routing functions the media engine interfaces with the WebPhone API **1326** to control communication with other processes, and further communicates with audio manager **1324** to communicate with the system input/output apparatus, such as sound card **1200** of FIG. **12**. Media engine **1314** may be designed to employ heuristic methods to sense and efficiently utilize available bandwidth to achieve timely and accurate delivery of all data streams, both real-time and non-real-time.

Media engine **1316** further interacts with WebPhone codec **1320** to achieve compression and decompression of audio data streams. Codec **1320** provides coding of digital samples from the sound card **1200** of FIG. **12** into a compressed format more suitable for transmission over a computer network. Codec **1320** further provides decoding of a compressed signal prior to its submission to sound card **1200** for subsequent conversion to an audible analog signal. In the exemplary embodiment, WebPhone codec **1320** is implemented in a modular fashion so that codecs may be replaced and updated with newer, more efficient compression/decompression algorithms via the Plug and Play protocol. A codec suitable for use with the present invention is the True Speech codec, version 8.5, commercially available from the DSP Group, Inc., Santa Clara, Calif. The True Speech codec is an enhanced linear predicative coding algorithm, specifically designed to efficiently encode and decode human speech data. The True Speech codec samples the digital sample stream from sound card **1200**, and, using a look-up table-based algorithm, tries to predict the value of the next data sample in the digital data stream based on the history of prior data sample values. The compressed data stream comprises a combination of identifiers of the predicted sample values, as well as error values used to correct the predictive values. Accordingly, the amount of digital data actually transmitted to represent the audio signal is significantly reduced in comparison to transmission of the actual data samples generated by sound card **1200**. The True Speech codec provides temporal, frequency domain compression of the digital data representing the audio signal.

Audio manager **1324** handles communication with the audio sound card **1200** and presents a common interface to media engine **1314**. Audio manager **1324** interfaces with sound card **1200** through one or more application program interfaces. In the illustrative embodiment, audio manager **1324** utilizes low-level Microsoft Windows wave input/output routines to interface with MCI compliant sound cards. As with codecs **1320**, audio manager **1324** may be implemented to adhere to the Plug and Play protocol so other compliant audio sound cards or circuits, such as those for the Apple Macintosh, commercially available from Apple Computer Company, Cupertino, Calif., or a Unix compatible sound card or circuit may interact with the audio manager **1324**.

The WebPhone API **1326** enables the WebPhone to communicate with other WebPhones, connection and directory assistance servers, Internet gateway servers, credit processing servers, database access servers and other client processes implementing the WebPhone API. As illustrated in FIG. **13**B, the WebPhone API utilizes sockets, i.e., a file handle or address indicating where data is to be sent, allowing WebPhone API enabled processes to reside on the same computer, on a local area network, on a wide area network, or over the Internet. A process **1328** communicates with the WebPhone API **1326** through a plurality of sockets

1322. The sockets 1322 are accessible by network 1330 through a number of protocols including Internet Protocol (IP) 1332, Transmission Control Protocol (TCP) 1334, Real-Time Protocol (RTP) 1336 and User Datagram Protocol (UDP) 1338. The WebPhone API provides remote command control of WebPhones and servers via the TCP. WebPhone API 1326 transfers real-time and streamed audio via the UDP protocol and real-time audio and video data via the UDP and RTP protocols. The WebPhone API utilizes TCP to transfer data of different types, i.e., file, image, graphics, etc. as well as to transfer streamline video and other multimedia data types, such as Java developed by Sun MicroSystems, Mountain View, Calif. In addition, the WebPhone API provides user definable commands and data types.

FIG. 14 illustrates the graphic display produced upon invoking the WebPhone application. Display 1400 is an alternative embodiment to that illustrated in FIGS. 5–6 with similar graphic elements, icons and display areas functioning as previously described with reference to FIGS. 5–6.

WebPhone Global Server

Having described the architecture of the WebPhone software which enables the first and second processing units to establish point-to-point communication over a network, a discussion of the global connection/information server is appropriate.

Referring to FIG. 15A, a network diagram, similar to that shown in FIG. 10, is illustrated, including a schematic diagram of the global server 1500 and the various devices operatively coupling server 1500 to the Internet 1530. A first processing unit executing the WebPhone application, hereafter referred to as WebPhone 1536, is coupled to Internet 1530 through an Internet service provider 1532. Similarly, a second processing unit executing the WebPhone application, referred to as WebPhone 1538, is coupled to the Internet 1530 by an Internet service provider 1534. Global server 1500 is coupled to Internet 1530 by an Internet service provider 1528, a CSU/DSU 1526, a router 1524, and a fire wall server 1522. In the illustrative embodiment, fire wall server 1522 and global server 1500 are connected through a local area network 1520. Network 1520 may be implemented with an Ethernet or other suitable transport for TCP/IP communications. However, as will be obvious to those recently skilled in the arts, server 1500 may be connected directly to fire wall server 1522.

In the illustrative embodiment, firewall server 1522 is a single firewall mechanism which protects unauthorized access from network 1530 into global server 1500. Firewall server 1522 may be implemented on a work station, such as a SPARC 5 or SPARC 20 server from Sun MicroSystems, executing a commercially available firewall software application such as Raptor, available from Raptor Systems. Essentially, the firewall server prevents unauthorized access into global server 1500 and thereby prevents destruction of any of the information contained therein by checking the source of requests for information to global server 1500.

Router 1524 translates logical addresses among networked topologies and may be implemented with any number of commercial router devices such as the CISCO model 2501 router executing CISCO 11.0 software, both commercially available from CISCO Systems, Inc., San Jose, Calif.

CSU/DSU 1526 (Channel Send Unit/Data Send Unit) functions as a sophisticated modem, converting network data to high speed serial data for transfer over a T1 or T3 line. Such high speed data is connected to another CSU/DSU, typically at the telephone company over the T1 or T3 line. An apparatus suitable for use in implementing CSU/DSU 1526 in the present invention is the AT&T Paradigm by AT&T Laboratories, Murray Hill, N.J.

FIG. 15A further illustrates a logical schematic of global server 1500. The server comprises a hardware platform 1508 on which an operating system 1510 executes. In the illustrative embodiment, hardware platform 1508 may comprise any number of commercially available high end work stations such as a DEC Alpha 4100 System, commercially available from Digital Equipment Corporation, Maynard, Mass., or a SPARC 5 or a SPARC 20, both commercially available from Sun Micro Systems, Mountain View, Calif. Operating system 1510, in the illustrative embodiment, may comprise the Unix, commercially available from Novell, Windows NT, commercially available from Microsoft Corporation, or Solaris, commercially available from Sun MicroSystems, Inc. Executing on operating system 1510 are a number of processes including connection server 1512, information server 1514, database server 1518 and database 1516.

Connection Server

Connection server 1512 provides a directory information service to WebPhone client processes currently on-line with respect to the computer network. Connection server 1512 behaves like a virtual machine within global server 1500 and interacts with database 1516 through database server 1518 and with network interface card 1540 through the WebPhone API. The basic function of connection server 1512 is to provide a one-to-one mapping between an identifier of a WebPhone client process, such as a E-mail address, and the current IP address, dynamic or fixed, associated with that WebPhone client process.

As described in further detail hereinafter, when a WebPhone client transmits a <CONNECT REQ> packet to global server 1500, an E-mail address such as "Shane@netspeak.com" is provided to connection server 1512. Connection server 1512 then compares the E-mail address with the values of the records contained in on-line table 1516B and, if a match occurs with one of the records contained therein, transmits the value of the Internet Protocol address associated with that record to the requesting WebPhone client, i.e., a one-to-one matching between E-mail addresses and Internet Protocol addresses.

Referring to FIG. 16A, a flow chart illustrating the basic process steps used by connection server 1512 to implement a one-to-one mapping of E-mail addresses to Internet Protocol addresses in accordance with the present invention is illustrated. The coding of the process steps of the flowchart of FIG. 16A into instructions suitable to control global server 1500 will be understandable by those having ordinary skill in the art of programming. Connection server 1512 remains in an idle state until a <CONNECT REQ> packet is transmitted from a WebPhone client to global server 1500, as illustrated by decisional block 1610 of FIG. 16A. Upon receipt of the packet, connection server 1512 extracts the E-mail address from the packet and supplies the E-mail address to database server 1518 which them communicates using the ODBC standard with database 1516 to perform a search of On-line Table 1516B, as illustrated by process blocks 1612 and 1614. Database 1516 performs a search of on-line Table 1516B and supplies the current Internet Protocol address of the WebPhone client associated with the E-mail address to connection server 1512, via database server 1518. If a corresponding Internet Protocol address is found for the E-mail address contained in the query, connection server 1512 supplies the Internet protocol address to the requesting WebPhone client by transmitting a <CONNECT ACK> packet, as illustrated by decisional block 1616 and process block 1618. If, however, there is no Internet Protocol address associated with the queried E-mail address

or the WebPhone client is off line, connection server **1512** will send an <OFFLINE> packet to the WebPhone client, as illustrated by process block **1622**. Connection server **1512** will return to an idle state to await the receipt of another <CONNECT REQ> packet, as illustrated by FIG. **16**A. A description of the above described packets as well as a diagram illustrating the packet transfer sequence between a WebPhone client and global server **1500** can be found with reference to Tables 7–8 and FIG. **17**A, respectively.

Information Server

Information server **1514** provides an interface between requests from WebPhone client processes and database **1516**. Information server **1514** includes code written to extract the search criteria from an <INFO REQ> packet and supply the search criteria to the database search engine of database **1516** using the ODBC standard. In particular, referring to FIG. **16**B, a flow chart illustrating the basic process steps used by information server **1514** in performing information/directory service functions in accordance with the present invention is illustrated. The coding of the process steps of the flow chart into instructions suitable for execution by global server **1500** will be understood by those having ordinary skill in the art of programming. Information server **1514** remains idle until an <INFO REQ> packet is received from a WebPhone client process, as illustrated by decisional step **1630**. Next, information server **1514** extracts the data elements defined within the <INFO REQ> packet and supplies them to database server **1518** which, in turn, forward them to database **1516**, as represented by the process step **1634** and **1636**. The search engine contained within database **1516** performs the search and supplies to information server **1514** all client records meeting the search criteria specified in the <INFO REQ> packet, or a message indicating that no records were found. Next, information server **1514** transmits a <INFO ACK> packet to the WebPhone client process indicating the number of records satisfying the search criteria, as indicated by process step **1638**. The WebPhone client may wish to receive all records satisfying the search criteria, or, if the number is excessively large, may desire to further refine the search by transmitting a <INFO ABORT> packet to information server **1514** and defining new search parameters to be sent with a subsequent <INFO REQ> packet. If a <INFO ABORT> packet is received by information server **1514**, the process will return to an idle state, as illustrated by decisional block **1640**. If no <INFO ABORT> packet was received, information server **1514** will transmit one or more <INFO> packets to the requesting WebPhone client until all records have been received by the WebPhone client, as illustrated by process step **1642**. Information server **1514** will return to an idle state awaiting another <INFO REQ> packet, as illustrated in FIG. **16**B. A description of the packets comprising the WebPhone protocol is illustrated in Tables 7–8 and a diagram illustrating the packet transfer sequence defined in FIG. **17**A–B.

Network interface card **1540** interfaces with connection server **1512**, information **1514**, and database server **1518** using the WebPhone API definition, as described herein, and the Windows Sockets 1.1 Protocol, or, in a Unix-based operating system, Berkeley Sockets Network API. Network interface card **1514** may comprise, in illustrative embodiment, an Ethernet card capable of transmitting data at rates of 100 Mbps or greater, such cards being commercially available through a number of different vendors.

The connection from CSU/DSU **1526** to ISP **1528** may comprise a TI connection, i.e., a long-distance, digital, point-to-point communication circuit capable of transmitting a signal at 1.544 Mbps with 24 channels at 64 Kbps. Alternatively, a T3 connection may be used, i.e., a connection is similar to a T1 connection except it is capable of transmitting at 44.746 Mbps per second with up to 28 T1 channels. Other connections may be suitable, depending on specific requirements and availability.

Database

Database **1516** of global server **1500** may be implemented with any of a number of commercially available structured query language (SQL) database engines, such as Oracle 7.x, Informix, or Microsoft SQL server 6.x. The SQL database resides on a RAID **1** and RAID **5** mirrored disk array. As will be explained hereinafter, database **1516** interacts with control server **1512** and information server **1514** through database server **1518**. In the illustrative embodiment, database **1516** comprises a Client table **1516**A, an On-line table **1516**B, a WebBoard table **1516**C, a WebBoard configuration table **1516**D and a WebBoard Source table **1516**E.

Client table **1516**A comprises a plurality of records, each of which may have the fields and corresponding data elements as described in Table 1. Each WebPhone user, hereinafter "client," has a separate record in table **1516**A containing the information defining the client's profile of personal information. In Table 1, the "activated," "paid," and "published" fields are boolean yes/no fields. The "id" field comprises a unique ID sequence identifying a particular WebPhone client. The "activation date," "address change date," and "access date" fields are time references measured in seconds since 00:00 Coordinated Universal Time (UTC), Jan. 1, 1970. The "IPAddr" field represents the Internet protocol address of the WebPhone client and, if unknown, has a default value of 0.0.0.0. The database record containing a WebPhone client's profile, is defined upon first logging-on to global server **1500** and may be updated each time a WebPhone user's profile changes, as explained hereinafter.

The On-line table **1516**B provides a dynamic list of those clients from **1516**A who are currently On-line, as well as their current Internet protocol address. On-line Table **1516**B comprises a plurality of records each of which may have the fields and data types illustrated in Table 2. The record entries of On-line table **1516**B are used by connection server **1512** and information server **1514**, as explained hereinafter, to provide a directory of those WebPhone client processes currently having on-line status with respect to the computer network.

The WebBoard™ is a virtual multimedia billboard which is transmitted as a series of multimedia data files to WebPhone client processes while the WebPhone application is activated. An extensive description of the WebBoard utility and its operation can be found in copending U.S. patent application Ser. No. XX/XXX,XXX entitled Method and Apparatus for Distribution of Multimedia Data Over a Computer Network by Mattaway et al., commonly assigned, the subject matter of which is incorporated herein by reference.

A number of tables are associated with the WebBoard functionality including WebBoard table **1516**C, a WebBoard configuration table **1516**D, and a WebBoard source table **1516**E. WebBoard table **1516**C includes a plurality of records each describing a specific WebBoard and having the field and data types illustrated in Table 3. The "id" field of Table 3 provides a unique identification number for the WebBoard file. The "imageType" field defines the video format of the image such as JPEG, TIF, GIF, etc. The "audio" field defines the nature of the audio file, e.g. a .wav file or a MIDI file, while the "audioType" field defines the

codec, if any, used to compress/decompress the audio file. The "hits" field defines the number of times the WebBoard has been selected by WebPhone clients, while the "hits profile" field defines the file name of the file identifying those WebPhone clients generating hits to the subject WebBoard.

The WebBoard configuration table **1516**D may have at least one record having the fields and data types illustrated in Table 4. The count field represents the number of WebBoard records currently in the table **1516**C.

The WebBoard source table **1516**E may comprise a plurality of records each having the fields and data types defined in Table 5. The "URL" field of Table 5 defines a data link in accordance with Uniform Resource Locator protocol to the home page or Web site of the source. In the illustrative embodiment, any entity, including vendors, advertisers, individuals or groups wishing to post information or having a Web site or home page may have a WebBoard displayable through the present invention.

Database Server

Database server **1518** serves as the interface between database **1516** and connection server **1512** and information server **1514**. Specifically, connection server **1512** and information server **1514** communicate with database engine **1518** through application program interfaces embedded in the code implementation of both the connection server and the information server. Database server **1518** communicates with database **1516**, in the illustrative embodiment, using the open database connectivity (ODBC) standard, developed by Microsoft Corporation, Redmond, Wash. Database server **1518** functions to supply structured database queries to database **1516** and to supply the results therefrom to connection server **1514** and information server **1512**. In the illustrative embodiment, database server **1518** may be implemented as a "virtual machine" executing on global server **1500**, or, alternatively, may be implemented on a separate computer system such as a DEC Alpha 4100 Workstation executing DEC Unix operating system, both available from Digital Equipment Corporation, Maynard, Mass. Database server **1518** communicates with network interface card **1518** using the WebPhone Application Program Interface described herein.

Global Server Network

In the illustrative embodiment, global server **1500** is implemented as a single server apparatus on which a plurality of "virtual machines" execute simultaneously. However, it will be obvious to those reasonably skilled in the art that a plurality of separate servers, one dedicated to each of connection server **1512**, information server **1514**, and database server **1518** may be interconnected to database **1516** and to each other using a local area network, to form a composite "virtual" global server, as illustrated by FIG. **15**B, the construction of the system illustrated in FIG. **15**B being within the knowledge of those reasonably skilled in the art in light of the descriptions contained herein.

It is further contemplated within the present invention that more than one global server **1500** may be utilized, as illustrated by FIG. **15**C. In this implementation, multiple global servers **1500**A–D are maintained for fault tolerant load sharing, each one performing the above-described connection server, information server and database server processes. Each of global servers **1500**A–D are connected to the Internet via a separate T1 or T3 connection to different Internet service providers, and are synchronized with each other via database server replication. In such an embodiment, multiple global servers may be located in close proximity or in geographically disparate locations. In such an embodiment, the WebPhone application is provided with the network address information of each global server **1500**A–D. In the event that any one of the global servers initially contacted is nonresponsive the WebPhone application will attempt connection to one or more of the remaining global servers to obtain directory and information services.

Further, in an implementation with multiple global servers, if the initially contacted global server is unable to accommodate a WebPhone client request, or, is not geographically convenient, the global server can provide the network address of another global server capable of servicing the WebPhone client's request or which is logically more convenient. This process may occur during the initial log-in of the WebPhone client process, as described with references to messages **1**–**5** of FIG. **17**A.

As previously described, if none of the global servers are available, the WebPhone application can rely on the secondary Internet Protocol technique in which a WebPhone client process sends its current dynamically assigned Internet Protocol address to a prospective WebPhone callee through an E-mail message, as described herein.

WebPhone Protocol

Prior to describing the interaction of the connection server **1512** and information server **1514** with WebPhone client processes, a description of the WebPhone protocol by which the WebPhone client processes and the global server **1500** communicate is appropriate. Tables 6–7 below illustrate the packet definitions of the packets comprising the WebPhone protocol (WPP) including the packet type, the direction and the data elements comprising each packet. In Tables 6–7 the symbol "→" indicates a packet transmitted by a WebPhone client process, while the "←" symbol indicates a packet transmitted by the global server. Tables 8–9 define the data elements described in Tables 6–7. In Tables 6–9, the terms "ULONG" and "UNSIGNED LONG" designate an unsigned long integer value, i.e., 32-bit integer value. Similarly, the terms "USHORT" and "UNSIGNED SHORT" designate an unsigned short integer value, i.e., 16-bit integer value. The term "CHAR" designates a single character, typically assuming a binary value of either 1 or 0. The term "VARCHAR(X)", where X is an integer, value symbolizes a variable length character string, with the number of characters indicated with the integer value. The term "UNSIGNED CHAR" designates an 8-bit character code, i.e., no sign bit. Finally, the term "variable" indicates a variable length data field.

FIG. **17**A illustrates a schematic block diagram of a packet transfer sequence between a pair of WebPhone client processes and the global server, in accordance with the present invention. Each WebPhone application, also referred to as a WebPhone client process, connects to global server **1500** upon start up to inform global server **1500** that the WebPhone client process is on-line and available to make and/or receive calls. Specifically, as illustrated in FIG. **17**A, WebPhone **1536** opens a socket to the global server **1500** and transmits an <ONLINE REQ> packet from WebPhone **1536** to Global server **1500**, as illustrated by message **1** and FIG. **17**A. The <ON LINE REQ> packet may have the format and data illustrated in Table 6, and additional Feature bits which define the functionality of the WebPhone application, as explained in greater detail hereinafter. In response, connection server **1512** and information server **1514** of global server **1500** use the information contained in the <ONLINE REQ> packet to update the status of database **1516**. In the event that the WebPhone client process is logging on for the first time, global server **1500** returns to the WebPhone **1536** a <USER INFO REQ> packet, as illus-

trated by message **2** of FIG. **17**A. The <USER INFO REQ> packet includes the elements as defined in Table 9. In response, WebPhone **1536** returns a <USER INFO> packet as illustrated by message **3** of FIG. **17**A. The <USER INFO> packet contains the data elements defined in Table 8. Connection server **1512** and information server **1514** of global server **1500** utilize the data in the <USER INFO> packet to update database **1516**. Specifically, information server **1514** utilizes such data to create a record in client table **1516**A representing WebPhone **1536**. Next, global server **1500** transmits to WebPhone **1536** a <REGISTRATION> packet, as illustrated by message **4** of FIGS. **17**A. The <REGISTRATION> packet contains the data described in Table **7** plus Feature bits, as described hereinafter. The <REGISTRATION> packet returned to WebPhone **1536** enables certain functions within the WebPhone architecture based on predetermined criteria, for example, whether the user has paid for the product, or which version of the product the user possesses. Following the <REGISTRATION> packet, global server **1500** further transmits an <ONLINE ACK> packet, as illustrated by message **5** of FIG. **17**A. Prior to transmission of the <ONLINE ACK> packet, connection server **1514** updates database **1516**, specifically On-line table **1516**B to indicate that WebPhone **1536** is on-line with respect to the computer network. Upon receiving the <ONLINE ACK> packet, WebPhone **1536** closes the socket to global server **1500**.

In the event WebPhone **1536** had previously registered with global server **1500**, only messages **1** and **5** are required to establish WebPhone **1536** as being on-line. If WebPhone **1536** had new user information to supply to global server **1500**, then packet sequence illustrated by messages **3** and **4** would occur.

Although the packet sequence illustrated by messages **1–5** is described with reference to WebPhone **1536**, WebPhone **1538** interacts in a similar manner with global server **1500** to establish on-line status. No further interaction occurs between the respective WebPhone client processes and the global server unless the WebPhones require directory or search assistance about a prospective callee.

In one calling scenario, a WebPhone user knows the E-mail address of another WebPhone user to which he/she wishes to establish a point-to-point communication, however, the current dynamically assigned Internet protocol address of the callee is unknown to the caller. In this scenario, the user of WebPhone **1536** requests assistance from global server **1500** to obtain the current dynamically assigned Internet Protocol address of the prospective callee WebPhone. First, the user of WebPhone **1536** specifies the callee by entering all or part of the callee party's name or alias in the party name field area of the graphic user interface. If the party is not in the WebPhone user's local directory, the IP address or E-mail address of the callee WebPhone may be entered into the number field area of the graphic user interface, followed by activation of the send button or icon on the graphic user interface. As a result, WebPhone **1536** opens a socket to global server **1500** and transmits a <CONNECT REQ> packet having the format described in Table 6. Connection server **1512** of global server **1500** utilizes the value of the E-mail address specified in the <CONNECT REQ> packet to perform a one-to-one mapping in the on-line table **1516**B to determine the current Internet Protocol address of the indicated callee, as illustrated by the flowchart of FIG. **15**A. Once this mapping is performed, the server **1500** transmits to WebPhone **1536** a <CONNECT ACK> packet, as indicated by message **7**A of FIG. **17**A. The <CONNECT ACK> packet has the format and content as illustrated in Table **6** and includes the IP address of the callee as well as information such as an error code to indicate that no WebPhone application is associated with that callee. Alternatively, if the selected callee is off line, global server **1500** transmits to WebPhone **1536** an <OFF LINE> packet to indicate that the desired party is not on-line, as illustrated by message **7**B of FIG. **17**A. Following the receipt of either a <CONNECT ACK> or an <OFF LINE> packet by WebPhone **1536**, the socket to global server **1500** opened by WebPhone **1536** is closed.

If the current Internet Protocol address of the callee was returned from global server **1500**, the packet transmission sequence illustrated between WebPhones **1536** and **1538** of FIG. **17**A transpires. Whether a calling WebPhone knows the Internet Protocol address of the callee WebPhone, as in the case of a fixed Internet Protocol address, or obtains the Internet Protocol address from global server **1500**, as previously described, the calling sequence to establish a call occurs as follows. WebPhone **1536** opens a socket to WebPhone **1538**. Next, WebPhone **1536** transmits to WebPhone **1538** a <CALL> packet as illustrated by message **8** of FIG. **16**A. The <CALL> packet has the format illustrated in Table **6** and may, optionally, include information identifying the compression/decompression (codec) used by the caller WebPhone. In response to the <CALL> packet, WebPhone **1538** may return with a number of different packets, as illustrated by messages **9**A–D. First, callee WebPhone **1538** may respond to caller WebPhone **1538** with a <REJECT> packet, as illustrated by message **9**A, indicating that the callee WebPhone does not wish to be disturbed, e.g. total call blocking, or, that the callee WebPhone does not wish to talk to caller WebPhone, e.g. party specific or group specific call blocking. In the event of party or group specific call blocking, the user information contained within the <CALL> packet of message **9**A is compared by the caller WebPhone application to a predefined list of WebPhone user information profiles which the callee does not wish to converse, such list having been predefined by the callee in the WebPhone user's personal directory, as explained hereinafter. Upon receiving the <REJECT> packet the caller WebPhone annunciates the result to the user and the socket to the callee WebPhone is closed.

Alternatively, callee WebPhone **1538** may return a <BUSY> packet, as illustrated by message **9**B of FIG. **17**A. The <BUSY> packet indicates that the callee WebPhone is currently utilizing all available lines within its WebPhone application.

A further possible response from callee WebPhone **1538** is to issue an <ANSWER MACH> packet, as illustrated by message **9**C of FIG. **17**A. The <ANSWER MACH> packet includes data indicating whether the machine is capable of receiving voice mail type messages, as described in greater detail in copending U.S. patent application Ser. No. XX/XXX,XXX entitled "Method and Apparatus for Providing Caller Identification Based Out-Going Messages in a Computer Telephony Environment," by Mattaway et al., commonly assigned and incorporated herein by reference.

The preferred response by callee WebPhone **1538** is to transmit a call acknowledge <CALL ACK> packet, as illustrated by message **9**D of FIG. **17**A. The <CALL ACK> packet has the data content illustrated in Table 6. Both the <CALL> and <CALL ACK> packets contain the information of the WebPhone users sending the packet. This information is useful by the recipient of the packet for a number of purposes. For example, the user information is displayed on the enunciator area of the WebPhone graphic display to identify the party placing the call. Second, the user may

select such information and, using the drag and drop functionality of the WebPhone graphic user interface, add the user information to the callee WebPhone user's personal directory resident within his/her specific WebPhone application. In such a manner, both parties are completely identified to each other prior to commencing audio communications. The transmission of complete caller identification information with the <CALL> and <CALL ACK> symbols packets enables such functions as individual or group specific call blocking, party specific outgoing messages, visual caller identification, and party specific priority ringing and sound effects, as explained herein.

Following transmission of <CALL ACK> packet by callee WebPhone **1538**, the callee WebPhone further transmits an <ANSWER> packet to caller WebPhone **1536**, as illustrated by message **10** of FIG. **17**A. Like the <BUSY> packet, the <ANSWER>packet is essentially empty, containing nothing more than a session ID number which is unique to the call. The socket previously opened by caller WebPhone **1536** over which the forgoing packets were transmitted remains open for the transmission of control information between caller WebPhone **1536** and callee WebPhone **1538**. Such control information may comprise an <END> packet signaling the end of a call, a <HOLD> packet indicating that one of the parties to a call has placed the call "on hold" or other packets related to advance functionality of the WebPhone architecture. In addition, caller WebPhone **1536** opens a second socket to callee WebPhone **1538** over which the respective WebPhones may exchange <AUDIO> packets, as illustrated by messages **11**A–B of FIG. **17**A. The <AUDIO> packets have the data content illustrated in Table 6. The WebPhone application enables the parties to converse in real-time, telephone quality, encrypted audio communication over the Internet and other TCP/IP based networks. If both WebPhone client processes are utilized with full duplex sound cards, such as that illustrated in FIG. **12**, the WebPhone users may transmit and receive audio packets simultaneously, similar to normal telephone conversation. However, if the WebPhone client processes are used with half duplex sound cards, a WebPhone user may only transmit or receive audio data simultaneously, similar to a speaker phone. Exchange of <AUDIO> packets continues until either the callee WebPhone or the caller WebPhone transmits an <END> packet, as illustrated by message **12** of FIG. **16**A. Following the receipt of an end packet, the WebPhone client process will cease to accept subsequent audio packets.

Following either transmission or receipt of an <END> packet by the caller WebPhone, the socket opened by the caller WebPhone to the callee WebPhone over which real-time audio communication occurred is closed. Similarly, the previously opened socket over which control information was transmitted between the callee and caller WebPhones is likewise closed.

Referring now FIG. **17**B, if a WebPhone caller seeks to determine whether a prospective WebPhone callee is connected to the computer network, but, has little information regarding the client process, information server **1514** may be utilized as described. The WebPhone user defines One or more of the first name, last name, company, city, state, or country values of the Query field contained within the <INFO REQ> packet sends the packet to the global server. WebPhone **1536** opens a socket to global server **1500** and forwards <INFO REQ> packet to global server **1500**, as illustrated by message **1** of FIG. **17**B. Information server **1514** extracts the values specified the query field of the <INFO REQ> packet and queries the database **1516**, as previously described with reference to FIG. **16**B. Global server **1500** then transmits a <INFO ACK> packet back to WebPhone **1536**, as illustrated by message **2** of FIG. **17**B. The <INFO ACK> packet has the format and data elements indicated in Table 7, including the number of parties satisfying the search criteria, specified in the <INFO REQ> packet. If the user of WebPhone **1536** wishes to receive the number of parties satisfying the search criteria global server **1500** automatically transmits to WebPhone **1536** one or more <INFO> packets, as illustrated by messages **3**A–C of FIG. **17**B. The <INFO> packet has the format and data elements as described in Tables 6–7. At any time following transmission of the <INFO ACK> packet, WebPhone **1536** may transmit an <INFO ABORT> packet to either prevent transmission of any <INFO> packets or to stop transmission of any remaining packets, as illustrated by message **4** of FIG. **17**B. The <INFO ABORT> packet has the for mat and data elements as described in Table 6–7.

Once the user receives the information contained within the <INFO> packets satisfying the search criteria, the user may store such information in his/her personal WebPhone directory by dragging and dropping the information from the annunciator area to the direction dialog box using the WebPhone GUI.

The methods and apparatus described herein provide computer users with a powerful protocol in which to directly establish real-time, point-to-point communications over computer networks directly without server required linking. The a directory server assists in furnishing the current dynamically assigned internet protocol address of other similarly equipped computer users or information about such users.

WebPhone Graphic User Interface

Referring again to FIG. **14**, the WebPhone GUI **1400** consists of a main window which has the look of a modern cellular flip phone and a set of dialog boxes launched from window. Operation of the WebPhone is controlled by selecting objects, i.e., buttons, text and images, and dragging objects, i.e., lines, parties, messages, etc., as explained hereinafter.

WebPhone GUI **1400** comprises a plurality of visual objects, including display **1402**, number pad **1406**, line pad **1404**, call function buttons **1408**, phone function buttons **1410** and audio controls (not shown). Display **1402** provides a number of distinct area for presentation of entering of information useful in operation of the WebPhone application. A party name field **1402**A displays the name of the caller when an incoming call arrives and may also be used for entering the name of a party, up to 25 characters. By entering the name of a party in the party name field **1402**A and pressing one or more of the phone function buttons **1410**, various activities may be accommodated. For example, entering the name of a party in the party name field and pressing the [SND] button causes the WebPhone to first search the personal information directory for the information profile of the party entered. If such party's information is not already resident in the personal information directory, the WebPhone will open up a directory assistance dialog allowing the user to enter information to be submitted to the information server **1514** for searching, as described previously. Further, clicking the entered party name with the right mouse button causes a dialog box to appear enabling the user to modify the current directory entry, if any, for the party entered.

Entering the IP address of a party in the party IP address field followed by the [SND] button causes initiation of a call. If the callee's name exists within the caller's personal directory, or the call is established, the callee's name will appear in a party name field for caller ID purposes.

The third line of the display **1402** serves as a status annunciator line for displaying iconic feedback about the status of events within the WebPhone. Such status icons may include icons indicating enablement of call forwarding, call blocking, do not disturb, priority ringing, file transfer occurring, voice mail transfer occurring or call camping.

The line number annunciator indicates the line, i.e., lines **1–4**, currently active, as illustrated by annunciated field **1402**J. A main LED **1402**F indicates when a line is active by changing color. Time field **1402**C displays the local time when no lines are active. When one of the lines L1–L4 are active, time field **1402**C displays the callee party's time. By single clicking the time field the user can cycle through the two different time values.

The line status field **1402**H displays the status of the currently selected line, illustrated in FIG. **14** as displaying "talk" status. A call duration field **1402**D displays the elapsed time in minutes and seconds since the currently displayed call commenced.

The V-mail field **1402**G displays the number of the new voice mail messages and the total number of voice mail messages received.

When one or more call functions such as call conferencing, call blocking, priority ringing, call camping, or call forwarding are activated, the list of those parties within the WebPhone personal directory having such functionality active for their information profile can be viewed in the party name field by selecting a list arrow (not shown) icon which appears whenever one of the previously described functions is activated. Pressing the icon arrow allows the parties to be viewed sequentially.

The number pad buttons **0–9** also serve as speeddial buttons. Right clicking on any one of the number pad buttons **0–9** causes the name, alias, e-mail address and IP address, if known, of the party assigned to that speed dial position to be displayed on display **1402**.

If a user right clicks on any of lines L1–L4 the name, alias, e-mail address and IP address of the party on that line will similarly appear for a predetermined period of time and then revert back to the normal display.

The keypad buttons displayed on WebPhone GUI **1400** may assume one of two states. A button may be a momentary button which, when pressed, i.e., left clicked, gets pushed in and then pops back out again. A second type of button is a toggle button which when pressed gets pushed in and stays in until pressed again. Number pad buttons **0–9** are momentary buttons which may be used to enter the Internet Protocol address of a party and which each house a speed-dial position. The user may assign a party to one of the ten speed-dial positions by selecting the user's information displayed in display **1402** and then dragging it onto the keypad button. To speed-dial one of the ten buttons the user simply presses the appropriate number followed by the [SND] button. As stated previously, if the user right clicks on one of the number pad buttons, the information about the party assigned to the speed-dial position will be displayed.

The line pad **1404** comprises four toggle buttons L1–L4, each of which has a letter, a number and an LED indicating the status of the line. When one or more parties are associated, i.e., dragged and dropped, with a line, the letter designating the appropriate line turns from an L to C indicating a conference call. When only one party is left on the line the letter designation reverts from a C back to an L indicating a regular call. Only one line, button may be selected at a time when an incoming call arrives. Pressing any of the line buttons assigns the incoming call to the selected line. Pressing a line button, i.e., left clicking, when the line is in use places the line on hold. Subsequent depressing the line button takes the call off hold.

A number of call function buttons **1408**, including the [RCL], [END], [SND], [DND], [MUT], [HLD], [CMP], [BLK], [PRI], [FWD], not all of which are shown in FIG. **14**, are used to control operation of calls. The [RCL] button is a momentary button used to recall the last number dialed. Pressing [RCL] recalls the last party called by displaying the party's name, alias, e-mail address and IP address, if known. Selecting a free line following depression of the [RCL] button followed by the [SND] button will cause the party last called to be dialed. The [END] button is a momentary button and terminates a call upon depression. The [SND] button is a momentary button and is used to both place and answer calls. Depressing the [SND] button when a call is being announced causes the call to be answered on a preselected line or a line indicated by the user. Depression of the [SND] button once a callee's information is entered into display **1402** causes the party to be called, if the required information is present, or otherwise causes an information server connection to be established and activated, as previously described.

The [DND] button is a toggle button and is used to activate the Do Not Disturb function of the WebPhone. When activated, the [DND] button causes all inbound calls to be routed to the answering machine.

The [MUT] button is a toggle button which, upon depression, causes disabling of the microphone associated with a user's WebPhone system. When the [MUT] button is enabled, the main LED **1402**F and the status line **1402**H change to indicate that the call muted. Depression of the [MUT] button is undetected by one or more callees.

The [HLD] button is a momentary button and is used to place a call on hold. When a user depresses the [HLD] button a party or parties to a conference call are placed on hold, e.g., the microphone and speaker of the system are effectively disabled. When a called is placed on hold, the main LED **1402**F and call status field **1402**H indicate the change. To take a call off hold, the user depresses the line button of the call being held.

The [CMP] button is a momentary button that causes the WebPhone user to camp on a party, i.e., perpetual redial. Camping on a party serves to insure that the user's call will go through when the party is available. After placing a call, if the callee responds with either a busy or on off-line status, the user may press the [CPM] button to camp on that party. To remove a camp from a party, the user presses the delete key from the computer keyboard.

The [BLK] button is a toggle button and enables or disables call blocking. Depression of the [BLK] button enables call blocking causing all inbound calls from parties who have call blocking designated in their information profile within the personal information directory to be either rejected or routed to the answer machine. Whether a call is to be rejected or routed to the answering machine is specified in a party's information profile record within the personal information directory, in a manner, as previously described.

The [PRI] button is a toggle button which enables or disables priority ringing. Depression of the button enables priority ringing of all inbound calls from parties, i.e. generation of customized sound effects and/or graphic announcements when a call arrives. As with call blocking, priority ringing is specified within a party's information profile record in the user's personal information directory.

The [FWD] button is a toggle button which enables or disables call forwarding. Depression of the button enables call forwarding of selected inbound calls to the party speci-

fied in the appropriate information profile record in the personal information directory. The WebPhone will first search in the personal information directory for an information profile record which matches the inbound call. If a match occurs, and call forwarding is enabled, the inbound call will be forwarded to the party designated within the matched information profile record. If no party is designated, the call will be forwarded to a default forwarding party.

In addition to the call function buttons, a number of phone function buttons **1410** including a [CFG], [DIR], [MSG], [DAT], [LOG], [], and ? buttons enable users to further direct functions of a phone. Specifically, the ? button is a momentary button which invokes an interactive, multimedia tutorial and help system about the WebPhone. The [CFG] button is a momentary button, depression of which launches a configuration dialog which enables the user to change the operating parameters of the WebPhone. The [DIR] button is a momentary button, depression of which launches the phone directory dialog which enables a user to add, store, update, view, and delete parties and to obtain directory assistance from global server **1500**, as described previously. The [MSG] button is likewise a momentary button, depression of which launches the voicemail message dialog which enables a user to view, sort, playback, delete, save and restore voicemail messages, as well as to create, playback, delete, save, and restore custom outgoing messages and assign them to information profile records in the personal information directory.

The [DAT] button is a momentary button, depression of which launches a data file transfer dialog enabling a user to monitor and control the progress of a data file transferred over the communication link established with the WebPhone, such dialog further enables a user to retrieve and create E-mail.

The [LOG] button is a momentary button, depression of which launches a call activity log dialog which enables a user to use, sort, search for, print, and delete call related events. An "X" icon is provided to exit the WebPhone. If one or more calls are active when the X icon is selected, a dialog box will appear asking the user if he/she really wishes to exit and terminate active calls. Other icons are provided for minimizing or iconifying the WebPhone application.

In addition to the above-described display, the WebPhone GUI **1400** includes a number of audio control buttons and sliders (not shown in FIG. **14**). These graphic elements enable the user to control the recording the playback of voicemail and outgoing messages and operate similar to conventional audio tape deck controls. In the illustrative embodiment, and similar to that shown in FIG. **5**, a progress bar is illustrated which displays the extent of progress during playback and audio recording processes. Momentary buttons may be provided for rewinding the "virtual tape" to the beginning and for fast forwarding the tape to the end of a recording. Further, momentary buttons are provided for aborting, as well as stopping, playback of audio. A speaker card button, implemented as a toggle button, is provided to play back audio on the sound card's speaker. A special momentary button for audio playback is provided. When initially depressed, audio playing commences. The button then pops out and becomes a pause button. Subsequent depression pauses the audio. The button then pops out again to become a play button. A record button, in the form of a toggle button is provided to control recording of audio. When the button is depressed the user is in an audio record mode and can record voicemail or outgoing messages. To stop recording, the button is pressed again or the stop is button is pressed. A slider-type graphic potentiometer is provided to control speaker volume and enables the user to adjust output volume of the audio received during conversation and playback of voicemail and outgoing messages. The speaker control will attenuate the sound card speaker volume. A similar control is provided to control microphone volume and enables the user to adjust the input volume of audio recorded during conversation and recording of voicemail and outgoing messages. The microphone slider control attenuates the sound card's microphone volume.

WebPhone Application Object Implementation

As previously described, with reference to FIGS. **13**A–B, the WebPhone application comprises a set of object modules which work together in a concerted fashion to provide real-time, multitasking, network-based media transmission and reception. Specifically, the WebPhone GUI, user interface, event manager, and media engine utilize a number of objects to house and manipulate data associated with the operation of the WebPhone application. The GUI objects control the look and feel of the graphic user interface controls which comprise the WebPhone user interface. Some user interface objects maintain and manage many of the states of the WebPhone and control the behavior of the GUI controls, as illustrated in FIGS. **18**A–D.

FIG. **18**A illustrates the hierarchical relationship between objects within the WebPhone. The UIVirtualBase **1812** is a class from which UIVirtualControl object **1810** and UIVirtual object **1808** inherit their respective attributes and member functions. GUIControl object **1802** inherits its attributes and member functions from UIVirtualControl **1810**, as illustrated. UICollection object **1806** inherits its properties from the UIVirtual object class **1808**. The UIControl object inherits its attributes and member functions from both the UIVirtual control object class **1810** and the UIVirtual object class **1808**.

Referring to FIG. **18**B the UIControl object **1804** itself serves as a class from which the UIButton object **1828**, UISlider object **1826**, UIScroller object **1824**, UITab object **1822**, UIDisplay object **1818**, UIListBox object **1820**, UIComboBox **1814**, and UIEditBox **1816** are subclasses. As illustrated in FIG. **18**C, the UIPushButton **1842**, UIPlayRun object **1844** and UIToggle object **1846**, are subclasses of the UIButton object **1848**. As illustrated in FIG. **18**D, the UIPhone object **1838**, UICall object **1832**, UILine object **1834**, and UIPopUp object **1836** are derived from or inherit their attributes and member functions from the UICollection object class **1806**.

Each WebPhone control has two objects associated therewith, a windowing system specific GUIcontrol object **802** and a generic UI control object **1804**. When the GUIcontrol object's state is changed by the user, GUIcontrol **1802** verifies the change with UIcontrol **1804** to validate the change. UIcontrol **1804** is a child of the UIcollection **1806**. When UIcontrol's sibling, GUIcontrol **1802** requests UIcontrol **1804** to verify a change, and the change is accepted, GUIcontrol **1802** must verify the change with its parent object. The parent UIcollection **1806** may have its own parent, another UIcollection object, that it must verify the change with. The UIPhone object **1838** is a member of the UI collection class. UIPhone has final approval over all changes in the state of the WebPhone. UIPhone **1838** further tells child objects when the event manager changes the phone state and further creates jobs for the event manager based on user actions.

The WebPhone drag and drop functionality utilizes the standard Windows® drag and drop interface and adds several unique object types to interact therewith. Specifically,

each UIcontrol and GUIcontrol object has two new member functions added, e.g., set dragtype and acceptdrop types. The set dragtype call sets the type of drag that the control will perform if the mouse or other pointing device is moved out of the control window with the left mouse button down. The accept droptype defines the types of drags the control will accept.

Event Manager and Media Engine

The event manager is a state machine consisting of an array of pointers to functions and states which make up a state-event table. When an event occurs as caused by the mouse, keyboard, mic, speaker, or socket, it is up to the user interface to determine if the event requires the attention of the event manager. The event manager is not notified of events which effect only the graphic user interface, e.g., the user depresses the [DIR] button to open the phone directory dialog.

Referring to FIGS. **19**A–C, a conceptual block diagram illustrating the event manager and media engine objects utilized by the WebPhone is presented. Specifically, the following objects are utilized by both the user interface and the event manager to manager the state of calls and tasks that are to be performed:

line
job
party
task

As illustrated in FIG. **19**A, a Line object is represented by the pentagon shape with a number contained therein. The Line object has the attributes of state and duration and a *job pointer. Member functions for the Line object include createcall () and removecall (). The Job object is illustrated with a rectangle having pointers extended therefrom as illustrated in FIG. **19**A. Attributes of the job object include, ID, type, state, and parties, and pointer attributes party, inTask, outTask, nextjob, prevjob. The Job object has the member functions of AddParty, RemoveParty, CreateTask, and RemoveTask. The Party object, illustrated with a triangular symbol, includes the attributes of state, session, socket, and partyRec, and the member functions of LoadParty.

The Task object includes the attributes of command, source, destination, extent, fileHandle, fileType, fileLength, fileSize, mic, speaker, and flags, as wells as pointer attributes *job and *buf. The values assumable by the command attribute of the Task object may include initialize, close, start, stop, fill, and use, etc. The values assumable by the source and destination attributes of the task object may include microphone, speaker, socket, and file. FIG. **19**B illustrates the relationship between Line objects and Job objects and the pointers linking the two. FIG. **19** illustrates the relationship between Party objects, Job objects and Task objects and the pointers linking the Job objects to the parties and tasks.

Media Engine Implementation

FIGS. **20**A–D illustrate the process steps performed by the media engine of the WebPhone in accordance with the present invention. The coding of the process steps of the flowchart of FIGS. **20**A–D and to instructions suitable for use by the WebPhone will be understandable by those having ordinary skill in the programming arts. FIG. **20**A illustrates the process executed by the media engine when the CMD attribute of a Task object is defined as a AE_USEME command, as previously illustrated in FIG. **19**A. The Task objects are set up by the event manager. The media engine manages routing and resources. For example a microphone, file or socket may provide a source of data to media engine while a destination may comprise either a speaker file or socket. The media engine serves to perform compression/decompression as well as copying functions. For the purposes of describing flowcharts **20**A–D the media engine will referred to as media engine **2000**.

Referring to FIG. **20**A, media engine **2000** first determines the source of a data stream, as illustrated by decisional block **2002**. If the source is a microphone, media engine **2000** determines whether or not the current audio data from the microphone source is silence, as illustrated in decisional block **2004**. If the audio stream from the microphone is not silent the data will be accumulated into a microphone buffer, as illustrated by procedural block **2006**. Next, the media engine will determine whether or not the buffer is full, as illustrated by decisional **2008**. If the buffer is full, process flow will proceed to a determination of the destination via connector Q. If in decisional block **2004** the determination was made that the audio data from the microphone was silence, the media engine notes the length of the silence, as illustrated by procedural block **2010**. Next, the media engine determines whether or not the buffer is empty, as illustrated by decisional block **2012**. If the buffer is empty, process flow proceeds to a determination of the source, via connector R, as illustrated by decisional block **2030**.

Returning again to decisional **2014**, a determination of the destination of the audio data made after either a determination that the buffer is full, via connector Q, or that the source of the audio data is a socket, e.g., one of the branches of decisional block **2002**. If in decisional block **2014** a determination is made that the destination is a socket, media engine **2000** determines if a party is online, as illustrated by decisional block **2028**. If the party is online media engine **2000** will write to the socket associated with that party, as illustrated by procedural block **2026**. The process as illustrated by decisional **2028** and process block **2026** are repeated for every party associated with the Job object, i.e., conference calls include multiple parties. Following writing to the parties socket, process flow returns decisional block **2030** for a determination of the source, as illustrated. If in decisional block **2014** a determination was made that the speaker was the destination, media engine makes a further determination to whether or not the there is more than one party on the conversation, i.e., conference call, as illustrated by decisional block **2020**. If there is only one other party besides the user on the call, process flow proceeds to junction K where the audio data is written to the speaker, as illustrated by process block **2022**. If in decisional block **2020** a determination was made that multiple parties were associated with a call media engine **2000** mixes the audio data into a mixing buffer, as illustrated by process block **2016**. Next media engine **2000** determines whether or not the speaker is idle. If so, the audio data from the mixing buffer is written to the speaker as illustrated by procedural block **2022**. Otherwise, process flow proceeds to junction R. In decisional block **2030** media engine **2000** determines again what the source of an audio data stream is. If the source is determine to be a socket, media engine **2000** will place the empty buffer on the winSock queue, as illustrated by process block **2036**. If the source is determined to be a microphone, and the microphone is enabled, as determined in decisional block **2032**, media engine **2000** will place the empty buffer on the mic sampling queue, as illustrated by process block **2034**. Otherwise, media engine **2000** will place the empty buffer in the free pool of buffer space, as illustrated by process **2038**. Either branch of decisional block **2030** will result in a return from the task execution process, as illustrated.

FIG. **20**B, illustrates the process flow performed by media engine **2000** upon receiving a task object from the event

manager having the CMD attribute defined with a AE_START, i.e., the event manager instructs the media engine to start a copy operation from a source to a destination. First, media engine **2000** determines whether or not the source is a microphone or a file, as illustrated by decisional block **2040**. If the source is a file, process flow proceeds to block **2062** of FIG. **20**C via connector F, as described hereinafter. If the source is determined to be a microphone, media engine **2000** will determine whether or not the microphone is on, as illustrated by decisional **2044**. If the microphone is not on, an internal error notification will be generated, as illustrated by procedural block **2046**. If the microphone is on, media engine **2000** will enable microphone sampling, obtain space from the buffer pool, and perform an asynchronous read from the microphone, as illustrated by process blocks **2048**, **2050** and **2052**, respectively. If in decisional block **2040** media engine **2000** determined that the source was a socket, buffer space will be retrieved from the buffer pool, as illustrated by process block **2042**, and an asynchronous read from the socket will be performed, as illustrated by process block **2045**. Following the an asynchronous read from either a socket or a microphone, media engine **2000** will return the task to the event manager, as illustrated.

FIG. **20** illustrates the process flow performed by media engine **2000** upon receiving a Task object from the event manager in which the CMD attribute is defined with a AE_FILLME command value, i.e., an empty packet has been returned from either an MCI or WINSOCK asynchronous write operation upon completion. First, media engine **2000** determines whether the source is from a file or either a socket or speaker, as illustrated by decisional block **2054**. If the source is a file, media engine **2000** will read a portion of the file, as illustrated by process block **2062**. Next, media engine **2000** will make a determination as to whether the destination is either a socket or a speaker, as illustrated by decisional block **2068**. If the destination is a socket process flow will return to decisional block **2028** of FIG. **20**A via connector S, as illustrated. If the destination is a speaker, process flow will proceed to process block **2022** of FIG. **20**A via connector K as illustrated.

If a determination was made in decision **2056** that the destination is a socket, media engine **2000** will place the buffer associated with the task or message in the WINSOCK free pool of buffer space, as illustrated by process block **2058**. If the destination is determined to be a speaker, media engine **2000** next determines whether or not the buffer is empty, as illustrated by decision block **2060**. If the buffer is not empty, the data within the mixing buffer will be written to the speaker, as illustrated by message **2064**. If the buffer is empty, the buffer associated with the message, i.e., task, will be placed in the MCI message free pool, as illustrated by process block **2066**. Both branches decisional block **2056** result in a return from the task by media engine **2000**, as illustrated. In the above-described flow diagrams, a message may be a task implementation similar to the manner in which Microsoft Windows uses messages for task completion operations.

FIG. **20**D illustrates the process path taken by media engine **2000** when the CMD attribute of a Task object is defined as a AE_STOP value, i.e., the event manager instructs the media engine to stop the current operation on behalf of a specified task. The process begins with the determination of whether or not the source is a microphone or file, as illustrated by decisional block **2070**. If it is determined that the source is a file, process flow proceeds to block **280** where the source is set to none, i.e., no further data will retrieved or processed. If the process is determined to be a socket, media engine **2000** cancels any pending asynchronous reads from the socket, as illustrated by process block **2074**. If a determination is made that the source is a microphone, media engine **2000** will determine whether or not the microphone is on, as illustrated by decisional block **2072**. If the microphone is on, media engine **2000** cancels sampling of the audio signal from the microphone, as illustrated by process block **2076**, and, discards the pending data in the mix buffer, as illustrated by process block **2078**. Regardless of the determination of the source, all branches of the process flow terminate with the setting of the source to none or null, indicating a termination of the operation and a return by media **2000** from the task, as illustrated.

In an alternate embodiment, the various aspects of the invention may be implemented as a computer program product for use with a computer system. Such implementation may comprise a series of computer instructions either fixed on a tangible medium, such as a computer readable media, e.g. diskette **1142**, CD-ROM **1147**, ROM **1115**, or fixed disk **1152** of FIG. **11**, or transmittable to a computer system, via a modem or other interface device, such as communications adapter **1190** connected to the network **1195** over a medium **1191**. Medium **1191** can be either a tangible medium, including but not limited to optical or analog communications lines, or may be implemented with wireless techniques, including but not limited to microwave, infrared or other transmission techniques. The series of computer instructions embodies all or part of the functionality previously described herein with respect to the invention. Those skilled in the art will appreciate that such computer instructions can be written in a number of programming languages for use with many computer architectures or operating systems. Further, such instructions may be stored using any memory technology, present or future, including, but not limited to, semiconductor, magnetic, optical or other memory devices, or transmitted using any communications technology, present or future, including but not limited to optical, infrared, microwave, or other transmission technologies. It is contemplated that such a computer program product may be distributed as a removable media with accompanying printed or electronic documentation, e.g., shrink wrapped software, preloaded with a computer system, e.g., on system ROM or fixed disk, or distributed from a server or electronic bulletin board over a network, e.g., the Internet or World Wide Web.

Although various exemplary embodiments of the invention have been disclosed, it will be apparent to those skill in the art that various changes and modifications can be made which will achieve some of the advantages of the invention without departing from the spirit and scope of the invention. These and other obvious modifications are intended to be covered by the appended claims.

TABLE 1

Client Table

Field	Data type	Comments
id	ulong	Unique ID Sequence
activated	char	0 = NO, 1 = YES
activationDate	ulong	Secs since 00:00 UTC Jan. 1, 1970
version capability	ushort	Version of the Webphone
version protocol	ushort	
version vendor	ushort	
paid	char	0 = NO, 1 = YES

TABLE 1-continued

Client Table

Field	Data type	Comments
prePaidCode	varchar(16)	
firstName	varchar(10)	
lastName	varchar(25)	
alias	varchar(20)	
emailAddr	varchar(90)	
IPAddr	varchar(80)	0.0.0.0 if not known
street	varchar(50)	
apt	varchar(5)	
city	varchar(20)	
state	varchar(20)	
country	varchar(20)	
postalCode	varchar(20)	
phone	varchar(25)	
fax	varchar(25)	
feature bits	ulong	WebPhone Feature Definitions
company	varchar(25)	Company Name
addrChanges	char	No. of address changes
addrChangeDate	ulong	Secs since 00:00 UTC
publish	char	0 = NO, 1 = YES
accessDate	ulong	Secs since 00:00 UTC
accessCount	ulong	# of log ons
callCount	ulong	# o outbound calls
social security number	ulong	optional
age	ushort	optional
occupation code	ushort	optional
interest codes	ushort	optional
household income range	ushort	optional

TABLE 2

Online Table

Field	Data Type	Comments
emailAddr	varchar(90)	
IPAddr	varchar(80)	
flags	char	
onlineDate	ulong	Secs since 00:00 UTC

TABLE 3

WebBoard Table

Field	Data Type	Comments
id	ulong	Unique ID Sequence
image	varchar(255)	Filename of image file
imageType	char	GIF = 0, JPG = 1, RLE = 3
audio	varchar(255)	Filename of TSP encoded.WAV file
audioType	char	GSM=0, TRUESPEECH = 1
hits	ulong	Number of accrued hits
hitsprofile	varchar(8)	Filename of Demographics
version	ulong	version of WebBoard
URL	varchar(255)	home page url

TABLE 4

WebBoard Config Table

Field	Data Type	Comments
count	ulong	Number of WebBoards

TABLE 5

Source Table

Field	Data Type	Comments
id	ulong	Unique ID Sequence
weboardID	ulong	Link to WebBoard record
name	varchar(50)	Company's name
url	varchar(80	URL to Home Page
street	varchar(50)	
apt	varchar(5)	
city	varchar(20)	
state	varchar(20)	
country	varchar(20)	
postalCode	varchar(20)	
phone	varchar(25)	
fax	varchar(25)	
contact	varchar(35)	Name of contact

TABLE 6

WebPhone Protocol (WPP) Packet Definitions

Packet	Packet Type	Direction	Data
Invalid	WPP_INVALID	←→	WPP_INVALID
Online Req	WPP_ONLINEREQ	→	WPP_ONLINEREQ, sid, version, emailAddr, IPAddr, onlineState, feature bits
OnlineACK	WPP ONLINEACK	←	WPP_ONLINEACK, sid onlineStatus, feature bits
Offline	WPP_OFFLINE	←→	WPP_OFFLINE, sid
Hello	WPP_HELLO	←→	WPP_HELLO, sid, version
Connect Req	WPP_CONNECTREQ	→	WPP_CONNECTTREQ, sid, version, callType, partyEmailAddr, emailAddr, IPAddr, connectState
Connect ACK	WPP_CONNECTACK	←→	WPP_CONNECTACK, sid, connectStatus, partyIPaddr
Call	WPP_CALL	←→	WPP CALL, sid, version, emailAddr, IPAddr, userinfo
CallACK	WPP_CALLACK	←→	WPP_CALLACK, sid, version, emailAddr, IpAddr, userinfo

TABLE 6-continued

WebPhone Protocol (WPP) Packet Definitions

Packet	Packet Type	Direction	Data
CnfCall	WPP_CNFCALL	←→	WPP_CNFCALL, sid, version, emailAddr, IPAddr, userinfo
CnfCallACK	WPP_CNFCALLACK	←→	WPP_CNFCALLACK, sid, version
Answer	WPP_ANSWER	←→	WPP_ANSWER, sid
Busy	WPP_BUSY	←→	WPP_BUSY, sid
AnsMachine	WPP_ANSMACH	←→	WPP_ANSMACH, sid, state
End	WPP_END	←→	WPP_END, sid
Hold	WPP_HOLD	←→	WPP_HOLD, SID, (ON/OFF)
Reject	WPP_REJECT	←→	WPP_REJECT, sid
Camp	WPP_CAMP	←→	WPP_CAMP, sid
CampACK	WPP_CAMPACK	←→	WPP_CAMPACK, sid
Audio	WPP_AUDIO	←→	WPP_AUDIO, sid, audioType, silence, length, audioData
Pulse	WPP_PULSE	→	WPP_PULSE, sid
Adjpulse	WPP_PULSE	←	WPP_ADJPULSE, sid, adjPulse
Vmail	WPP_VMAIL	←→	WPP_VMAIL, sid, audioType, silence, length, audioData
VmailEnd	WPP_VMAILEND	←→	WPP_VMAILEND, sid
OgmEnd	WPP_OGMEND	←→	WPP_OGMEND, sid
CnfAdd	WPP_CNFADD	←→	WPP_CNFADD, sid partyEmailAddr, partyPaddr, partinfo
CnfDrop	WPP_CNFDROP	←→	WPP_CNFDROP, sid
FileXmtReq	WPP_FILEXMTREQ	←→	WPP_FILEXMTREQ, sid, file Type, fileName, fileSize

TABLE 7

WebPhone Protocol (WPP) Packet Definitions

Packet	Packet Type	Direction	Data
FileXmtAck	WPP_FILEXMTACK	←→	WPP_FILEXMTACK, sid
File	WPP_FILE	←→	WPP_FILE, sid, length, fileData
FileXmtEnd	WPP_FILEXMTEND	←→	WPP_FILEXMTEND, sid
FileXmtAbort	WPP_FILEXMTABORT	←→	WPP_FILEXMTABORT, sid
InfoReq	WPP_INFOREQ	→	WPP_INFOREQ, sid, query
InfoACK	WPP_INFOACK	←	WPP_INFOACK, sid, nparties
Info	WPP_INFO	←	WPP_INFO, sid, partyInfo
InfoAbort	WPP_INFOABORT	→	WPP_INFOABORT, sid
UserInfoReq	WPP_USRINFOREQ	←	WPP_USRINFOREQ, sid
UserInfo	WPP_USRINFO	→	WPP_USRINFO, sid, version, userInfo
WBImageStart	WPP_WBIMAGESTART	←	WPP_WBIMAGESTART, sid, fileSize, ImageType, url
WBImage	WPP_WBIMAGE	←	WPP_WBIMAGEEND, sid
WBAudioStart	WPP_WBAUDIOSTART	←	WPP_WBAUDIOSTART, sid, fileSize, audioType
WBAudio	WPP_WBAUDIO	←	WPP_WBAUDIO, sid, length, audioData
WBAudioEnd	WPP_WBAUDIOEND	←	WPP_WBAUDIOEND, sid
Registration	WPP_REG	←	WPP_REG, sid, feature bits, EEMAILAddr, customer id
Audio Start	WPP_AUDIO START	←→	WPP_AUDIO START, sid
Audio End	WPP_AUDIO END	←→	WPP_AUDIO END, sid
Caller OK	WPP_CALLEROK	→	WPP_CALLEROK, sid, version, emailAddr, feature bits
Caller ACK	WPP_CALLERACK	←	WPP_CALLERACK, sid, callerStatus, feature bits
Key Pad	WPP_KEYPAD	←	WPP_KEYPAD, sid (ON/OFF)
Key	WPP_KEY	→	WPP_KEY, sid, ascii character
WBLIST	WPP_WBLIST	←	WPP_WBLIST. sid, list of WB IDs
WBLIST REQ	WPP_WBLISTREQ	→	WPP_BBLISTREQ, sid
WB REQ	WPP_WEBBOARDREQ	→	WPP_WEBBOARDREQ, sid, WBid, Client id
WB HIT	WPP_WEBBOARDHIT	→	WPP_WWBOARDHIT, sid, WB id, Client id
ANS FULL	WPP_ANS FULL	→	WPP_ANS FULL, sid

TABLE 8

WebPhone Protocol (WPP) Packet Data Definitions

Element	Data Type	Comment
WPP_*	unsigned char	WPP message identifier
sid	unsigned long	session id unique per call
version	unsigned(3)	version of the webphone (capability, protocol, vendor)
emailAddr	varchat(90)	email address of caller
IPAddr	varchar(80)	IP Address
onlineState	unsigned char	bit 0 (ACTIVE/INACTIVE) bit 1 (Merchant Phone) bit 2 (Connection Server) bit 3 (webboard disabled) bit 4 Not Used bit 5 Not Used bit 6 Not Used bit 7 Not Used
call Type	unsigned char	call type 0: EMAIL/1:IPCALL
partyEmailAddr	varchar(90)	email address of person to call
connectStatus	unsigned char	0:NO WEBPHONE 1: ONLINE 2:OFFLINE 3:RECONNECT 4:PERM_RECONNECT
partyIPAddr	varchar(80)	IP Address of person to call
userInfo	varchar(120)	firstName, LastName, alias, emailAddr, street, apt., city, state, country, postalCode, phone, fax, company
audioType	unsigned char	audio compress type 0:GSM 1:TRUESPEECH

TABLE 9

WebPhone Protocol (WPP) Packet Data Definition

Element	Data Type	Comment
length	unsigned short	length of audio or data in bytes
audioData	512 Bytes	compressed audio data

TABLE 9-continued

WebPhone Protocol (WPP) Packet Data Definition

Element	Data Type	Comment
feature bits	unsigned long	WebPhone feature definition
fileType	unsigned char	file type 0:DATA 1:EMAIL 2:TEXT 3:BINARY
fileName	varchar(13)	name of file to be transmitted.
fileSize	unsigned long	size of file to be transmitted in bytes
fileData	variable	file data
query	varchar(120)	firstName, lastName, company, city, state, country
nparties	unsigned long	number of parties or query records being sent
size	unsigned long	size of file (IMAGE or AUDIO) to be sent
imageType	unsigned char	image type 0:GIF 1:JPG
imageData	512 Bytes	image data
eemailAddr	varchar(90)	encrypted email Address
onlineStatus	unsigned char	0 OK -1 Error
callerStatus	unsigned char	0 is unpaid 1 if paid
onlineState	unsigned char	bit 0 webboard disabled bit 1 Not Used bit 2 Not Used bit 3 Not Used bit 4 Not Used bit 5 Not Used bit 6 Not Used bit 7 Not Used
WBid	unsigned long	link to WebBoard record
adjpulse	unsigned long	timer offset in secs

TABLE 10

Feature Definition

feature bit 0	0 = 1 line	1 = 4 lines
bit 1	0 = Limited Call Time	1 = Unrestricted Call Time
bit 2	0 = Limited VMail OGM	1 = Unlimited Vmail OGM
bit 3	0 = Limited Directory Entries	1 = Unlimited Dir Entries
bit 4	0 = Webboard Not Disabled	1 = Allowed to Disable
bit 5	0 = Conferencing(audio) Disabled	1 = Conferencing Enabled
bit 6	0 = Conferencing(video) Disabled	1 = Conferencing Enabled
bit 7	0 = Whiteboard Disabled	1 = Whiteboard Enabled
bit 8	0 = Offline voicemail Disabled	1 = Offline voicemail Enabled
bit 9–27 Reserved		
bit 28–30 Type of Phone	0 - Normal webphone 1 - Agent 2 - Business webphone 3 - Gateway 4 - ACD 5–7 reserved	
bit 31 1 = Disable all WebPhone features		

TABLE 11

Offset	Name	Size	Description
	Reserved		Reserved
+1	SessionID	4	Unique value for duration of this connection
+5	Version	6	WebPhone version and distributor stamp
+11	Codec	1	Audio compression algorithm selected
+12	FirstName	10	Given name, middle initial
+22	LastName	25	Surname
+47	Alias	20	Nickname
+67	EmailAddr	90	Caller's electronic mail address
+157	IpAddr	80	Caller's WebPhone's Internet address
+237	Street	50	Street address of user
+287	Apt	20	Apartment or suite number
+307	City	20	City name
+327	State	20	State or province
+347	Country	20	Country name
+367	ZipCode	20	Zip or postal code
+387	Phone	25	Telephone number
+412	Fax	25	Facsimile telephone number
+437	Company	25	Employer or organization name
+487	File Name	25	Name of file
+512	Action Code	25	Action descriptor
+537	File Type	10	File type descriptor
+547	Status	25	Status of WebPhone utility

What is claimed is:

1. A computer program product for use with a computer system, 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 a program code embodied in the medium comprising:

a. program code for transmitting an E-mail signal from the first process to the server process over the computer network, the E-mail signal containing a first network protocol address assigned to the first process upon connection to the computer network;

b. program code for receiving a second network protocol address from the second process over the computer network, the second network protocol address assigned to the second process upon connection to the computer network; and

c. program code, responsive to the second network protocol address, for establishing a point-to-point communication link between the first process and the second process over the computer network.

2. In a first computer process operatively coupled over a computer network to a second process and an mail server process, a method of establishing a point-to-point communication between the first and second processes comprising the steps of:

a. transmitting an E-mail signal to the server process over the computer network, the E-mail signal containing a first network protocol address assigned to the first process upon connection to the computer network;

b. receiving a second network protocol address from the second process over the computer network, the second network protocol address assigned to the second process upon connection to the computer network; and

c. establishing a point-to-point communication link between the first process and the second process over the computer network, in response to receiving the second network protocol address.

3. A computer program product for use with a computer system capable of executing a first process and communicating with other processes, a directory server process and a mail server process over a computer network, the computer program product comprising a computer usable medium having computer program code embodied in the medium, the program code comprising:

A. program code configured to determine the currently assigned network protocol address of the first process upon connection to the computer network;

B. program code configured to establish a communication connection with the directory server process once the assigned network protocol of the first process is known;

C. program code configured to forward the assigned network protocol address of the first process to the directory server process upon establishing a communication connection with the directory server process; and

D. program code configured to establish a point-to-point communication with another process over the computer network.

4. The computer program product of claim **3** wherein the program code configured to establish a point-to-point communication further comprises:

D.1 program code configured to transmit, from the first process to the directory server process, a query as to whether a second process is connected to the computer network; and

D.2 program code configured to receive a network protocol address of the second process from the directory server process, when the second process is connected to the computer network.

5. The computer program product of claim **3** wherein the program code configured to establish a point-to-point communication further comprises:

D.1 program code configured to transmit an E-mail message containing a network protocol address from the first process to the mail server process over the computer network;

D.2 program code configured to receive a second network protocol address from a second process over the computer network.

6. A computer program product for use with a 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 configured to, following connection of the first process to the computer network, forward to the server process a network protocol address at which the first process is connected to the computer network;

B. program code configured to query the address server as to whether the second process is connected to the computer network;

C. program code configured to receive a network protocol address of the second process from the address server, when the second process is connected to the computer network; and

D. program code configured to respond to the network protocol address of the second process, establish a point-to-point communication link with the second process over the computer network.

7. A computer data signal embodied in a carrier wave comprising:

A. program code configured to, following connection of a first process to a computer network, forward to a server process a network protocol address at which the first process is connected to the computer network;

B. program code configured to query the server process as to whether a second process is connected to the computer network;

C. program code configured to receive a network protocol address of the second process from the server process, when the second process is connected to the computer network; and

D. program code, responsive to the network protocol address of the second process, and configured to establish a point-to-point communication connection with the second process over the computer network.

8. An apparatus for use with a computer system, the computer system executing a first process operatively coupled over a computer network to a second process and a directory database server process, the apparatus comprising:

A. program logic configured to, following connection of the first process to the computer network forward to the address server a network, protocol address at which the first process is connected to the computer network;

B. program logic configured to query the address server as to whether the second process is connected to the computer network;

C. program logic configured to receive a network protocol address of the second process from the address server, when the second process is connected to the computer network; and

D. program logic configured to, in response to the network protocol address of the second process, establish a point-to-point communication link with the second process over the computer network.

9. A computer data signal embodied in a carrier wave comprising:

a. program code configured to access a directory database, the database having a network protocol address for a selected plurality of processes having on-line status with respect to the computer network, the network protocol address of each respective process forwarded to the database following connection to the computer network; and

b. program code responsive to one of the network protocol addresses and configured to establish a point-to-point communication link from the first process to the second process over the computer network.

10. In a first computer process operatively coupled over a computer network to a second process and an address server, a method of establishing a point-to-point communication between the first and second processes comprising the steps of:

a. accessing a directory database, the database having a network protocol address for a selected plurality of processes having on-line status with respect to the computer network, the network protocol address of each respective process forwarded to the database following connection to the computer network; and

b. in response to one of the network protocol addresses, establish a point-to-point communication link from the first process to the second process over the computer network.

11. An apparatus for use with a computer system, the computer system capable of executing a first process connectable over a computer network to a second process and a directory database server process, the apparatus comprising:

a. program logic configured to access a directory database, the database having a network protocol address for a selected plurality of processes having on-line status with respect to the computer network, the network protocol address of each respective process forwarded to the database following connection to the computer network; and

b. program logic responsive to one of the network protocol addresses and configured to establish a point-to-point communication link from the first process to the second process over the computer network.

12. A computer data signal embodied in a carrier wave comprising:

program code for transmitting to a server process, a network protocol address received by a first process following connection to a computer network;

program code for transmitting, to the server process, a query as to whether a second process is connected to the computer network;

program code for receiving a network protocol address of the second process from the server process, when the second process is connected to the computer network; and

program code, responsive to the network protocol address of the second process, for establishing a point-to-point communication link between the first process and the second process over the computer network.

13. In a first computer process operatively coupled over a computer network to a second process and an address server, a method of establishing a point-to-point communication between the first and second processes comprising the steps of:

a. transmitting to the server a network protocol address received by the first process following connection to the computer network;

b. transmitting, to the server, a query as to whether the second process is connected to the computer network;

c. receiving a network protocol address of the second process from the server, when the second process is connected to the computer network; and

d. program code, responsive to the network protocol address of the second process, for establishing a point-to-point communication link between the first process and the second process over the computer network.

14. An apparatus for use with a computer system, the computer system capable of executing a first process and operatively connectable to a second process and a server process over a computer network, the apparatus comprising:

program logic configured to transmit to the server a network protocol address received by the first process following connection to the computer network;

program logic configured to transmit, to the server, a query as to whether the second process is connected to the computer network;

program logic configured to receive a network protocol address of the second process from the server, when the second process is connected to the computer network; and

program logic, responsive to the network protocol address of the second process, and configured to establish a point-to-point communication link between the first process and the second process over the computer network.

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(12) EX PARTE REEXAMINATION CERTIFICATE (7927th)

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(54) **POINT-TO-POINT COMPUTER NETWORK COMMUNICATION UTILITY UTILIZING DYNAMICALLY ASSIGNED NETWORK PROTOCOL ADDRESSES**

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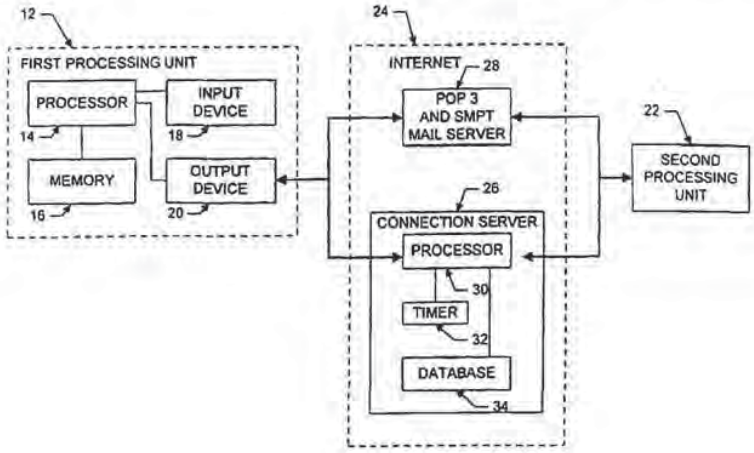
(57) **ABSTRACT**

A communication utility for establishing real-time, point-to-point communications between processes over a computer network includes apparatus for querying a server as to the network protocol address of another client process, and apparatus for directly establishing a communication link with the client process upon receipt of the network protocol address from the server. In one embodiment, the utility includes a sophisticated user interface having features similar to typical telephony hardware but implementing greater flexibility with software.



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EX PARTE REEXAMINATION CERTIFICATE ISSUED UNDER 35 U.S.C. 307

THE PATENT IS HEREBY AMENDED AS INDICATED BELOW.

Matter enclosed in heavy brackets [ ] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in italics indicates additions made to the patent.

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

The patentability of claims **12-14** is confirmed.

Claims **6-11** are determined to be patentable as amended.

Claims **1-5** were not reexamined.

6. A computer program product for use with a 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 configured to, following connection of the first process to the computer network, forward to the server process a *dynamically assigned* network protocol address at which the first process is connected to the computer network;

B. program code configured to query the address server as to whether the second process is connected to the computer network;

C. program code configured to receive a *dynamically assigned* network protocol address of the second process from the address server, when the second process is connected to the computer network; and

D. program code configured to respond to the network protocol address of the second process, establish a point-to-point communication link with the second process over the computer network.

7. A computer data signal embodied in a carrier wave comprising:

A. program code configured to, following connection of a first process to a computer network, forward to a server process a *dynamically assigned* network protocol address at which the first process is connected to the computer network;

B. program code configured to query the server process as to whether a second process is connected to the computer network;

C. program code configured to receive a *dynamically assigned* network protocol address of the second process from the server process, when the second process is connected to the computer network; and

D. program code, responsive to the network protocol address of the second process, and configured to establish a point-to-point communication connection with the second process over the computer network.

8. An apparatus for use with a computer system, the computer system executing a first process operatively coupled over a computer network to a second process and a directory database server process, the apparatus comprising:

A. program logic configured to, following connection of the first process to the computer network forward to the address server a *dynamically assigned* network**[.]** protocol address at which the first process is connected to the computer network;

B. program logic configured to query the address server as to whether the second process is connected to the computer network;

C. program logic configured to receive a *dynamically assigned* network protocol address of the second process from the address server, when the second process is connected to the computer network, and

D. program logic configured to, in response to the network protocol address of the second process, establish a point-to-point communication link with the second process over the computer network.

9. A computer data signal embodied in a carrier wave comprising:

a. program code configured to access a directory database, the database having a *dynamically assigned* network protocol address for a selected plurality of processes having on-line status with respect to the computer network, the *dynamically assigned* network protocol address of each respective process forwarded to the database following connection to the computer network; and

b. program code responsive to one of the *dynamically assigned* network protocol addresses and configured to establish a point-to-point communication link from the first process to the second process over the computer network.

10. In a first computer process operatively coupled over a computer network to a second process and an address server, a method of establishing a point-to-point communication between the first and second processes comprising the steps of:

a. accessing a directory database, the database having a *dynamically assigned* network protocol address for a selected plurality of processes having on-line status with respect to the computer network, the *dynamically assigned* network protocol address of each respective process forwarded to the database following connection to the computer network; and

b. in response to one of the *dynamically assigned* network protocol addresses, establish a point-to-point communication link from the first process to the second process over the computer network.

11. An apparatus for use with a computer system, the computer system capable of executing a first process connectable over a computer network to a second process and a directory database server process, the apparatus comprising:

a. program logic configured to access a directory database, the database having a *dynamically assigned* network protocol address for a selected plurality of processes having on-line status with respect to the computer network, the *dynamically assigned* network protocol address of each respective process forwarded to the database following connection to the computer network; and

b. program logic responsive to one of the *dynamically assigned* network protocol addresses and configured to establish a point-to-point communication link from the first process to the second process over the computer network.

* * * * *

EXHIBIT E

US006009469A

United States Patent [19]

Mattaway et al.

[11] Patent Number: 6,009,469

[45] Date of Patent: Dec. 28, 1999

[54] **GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION**

[75] Inventors: **Shane D. Mattaway**, Boca Raton; **Glenn W. Hutton**, Miami; **Craig B. Strickland**, Tamarac, all of Fla.

[73] Assignee: **NetSpeak Corporation**, Boca Raton, Fla.

[21] Appl. No.: **08/721,316**

[22] Filed: **Sep. 25, 1996**

Related U.S. Application Data

[63] Continuation-in-part of application No. 08/533,115, Sep. 25, 1995

[60] Provisional application No. 60/025,415, Sep. 4, 1996, and provisional application No. 60/024,251, Aug. 21, 1996.

[51] **Int. Cl.**[6] **G06F 17/00**

[52] **U.S. Cl.** **709/227**

[58] **Field of Search** 395/200.57, 200.58; 709/227, 228; 370/352, 355, 357, 389, 395

[56] **References Cited**

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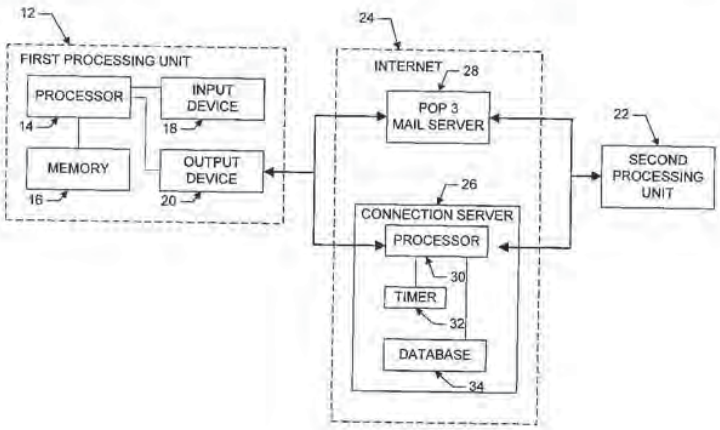
Primary Examiner—Ellis B. Ramirez

Attorney, Agent, or Firm—Kudirka & Jobse, LLP

[57] **ABSTRACT**

A communication utility for establishing real-time, point-to-point communications between processes over a computer network includes apparatus for querying a server as to the network protocol address of another client process, and apparatus for directly establishing a communication link with the client process upon receipt of the network protocol address from the server. In one embodiment, the utility includes a sophisticated user interface having features similar to typical telephony hardware but implementing greater flexibility with software.

18 Claims, 27 Drawing Sheets



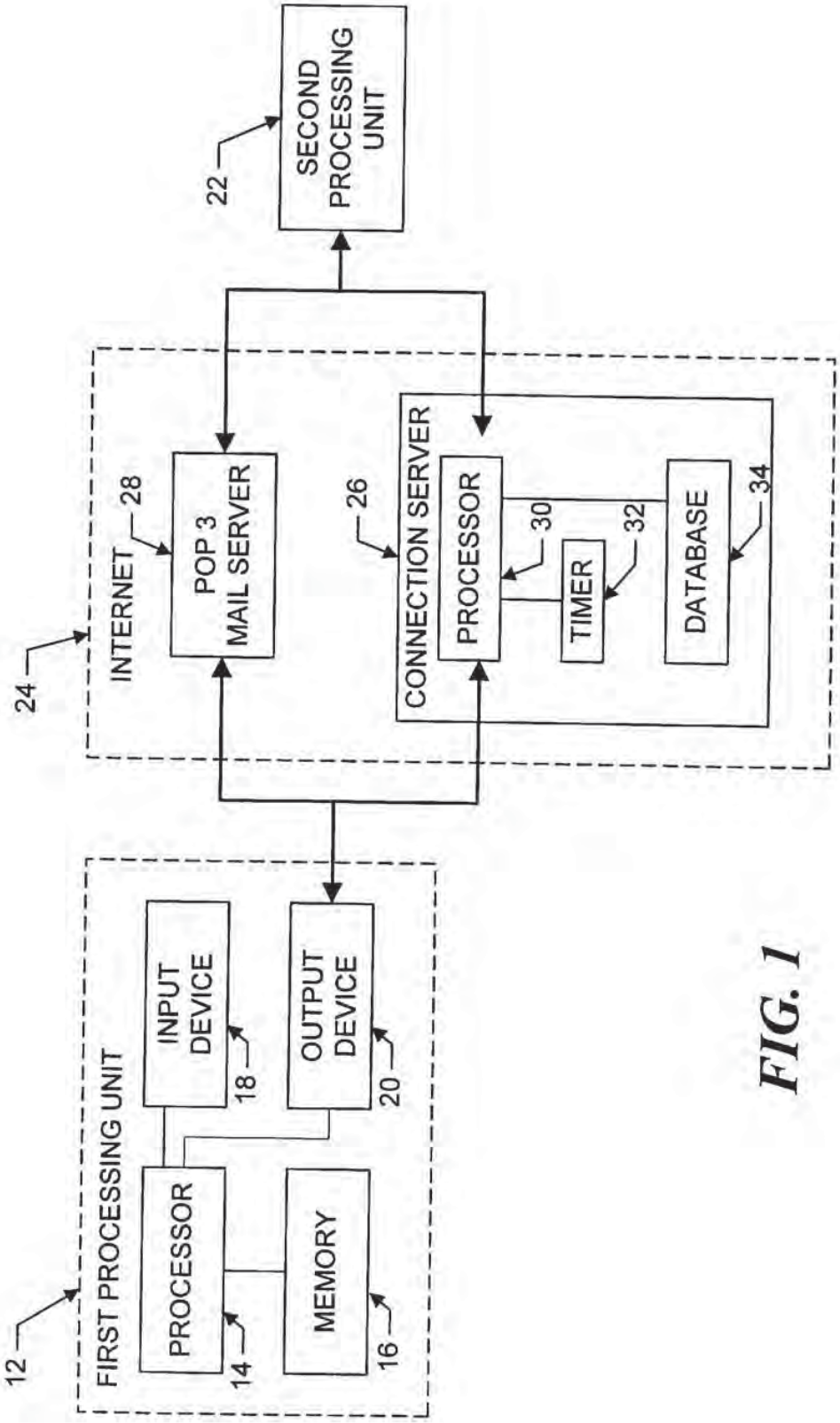

SECOND PROCESSING UNIT
22
INTERNET
24
POP 3 MAIL SERVER
28
CONNECTION SERVER
26
PROCESSOR
30
TIMER
32
DATABASE
34
FIRST PROCESSING UNIT
12
INPUT DEVICE
18
OUTPUT DEVICE
20
PROCESSOR
14
MEMORY
16

FIG. 1

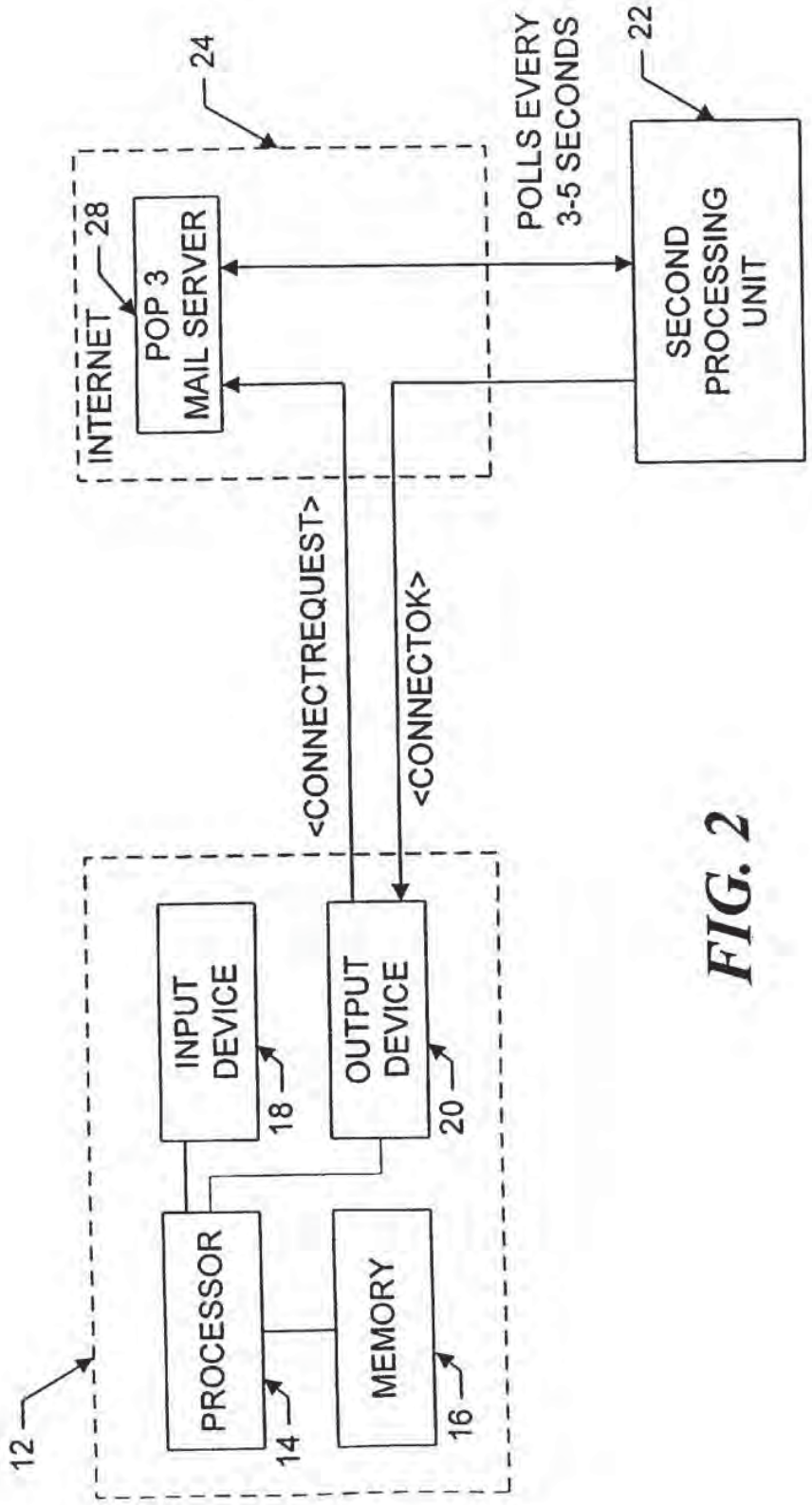

24
22
POLLS EVERY
3-5 SECONDS
INTERNET
28
POP 3
MAIL SERVER
SECOND
PROCESSING
UNIT
<CONNECTREQUEST>
<CONNECTOK>
INPUT
DEVICE
18
OUTPUT
DEVICE
20
PROCESSOR
14
MEMORY
16
12

FIG. 2

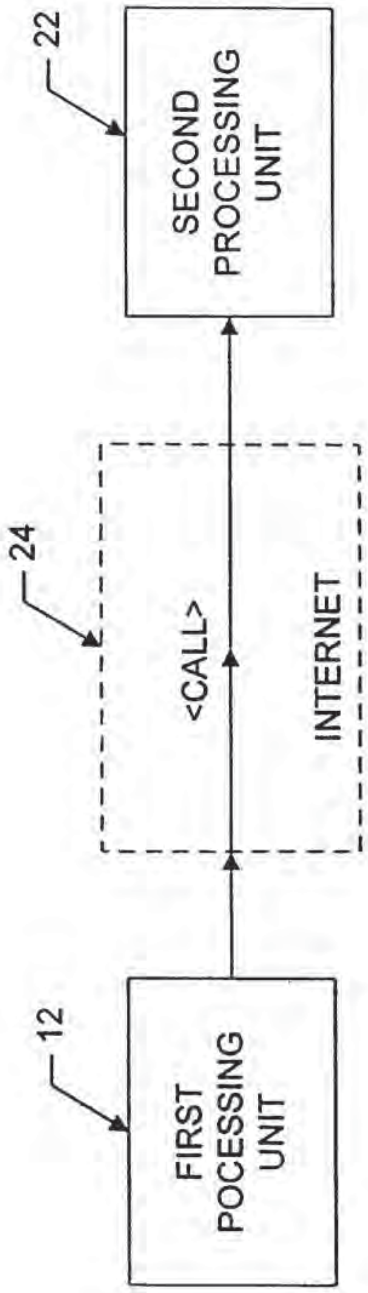
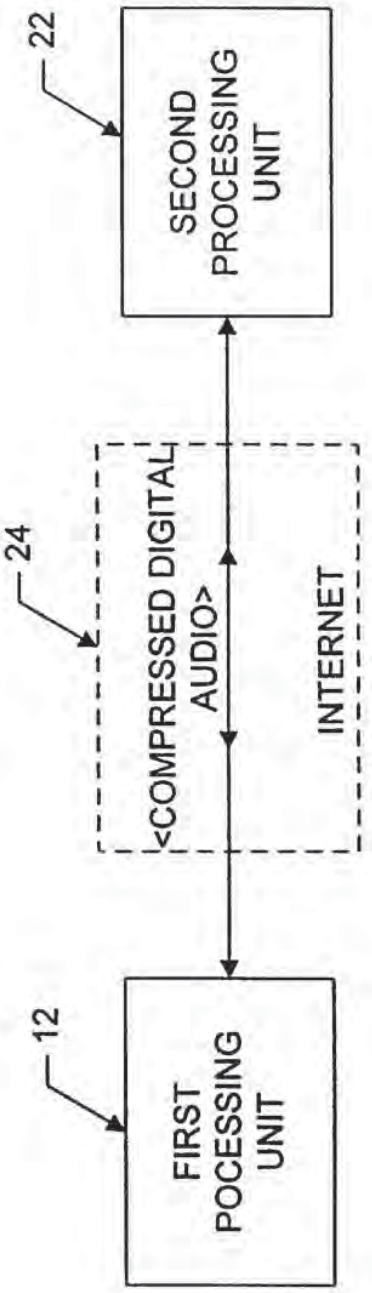

22
SECOND PROCESSING UNIT
24
<CALL>
INTERNET
12
FIRST POCESSING UNIT

FIG. 3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SECOND PROCESSING UNIT
24
<COMPRESSED DIGITAL AUDIO>
INTERNET
12
FIRST POCESSING UNIT

FIG. 4

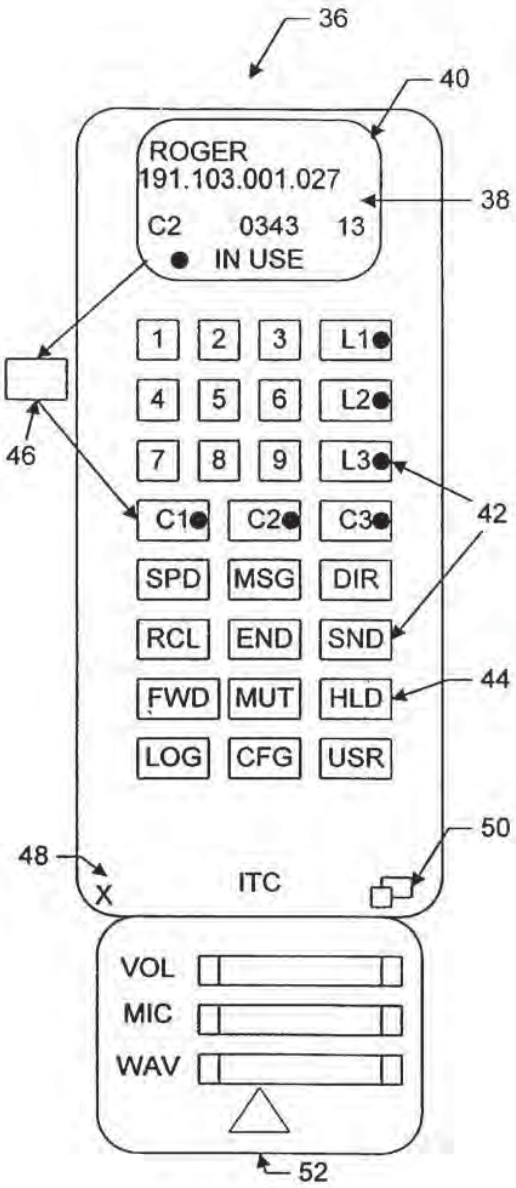
36
40
ROGER
191.103.001.027
C2 0343 13
IN USE
38
1 2 3 L1
4 5 6 L2
7 8 9 L3
C1 C2 C3
SPD MSG DIR
RCL END SND
FWD MUT HLD
LOG CFG USR
46
42
44
48
X
ITC
50
VOL
MIC
WAV
52

FIG. 5

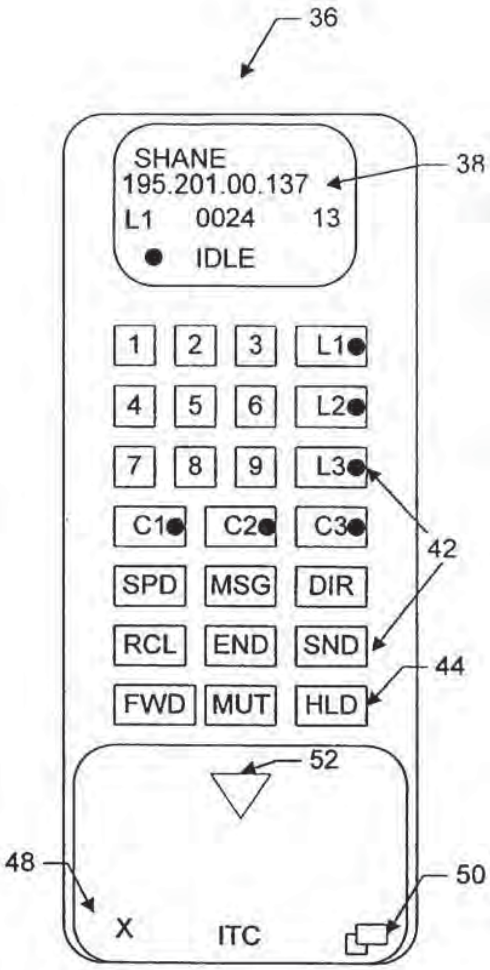
36
SHANE
195.201.00.137
L1 0024 13
IDLE
38
1 2 3 L1
4 5 6 L2
7 8 9 L3
C1 C2 C3
SPD MSG DIR
RCL END SND
FWD MUT HLD
42
44
52
48
X
ITC
50

FIG. 6

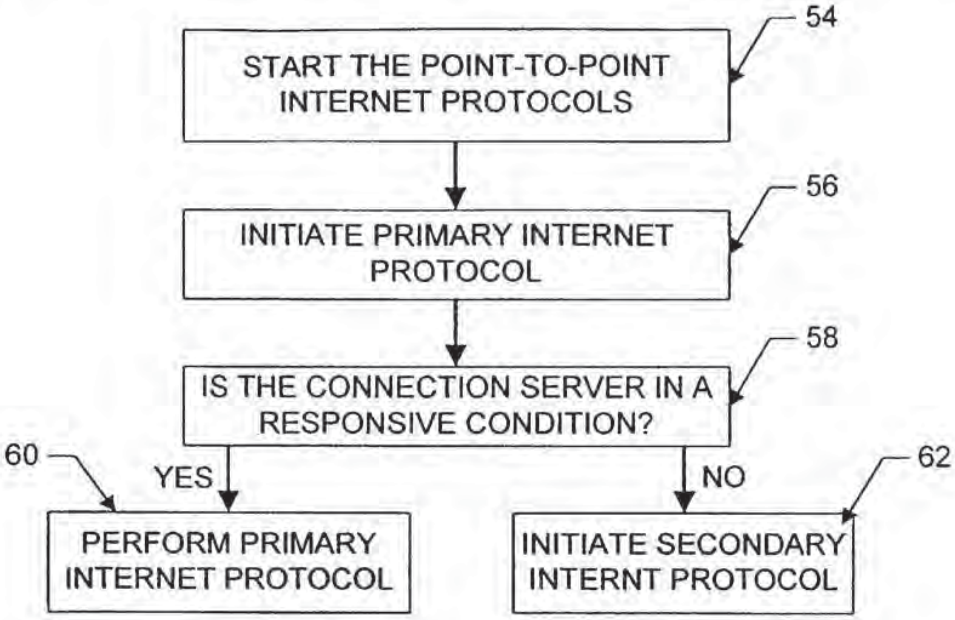
START THE POINT-TO-POINT INTERNET PROTOCOLS
54
INITIATE PRIMARY INTERNET PROTOCOL
56
IS THE CONNECTION SERVER IN A RESPONSIVE CONDITION?
58
60
YES
NO
62
PERFORM PRIMARY INTERNET PROTOCOL
INITIATE SECONDARY INTERNT PROTOCOL

FIG. 7

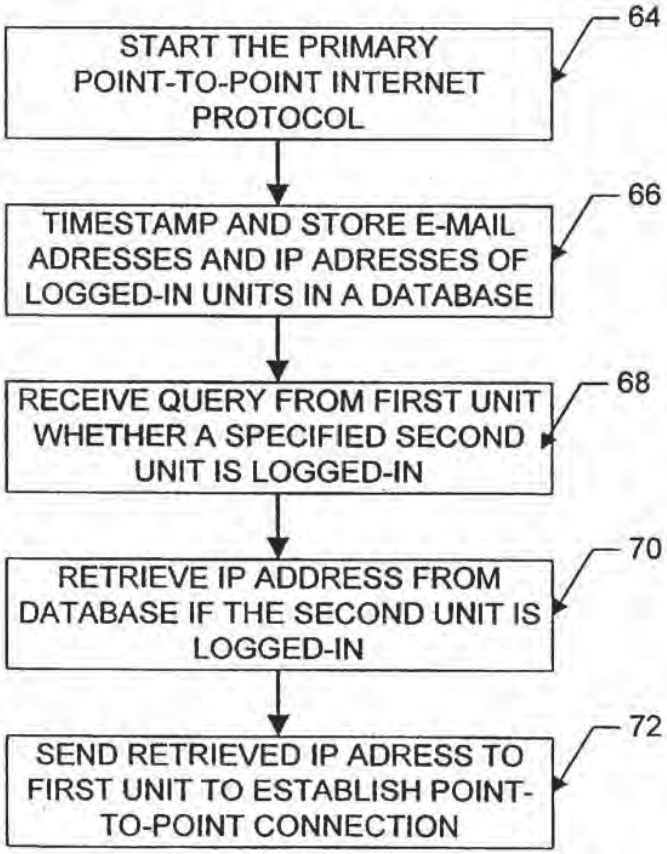
START THE PRIMARY POINT-TO-POINT INTERNET PROTOCOL
64
TIMESTAMP AND STORE E-MAIL ADRESSES AND IP ADRESSES OF LOGGED-IN UNITS IN A DATABASE
66
RECEIVE QUERY FROM FIRST UNIT WHETHER A SPECIFIED SECOND UNIT IS LOGGED-IN
68
RETRIEVE IP ADDRESS FROM DATABASE IF THE SECOND UNIT IS LOGGED-IN
70
SEND RETRIEVED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

FIG. 8

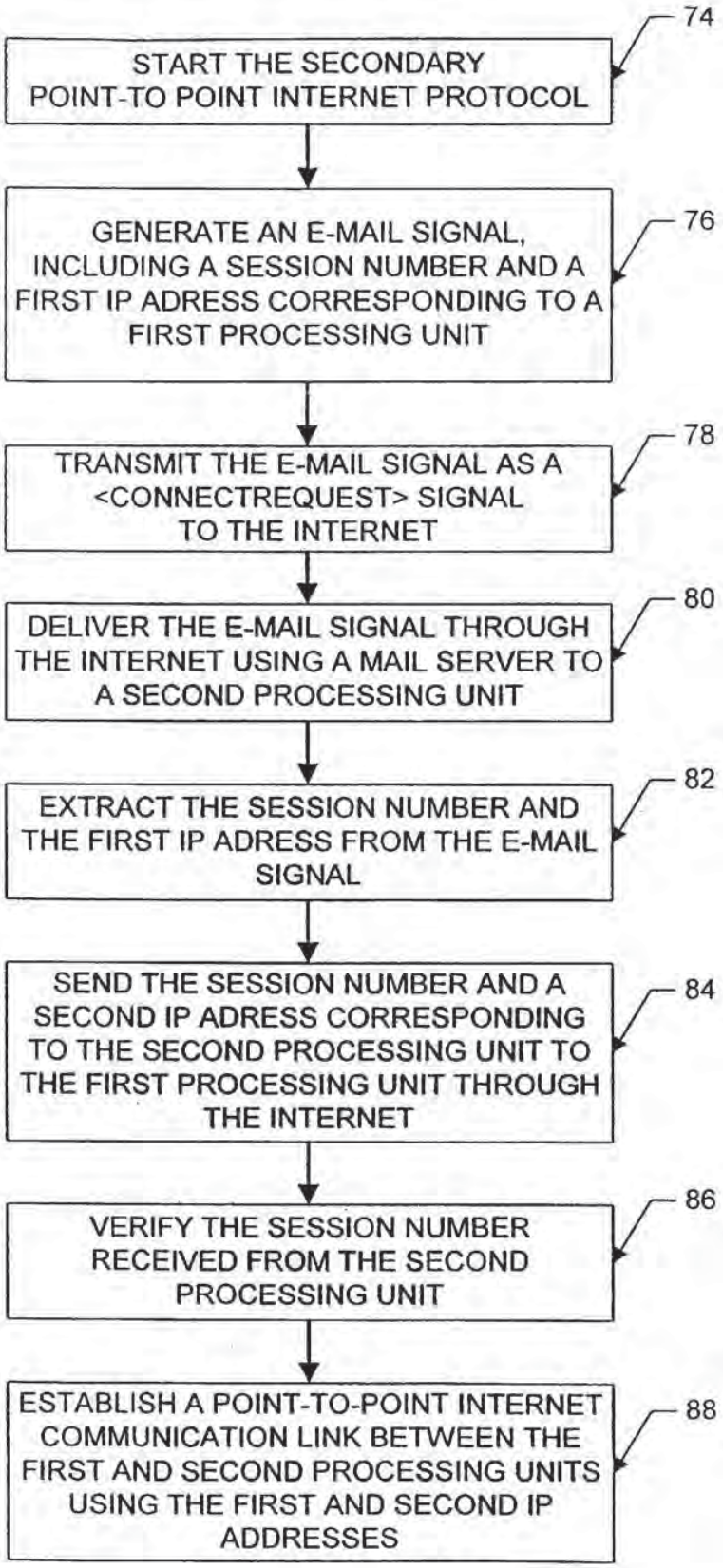
74
START THE SECONDARY POINT-TO POINT INTERNET PROTOCOL
76
GENERATE AN E-MAIL SIGNAL, INCLUDING A SESSION NUMBER AND A FIRST IP ADRESS CORRESPONDING TO A FIRST PROCESSING UNIT
78
TRANSMIT THE E-MAIL SIGNAL AS A <CONNECTREQUEST> SIGNAL TO THE INTERNET
80
DELIVER THE E-MAIL SIGNAL THROUGH THE INTERNET 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

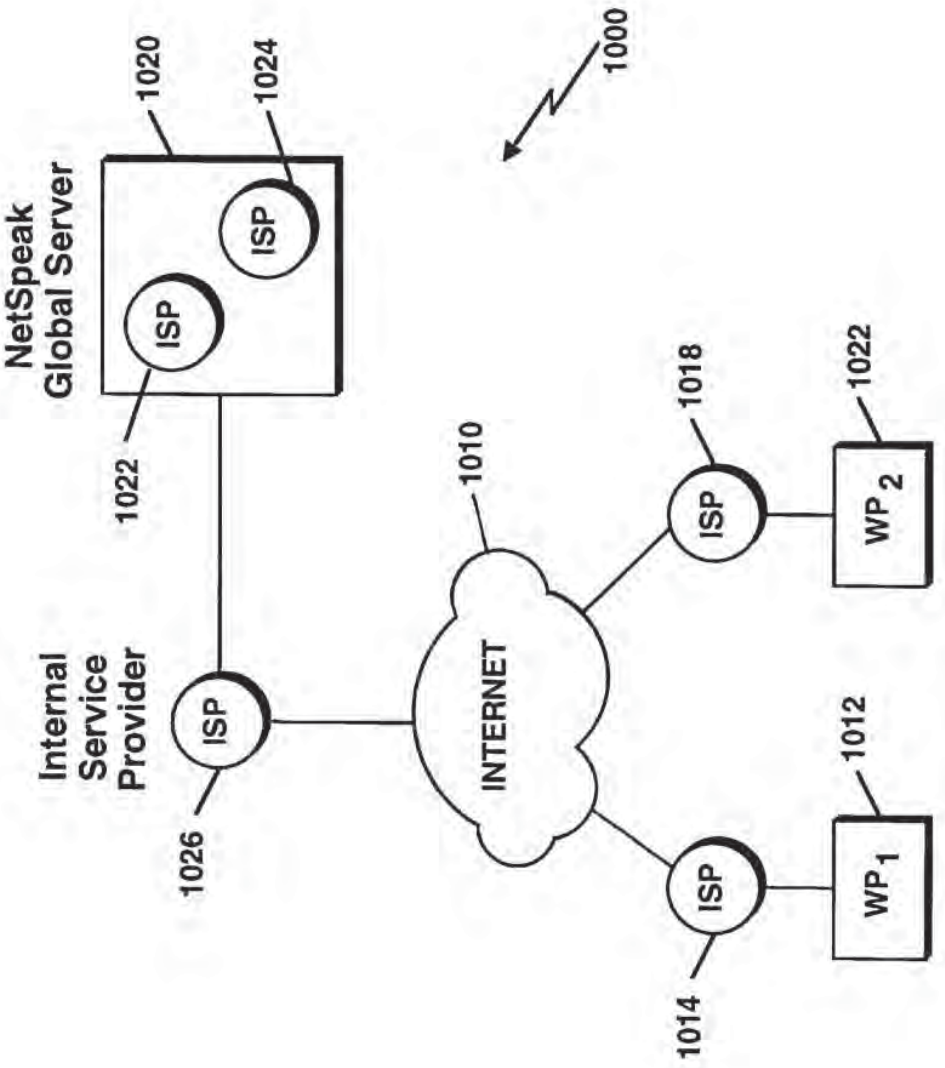
1000
NetSpeak Global Server
1020
1024
ISP
ISP
1022
Internal Service Provider
ISP
1026
INTERNET
1010
ISP
1018
WP 2
1022
ISP
1014
WP 1
1012

Figure 10

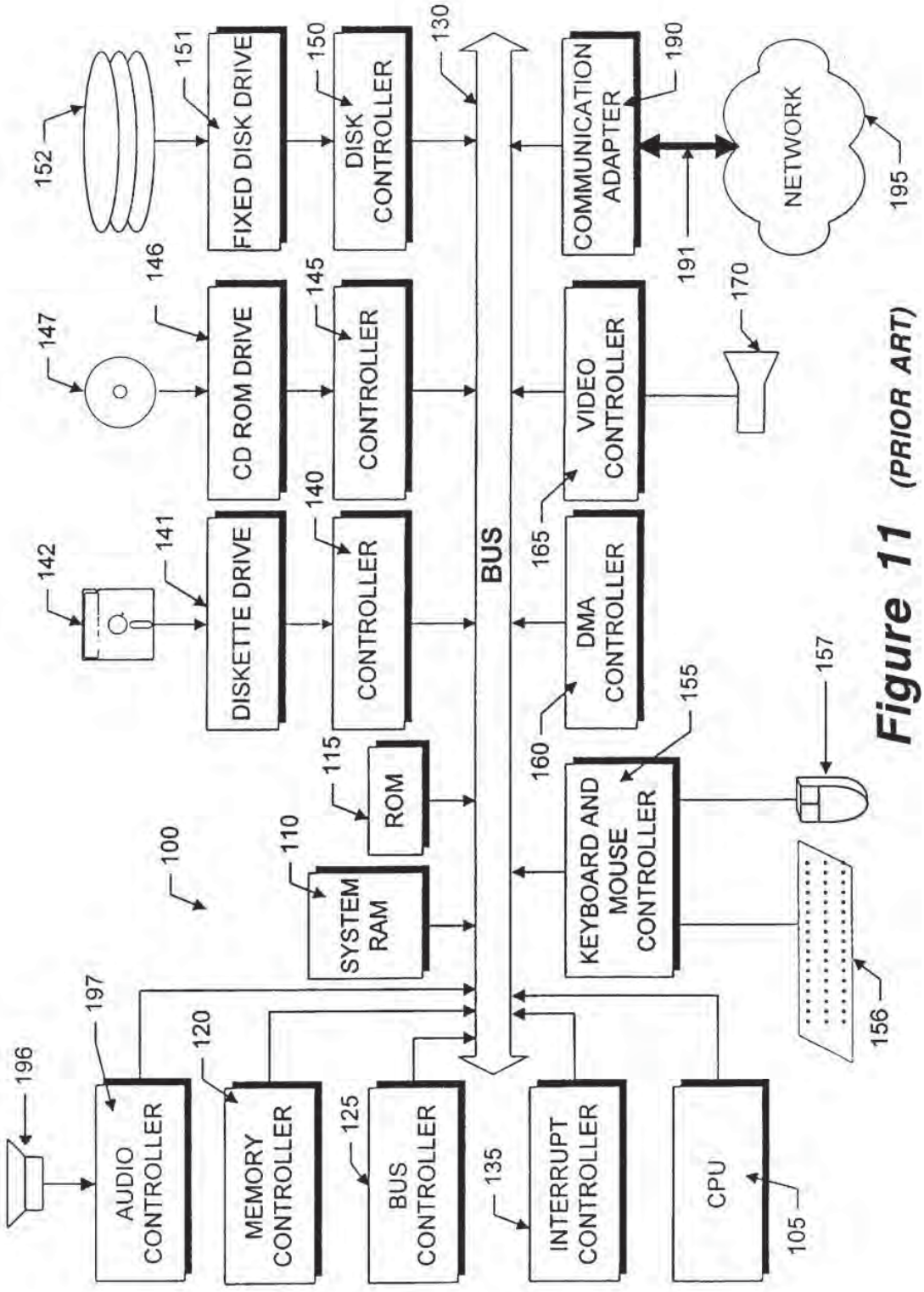

Figure 11 (PRIOR ART)

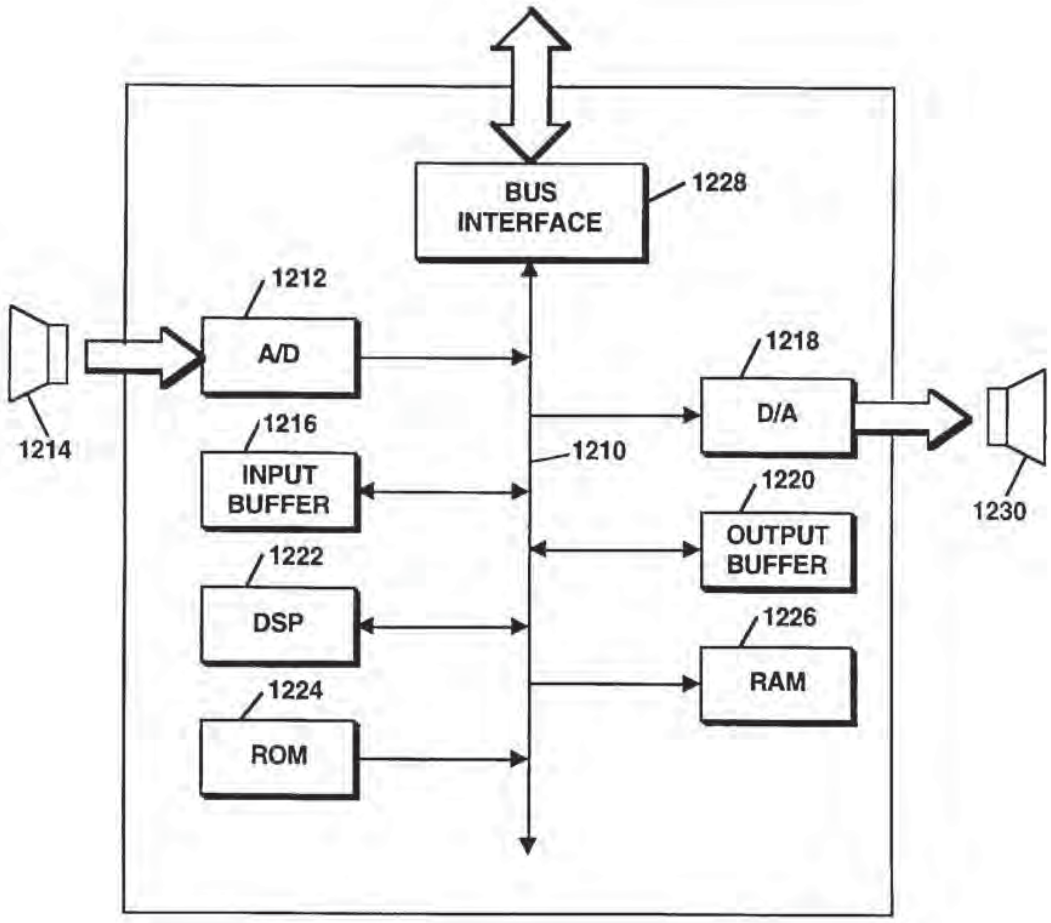

FIGURE 12 (PRIOR ART)

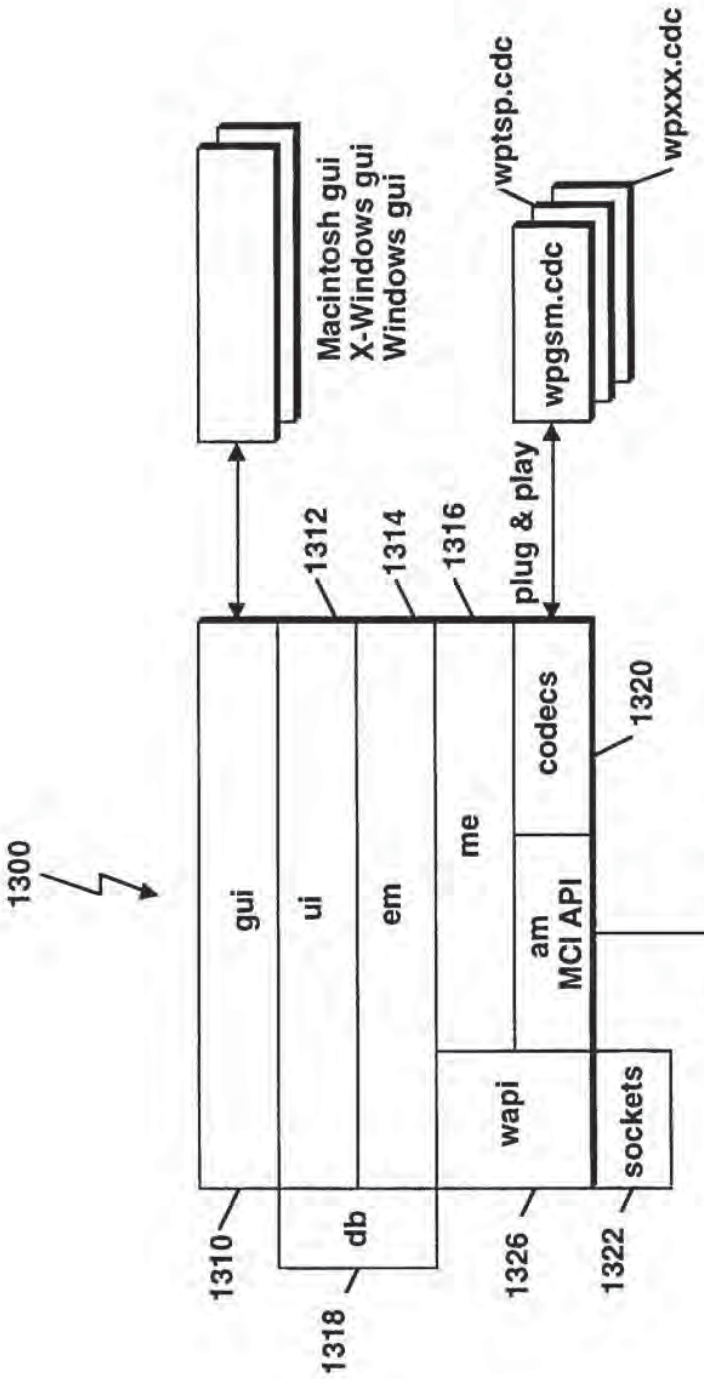
1300
gui
ui
em
me
codecs
am
MCI API
wapi
sockets
db
1310
1312
1314
1316
1318
1320
1322
1324
1326
plug & play
wptsp.cdc
wpxxx.cdc
wpgsm.cdc
Macintosh gui
X-Windows gui
Windows gui
Macintosh
UNIX
Windows

Figure 13 A

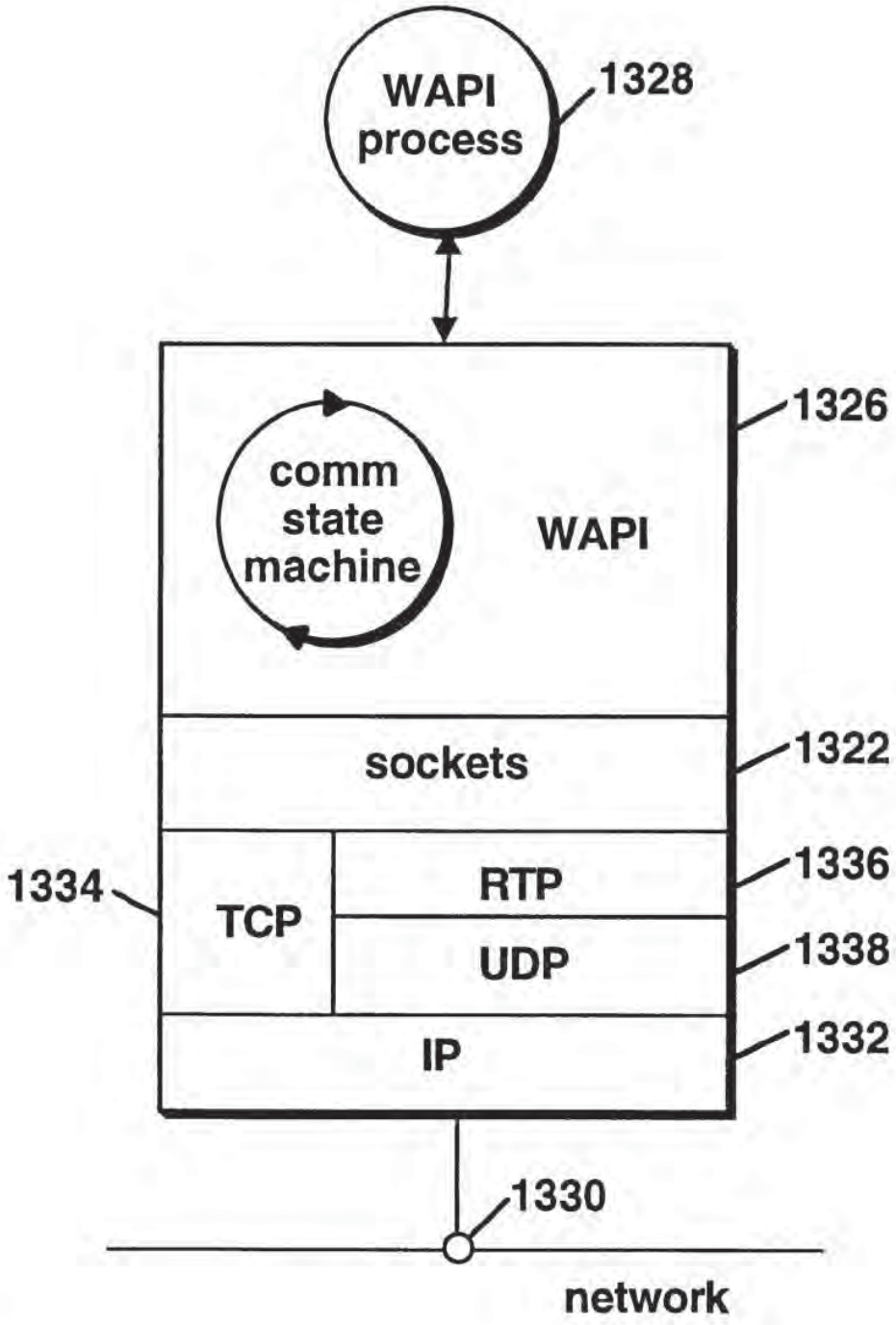
WAPI process
1328
comm state machine
WAPI
1326
sockets
1322
1334
TCP
RTP
1336
UDP
1338
IP
1332
1330
network

FIGURE 13 B

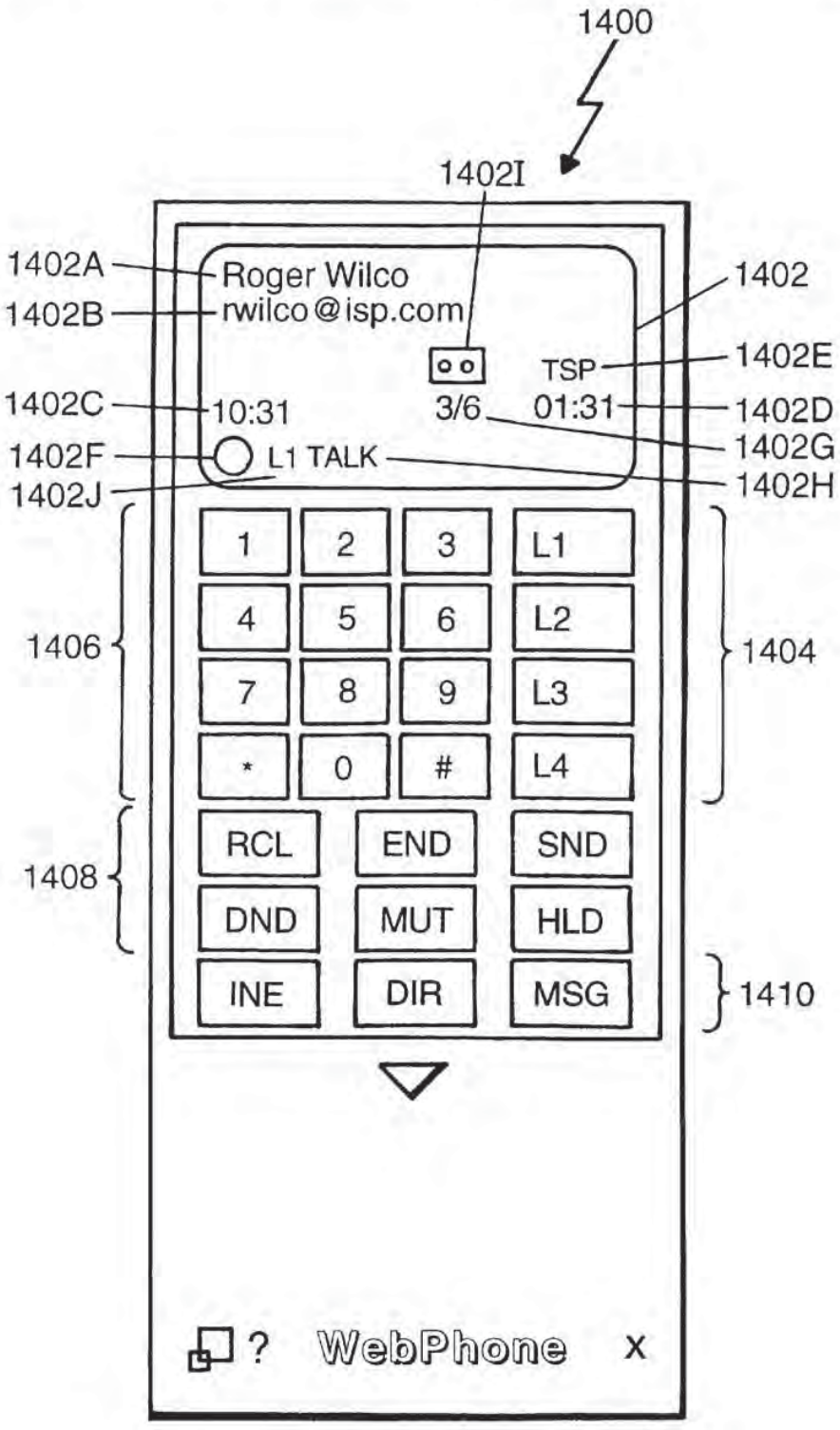
1400
1402I
1402A
Roger Wilco
1402B
rwilco@isp.com
1402
1402E
TSP
1402C
10:31
3/6
01:31
1402D
1402F
L1 TALK
1402G
1402J
1402H
1406
1404
1408
1410
1 2 3 L1
4 5 6 L2
7 8 9 L3
* 0 # L4
RCL END SND
DND MUT HLD
INE DIR MSG
? WebPhone X

Figure 14

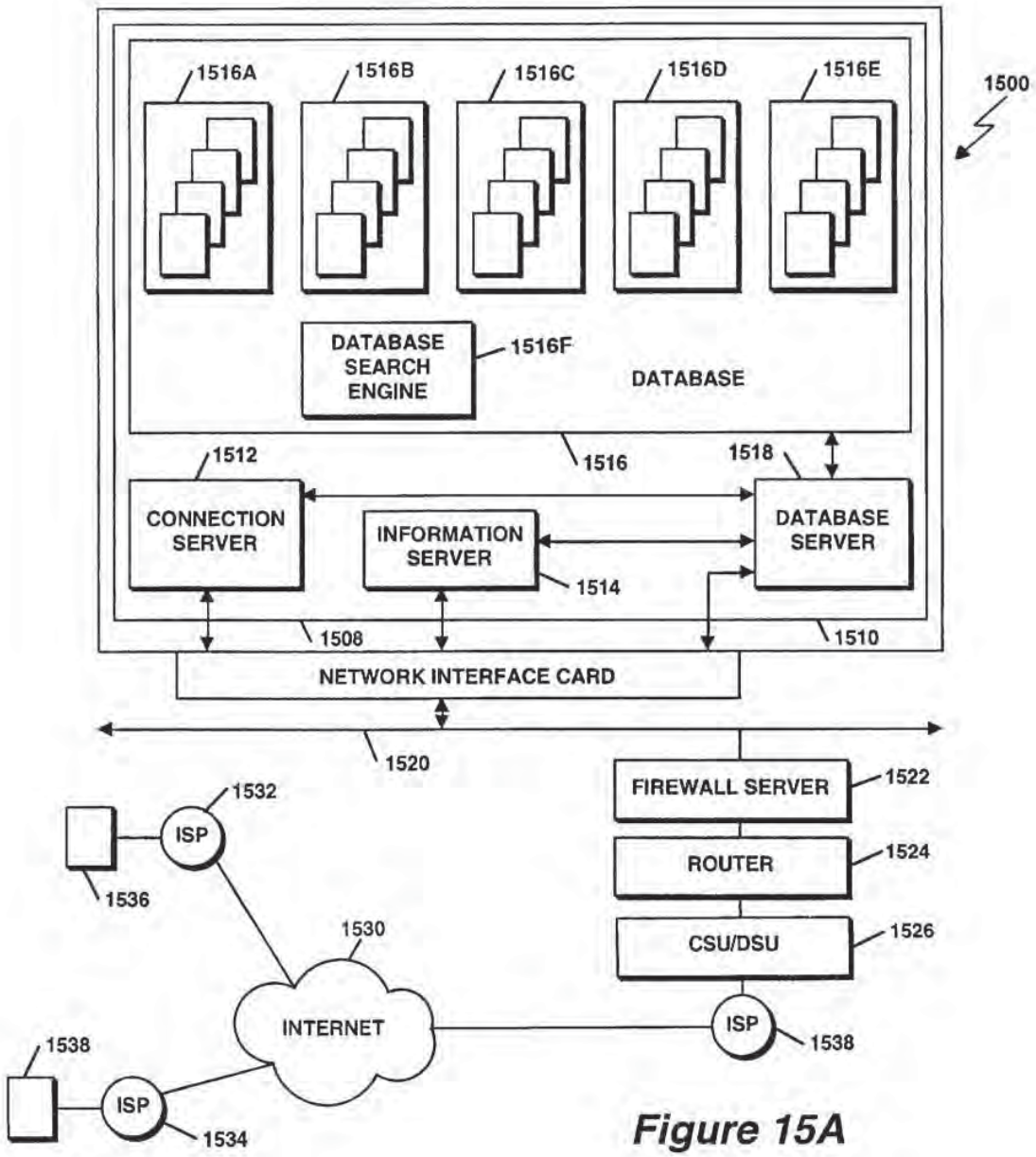
1500
1516A
1516B
1516C
1516D
1516E
DATABASE SEARCH ENGINE
1516F
DATABASE
1516
1512
1518
CONNECTION SERVER
INFORMATION SERVER
1514
DATABASE SERVER
1508
1510
NETWORK INTERFACE CARD
1520
1532
ISP
1536
1530
INTERNET
1538
ISP
1534
FIREWALL SERVER
1522
ROUTER
1524
CSU/DSU
1526
ISP
1538

Figure 15A

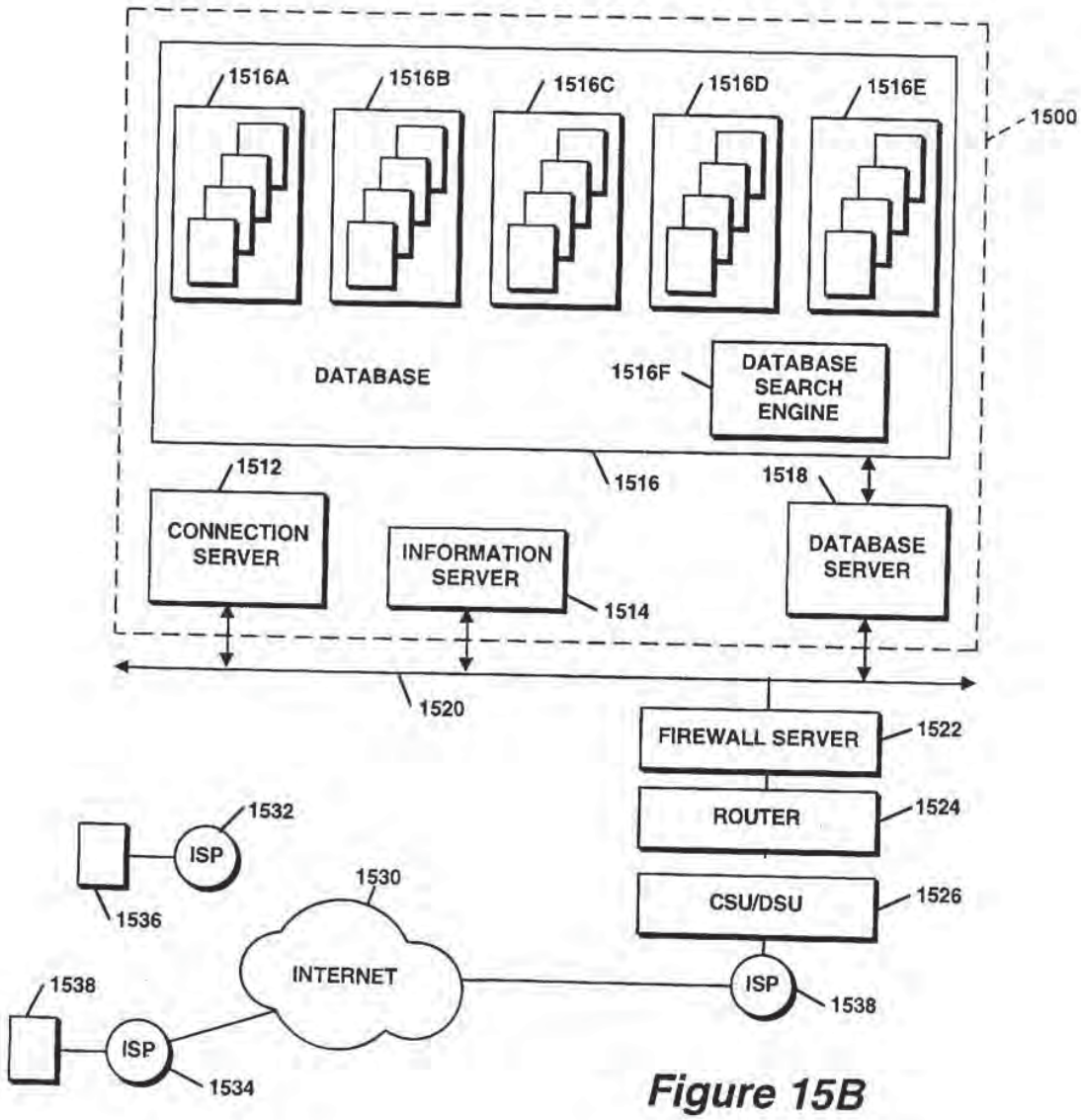
1516A
1516B
1516C
1516D
1516E
1500
DATABASE
1516F
DATABASE SEARCH ENGINE
1516
1512
CONNECTION SERVER
INFORMATION SERVER
1514
1518
DATABASE SERVER
1520
FIREWALL SERVER
1522
ROUTER
1524
CSU/DSU
1526
ISP
1538
1532
ISP
1536
1530
INTERNET
ISP
1538
1534

Figure 15B

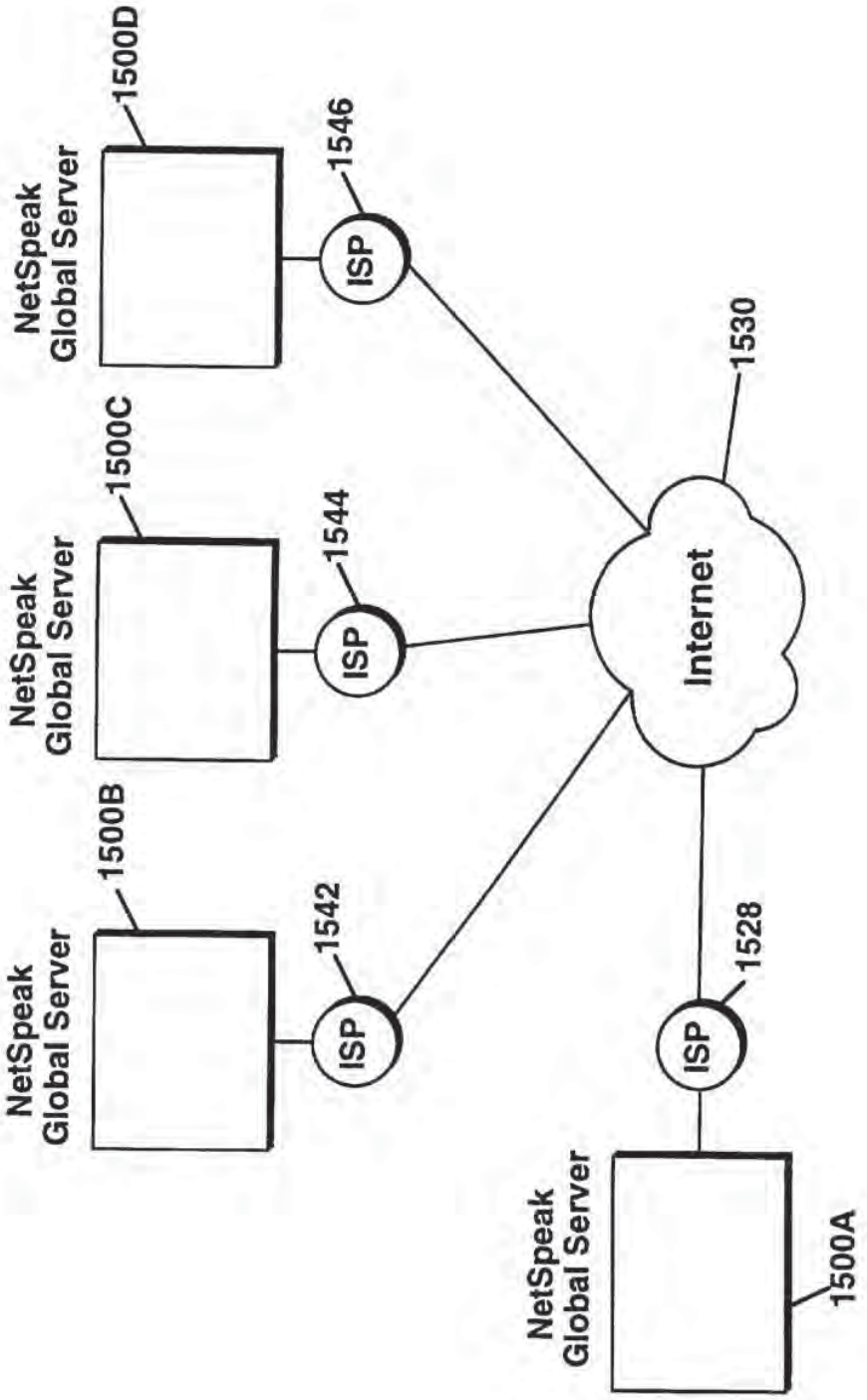
NetSpeak Global Server
1500D
1546
ISP
NetSpeak Global Server
1500C
1544
ISP
NetSpeak Global Server
1500B
1542
ISP
Internet
1530
ISP
1528
NetSpeak Global Server
1500A

Figure 15C

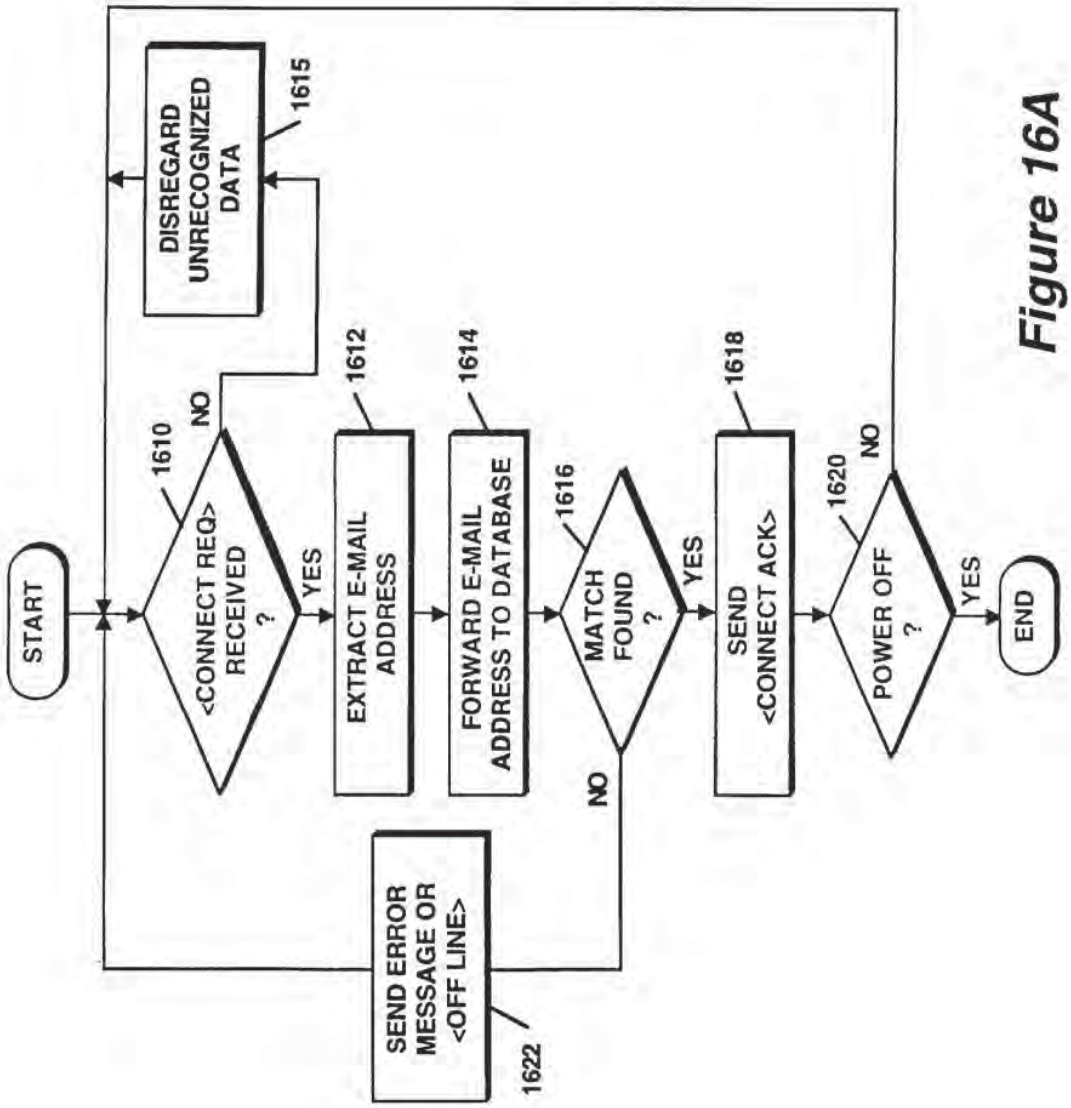
START
<CONNECT REQ> RECEIVED ?
1610
NO
YES
DISREGARD UNRECOGNIZED DATA
1615
EXTRACT E-MAIL ADDRESS
1612
FORWARD E-MAIL ADDRESS TO DATABASE
1614
MATCH FOUND ?
1616
NO
YES
SEND ERROR MESSAGE OR <OFF LINE>
1622
SEND <CONNECT ACK>
1618
POWER OFF ?
1620
NO
YES
END

Figure 16A

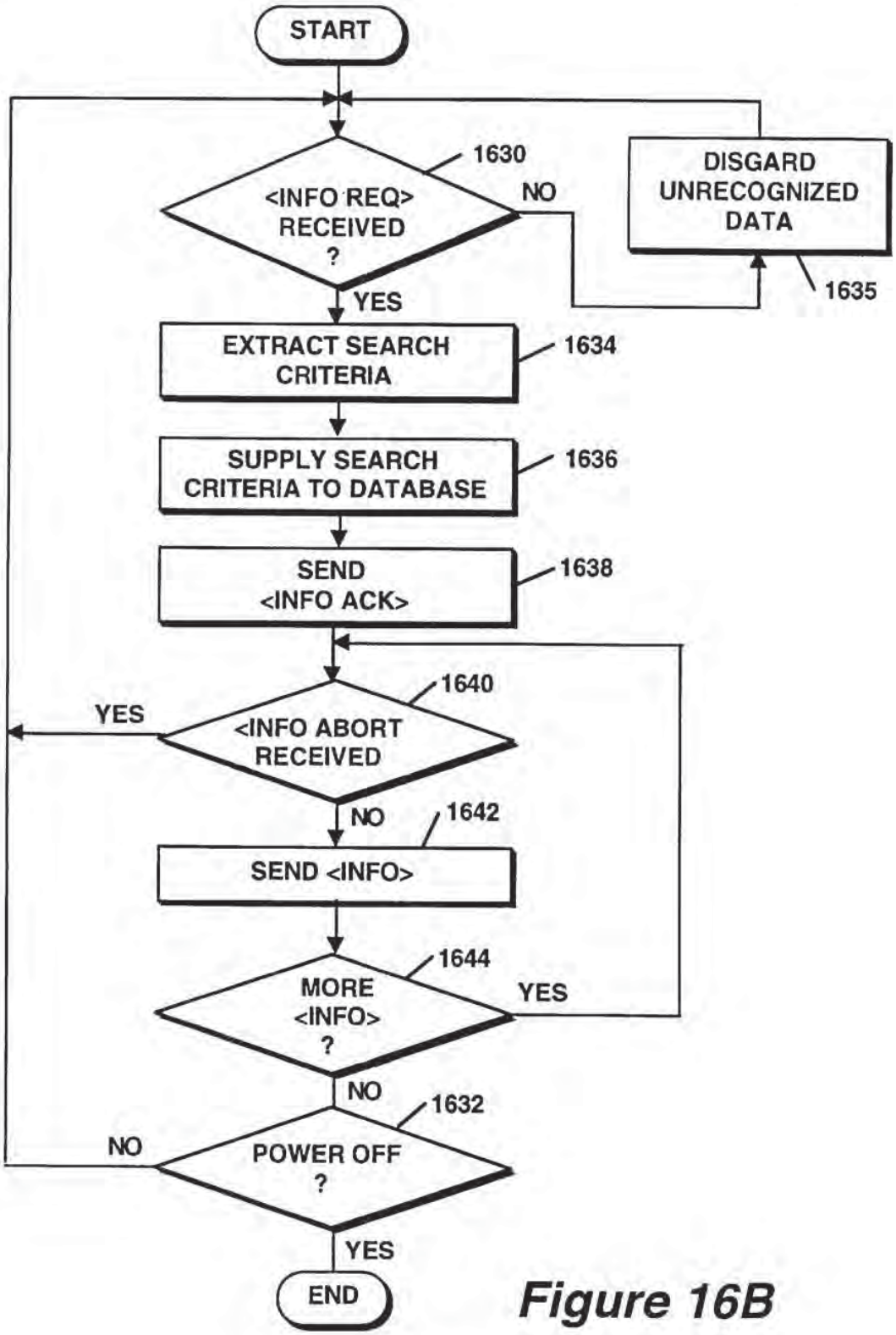
START
1630
<INFO REQ> RECEIVED ?
NO
DISGARD UNRECOGNIZED DATA
1635
YES
EXTRACT SEARCH CRITERIA
1634
SUPPLY SEARCH CRITERIA TO DATABASE
1636
SEND <INFO ACK>
1638
1640
YES
<INFO ABORT RECEIVED
NO
1642
SEND <INFO>
1644
MORE <INFO> ?
YES
NO
1632
NO
POWER OFF ?
YES
END

Figure 16B

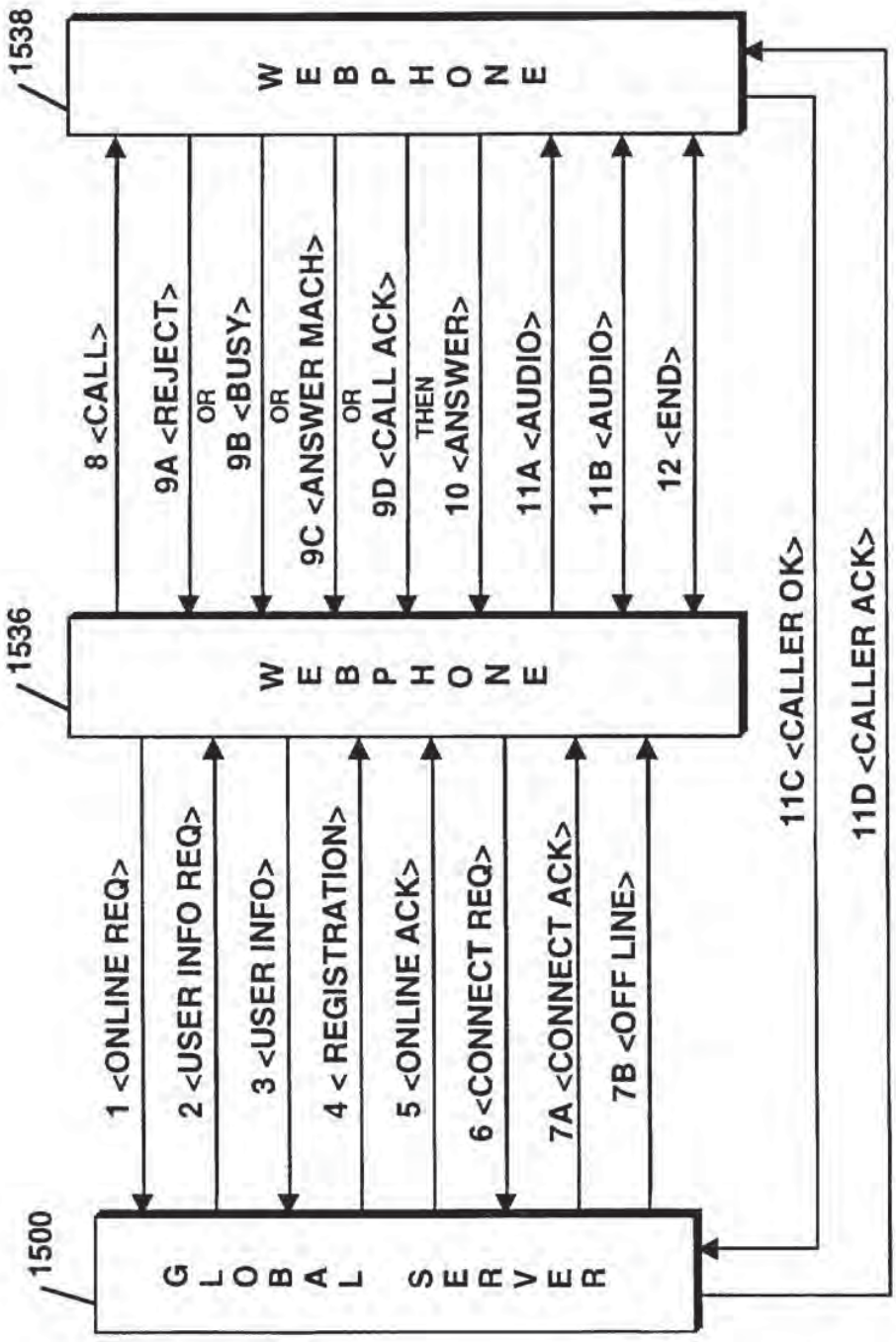
1538
WEB PHONE
1536
WEB PHONE
1500
GLOBAL SERVER
8 <CALL>
9A <REJECT>
OR
9B <BUSY>
OR
9C <ANSWER MACH>
OR
9D <CALL ACK>
THEN
10 <ANSWER>
11A <AUDIO>
11B <AUDIO>
12 <END>
1 <ONLINE REQ>
2 <USER INFO REQ>
3 <USER INFO>
4 < REGISTRATION>
5 <ONLINE ACK>
6 <CONNECT REQ>
7A <CONNECT ACK>
7B <OFF LINE>
11C <CALLER OK>
11D <CALLER ACK>

Figure 17A

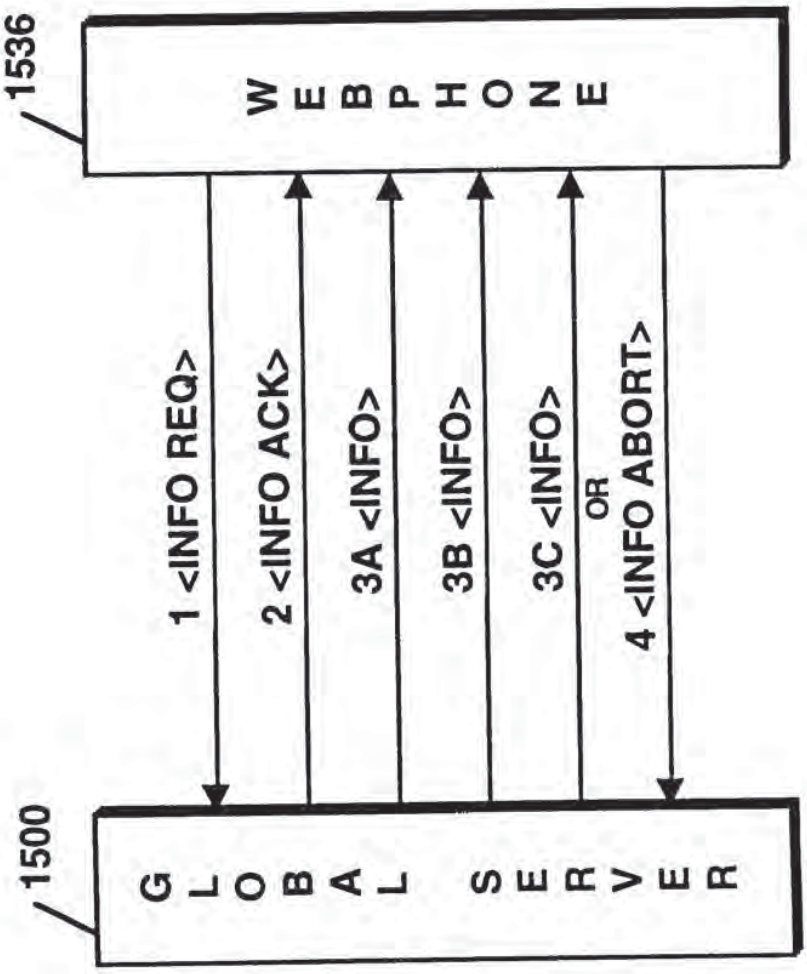
1536
WEBPHONE
1 <INFO REQ>
2 <INFO ACK>
3A <INFO>
3B <INFO>
3C <INFO>
OR
4 <INFO ABORT>
1500
GLOBAL SERVER

Figure 17B

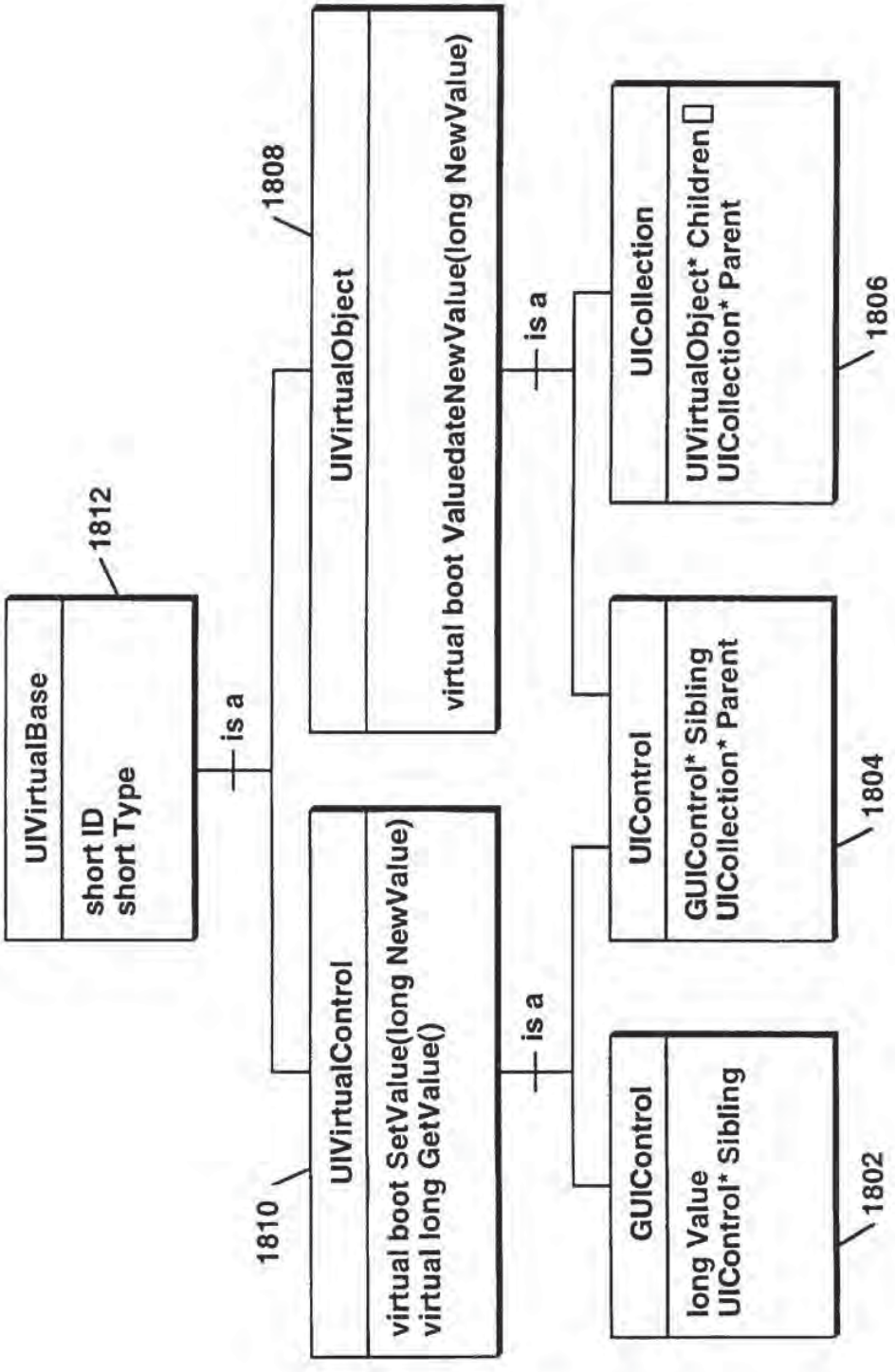
UIVirtualBase
short ID
short Type
1812
is a
UIVirtualObject
virtual boot ValuedateNewValue(long NewValue)
1808
UIVirtualControl
virtual boot SetValue(long NewValue)
virtual long GetValue()
1810
is a
UICollection
UIVirtualObject* Children
UICollection* Parent
1806
UIControl
GUIControl* Sibling
UICollection* Parent
1804
GUIControl
long Value
UIControl* Sibling
1802

Figure 18A

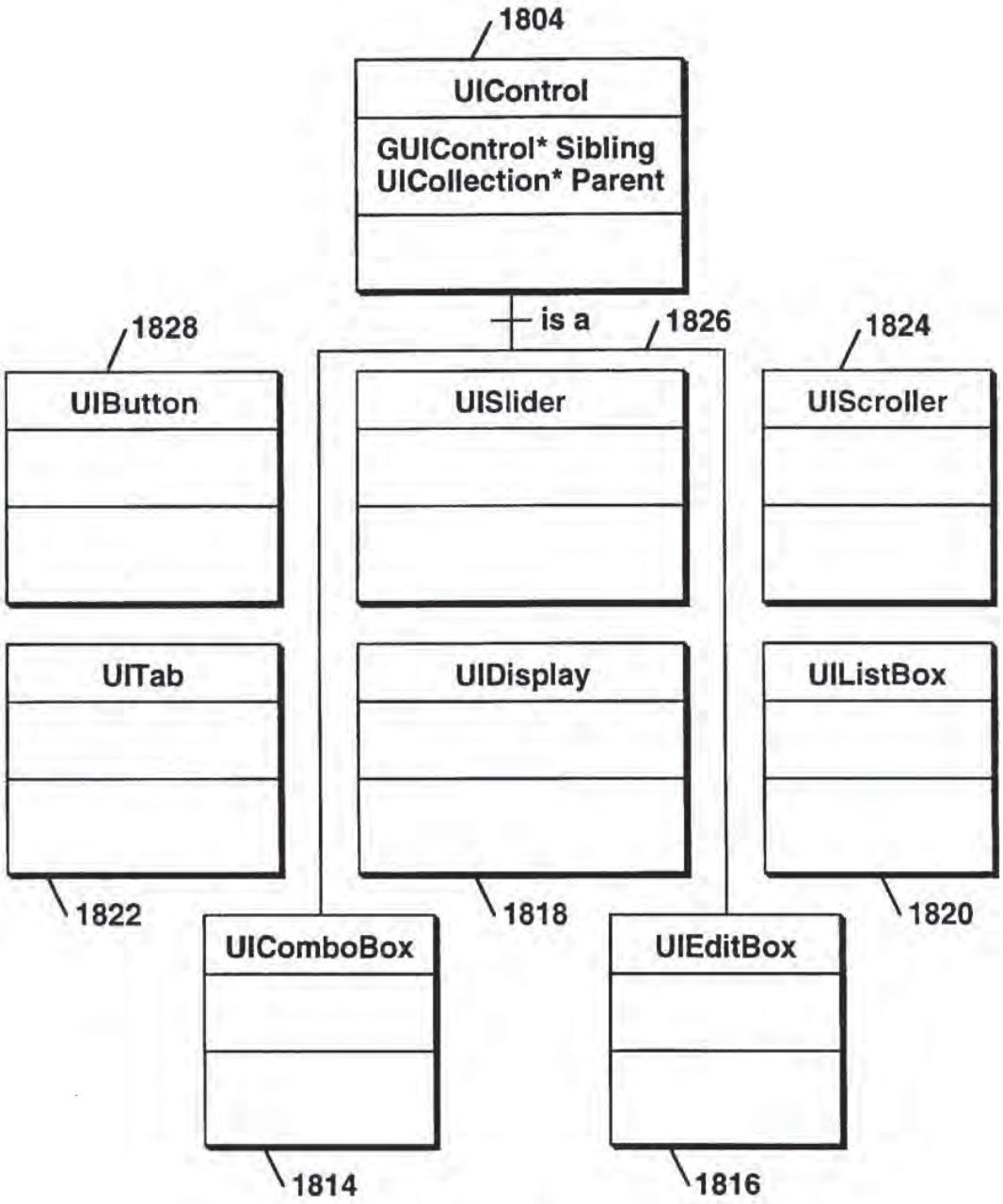
1804
UIControl
GUIControl* Sibling
UICollection* Parent
is a
1828
UIButton
1826
UISlider
1824
UIScroller
UITab
UIDisplay
UIListBox
1822
1818
1820
UIComboBox
UIEditBox
1814
1816

Figure 18B

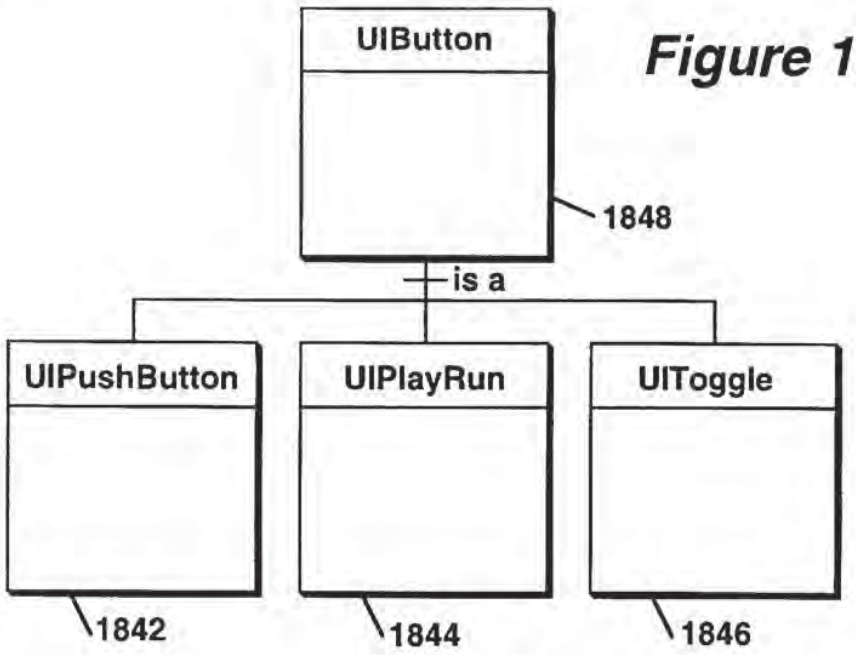

Figure 18C

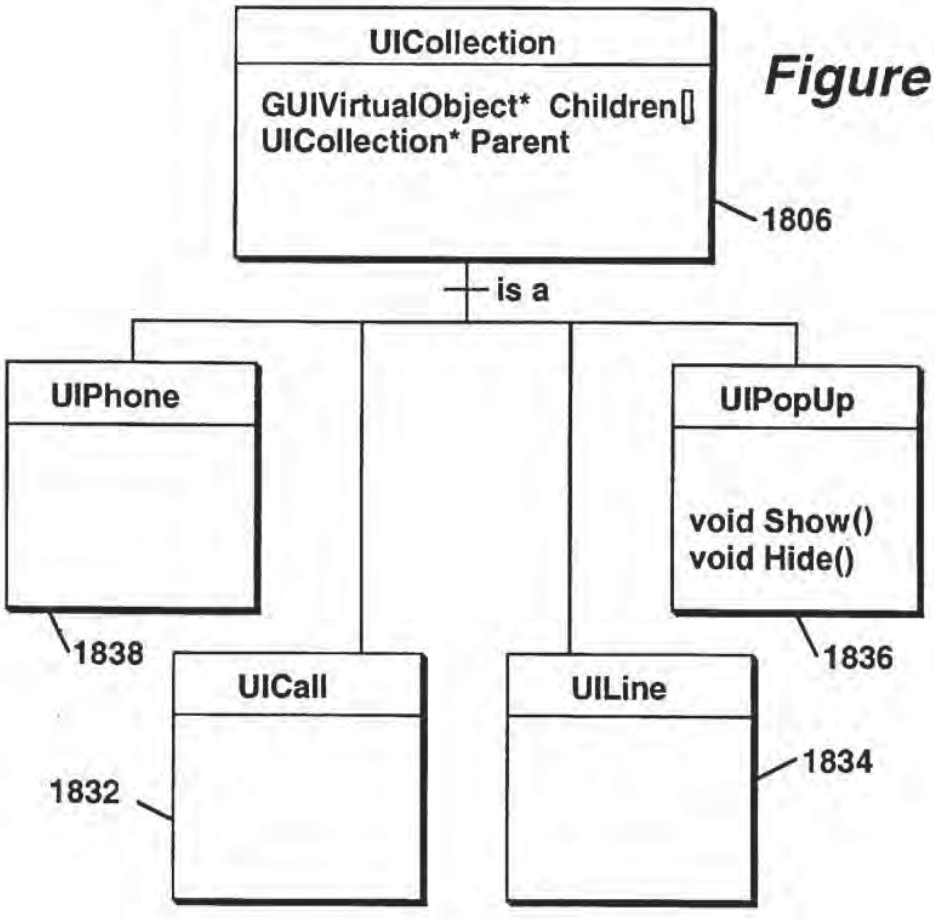

Figure 18D

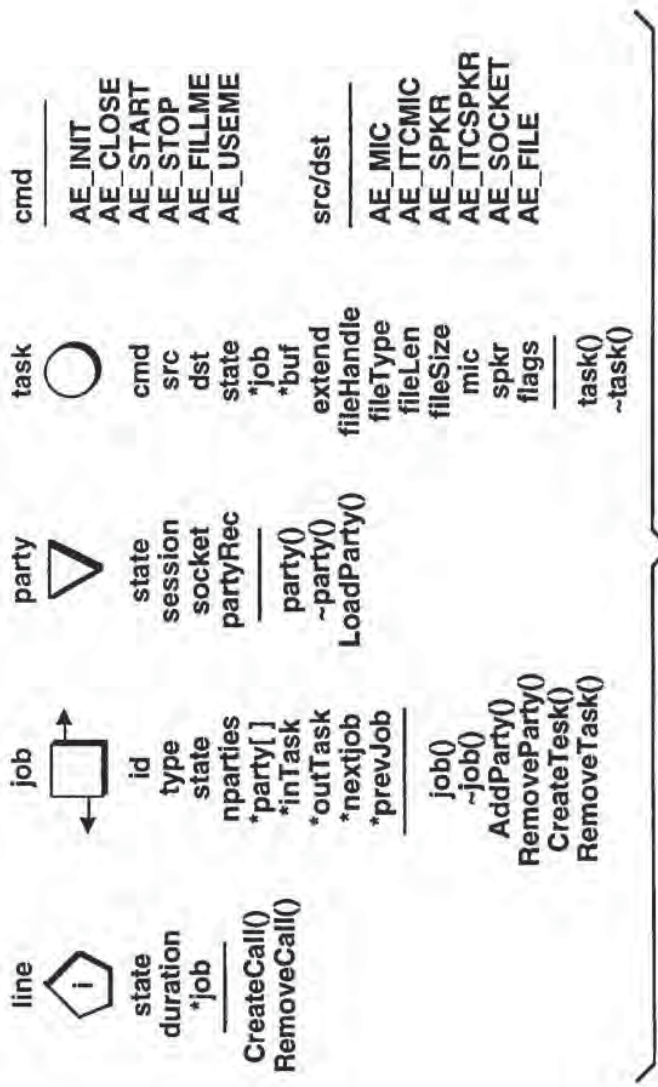

Figure 19A

Figure 19B

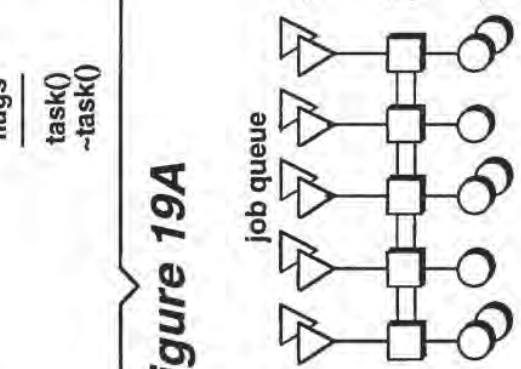

Figure 19C

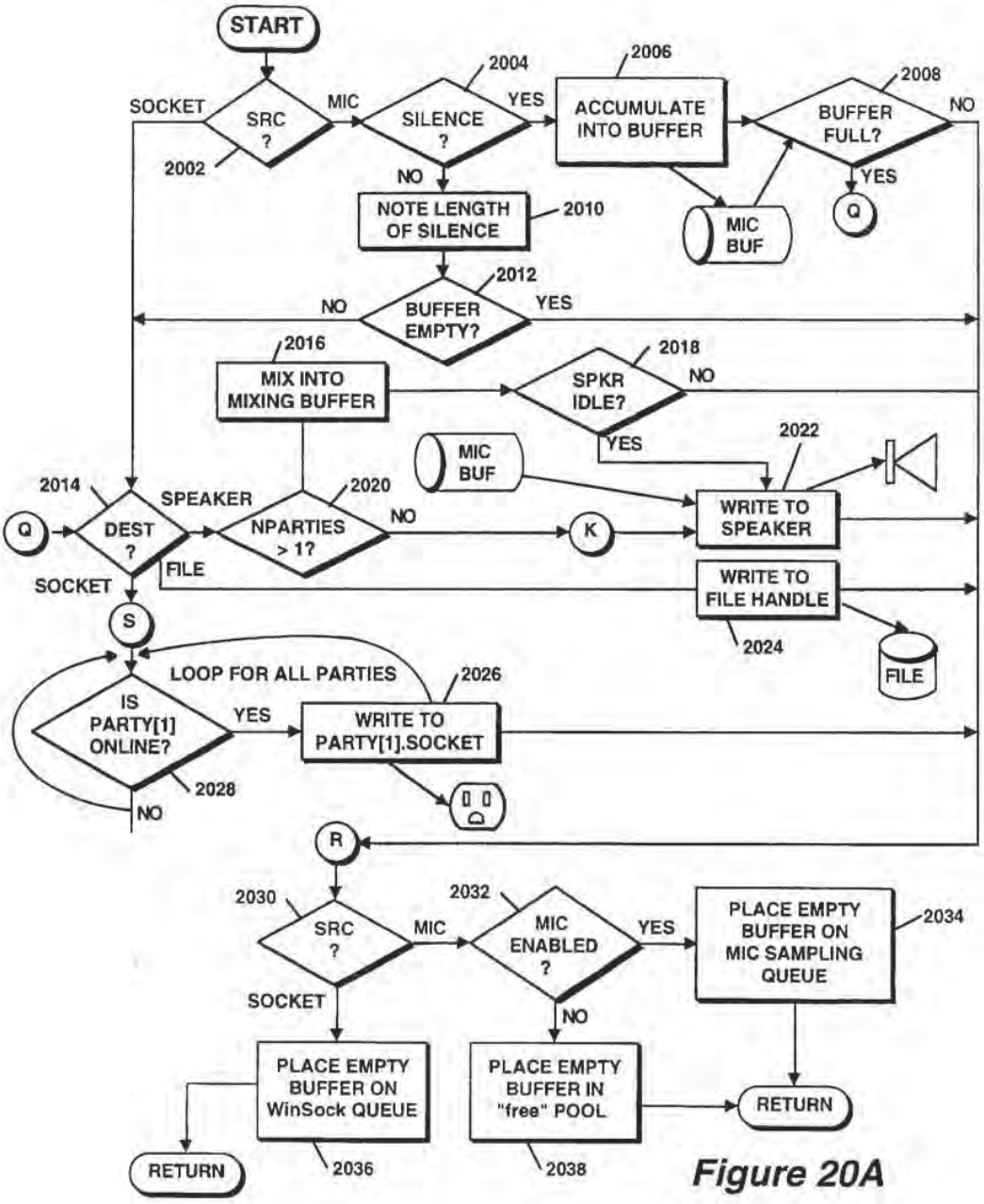
START
SRC ?
SOCKET
MIC
2002
SILENCE ?
2004
YES
NO
ACCUMULATE INTO BUFFER
2006
BUFFER FULL?
2008
NO
YES
Q
MIC BUF
NOTE LENGTH OF SILENCE
2010
BUFFER EMPTY?
2012
NO
YES
MIX INTO MIXING BUFFER
2016
SPKR IDLE?
2018
NO
YES
MIC BUF
2022
WRITE TO SPEAKER
Q
DEST ?
2014
SPEAKER
NPARTIES > 1?
2020
NO
K
FILE
SOCKET
WRITE TO FILE HANDLE
2024
FILE
S
LOOP FOR ALL PARTIES
2026
IS PARTY[1] ONLINE?
YES
WRITE TO PARTY[1].SOCKET
2028
NO
R
SRC ?
2030
MIC
MIC ENABLED ?
2032
YES
PLACE EMPTY BUFFER ON MIC SAMPLING QUEUE
2034
SOCKET
NO
PLACE EMPTY BUFFER ON WinSock QUEUE
PLACE EMPTY BUFFER IN "free" POOL
RETURN
RETURN
2036
2038

Figure 20A

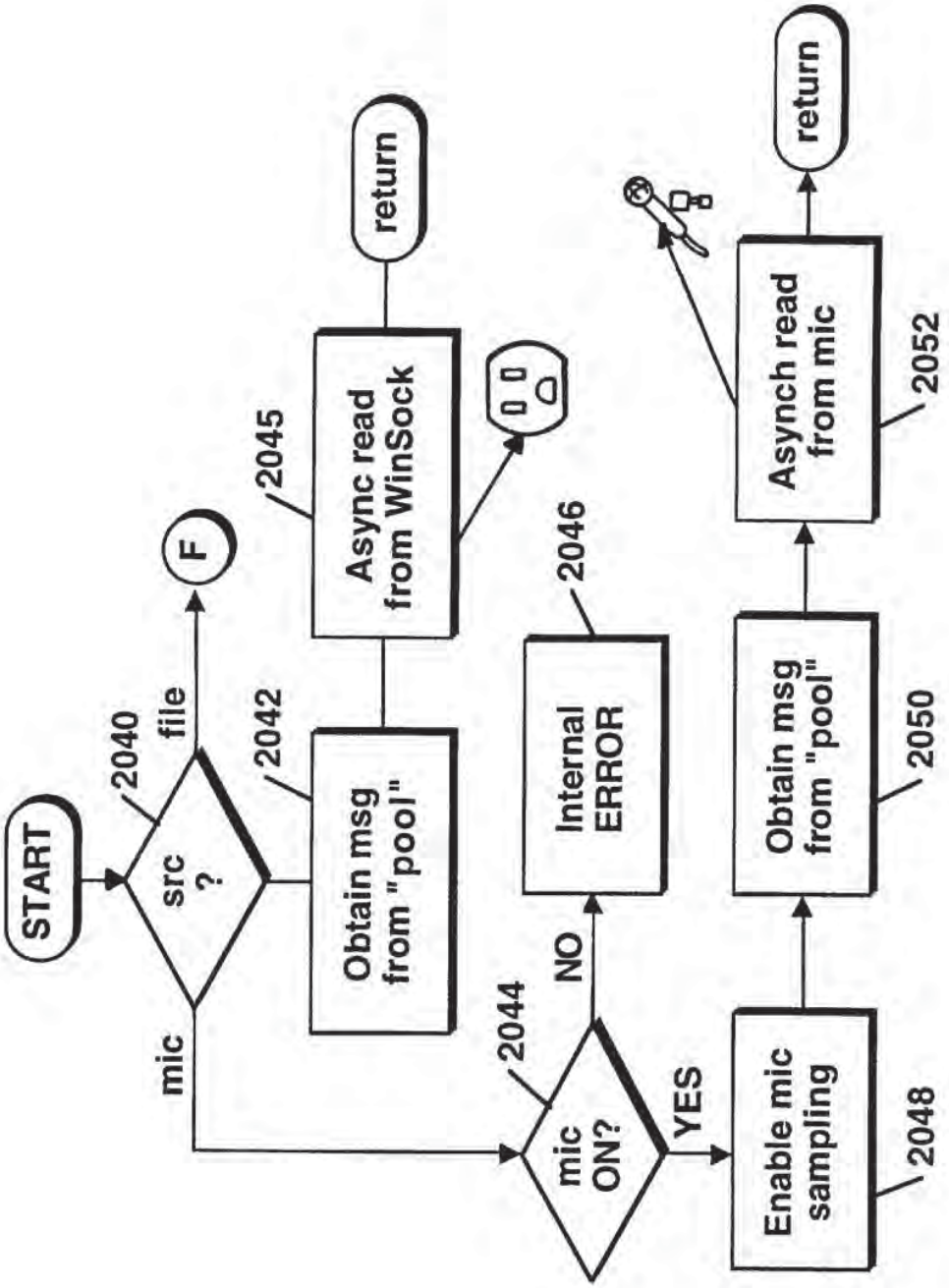
START
2040
src ?
file
F
mic
2042
Obtain msg from "pool"
2045
Async read from WinSock
return
2044
mic ON?
NO
2046
Internal ERROR
YES
2048
Enable mic sampling
2050
Obtain msg from "pool"
2052
Asynch read from mic
return

Figure 20B

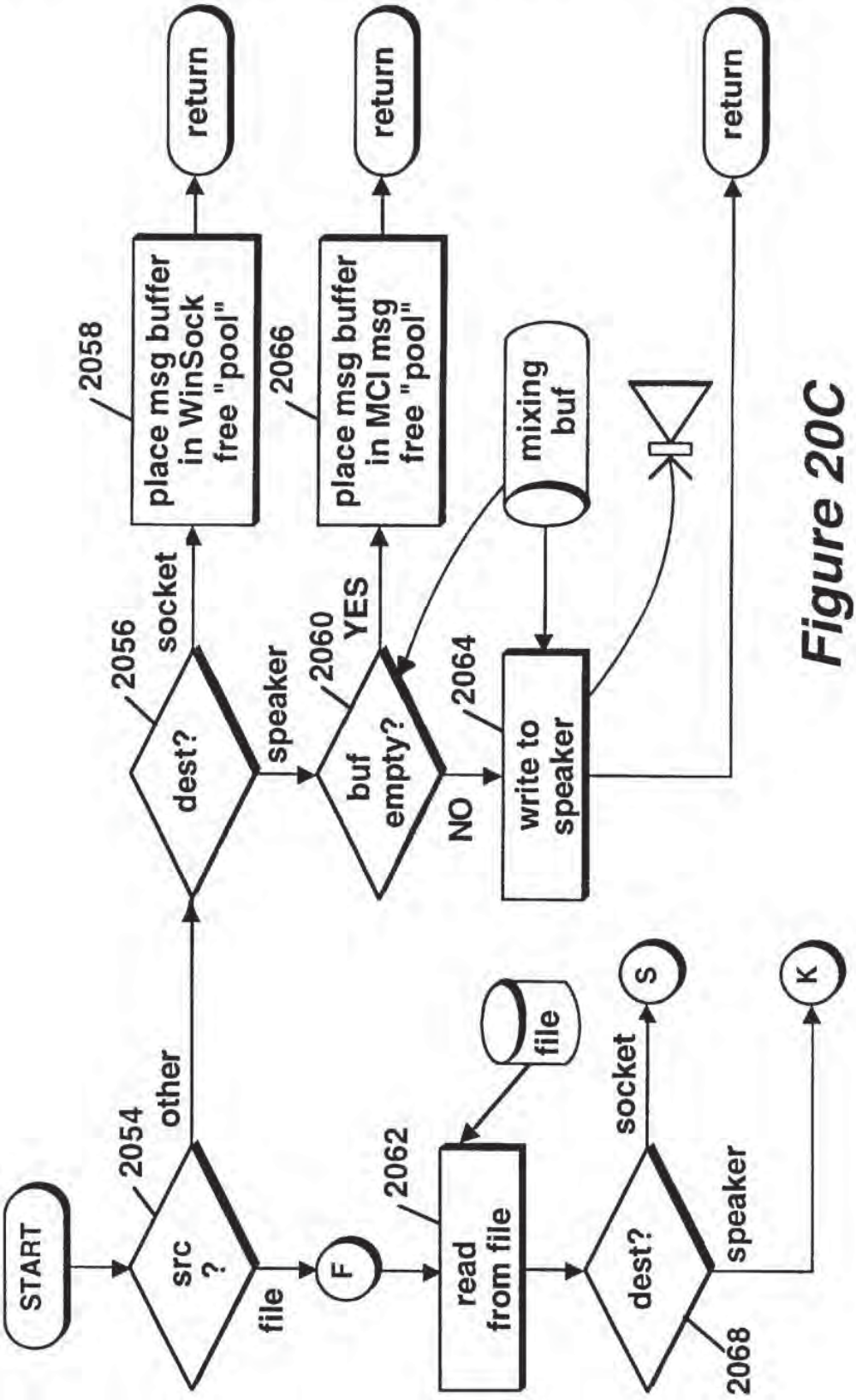
START
src ?
2054
other
file
F
read from file
2062
file
socket
S
K
dest?
2068
speaker
dest?
2056
socket
speaker
buf empty?
2060
YES
NO
2064
write to speaker
mixing buf
place msg buffer in WinSock free "pool"
2058
place msg buffer in MCI msg free "pool"
2066
return
return
return

Figure 20C

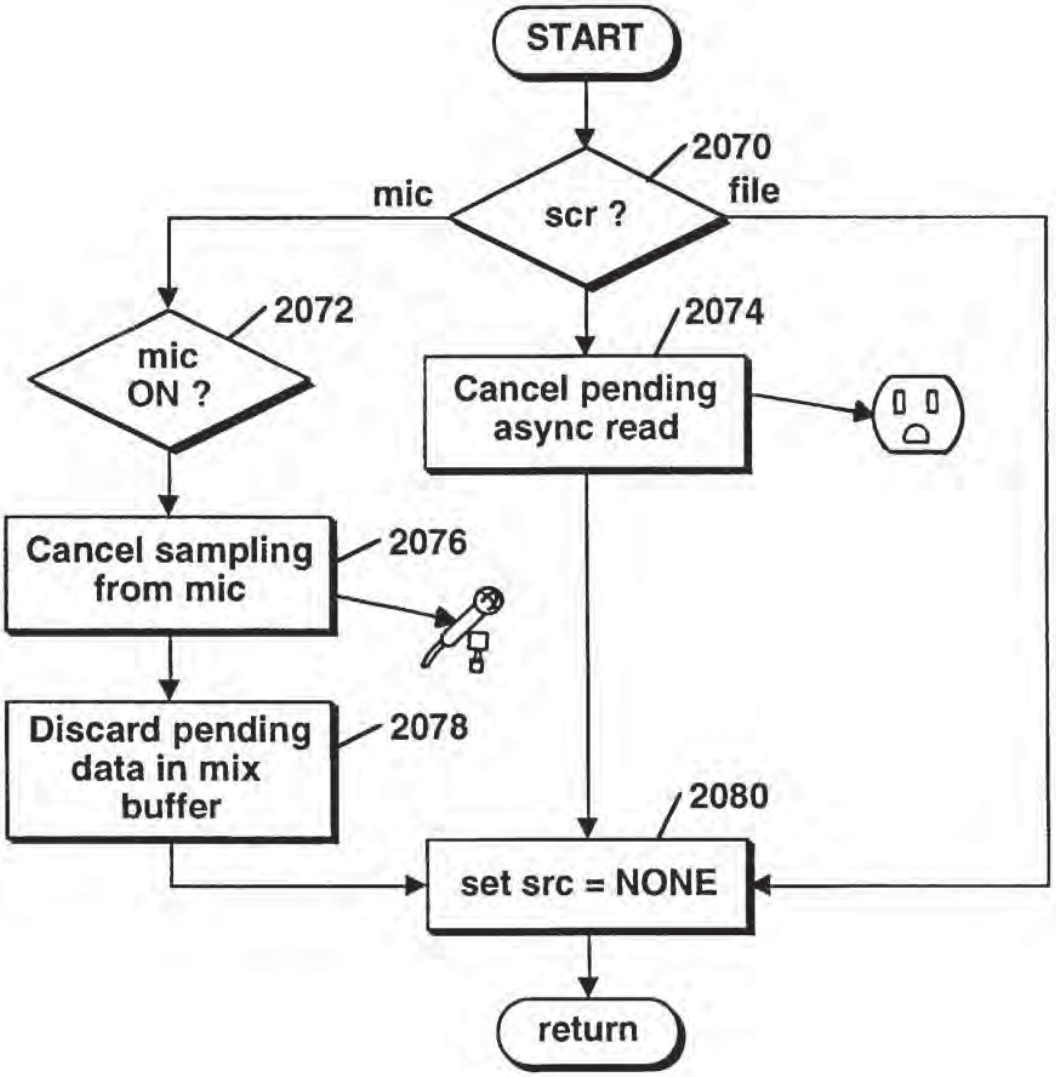
START
2070
scr ?
mic
file
2072
mic ON ?
2074
Cancel pending async read
Cancel sampling from mic
2076
Discard pending data in mix buffer
2078
2080
set src = NONE
return

Figure 20D

GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION

RELATED APPLICATIONS

This application is a continuation-in-part of U.S. patent application Ser. No. 08/533,115 (Pending) entitled Point-to-Point Internet Protocol, by Glenn W. Hutton, filed Sep. 25, 1995, commonly assigned, the subject matter of which is incorporated herein by reference.

To the extent that any matter contained herein is not already disclosed in the above-identified parent application a location claims priority to U.S. provisional patent application 60/025,415 entitled Internet Telephony Apparatus and Method by Mattaway et al., filed Sep. 4, 1996, and U.S. provisional patent application Ser. No. 60/024,251 entitled System and Methods for Point-To-Point Communications Over a Computer Network, by Mattaway et al., filed Aug. 21, 1996.

In addition, this application is one of a number of related applications filed on an even date herewith and commonly assigned, the subject matters of which are incorporated herein by reference, including the following:

- U.S. patent application Ser. No. 08/719,894, entitled Directory Server For Providing Dynamically Assigned Network Protocol Addresses, by Mattaway et al.;
- U.S. patent application Ser. No. 08/719,554, entitled Point-to-point Computer Network Communication Utility Utilizing Dynamically Assigned Network Protocol Addresses, by Mattaway et al.;
- U.S. patent application Ser. No. 08/719,640, entitled Method And Apparatus For Dynamically Defining Data Communication Utilities, by Mattaway et al.;
- U.S. patent application Ser. No. 08/719,891, entitled Method And Apparatus For Distribution And Presentation Of Multimedia Data Over A Computer Network, by Mattaway et al.;
- U.S. patent application Ser. No. 08/719,898, entitled Method And Apparatus For Providing Caller Identification Based Out-going Messages In A Computer Telephony Environment, by Mattaway et al.;
- U.S. patent application Ser. No. 08/718,911, entitled Method And Apparatus For Providing Caller Identification Based Call Blocking In A Computer Telephony Environment, by Mattaway et al.; and
- U.S. patent application Ser. No. 08/719,639, entitled Method And Apparatus For Providing Caller Identification Responses In A Computer Telephony Environment, by Mattaway et al.

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, Aug. 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, real-time 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 real-time of voice and video have been generally difficult to attain.

The ability to locate users having temporary or dynamically assigned Internet Protocol address has been difficult without the user manually initiating the communication. Accordingly, spontaneous, real-time communications with such users over computer networks have been impractical. Further, it is desirable to have a communication utility which contains familiar features and functions to current communication utility such as telephones and cellular telephones. It is even further desirable to utilize the current graphic user interface technology associated with computer software in a manner to achieve a more flexible interface to a such a communication utility, without the limitations associated with hardware.

Accordingly, a need exists for a way to determine whether computer users are actively connected to a computer network.

A further need exists for a way to obtain the dynamically assigned Internet Protocol address of a user having on-line status with respect to a computer network, particularly the Internet.

An even further need exists for a method and apparatus by which to establish real-time, point-to-point communications over a computer network using a communication utility having an interface which combines the familiar aspects of current hardware communication utilities but which allows for the flexibility associated with graphic user interfaces.

SUMMARY OF THE INVENTION

The above deficiencies in the prior art and previously described needs are fulfilled by the present invention which

provides a virtual communications utility displayable on computer system interfaces which enables real-time, point-to-point communications over computer networks. According to one embodiment of the present invention, a computer program product for use with a computer system having a display and an audio transducer comprises a computer usable medium having computer readable code means embodied therein comprising program code means for generating a user interface, program code means responsive to user input commands for establishing a point-to-point communication link with another computer over a network and program code means responsive to audio data from the audio transducer for transmitting the audio data over the communication link.

According to another embodiment of the present invention, a computer program product for use with a computer system comprises a computer usable medium having computer readable program code means embodied thereon comprising code means for transmitting from a client process to a server a query as to whether a second client process is connected to the computer network, program code means for receiving the network protocol address of the second process from the server, and program code means responsive to the network protocol address of the second client process for establishing a point-to-point communication link between the first client process and the second client process.

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;

FIG. **9** illustrates a flowchart of the performance of the secondary point-to-point Internet protocol;

FIG. **10** illustrates schematically a computer network over which the present invention may be utilized;

FIG. **11** is a block diagram of a computer system suitable for use with the present invention;

FIG. **12** is a block diagram of an audio processing card suitable for use with the computer system of FIG. **10**;

FIGS. **13** A–B are schematic block diagrams of the elements comprising the inventive computer network telephony mechanism of the present invention;

FIG. **14** is a screen capture illustrating an exemplary user interface of the present invention;

FIG. **15** is a schematic diagram illustrating the architecture of the connection server apparatus suitable for use with the present invention;

FIG. **16**A is a flowchart illustrating the process steps performed by the connection server in accordance with the present invention;

FIG. **16**B is a flowchart illustrating the process steps performed in accordance with the information server of the present invention;

FIGS. **17**A–B are schematic block diagrams illustrating of the packet transfer sequence in accordance with the communication protocol of the present invention;

FIGS. **18**A–D are conceptual block diagrams illustrating user interface and graphic user interface objects utilized by the communication utility of the present invention;

FIGS. **19**A–C are conceptual block diagrams illustrating the event manager and media engine objects utilized by the communication utility of the present invention; and

FIGS. **20**A–D illustrate process steps performed by the media engine function of the communication utility in accordance with the present invention.

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 Kilobit-per-second 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, Fla., 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, Calif., 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 implemented with a Post Office Protocol (POP) Version **3** mail server and the Simple Mail Transfer Protocol (SMTP), 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**.

In the illustrative embodiment, the POP protocol is utilized to retrieve E-mail messages from mail server **28** while the SMTP protocol is used to submit E-mail message to 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 of available memory. 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, Wash., and other operating systems and GUIs, such as OS/2 and OS/2 WARP, available from IBM CORPORATION, Boca Raton, Fla. 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 touch-screen 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 DSP32 C, 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 fall 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 caller 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 callee 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 an Internet 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 an Internet 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, unreachable, 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 <ConnectReq> message via E-mail over the Internet **24** to the mail server **28**. The E-mail including the <ConnectReq> 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.

The following E-mail messages are transmitted to a remote users post office protocol server via simple mail transport protocol using MIME by the event manager, as explained hereinafter.

<ConnectRequest>

<CampRequest>

<VoiceMail>

<FileTransfer>

<E-mail>

The following E-mail messages are received from a local WebPhone users POP server via the POP protocol using MIME by the event manager, as explained hereinafter.

<Connect Request>

<Camp Request>

<Voice Mail>

<File Transfer>

<E-mail>

<Registration>

As described above, the first processing unit **12** may send the <ConnectReq> 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 <ConnectReq> 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.

Second processing unit **22** polls mail server **28** at an interval, for example, once a minute, to check for incoming E-mail. Generally, second processing unit **22** checks the messages stored on mail server **28** at regular intervals to wait for and detect incoming E-mail indicating a <CONNECT REQ> message from first processing unit **12**.

Typically, for sending E-mail to user's 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 Internet **24** and directed to the permanent IP address of the mail server providing the target user's mail services. The E-mail is transported by a standard protocol, for example, SMTP, and stored into memory (not shown in FIG. **1**) associated with mail server **28**.

The E-mail may subsequently be retrieved by processing unit **22** on behalf of the user with another standard protocol, for example POP **3**. The actual IP address utilized by the

user's processing unit is immaterial to the retrieval of E-mail, as the mail server **28** can, for example, be polled or queried from any point on the network.

Upon 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**.

Real-time 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 <ConnectOK> 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 <ConnectReq> 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 lamps or 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 confer-

ence 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 connection server **26** is not operable.

Referring to FIG. **8**, in conjunction with FIGS. **1** and **3–4**, the disclosed point-to-point Internet protocol and system **10** are illustrated. Connection server **26** starts the primary 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**.

The primary and secondary point-to-point Internet protocols previously described enable users to establish real-time direct communication links over the Internet or other computer networks without the need for any interaction with connection server **26**, the connection server providing only directory and information related services.

FIG. **10** illustrates an exemplary computer network **1000** over which the invention may operate. A first processing unit **1012** is coupled to a computer network, illustrated here as the Internet **1010**, through an Internet service provider **1014**. Similarly, a second processing unit **1022** is coupled to Internet **1010** through Internet service provider **1018**. The inventive directory server **1020** is similarly coupled to Internet **1010** through Internet service provider **1026**. Directory server **1020** further comprises a connection server **1022** and information server **1024**, as will be explained hereinafter. The first processing unit **1012**, second processing unit **1022** and directory server **1020** are operatively coupled to each other via the Internet **1010**. It will be obvious to those reasonably skilled in the art that network **1000** is not

restricted to implementation over the Internet **1010** but may comprise other network configurations such as a local area network (LAN), a wide area network (WAN), a global area network or any number of private networks currently referred to as an Intranet. Such networks may be implemented with any number of hardware and software components, transmission media and network protocols.

Exemplary Computer Architecture

FIG. **11** illustrates the system architecture for a computer system **1100** such as an IBM PS/2®, suitable for implementing first and second processing units **1012** and **1022**, respectively, of FIG. **10**, as well as global server **1020**. The exemplary computer system of FIG. **11** is for descriptive purposes only. Although the description may refer to terms commonly used in describing particular computer systems, such as in IBM PS/2 computer, the description and concepts equally apply to other computer systems ranging from personal digital assistants (PDAs) to workstations to mainframe systems.

Computer system **1100** includes a central processing unit (CPU) **1105**, which may be implemented with a conventional microprocessor. System **1100** further includes a random access memory (RAM) **1110** for temporary storage of information, and a read only memory (ROM) **1115** for permanent storage of information. A memory controller **1120** is provided for controlling RAM **1110**. A bus **1130** interconnects the components of computer system **1100**. A bus controller **1125** is provided for controlling bus **1130**. An interrupt controller **1135** is used for receiving and processing various interrupt signals from the system components.

Mass storage may be provided by diskette **1142**, CD ROM **1147**, or hard drive **1152**. Data and software may be exchanged with computer system **1100** via removable media such as diskette **1142** and CD ROM **1147**. Diskette **1142** is insertable into diskette drive **1141** which is, in turn, connected to bus **1130** by a controller **1140**. Similarly, CD ROM **1147** is insertable into CD ROM drive **1146** which is, in turn, connected to bus **1130** by controller **1145**. Hard disk **1152** is part of a fixed disk drive **1151** which is connected to bus **1130** by controller **1150**.

User input to computer system **100** may be provided by a number of devices. For example, a keyboard **1156** and mouse **1157** are connected to bus **1130** by controller **1155**. An audio transducer **1196**, which may act as both a microphone and a speaker, is connected to bus **1130** by audio controller **1197**, as illustrated. It will be obvious to those reasonably skilled in the art that other input devices, such as a pen and/or tablet may be connected to bus **1130** with an appropriate controller and software, as required. DMA controller **1160** is provided for performing direct memory access to RAM **1110**. A visual display is generated by video controller **1165** which controls video display **1170**. Computer system **1100** also includes a communications adaptor **1190** which allows the system to be interconnected to a network such as a local area network (LAN), a wide area network (WAN), or the Internet, schematically illustrated by transmission medium **1191** and network **1195**.

In the illustrative embodiment, computer system **1100** may include an Intel microprocessor such as the 80486DX-33 MHz, or faster, a 14.4 Kb communication modem or faster, and a sound card, as further described with reference to FIG. **12**.

Operation of computer system **1100** is generally controlled and coordinated by operating system software, such as the OS/2® operating system, available from International Business Machines Corporation, Boca Raton, Fla., or Windows® DOS-based operating system available from Microsoft Corp., Redmond, Wash. The operating system controls allocation of system resources and performs tasks such as process scheduling, memory management, networking, and I/O services, among other things.

FIG. **12** illustrates schematically an audio sound card **1200** which may be used to implement audio controller **1197** of FIG. **11**. Specifically, sound card **1200** may comprise, in the exemplary embodiment, an analog-to-digital (A/D) converter **1212**, an input buffer **1216**, a digital signal processor (DSP) **1222**, ROM **1224**, RAM **1226**, an output buffer **1220**, and an analog-to-digital (D/A) converter **1218**, all of which may be interconnected over a bus **1210**. Bus **1210** is in turn coupled to a bus interface **1228** which, in turn, is coupled to bus controller **1125** of computer system **1100** of FIG. **11**.

As illustrated in FIG. **12**, A/D converter **1212** is coupled to audio transducer **1214** which is typically a microphone. Conversely, D/A converter **1218** is coupled to audio transducer **1230**, typically a speaker. It will be obvious to those reasonably skilled in the art that audio transducers **1214** and **1230**, may be combined into a single element which serves as both a transmitter and receiver of audio signal.

In operation, A/D converter **1212** samples the audio signals supplied to it by transducer **1214** and stores the digital samples in buffer **1216**. The digital sampling occurs under control of a program typically stored in ROM **1224**, or, alternatively, under the control of digital signal processor **1222**. The digital samples stored in input buffer **1216** are forwarded periodically, typically when the buffer reaches near capacity, over bus **1210** to bus **1130** of FIG. **11**, for further processing by computer system **1100**. The device driver for audio sound card **1200** generates system interrupts which will cause the digital samples stored in input buffer **1216** to be retrieved for processing. In the exemplary embodiment, the digital samples are uncompressed as supplied to computer system **1100**. However, compression of the digital samples may occur using DSP **1222** executing an appropriate compression algorithm, if desired.

Digital audio samples from computer system **1100** are also be converted to analog signals by sound card **1200**. The digital samples are supplied to bus **1210** and temporarily stored into output buffer **1220**. The digital samples are then converted by D/A converter **1218** into an analog signals which are then supplied to audio transducer **1230**, i.e., a speaker, or to further amplification and processing devices.

Sound card **1200** contemplated for use with the present invention may be implemented with any number of Windows compliant sound cards, such as the Sound Blaster sound card, commercially available from Creative Technologies Ltd., Singapore. Such Window compliant sound cards have a Windows compliant software interface allowing a standardized mechanism for software programs to operate the sound card device, such as Winsock 1.1.

WebPhone Application

In the exemplary embodiment of the present invention, each of first processing unit **1012** and second processing unit **1022** of FIG. **10** are executing a software application capable of enabling point-to-point communication over network **1000**, such as an Internet telephone application. One such application suitable for use with the present invention is the WebPhone Version 1.0 or higher, software, hereafter referred as the "WebPhone," commercially available from NetSpeak Corporation, Boca Raton, Fla. A description of the architecture and operation of the WebPhone is provided herein with reference to FIGS. **5–6**, **13A–B** and **14**. An extensive detailed description of the architecture, application program interface, graphic user interface, and operation of the WebPhone can be found in copending U.S. patent application

Ser. No. 08/719,554, XXX entitled "Point-to-Point Computer Network Communication Utility Utilizing Dynamically Assigned Internet Protocol Addresses" by Mattaway et al. filed on an even date herewith and commonly assigned, the complete subject matter of which is incorporated herein by reference.

Referring to FIGS. **13A–B**, schematic block diagrams of the WebPhone architecture are illustrated. The WebPhone is an end-user software application which enables users to send real-time audio data to other WebPhone users over the Internet or any public or private TCP/IP based computer networks. The WebPhone application and architecture may be designed to run on any number of operating systems or computer architectures. In the illustrative embodiment, the WebPhone application is implemented as a Windows compatible application executable on an IBM PC architecture or a clone thereof.

Referring to FIG. **13A**, the WebPhone **1300** comprises a set of object modules, written in a programming language such as C++, which work together in a concerted fashion to provide real-time, multitasking, network-based media transmission and reception. WebPhone **1300** comprises a graphic user interface (GUI) **1310**, a user interface (UI) **1312**, an event manager **1314**, a media engine **1316**, a database dynamic link library **1318**, one or more audio compression/decompression (codecs) **1320**, an audio manager **1324**, a WebPhone application program interface (API) **1326**, and a network interface **1322**.

WebPhone GUI **1310** comprises the visual objects seen on a computer display by the user, as illustrated by the screen capture of FIG. **14** discussed hereinafter. WebPhone GUI **1310** serves only to display the artwork associated with the underlying objects of WebPhone UI **1312**. WebPhone GUI **1310** may be implemented in a modular fashion distinct from the WebPhone UI for rapid portability. In this manner, other graphic user interface environments such as those compatible with the Macintosh, X-Windows or OS/2 operating systems, may be substituted via the Plug and Play protocol, as would be understood by those reasonably skilled in the arts.

The WebPhone UI **1312** objects maintain the state of the WebPhone GUI and provide feedback to the WebPhone GUI objects from events originating from either the user or the event manager **1314**. When WebPhone changes a state that requires user notification, WebPhone UI objects notify associated WebPhone GUI objects to display the appropriate art work to the user. WebPhone UI objects also interface with the database dynamic link library **1318** to maintain the WebPhone database information, e.g. configuration information, phone directory information, etc.

The WebPhone event manager **1314** processes all the events originating from the user, via WebPhone UI **1312**, the media engine **1316**, and WebPhone API **1326**. Event manager **1314** may be implemented as a table-driven state machine that processes the above-identified events and performs the functions necessary to bring the WebPhone from one state to another. For example, event manager **1314** interacts with media engine **1316** to create, control and remove concurrently executing jobs managed by media engine **1316**. Event manager **1314** also interfaces with the WebPhone API **1326** to provide communications with other WebPhones and connection servers, as described in more detail hereinafter. WebPhone database **1318** is a dynamic link library of tree-based subroutines that provide fast database access to the WebPhone configuration information, personal phone directory, etc.

WebPhone media engine **1316** manages the allocation of associated resources to provide a multitasking environment and controls the flow of real-time data streams, e.g., conversations, outgoing messages, etc., and non-real-time data streams, e.g., voice mail, graphic images, files, etc., to and from a user network connection. The objects representing tasks are created by event manager **1314**, thereby freeing media engine **1316** to manage resource routing. Specifically, the media engine routes data streams from sources such as a microphone, file or network socket, to destinations such as speaker, destination file or other network socket. To perform such routing functions the media engine interfaces with the WebPhone API **1326** to control communication with other processes, and further communicates with audio manager **1324** to communicate with the system input/output apparatus, such as sound card **1200** of FIG. **12**. Media engine **1314** may be designed to employ heuristic methods to sense and efficiently utilize available bandwidth to achieve timely and accurate delivery of all data streams, both real-time and non-real-time.

Media engine **1316** further interacts with WebPhone codec **1320** to achieve compression and decompression of audio data streams. Codec **1320** provides coding of digital samples from the sound card **1200** of FIG. **12** into a compressed format more suitable for transmission over a computer network. Codec **1320** further provides decoding of a compressed signal prior to its submission to sound card **1200** for subsequent conversion to an audible analog signal. In the exemplary embodiment, WebPhone codec **1320** is implemented in a modular fashion so that codecs may be replaced and updated with newer, more efficient compression/decompression algorithms via the Plug and Play protocol. A codec suitable for use with the present invention is the True Speech codec, version 8.5, commercially available from the DSP Group, Inc., Santa Clara, Calif. The True Speech codec is an enhanced linear predicative coding algorithm, specifically designed to efficiently encode and decode human speech data. The True Speech codec samples the digital sample stream from sound card **1200**, and, using a look-up table-based algorithm, tries to predict the value of the next data sample in the digital data stream based on the history of prior data sample values. The compressed data stream comprises a combination of identifiers of the predicted sample values, as well as error values used to correct the predictive values. Accordingly, the amount of digital data actually transmitted to represent the audio signal is significantly reduced in comparison to transmission of the actual data samples generated by sound card **1200**. The True Speech codec provides temporal, frequency domain compression of the digital data representing the audio signal.

Audio manager **1324** handles communication with the audio sound card **1200** and presents a common interface to media engine **1314**. Audio manager **1324** interfaces with sound card **1200** through one or more application program interfaces. In the illustrative embodiment, audio manager **1324** utilizes low-level Microsoft Windows wave input/output routines to interface with MCI compliant sound cards. As with codecs **1320**, audio manager **1324** may be implemented to adhere to the Plug and Play protocol so other compliant audio sound cards or circuits, such as those for the Apple Macintosh, commercially available from Apple Computer Company, Cupertino, Calif., or a Unix compatible sound card or circuit may interact with the audio manager **1324**.

The WebPhone API **1326** enables the WebPhone to communicate with other WebPhones, connection and directory assistance servers, Internet gateway servers, credit processing servers, database access servers and other client pro-

cesses implementing the WebPhone API. As illustrated in FIG. **13**B, the WebPhone API utilizes sockets, i.e., a file handle or address indicating where data is to be sent, allowing WebPhone API enabled processes to reside on the same computer, on a local area network, on a wide area network, or over the Internet. A process **1328** communicates with the WebPhone API **1326** through a plurality of sockets **1322**. The sockets **1322** are accessible by network **1330** through a number of protocols including Internet Protocol (IP) **1332**, Transmission Control Protocol (TCP) **1334**, Real-Time Protocol (RTP) **1336** and User Datagram Protocol (UDP) **1338**. The WebPhone API provides remote command control of WebPhones and servers via the TCP. WebPhone API **1326** transfers real-time and streamed audio via the UDP protocol and real-time audio and video data via the UDP and RTP protocols. The WebPhone API utilizes TCP to transfer data of different types, i.e., file, image, graphics, etc. as well as to transfer streamline video and other multimedia data types, such as Java developed by Sun MicroSystems, Mountain View, Calif. In addition, the WebPhone API provides user definable commands and data types.

FIG. **14** illustrates the graphic display produced upon invoking the WebPhone application. Display **1400** is an alternative embodiment to that illustrated in FIGS. **5–6** with similar graphic elements, icons and display areas functioning as previously described with reference to FIGS. **5–6**.

WebPhone Global Server

Having described the architecture of the WebPhone software which enables the first and second processing units to establish point-to-point communication over a network, a discussion of the global connection/information server is appropriate.

Referring to FIG. **15**A, a network diagram, similar to that shown in FIG. **10**, is illustrated, including a schematic diagram of the global server **1500** and the various devices operatively coupling server **1500** to the Internet **1530**. A first processing unit executing the WebPhone application, hereafter referred to as WebPhone **1536**, is coupled to Internet **1530** through an Internet service provider **1532**. Similarly, a second processing unit executing the WebPhone application, referred to as WebPhone **1538**, is coupled to the Internet **1530** by an Internet service provider **1534**. Global server **1500** is coupled to Internet **1530** by an Internet service provider **1528**, a CSU/DSU **1526**, a router **1524**, and a fire wall server **1522**. In the illustrative embodiment, fire wall server **1522** and global server **1500** are connected through a local area network **1520**. Network **1520** may be implemented with an Ethernet or other suitable transport for TCP/IP communications. However, as will be obvious to those recently skilled in the arts, server **1500** may be connected directly to fire wall server **1522**.

In the illustrative embodiment, firewall server **1522** is a single firewall mechanism which protects unauthorized access from network **1530** into global server **1500**. Firewall server **1522** may be implemented on a work station, such as a SPARC 5 or SPARC 20 server from Sun MicroSystems, executing a commercially available firewall software application such as Raptor, available from Raptor Systems. Essentially, the firewall server prevents unauthorized access into global server **1500** and thereby prevents destruction of any of the information contained therein by checking the source of requests for information to global server **1500**.

Router **1524** translates logical addresses among networked topologies and may be implemented with any number of commercial router devices such as the CISCO model 2501 router executing CISCO 11.0 software, both commercially available from CISCO Systems, Inc., San Jose, Calif.

CSU/DSU **1526** (Channel Send Unit/Data Send Unit) functions as a sophisticated modem, converting network data to high speed serial data for transfer over a T1 or T3 line. Such high speed data is connected to another CSU/DSU, typically at the telephone company over the T1 or T3 line. An apparatus suitable for use in implementing CSU/DSU **1526** in the present invention is the AT&T Paradigm by AT&T Laboratories, Murray Hill, N.J.

FIG. **15**A further illustrates a logical schematic of global server **1500**. The server comprises a hardware platform **1508** on which an operating system **1510** executes. In the illustrative embodiment, hardware platform **1508** may comprise any number of commercially available high end work stations such as a DEC Alpha 4100 System, commercially available from Digital Equipment Corporation, Maynard, Mass., or a SPARC 5 or a SPARC 20, both commercially available from Sun Micro Systems, Mountain View, Calif. Operating system **1510**, in the illustrative embodiment, may comprise the Unix, commercially available from Novell, Windows NT, commercially available from Microsoft Corporation, or Solaris, commercially available from Sun MicroSystems, Inc. Executing on operating system **1510** are a number of processes including connection server **1512**, information server **1514**, database server **1518** and database **1516**.

Connection Server

Connection server **1512** provides a directory information service to WebPhone client processes currently on-line with respect to the computer network. Connection server **1512** behaves like a virtual machine within global server **1500** and interacts with database **1516** through database server **1518** and with network interface card **1540** through the WebPhone API. The basic function of connection server **1512** is to provide a one-to-one mapping between an identifier of a WebPhone client process, such as a E-mail address, and the current IP address, dynamic or fixed, associated with that WebPhone client process.

As described in further detail hereinafter, when a WebPhone client transmits a <CONNECT REQ> packet to global server **1500**, an E-mail address such as "Shane@netspeak.com" is provided to connection server **1512**. Connection server **1512** then compares the E-mail address with the values of the records contained in on-line table **1516**B and, if a match occurs with one of the records contained therein, transmits the value of the Internet Protocol address associated with that record to the requesting WebPhone client, i.e., a one-to-one matching between E-mail addresses and Internet Protocol addresses.

Referring to FIG. **16**A, a flow chart illustrating the basic process steps used by connection server **1512** to implement a one-to-one mapping of E-mail addresses to Internet Protocol addresses in accordance with the present invention is illustrated. The coding of the process steps of the flowchart of FIG. **16**A into instructions suitable to control global server **1500** will be understandable by those having ordinary skill in the art of programming. Connection server **1512** remains in an idle state until a <CONNECT REQ> packet is transmitted from a WebPhone client to global server **1500**, as illustrated by decisional block **1610** of FIG. **16**A. Upon receipt of the packet, connection server **1512** extracts the E-mail address from the packet and supplies the E-mail address to database server **1518** which them communicates using the ODBC standard with database **1516** to perform a search of On-line Table **1516**B, as illustrated by process blocks **1612** and **1614**. Database **1516** performs a search of on-line Table **1516**B and supplies the current Internet Protocol address of the WebPhone client associated with the

E-mail address to connection server **1512**, via database server **1518**. If a corresponding Internet Protocol address is found for the E-mail address contained in the query, connection server **1512** supplies the Internet protocol address to the requesting WebPhone client by transmitting a <CONNECT ACK> packet, as illustrated by decisional block **1616** and process block **1618**. If, however, there is no Internet Protocol address associated with the queried E-mail address or the WebPhone client is off line, connection server **1512** will send an <OFFLINE> packet to the WebPhone client, as illustrated by process block **1622**. Connection server **1512** will return to an idle state to await the receipt of another <CONNECT REQ> packet, as illustrated by FIG. **16**A. A description of the above described packets as well as a diagram illustrating the packet transfer sequence between a WebPhone client and global server **1500** can be found with reference to Tables **7–8** and FIG. **17**A, respectively.

Information Server

Information server **1514** provides an interface between requests from WebPhone client processes and database **1516**. Information server **1514** includes code written to extract the search criteria from an <INFO REQ> packet and supply the search criteria to the database search engine of database **1516** using the ODBC standard. In particular, referring to FIG. **16**B, a flow chart illustrating the basic process steps used by information server **1514** in performing information/directory service functions in accordance with the present invention is illustrated. The coding of the process steps of the flow chart into instructions suitable for execution by global server **1500** will be understood by those having ordinary skill in the art of programming. Information server **1514** remains idle until an <INFO REQ> packet is received from a WebPhone client process, as illustrated by decisional step **1630**. Next, information server **1514** extracts the data elements defined within the <INFO REQ> packet and supplies them to database server **1518** which, in turn, forward them to database **1516**, as represented by the process step **1634** and **1636**. The search engine contained within database **1516** performs the search and supplies to information server **1514** all client records meeting the search criteria specified in the <INFO REQ> packet, or a message indicating that no records were found. Next, information server **1514** transmits a <INFO ACK> packet to the WebPhone client process indicating the number of records satisfying the search criteria, as indicated by process step **1638**. The WebPhone client may wish to receive all records satisfying the search criteria, or, if the number is excessively large, may desire to further refine the search by transmitting a <INFO ABORT> packet to information server **1514** and defining new search parameters to be sent with a subsequent <INFO REQ> packet. If a <INFO ABORT> packet is received by information server **1514**, the process will return to an idle state, as illustrated by decisional block **1640**. If no <INFO ABORT> packet was received, information server **1514** will transmit one or more <INFO> packets to the requesting WebPhone client until all records have been received by the WebPhone client, as illustrated by process step **1642**. Information server **1514** will return to an idle state awaiting another <INFO REQ> packet, as illustrated in FIG. **16**B. A description of the packets comprising the WebPhone protocol is illustrated in Tables 7–8 and a diagram illustrating the packet transfer sequence defined in FIG. **17**A–B.

Network interface card **1540** interfaces with connection server **1512**, information **1514**, and database server **1518** using the WebPhone API definition, as described herein, and the Windows Sockets 1.1 Protocol, or, in a Unix-based operating system, Berkeley Sockets Network API. Network interface card **1514** may comprise, in illustrative embodiment, an Ethernet card capable of transmitting data at rates of 100 Mbps or greater, such cards being commercially available through a number of different vendors.

The connection from CSU/DSU **1526** to ISP **1528** may comprise a T1 connection, i.e., a long-distance, digital, point-to-point communication circuit capable of transmitting a signal at 1.544 Mbps with 24 channels at 64 Kbps. Alternatively, a T3 connection may be used, i.e., a connection is similar to a T1 connection except it is capable of transmitting at 44.746 Mbps per second with up to 28 T1 channels. Other connections may be suitable, depending on specific requirements and availability.

Database

Database **1516** of global server **1500** may be implemented with any of a number of commercially available structured query language (SQL) database engines, such as Oracle 7.x, Informix, or Microsoft SQL server 6.x. The SQL database resides on a RAID **1** and RAID **5** mirrored disk array. As will be explained hereinafter, database **1516** interacts with control server **1512** and information server **1514** through database server **1518**. In the illustrative embodiment, database **1516** comprises a Client table **1516**A, an On-line table **1516**B, a WebBoard table **1516**C, a WebBoard configuration table **1516**D and a WebBoard Source table **1516**E.

Client table **1516**A comprises a plurality of records, each of which may have the fields and corresponding data elements as described in Table 1. Each WebPhone user, hereinafter "client," has a separate record in table **1516**A containing the information defining the client's profile of personal information. In Table 1, the "activated," "paid," and "published" fields are boolean yes/no fields. The "id" field comprises a unique ID sequence identifying a particular WebPhone client. The "activation date," "address change date," and "access date" fields are time references measured in seconds since 00:00 Coordinated Universal Time (UTC), Jan. 1, 1970. The "IPAddr" field represents the Internet protocol address of the WebPhone client and, if unknown, has a default value of 0.0.0.0. The database record containing a WebPhone client's profile, is defined upon first logging-on to global server **1500** and may be updated each time a WebPhone user's profile changes, as explained hereinafter.

The On-line table **1516**B provides a dynamic list of those clients from **1516**A who are currently On-line, as well as their current Internet protocol address. On-line Table **1516**B comprises a plurality of records each of which may have the fields and data types illustrated in Table 2. The record entries of On-line table **1516**B are used by connection server **1512** and information server **1514**, as explained hereinafter, to provide a directory of those WebPhone client processes currently having on-line status with respect to the computer network.

The WebBoard™ is a virtual multimedia billboard which is transmitted as a series of multimedia data files to WebPhone client processes while the WebPhone application is activated. An extensive description of the WebBoard utility and its operation can be found in copending U.S. patent application Ser. No. 08/719,891 entitled Method and Apparatus for Distribution of Multimedia Data Over a Computer Network by Mattaway et al., commonly assigned, the subject matter of which is incorporated herein by reference.

A number of tables are associated with the WebBoard functionality including WebBoard table **1516**C, a WebBoard configuration table **1516**D, and a WebBoard source table **1516**E. WebBoard table **1516**C includes a plurality of

records each describing a specific WebBoard and having the field and data types illustrated in Table 3. The "id" field of Table 3 provides a unique identification number for the WebBoard file. The "imageType" field defines the video format of the image such as JPEG, TIF, GIF, etc. The "audio" field defines the nature of the audio file, e.g. a .wav file or a MIDI file, while the "audioType" field defines the codec, if any, used to compress/decompress the audio file. The "hits" field defines the number of times the WebBoard has been selected by WebPhone clients, while the "hits profile" field defines the file name of the file identifying those WebPhone clients generating hits to the subject WebBoard.

The WebBoard configuration table **1516**D may have at least one record having the fields and data types illustrated in Table 4. The count field represents the number of WebBoard records currently in the table **1516**C.

The WebBoard source table **1516**E may comprise a plurality of records each having the fields and data types defined in Table 5. The "URL" field of Table 5 defines a data link in accordance with Uniform Resource Locator protocol to the home page or Web site of the source. In the illustrative embodiment, any entity, including vendors, advertisers, individuals or groups wishing to post information or having a Web site or home page may have a WebBoard displayable through the present invention.

Database Server

Database server **1518** serves as the interface between database **1516** and connection server **1512** and information server **1514**. Specifically, connection server **1512** and information server **1514** communicate with database engine **1518** through application program interfaces embedded in the code implementation of both the connection server and the information server. Database server **1518** communicates with database **1516**, in the illustrative embodiment, using the open database connectivity (ODBC) standard, developed by Microsoft Corporation, Redmond, Wash. Database server **1518** functions to supply structured database queries to database **1516** and to supply the results therefrom to connection server **1514** and information server **1512**. In the illustrative embodiment, database server **1518** may be implemented as a "virtual machine" executing on global server **1500**, or, alternatively, may be implemented on a separate computer system such as a DEC Alpha 4100 Workstation executing DEC Unix operating system, both available from Digital Equipment Corporation, Maynard, Mass. Database server **1518** communicates with network interface card **1518** using the WebPhone Application Program Interface described herein.

Global Server Network

In the illustrative embodiment, global server **1500** is implemented as a single server apparatus on which a plurality of "virtual machines" execute simultaneously. However, it will be obvious to those reasonably skilled in the art that a plurality of separate servers, one dedicated to each of connection server **1512**, information server **1514**, and database server **1518** may be interconnected to database **1516** and to each other using a local area network, to form a composite "virtual" global server, as illustrated by FIG. **15**B, the construction of the system illustrated in FIG. **15**B being within the knowledge of those reasonably skilled in the art in light of the descriptions contained herein.

It is further contemplated within the present invention that more than one global server **1500** may be utilized, as illustrated by FIG. **15**C. In this implementation, multiple global servers **1500**A–D are maintained for fault tolerant load sharing, each one performing the above-described connection server, information server and database server processes. Each of global servers **1500**A–D are connected to the Internet via a separate T1 or T3 connection to different Internet service providers, and are synchronized with each other via database server replication. In such an embodiment, multiple global servers may be located in close proximity or in geographically disparate locations. In such an embodiment, the WebPhone application is provided with the network address information of each global server **1500**A–D. In the event that any one of the global servers initially contacted is nonresponsive the WebPhone application will attempt connection to one or more of the remaining global servers to obtain directory and information services.

Further, in an implementation with multiple global servers, if the initially contacted global server is unable to accommodate a WebPhone client request, or, is not geographically convenient, the global server can provide the network address of another global server capable of servicing the WebPhone client's request or which is logically more convenient. This process may occur during the initial log-in of the WebPhone client process, as described with references to messages **1**–**5** of FIG. **17**A.

As previously described, if none of the global servers are available, the WebPhone application can rely on the secondary Internet Protocol technique in which a WebPhone client process sends its current dynamically assigned Internet Protocol address to a prospective WebPhone callee through an E-mail message, as described herein.

WebPhone Protocol

Prior to describing the interaction of the connection server **1512** and information server **1514** with WebPhone client processes, a description of the WebPhone protocol by which the WebPhone client processes and the global server **1500** communicate is appropriate. Tables 6–7 below illustrate the packet definitions of the packets comprising the WebPhone protocol (WPP) including the packet type, the direction and the data elements comprising each packet. In Tables 6–7 the symbol "→" indicates a packet transmitted by a WebPhone client process, while the "←" symbol indicates a packet transmitted by the global server. Tables 8–9 define the data elements described in Tables 6–7. In Tables 6–9, the terms "ULONG" and "UNSIGNED LONG" designate an unsigned long integer value, i.e., 32-bit integer value. Similarly, the terms "USHORT" and "UNSIGNED SHORT" designate an unsigned short integer value, i.e., 16-bit integer value. The term "CHAR" designates a single character, typically assuming a binary value of either 1 or 0. The term "VARCHAR(X)", where X is an integer, value symbolizes a variable length character string, with the number of characters indicated with the integer value. The term "UNSIGNED CHAR" designates an 8-bit character code, i.e., no sign bit. Finally, the term "variable" indicates a variable length data field.

FIG. **17**A illustrates a schematic block diagram of a packet transfer sequence between a pair of WebPhone client processes and the global server, in accordance with the present invention. Each WebPhone application, also referred to as a WebPhone client process, connects to global server **1500** upon start up to inform global server **1500** that the WebPhone client process is on-line and available to make and/or receive calls. Specifically, as illustrated in FIG. **17**A, WebPhone **1536** opens a socket to the global server **1500** and transmits an <ONLINE REQ> packet from WebPhone **1536** to Global server **1500**, as illustrated by message **1** and FIG. **17**A. The <ON LINE REQ> packet may have the format and data illustrated in Table 6, and additional Feature bits which define the functionality of the WebPhone

application, as explained in greater detail hereinafter. In response, connection server **1512** and information server **1514** of global server **1500** use the information contained in the <ONLINE REQ> packet to update the status of database **1516**. In the event that the WebPhone client process is logging on for the first time, global server **1500** returns to the WebPhone **1536** a <USER INFO REQ> packet, as illustrated by message **2** of FIG. **17**A. The <USER INFO REQ> packet includes the elements as defined in Table 9. In response, WebPhone **1536** returns a <USER INFO> packet as illustrated by message **3** of FIG. **17**A. The <USER INFO> packet contains the data elements defined in Table 8. Connection server **1512** and information server **1514** of global server **1500** utilize the data in the <USER INFO> packet to update database **1516**. Specifically, information server **1514** utilizes such data to create a record in client table **1516**A representing WebPhone **1536**. Next, global server **1500** transmits to WebPhone **1536** a <REGISTRATION> packet, as illustrated by message **4** of FIG. **17**A. The <REGISTRATION> packet contains the data described in Table 7 plus Feature bits, as described hereinafter. The <REGISTRATION> packet returned to WebPhone **1536** enables certain functions within the WebPhone architecture based on predetermined criteria, for example, whether the user has paid for the product, or which version of the product the user possesses. Following the <REGISTRATION> packet, global server **1500** further transmits an <ONLINE ACK> packet, as illustrated by message **5** of FIG. **17**A. Prior to transmission of the <ONLINE ACK> packet, connection server **1514** updates database **1516**, specifically On-line table **1516**B to indicate that WebPhone **1536** is on-line with respect to the computer network. Upon receiving the <ONLINE ACK> packet, WebPhone **1536** closes the socket to global server **1500**.

In the event WebPhone **1536** had previously registered with global server **1500**, only messages **1** and **5** are required to establish WebPhone **1536** as being on-line. If WebPhone **1536** had new user information to supply to global server **1500**, then packet sequence illustrated by messages **3** and **4** would occur.

Although the packet sequence illustrated by messages **1–5** is described with reference to WebPhone **1536**, WebPhone **1538** interacts in a similar manner with global server **1500** to establish on-line status. No further interaction occurs between the respective WebPhone client processes and the global server unless the WebPhones require directory or search assistance about a prospective callee.

In one calling scenario, a WebPhone user knows the E-mail address of another WebPhone user to which he/she wishes to establish a point-to-point communication, however, the current dynamically assigned Internet protocol address of the callee is unknown to the caller. In this scenario, the user of WebPhone **1536** requests assistance from global server **1500** to obtain the current dynamically assigned Internet Protocol address of the prospective callee WebPhone. First, the user of WebPhone **1536** specifies the callee by entering all or part of the callee party's name or alias in the party name field area of the graphic user interface. If the party is not in the WebPhone user's local directory, the IP address or E-mail address of the callee WebPhone may be entered into the number field area of the graphic user interface, followed by activation of the send button or icon on the graphic user interface. As a result, WebPhone **1536** opens a socket to global server **1500** and transmits a <CONNECT REQ> packet having the format described in Table 6. Connection server **1512** of global server **1500** utilizes the value of the E-mail address specified in the <CONNECT REQ> packet to perform a one-to-one mapping in the on-line table **1516**B to determine the current Internet Protocol address of the indicated callee, as illustrated by the flowchart of FIG. **15**A. Once this mapping is performed, the server **1500** transmits to WebPhone **1536** a <CONNECT ACK> packet, as indicated by message **7**A of FIG. **17**A. The <CONNECT ACK> packet has the format and content as illustrated in Table 6 and includes the IP address of the callee as well as information such as an error code to indicate that no WebPhone application is associated with that callee. Alternatively, if the selected callee is off line, global server **1500** transmits to WebPhone **1536** an <OFF LINE> packet to indicate that the desired party is not on-line, as illustrated by message **7**B of FIG. **17**A. Following the receipt of either a <CONNECT ACK> or an <OFF LINE> packet by WebPhone **1536**, the socket to global server **1500** opened by WebPhone **1536** is closed.

If the current Internet Protocol address of the callee was returned from global server **1500**, the packet transmission sequence illustrated between WebPhones **1536** and **1538** of FIG. **17**A transpires. Whether a calling WebPhone knows the Internet Protocol address of the callee WebPhone, as in the case of a fixed Internet Protocol address, or obtains the Internet Protocol address from global server **1500**, as previously described, the calling sequence to establish a call occurs as follows. WebPhone **1536** opens a socket to WebPhone **1538**. Next, WebPhone **1536** transmits to WebPhone **1538** a <CALL> packet as illustrated by message **8** of FIG. **16**A. The <CALL> packet has the format illustrated in Table 6 and may, optionally, include information identifying the compression/decompression (codec) used by the caller WebPhone. In response to the <CALL> packet, WebPhone **1538** may return with a number of different packets, as illustrated by messages **9**A–D. First, callee WebPhone **1538** may respond to caller WebPhone **1538** with a <REJECT> packet, as illustrated by message **9**A, indicating that the callee WebPhone does not wish to be disturbed, e.g. total call blocking, or, that the callee WebPhone does not wish to talk to caller WebPhone, e.g. party specific or group specific call blocking. In the event of party or group specific call blocking, the user information contained within the <CALL> packet of message **9**A is compared by the caller WebPhone application to a predefined list of WebPhone user information profiles which the callee does not wish to converse, such list having been predefined by the callee in the WebPhone user's personal directory, as explained hereinafter. Upon receiving the <REJECT> packet the caller WebPhone annunciates the result to the user and the socket to the callee WebPhone is closed.

Alternatively, callee WebPhone **1538** may return a <BUSY> packet, as illustrated by message **9**B of FIG. **17**A. The <BUSY> packet indicates that the callee WebPhone is currently utilizing all available lines within its WebPhone application.

A further possible response from callee WebPhone **1538** is to issue an <ANSWER MACH> packet, as illustrated by message **9**C of FIG. **17**A. The <ANSWER MACH> packet includes data indicating whether the machine is capable of receiving voice mail type messages, as described in greater detail in copending U.S. patent application Ser. No. 08/719,898 entitled "Method and Apparatus for Providing Caller Identification Based Out-Going Messages in a Computer Telephony Environment," by Mattaway et al., commonly assigned and incorporated herein by reference.

The preferred response by callee WebPhone **1538** is to transmit a call acknowledge <CALL ACK> packet, as illustrated by message **9**D of FIG. **17**A. The <CALL ACK>

packet has the data content illustrated in Table 6. Both the <CALL> and <CALL ACK> packets contain the information of the WebPhone users sending the packet. This information is useful by the recipient of the packet for a number of purposes. For example, the user information is displayed on the enunciator area of the WebPhone graphic display to identify the party placing the call. Second, the user may select such information and, using the drag and drop functionality of the WebPhone graphic user interface, add the user information to the callee WebPhone user's personal directory resident within his/her specific WebPhone application. In such a manner, both parties are completely identified to each other prior to commencing audio communications. The transmission of complete caller identification information with the <CALL> and <CALL ACK> symbols packets enables such functions as individual or group specific call blocking, party specific outgoing messages, visual caller identification, and party specific priority ringing and sound effects, as explained herein.

Following transmission of <CALL ACK> packet by callee WebPhone **1538**, the callee WebPhone further transmits an <ANSWER> packet to caller WebPhone **1536**, as illustrated by message **10** of FIG. **17**A. Like the <BUSY> packet, the <ANSWER> packet is essentially empty, containing nothing more than a session ID number which is unique to the call. The socket previously opened by caller WebPhone **1536** over which the forgoing packets were transmitted remains open for the transmission of control information between caller WebPhone **1536** and callee WebPhone **1538**. Such control information may comprise an <END> packet signaling the end of a call, a <HOLD> packet indicating that one of the parties to a call has placed the call "on hold" or other packets related to advance functionality of the WebPhone architecture. In addition, caller WebPhone **1536** opens a second socket to callee WebPhone **1538** over which the respective WebPhones may exchange <AUDIO> packets, as illustrated by messages **11**A–B of FIG. **17**A. The <AUDIO> packets have the data content illustrated in Table 6. The WebPhone application enables the parties to converse in real-time, telephone quality, encrypted audio communication over the Internet and other TCP/IP based networks. If both WebPhone client processes are utilized with full duplex sound cards, such as that illustrated in FIG. **12**, the WebPhone users may transmit and receive audio packets simultaneously, similar to normal telephone conversation. However, if the WebPhone client processes are used with half duplex sound cards, a WebPhone user may only transmit or receive audio data simultaneously, similar to a speaker phone. Exchange of <AUDIO> packets continues until either the callee WebPhone or the caller WebPhone transmits an <END> packet, as illustrated by message **12** of FIG. **16**A. Following the receipt of an end packet, the WebPhone client process will cease to accept subsequent audio packets.

Following either transmission or receipt of an <END> packet by the caller WebPhone, the socket opened by the caller WebPhone to the callee WebPhone over which real-time audio communication occurred is closed. Similarly, the previously opened socket over which control information was transmitted between the callee and caller WebPhones is likewise closed.

Referring now FIG. **17**B, if a WebPhone caller seeks to determine whether a prospective WebPhone callee is connected to the computer network, but, has little information regarding the client process, information server **1514** may be utilized as described. The WebPhone user defines One or more of the first name, last name, company, city, state, or country values of the Query field contained within the <INFO REQ> packet sends the packet to the global server. WebPhone **1536** opens a socket to global server **1500** and forwards <INFO REQ> packet to global server **1500**, as illustrated by message **1** of FIG. **17**B. Information server **1514** extracts the values specified the query field of the <INFO REQ> packet and queries the database **1516**, as previously described with reference to FIG. **16**B. Global server **1500** then transmits a <INFO ACK> packet back to WebPhone **1536**, as illustrated by message **2** of FIG. **17**B. The <INFO ACK> packet has the format and data elements indicated in Table 7, including the number of parties satisfying the search criteria, specified in the <INFO REQ> packet. If the user of WebPhone **1536** wishes to receive the number of parties satisfying the search criteria global server **1500** automatically transmits to WebPhone **1536** one or more <INFO> packets, as illustrated by messages **3**A–C of FIG. **17**B. The <INFO> packet has the format and data elements as described in Tables 6–7. At any time following transmission of the <INFO ACK> packet, WebPhone **1536** may transmit an <INFO ABORT> packet to either prevent transmission of any <INFO> packets or to stop transmission of any remaining packets, as illustrated by message **4** of FIG. **17**B. The <INFO ABORT> packet has the format and data elements as described in Table 6–7.

Once the user receives the information contained within the <INFO> packets satisfying the search criteria, the user may store such information in his/her personal WebPhone directory by dragging and dropping the information from the annunciator area to the direction dialog box using the WebPhone GUI.

The methods and apparatus described herein provide computer users with a powerful protocol in which to directly establish real-time, point-to-point communications over computer networks directly without server required linking. The a directory server assists in furnishing the current dynamically assigned internet protocol address of other similarly equipped computer users or information about such users.

WebPhone Graphic User Interface

Referring again to FIG. **14**, the WebPhone GUI **1400** consists of a main window which has the look of a modern cellular flip phone and a set of dialog boxes launched from window. Operation of the WebPhone is controlled by selecting objects, i.e., buttons, text and images, and dragging objects, i.e., lines, parties, messages, etc., as explained hereinafter.

WebPhone GUI **1400** comprises a plurality of visual objects, including display **1402**, number pad **1406**, line pad **1404**, call function buttons **1408**, phone function buttons **1410** and audio controls (not shown). Display **1402** provides a number of distinct area for presentation of entering of information useful in operation of the WebPhone application. A party name field **1402**A displays the name of the caller when an incoming call arrives and may also be used for entering the name of a party, up to 25 characters. By entering the name of a party in the party name field **1402**A and pressing one or more of the phone function buttons **1410**, various activities may be accommodated. For example, entering the name of a party in the party name field and pressing the [SND] button causes the WebPhone to first search the personal information directory for the information profile of the party entered. If such party's information is not already resident in the personal information directory, the WebPhone will open up a directory assistance dialog allowing the user to enter information to be submitted to the information server **1514** for searching, as described previously. Further, clicking the entered party name with the right

mouse button causes a dialog box to appear enabling the user to modify the current directory entry, if any, for the party entered.

Entering the IP address of a party in the party IP address field followed by the [SND] button causes initiation of a call. If the callee's name exists within the caller's personal directory, or the call is established, the callee's name will appear in a party name field for caller ID purposes.

The third line of the display **1402** serves as a status annunciator line for displaying iconic feedback about the status of events within the WebPhone. Such status icons may include icons indicating enablement of call forwarding, call blocking, do not disturb, priority ringing, file transfer occurring, voice mail transfer occurring or call camping.

The line number annunciator indicates the line, i.e., lines 1–4, currently active, as illustrated by annunciated field **1402**J. A main LED **1402**F indicates when a line is active by changing color. Time field **1402**C displays the local time when no lines are active. When one of the lines L1–L4 are active, time field **1402**C displays the callee party's time. By single clicking the time field the user can cycle through the two different time values.

The line status field **1402**H displays the status of the currently selected line, illustrated in FIG. **14** as displaying "talk" status. A call duration field **1402**D displays the elapsed time in minutes and seconds since the currently displayed call commenced.

The V-mail field **1402**G displays the number of the new voice mail messages and the total number of voice mail messages received.

When one or more call functions such as call conferencing, call blocking, priority ringing, call camping, or call forwarding are activated, the list of those parties within the WebPhone personal directory having such functionality active for their information profile can be viewed in the party name field by selecting a list arrow (not shown) icon which appears whenever one of the previously described functions is activated. Pressing the icon arrow allows the parties to be viewed sequentially.

The number pad buttons **0–9** also serve as speeddial buttons. Right clicking on any one of the number pad buttons **0–9** causes the name, alias, e-mail address and IP address, if known, of the party assigned to that speed dial position to be displayed on display **1402**.

If a user right clicks on any of lines L1–L4 the name, alias, e-mail address and IP address of the party on that line will similarly appear for a predetermined period of time and then revert back to the normal display.

The keypad buttons displayed on WebPhone GUI **1400** may assume one of two states. A button may be a momentary button which, when pressed, i.e., left clicked, gets pushed in and then pops back out again. A second type of button is a toggle button which when pressed gets pushed in and stays in until pressed again. Number pad buttons **0–9** are momentary buttons which may be used to enter the Internet Protocol address of a party and which each house a speed-dial position. The user may assign a party to one of the ten speed-dial positions by selecting the user's information displayed in display **1402** and then dragging it onto the keypad button. To speed-dial one of the ten buttons the user simply presses the appropriate number followed by the [SND] button. As stated previously, if the user right clicks on one of the number pad buttons, the information about the party assigned to the speed-dial position will be displayed.

The line pad **1404** comprises four toggle buttons L1–L4, each of which has a letter, a number and an LED indicating the status of the line. When one or more parties are associated, i.e., dragged and dropped, with a line, the letter designating the appropriate line turns from an L to C indicating a conference call. When only one party is left on the line the letter designation reverts from a C back to an L indicating a regular call. Only one line, button may be selected at a time when an incoming call arrives. Pressing any of the line buttons assigns the incoming call to the selected line. Pressing a line button, i.e., left clicking, when the line is in use places the line on hold. Subsequent depressing the line button takes the call off hold.

A number of call function buttons **1408**, including the [RCL], [END], [SND], [DND], [MUT], [HLD], [CMP], [BLK], [PRI], [FWD], not all of which are shown in FIG. **14**, are used to control operation of calls. The [RCL] button is a momentary button used to recall the last number dialed. Pressing [RCL] recalls the last party called by displaying the party's name, alias, e-mail address and IP address, if known. Selecting a free line following depression of the [RCL] button followed by the [SND] button will cause the party last called to be dialed. The [END] button is a momentary button and terminates a call upon depression. The [SND] button is a momentary button and is used to both place and answer calls. Depressing the [SND] button when a call is being announced causes the call to be answered on a preselected line or a line indicated by the user. Depression of the [SND] button once a callee's information is entered into display **1402** causes the party to be called, if the required information is present, or otherwise causes an information server connection to be established and activated, as previously described.

The [DND] button is a toggle button and is used to activate the Do Not Disturb function of the WebPhone. When activated, the [DND] button causes all inbound calls to be routed to the answering machine.

The [MUT] button is a toggle button which, upon depression, causes disabling of the microphone associated with a user's WebPhone system. When the [MUT] button is enabled, the main LED **1402**F and the status line **1402**H change to indicate that the call muted. Depression of the [MUT] button is undetected by one or more callees.

The [HLD] button is a momentary button and is used to place a call on hold. When a user depresses the [HLD] button a party or parties to a conference call are placed on hold, e.g., the microphone and speaker of the system are effectively disabled. When a called is placed on hold, the main LED **1402**F and call status field **1402**H indicate the change. To take a call off hold, the user depresses the line button of the call being held.

The [CMP] button is a momentary button that causes the WebPhone user to camp on a party, i.e., perpetual redial. Camping on a party serves to insure that the user's call will go through when the party is available. After placing a call, if the callee responds with either a busy or on off-line status, the user may press the [CPM] button to camp on that party. To remove a camp from a party, the user presses the delete key from the computer keyboard.

The [BLK] button is a toggle button and enables or disables call blocking. Depression of the [BLK] button enables call blocking causing all inbound calls from parties who have call blocking designated in their information profile within the personal information directory to be either rejected or routed to the answer machine. Whether a call is to be rejected or routed to the answering machine is specified in a party's information profile record within the personal information directory, in a manner, as previously described.

The [PRI] button is a toggle button which enables or disables priority ringing. Depression of the button enables

priority ringing of all inbound calls from parties, i.e. generation of customized sound effects and/or graphic announcements when a call arrives. As with call blocking, priority ringing is specified within a party's information profile record in the user's personal information directory.

The [FWD] button is a toggle button which enables or disables call forwarding. Depression of the button enables call forwarding of selected inbound calls to the party specified in the appropriate information profile record in the personal information directory. The WebPhone will first search in the personal information directory for an information profile record which matches the inbound call. If a match occurs, and call forwarding is enabled, the inbound call will be forwarded to the party designated within the matched information profile record. If no party is designated, the call will be forwarded to a default forwarding party.

In addition to the call function buttons, a number of phone function buttons **1410** including a [CFG], [DIR], [MSG], [DAT], [LOG], [ ], and ? buttons enable users to further direct functions of a phone. Specifically, the ? button is a momentary button which invokes an interactive, multimedia tutorial and help system about the WebPhone. The [CFG] button is a momentary button, depression of which launches a configuration dialog which enables the user to change the operating parameters of the WebPhone. The [DIR] button is a momentary button, depression of which launches the phone directory dialog which enables a user to add, store, update, view, and delete parties and to obtain directory assistance from global server **1500**, as described previously. The [MSG] button is likewise a momentary button, depression of which launches the voicemail message dialog which enables a user to view, sort, playback, delete, save and restore voicemail messages, as well as to create, playback, delete, save, and restore custom outgoing messages and assign them to information profile records in the personal information directory.

The [DAT] button is a momentary button, depression of which launches a data file transfer dialog enabling a user to monitor and control the progress of a data file transferred over the communication link established with the WebPhone, such dialog further enables a user to retrieve and create E-mail.

The [LOG] button is a momentary button, depression of which launches a call activity log dialog which enables a user to use, sort, search for, print, and delete call related events. An "X" icon is provided to exit the WebPhone. If one or more calls are active when the X icon is selected, a dialog box will appear asking the user if he/she really wishes to exit and terminate active calls. Other icons are provided for minimizing or iconifying the WebPhone application.

In addition to the above-described display, the WebPhone GUI **1400** includes a number of audio control buttons and sliders (not shown in FIG. **14**). These graphic elements enable the user to control the recording the playback of voicemail and outgoing messages and operate similar to conventional audio tape deck controls. In the illustrative embodiment, and similar to that shown in FIG. **5**, a progress bar is illustrated which displays the extent of progress during playback and audio recording processes. Momentary buttons may be provided for rewinding the "virtual tape" to the beginning and for fast forwarding the tape to the end of a recording. Further, momentary buttons are provided for aborting, as well as stopping, playback of audio. A speaker card button, implemented as a toggle button, is provided to play back audio on the sound card's speaker. A special momentary button for audio playback is provided. When initially depressed, audio playing commences. The button then pops out and becomes a pause button. Subsequent depression pauses the audio. The button then pops out again to become a play button. A record button, in the form of a toggle button is provided to control recording of audio. When the button is depressed the user is in an audio record mode and can record voicemail or outgoing messages. To stop recording, the button is pressed again or the stop is button is pressed. A slider-type graphic potentiometer is provided to control speaker volume and enables the user to adjust output volume of the audio received during conversation and playback of voicemail and outgoing messages. The speaker control will attenuate the sound card speaker volume. A similar control is provided to control microphone volume and enables the user to adjust the input volume of audio recorded during conversation and recording of voicemail and outgoing messages. The microphone slider control attenuates the sound card's microphone volume.

WebPhone Application Object Implementation

As previously described, with reference to FIGS. **13**A–B, the WebPhone application comprises a set of object modules which work together in a concerted fashion to provide real-time, multitasking, network-based media transmission and reception. Specifically, the WebPhone GUI, user interface, event manager, and media engine utilize a number of objects to house and manipulate data associated with the operation of the WebPhone application. The GUI objects control the look and feel of the graphic user interface controls which comprise the WebPhone user interface. Some user interface objects maintain and manage many of the states of the WebPhone and control the behavior of the GUI controls, as illustrated in FIGS. **18**A–D.

FIG. **18**A illustrates the hierarchical relationship between objects within the WebPhone. The UIVirtualBase **1812** is a class from which UIVirtualControl object **1810** and UIVirtual object **1808** inherit their respective attributes and member functions. GUIControl object **1802** inherits its attributes and member functions from UIVirtualControl **1810**, as illustrated. UICollection object **1806** inherits its properties from the UIVirtual object class **1808**. The UIControl object inherits its attributes and member functions from both the UIVirtual control object class **1810** and the UIVirtual object class **1808**.

Referring to FIG. **18**B the UIControl object **1804** itself serves as a class from which the UIButton object **1828**, UISlider object **1826**, UIScroller object **1824**, UITab object **1822**, UIDisplay object **1818**, UIListBox object **1820**, UIComboBox **1814**, and UIEditBox **1816** are subclasses. As illustrated in FIG. **18**C, the UIPushButton **1842**, UIPlayRun object **1844** and UIToggle object **1846**, are subclasses of the UIButton object **1848**. As illustrated in FIG. **18**D, the UIPhone object **1838**, UICall object **1832**, UILine object **1834**, and UIPopUp object **1836** are derived from or inherit their attributes and member functions from the UICollection object class **1806**.

Each WebPhone control has two objects associated therewith, a windowing system specific GUIcontrol object **802** and a generic UI control object **1804**. When the GUIcontrol object's state is changed by the user, GUIcontrol **1802** verifies the change with UIcontrol **1804** to validate the change. UIcontrol **1804** is a child of the UIcollection **1806**. When UIcontrol's sibling, GUIcontrol **1802** requests UIcontrol **1804** to verify a change, and the change is accepted, GUIcontrol **1802** must verify the change with its parent object. The parent UIcollection **1806** may have its own parent, another UIcollection object, that it must verify the change with. The UIPhone object **1838** is a member of the

UI collection class. UIPhone has final approval over all changes in the state of the WebPhone. UIPhone **1838** further tells child objects when the event manager changes the phone state and further creates jobs for the event manager based on user actions.

The WebPhone drag and drop functionality utilizes the standard Windows® drag and drop interface and adds several unique object types to interact therewith. Specifically, each UIcontrol and GUIcontrol object has two new member functions added, e.g., set dragtype and acceptdrop types. The set dragtype call sets the type of drag that the control will perform if the mouse or other pointing device is moved out of the control window with the left mouse button down. The accept droptype defines the types of drags the control will accept.

Event Manager and Media Engine

The event manager is a state machine consisting of an array of pointers to functions and states which make up a state-event table. When an event occurs as caused by the mouse, keyboard, mic, speaker, or socket, it is up to the user interface to determine if the event requires the attention of the event manager. The event manager is not notified of events which effect only the graphic user interface, e.g., the user depresses the [DIR] button to open the phone directory dialog.

Referring to FIGS. **19**A–C, a conceptual block diagram illustrating the event manager and media engine objects utilized by the WebPhone is presented. Specifically, the following objects are utilized by both the user interface and the event manager to manager the state of calls and tasks that are to be performed:

line
job
party
task

As illustrated in FIG. **19**A, a Line object is represented by the pentagon shape with a number contained therein. The Line object has the attributes of state and duration and a *job pointer. Member functions for the Line object include createcall ( ) and removecall ( ). The Job object is illustrated with a rectangle having pointers extended therefrom as illustrated in FIG. **19**A. Attributes of the job object include, ID, type, state, and parties, and pointer attributes party, intask, outTask, nextjob, prevjob. The Job object has the member functions of AddParty, RemoveParty, CreateTask, and RemoveTask. The Party object, illustrated with a triangular symbol, includes the attributes of state, session, socket, and partyRec, and the member functions of LoadParty.

The Task object includes the attributes of command, source, destination, extent, fileHandle, fileType, fileLength, fileSize, mic, speaker, and flags, as wells as pointer attributes *job and *buf. The values assumable by the command attribute of the Task object may include initialize, close, start, stop, fill, and use, etc. The values assumable by the source and destination attributes of the task object may include microphone, speaker, socket, and file. FIG. **19**B illustrates the relationship between Line objects and Job objects and the pointers linking the two. FIG. **19** illustrates the relationship between Party objects, Job objects and Task objects and the pointers linking the Job objects to the parties and tasks.

Media Engine Implementation

FIGS. **20**A–D illustrate the process steps performed by the media engine of the WebPhone in accordance with the present invention. The coding of the process steps of the flowchart of FIGS. **20**A–D and to instructions suitable for use by the WebPhone will be understandable by those having ordinary skill in the programming arts. FIG. **20**A illustrates the process executed by the media engine when the CMD attribute of a Task object is defined as a AE_USEME command, as previously illustrated in FIG. **19**A. The Task objects are set up by the event manager. The media engine manages routing and resources. For example a microphone, file or socket may provide a source of data to media engine while a destination may comprise either a speaker file or socket. The media engine serves to perform compression/decompression as well as copying functions. For the purposes of describing flowcharts **20** A–D the media engine will referred to as media engine **2000**.

Referring to FIG. **20**A, media engine **2000** first determines the source of a data stream, as illustrated by decisional block **2002**. If the source is a microphone, media engine **2000** determines whether or not the current audio data from the microphone source is silence, as illustrated in decisional block **2004**. If the audio stream from the microphone is not silent the data will be accumulated into a microphone buffer, as illustrated by procedural block **2006**. Next, the media engine will determine whether or not the buffer is full, as illustrated by decisional **2008**. If the buffer is full, process flow will proceed to a determination of the destination via connector Q. If in decisional block **2004** the determination was made that the audio data from the microphone was silence, the media engine notes the length of the silence, as illustrated by procedural block **2010**. Next, the media engine determines whether or not the buffer is empty, as illustrated by decisional block **2012**. If the buffer is empty, process flow proceeds to a determination of the source, via connector R, as illustrated by decisional block **2030**.

Returning again to decisional **2014**, a determination of the destination of the audio data made after either a determination that the buffer is full, via connector Q, or that the source of the audio data is a socket, e.g., one of the branches of decisional block **2002**. If in decisional block **2014** a determination is made that the destination is a socket, media engine **2000** determines if a party is online, as illustrated by decisional block **2028**. If the party is online media engine **2000** will write to the socket associated with that party, as illustrated by procedural block **2026**. The process as illustrated by decisional **2028** and process block **2026** are repeated for every party associated with the Job object, i.e., conference calls include multiple parties. Following writing to the parties socket, process flow returns decisional block **2030** for a determination of the source, as illustrated. If in decisional block **2014** a determination was made that the speaker was the destination, media engine makes a further determination to whether or not the there is more than one party on the conversation, i.e., conference call, as illustrated by decisional block **2020**. If there is only one other party besides the user on the call, process flow proceeds to junction K where the audio data is written to the speaker, as illustrated by process block **2022**. If in decisional block **2020** a determination was made that multiple parties were associated with a call media engine **2000** mixes the audio data into a mixing buffer, as illustrated by process block **2016**. Next media engine **2000** determines whether or not the speaker is idle. If so, the audio data from the mixing buffer is written to the speaker as illustrated by procedural block **2022**. Otherwise, process flow proceeds to junction R. In decisional block **2030** media engine **2000** determines again what the source of an audio data stream is. If the source is determine to be a socket, media engine **2000** will place the empty buffer on the winSock queue, as illustrated by process block **2036**. If the source is determined to be a microphone, and the microphone is enabled, as determined in decisional

block **2032**, media engine **2000** will place the empty buffer on the mic sampling queue, as illustrated by process block **2034**. Otherwise, media engine **2000** will place the empty buffer in the free pool of buffer space, as illustrated by process **2038**. Either branch of decisional block **2030** will result in a return from the task execution process, as illustrated.

FIG. **20**B, illustrates the process flow performed by media engine **2000** upon receiving a task object from the event manager having the CMD attribute defined with a AE_START, i.e., the event manager instructs the media engine to start a copy operation from a source to a destination. First, media engine **2000** determines whether or not the source is a microphone or a file, as illustrated by decisional block **2040**. If the source is a file, process flow proceeds to block **2062** of FIG. **20**C via connector F, as described hereinafter. If the source is determined to be a microphone, media engine **2000** will determine whether or not the microphone is on, as illustrated by decisional **2044**. If the microphone is not on, an internal error notification will be generated, as illustrated by procedural block **2046**. If the microphone is on, media engine **2000** will enable microphone sampling, obtain space from the buffer pool, and perform an asynchronous read from the microphone, as illustrated by process blocks **2048**, **2050** and **2052**, respectively. If in decisional block **2040** media engine **2000** determined that the source was a socket, buffer space will be retrieved from the buffer pool, as illustrated by process block **2042**, and an asynchronous read from the socket will be performed, as illustrated by process block **2045**. Following the an asynchronous read from either a socket or a microphone, media engine **2000** will return the task to the event manager, as illustrated.

FIG. **20** illustrates the process flow performed by media engine **2000** upon receiving a Task object from the event manager in which the CMD attribute is defined with a AE_FILLME command value, i.e., an empty packet has been returned from either an MCI or WINSOCK asynchronous write operation upon completion. First, media engine **2000** determines whether the source is from a file or either a socket or speaker, as illustrated by decisional block **2054**. If the source is a file, media engine **2000** will read a portion of the file, as illustrated by process block **2062**. Next, media engine **2000** will make a determination as to whether the destination is either a socket or a speaker, as illustrated by decisional block **2068**. If the destination is a socket process flow will return to decisional block **2028** of FIG. **20**A via connector S, as illustrated. If the destination is a speaker, process flow will proceed to process block **2022** of FIG. **20**A via connector K as illustrated.

If a determination was made in decision **2056** that the destination is a socket, media engine **2000** will place the buffer associated with the task or message in the WINSOCK free pool of buffer space, as illustrated by process block **2058**. If the destination is determined to be a speaker, media engine **2000** next determines whether or not the buffer is empty, as illustrated by decision block **2060**. If the buffer is not empty, the data within the mixing buffer will be written to the speaker, as illustrated by message **2064**. If the buffer is empty, the buffer associated with the message, i.e., task, will be placed in the MCI message free pool, as illustrated by process block **2066**. Both branches decisional block **2056** result in a return from the task by media engine **2000**, as illustrated. In the above-described flow diagrams, a message may be a task implementation similar to the manner in which Microsoft Windows uses messages for task completion operations.

FIG. **20**D illustrates the process path taken by media engine **2000** when the CMD attribute of a Task object is defined as a AE_STOP value, i.e., the event manager instructs the media engine to stop the current operation on behalf of a specified task. The process begins with the determination of whether or not the source is a microphone or file, as illustrated by decisional block **2070**. If it is determined that the source is a file, process flow proceeds to block **280** where the source is set to none, i.e., no further data will retrieved or processed. If the process is determined to be a socket, media engine **2000** cancels any pending asynchronous reads from the socket, as illustrated by process block **2074**. If a determination is made that the source is a microphone, media engine **2000** will determine whether or not the microphone is on, as illustrated by decisional block **2072**. If the microphone is on, media engine **2000** cancels sampling of the audio signal from the microphone, as illustrated by process block **2076**, and, discards the pending data in the mix buffer, as illustrated by process block **2078**. Regardless of the determination of the source, all branches of the process flow terminate with the setting of the source to none or null, indicating a termination of the operation and a return by media **2000** from the task, as illustrated.

In an alternate embodiment, the various aspects of the invention may be implemented as a computer program product for use with a computer system. Such implementation may comprise a series of computer instructions either fixed on a tangible medium, such as a computer readable media, e.g. diskette **1142**, CD-ROM **1147**, ROM **1115**, or fixed disk **1152** of FIG. **11**, or transmittable to a computer system, via a modem or other interface device, such as communications adapter **1190** connected to the network **1195** over a medium **1191**. Medium **1191** can be either a tangible medium, including but not limited to optical or analog communications lines, or may be implemented with wireless techniques, including but not limited to microwave, infrared or other transmission techniques. The series of computer instructions embodies all or part of the functionality previously described herein with respect to the invention. Those skilled in the art will appreciate that such computer instructions can be written in a number of programming languages for use with many computer architectures or operating systems. Further, such instructions may be stored using any memory technology, present or future, including, but not limited to, semiconductor, magnetic, optical or other memory devices, or transmitted using any communications technology, present or future, including but not limited to optical, infrared, microwave, or other transmission technologies. It is contemplated that such a computer program product may be distributed as a removable media with accompanying printed or electronic documentation, e.g., shrink wrapped software, preloaded with a computer system, e.g., on system ROM or fixed disk, or distributed from a server or electronic bulletin board over a network, e.g., the Internet or World Wide Web.

Although various exemplary embodiments of the invention have been disclosed, it will be apparent to those skill in the art that various changes and modifications can be made which will achieve some of the advantages of the invention without departing from the spirit and scope of the invention. These and other obvious modifications are intended to be covered by the appended claims.

TABLE 1

Client Table

Field	Data Type	Comments
id	ulong	Unique ID Sequence
activated	char	0 = NO, 1 = YES
activationDate	ulong	Secs since 00:00 UTC Jan 1, 1970
version capability	ushort	Version of the Webphone
version protocol	ushort	
version vendor	ushort	
paid	char	0 = NO, 1 = YES
prePaidCode	varchar (16)	
firstName	varchar (10)	
lastName	varchar (25)	
alias	varchar (20)	
emailAddr	varchar (90)	
IPAddr	varchar (80)	0.0.0.0 if not known
street	varchar (50)	
apt	varchar (5)	
city	varchar (20)	
state	varchar (20)	
country	varchar (20)	
postalCode	varchar (20)	
phone	varchar (25)	
fax	varchar (25)	
feature bits	ulong	WebPhone Feature Definitions
company	varchar (25)	Company Name
addrChanges	char	No. of address changes
addrChangeDate	ulong	Secs since 00:00 UTC
publish	char	0 = NO, 1 = YES
accessDate	ulong	Secs since 00:00 UTC
accessCount	ulong	# of log ons
callCount	ulong	# of outbound calls
social security number	ulong	optional
age	ushort	optional
occupation code	ushort	optional
interest codes	ushort	optional
household income range	ushort	optional

TABLE 2

Online Table

Field	Data Type	Comments
emailAddr	varchar (90)	
IPAddr	varchar (80)	
flags	char	
onlineDate	ulong	Secs since 00:00 UTC

TABLE 3

WebBoard Table

Field	Data Type	Comments
id	ulong	Unique ID Sequence
image	varchar (255)	Filename of image file
imageType	char	GIF = 0, JPG = 1, RLE = 3
audio	varchar (255)	Filename of TSP encoded.WAV file
audioType	char	GSM = 0, TRUESPEECH = 1
hits	ulong	Number of accrued hits
hitsprofile	varchar (8)	Filename of Demographics
version	ulong	version of WebBoard
URL	varchar (255)	home page url

TABLE 4

Weboard Config Table

Field	Data Type	Comments
count	ulong	Number of WebBoards

TABLE 5

Source Table

Field	Data Type	Comments
id	ulong	Unique ID Seqence
weboardID	ulong	Link to WebBoard record
name	varchar (50)	Company's name
url	varchar (80	URL to Home Page
street	varchar (50)	
apt	varchar (5)	
city	varchar (20)	
state	varchar (20)	
country	varchar (20)	
postalCode	varchar (20)	
phone	varchar (25)	
fax	varchar (25)	
contact	varchar (35)	Name of contact

TABLE 6

WebPhone Protocol (WPP) Packet Definitions

Packet	Packet Type	Direction	Data
Invalid	WPP_INVALID	← →	WPP_INVALID
Online Req	WPP_ONLINEREQ	→	WPP_ONLINEREQ, sid, version, emailAddr, IPAddr, onlineState, feature bits
OnlineACK	WPP ONLINEACK	←	WPP_ONLINEACK, sid onlineStatus, feature bits
Offline	WPP_OFFLINE	← →	WPP_OFFLINE, sid
Hello	WPP_HELLO	← →	WPP_HELLO, sid, version
Connect Req	WPP_CONNECTREQ	→	WPP_CONNECTREQ, sid, version, callType, partyEmailAddr, emailAddr,

TABLE 6-continued

WebPhone Protocol (WPP) Packet Definitions

Packet	Packet Type	Direction	Data
			IPAddr, connectState
Connect ACK	WPP_CONNECTACK	← →	WPP_CONNECTACK, sid, connectStatus, partyIPaddr
Call	WPP_CALL	← →	WPP_CALLACK, sid, version, emailAddr, IpAddr, userInfo
CallACK	WPP_CALLACK	← →	WPP_CALLACK, sid, version, emailAddr, IpAddr, userInfo
CnfCall	WPP_CNFCALL	← →	WPP_CNFCALL, sid, version, emailAddr, IpAddr, userInfo
CnfCallACK	WPP_CNFCALLACK	← →	WPP_CNFCALLACK, sid, version
Answer	WPP_ANSWER	← →	WPP_ANSWER, sid
Busy	WPP_BUSY	← →	WPP_BUSY, sid
AnsMachine	WPP_ANSMACH	← →	WPP_ANSMACH, sid, state
End	WPP_END	← →	WPP_END, sid
Hold	WPP_HOLD	← →	WPP_HOLD, SID, (ON/OFF)
Reject	SPP_REJECT	← →	WPP_REJECT, sid
Camp	WPP_CAMP	← →	WPP_CAMP, sid
CampACK	WPP_CAMPACK	← →	WPP_CAMPACK, sid
Audio	WPP_Audio	← →	WPP_AUDIO, sid, audioType, silence, length, audioData
Pulse	WPP_PULSE	→	WPP_PULSE, sid
Adjpulse	WPP_PULSE	←	WPP_ADJPULSE, sid, adjPulse
Vmail	WPP_VMAIL	← →	WPP_VMAIL, sid, audioType, silence, length, audioData
VmailEnd	WPP_VMAILEND	← →	WPP_VMAILEND, sid
OgmEnd	WPP_OGMEND	← →	WPP_OGMEND, sid
CnfAdd	WPP_CNFADD	← →	WPP_CNFADD, sid, partyEmailAddr, partyIPaddr, partInfo
CnfDrop	WPP_CNFDROP	← →	WPP_FILEXMTREQ, sid, file Type, fileName, fileSize

TABLE 7

WebPhone Protocol (WPP) Packet Definitions

Packet	Packet Type	Direction	Data
FileXmtAck	WPP_FILEXMTACK	← →	WPP_FILEXMTACK, sid
File	WPP_FILE	← →	WPP_FILE, sid, length, fileData
FileXmtEnd	WPP_FILEXMTEND	← →	WPP_FILEXMTEND, sid
FileXmtAbort	WPP_FILEXMTABORT	← →	WPP_FILEXMTABORT, sid
InforReq	WPP_INFOREQ	→	WPP_INFOREQ, sid, query
InfoACK	WPP_KNFOACK	←	WPP_INFOACK, sid, nparties
Info	WPP_INFO	←	WPP_INFO, sid, partyInfo
InfoAbort	WPP_INFORABORT	→	WPP_INFOABORT, sid
UserInfoReq	WPP_USRINFOREQ	←	WPP_USRINFOREQ, sid
UserInfo	WPP_USRINFO	→	WPP_USRINFO, sid, version, userInfo
WBImageStart	WPP_WBIMAGESTART	←	WPP_WBIMAGESTART, sid, fileSize, imageType, url
WBImage	WPP_WBIMAGE	←	WPP_WBIMAGE, sid, length, imageData
WBImageEnd	WPP_WBIMAGEEND	←	WPP_WBIMAGEEND, sid
WBAudioStart	WPP_WBAUDIOSTART	←	WPP_WBAUDIOSTART, sid, fileSize, audioType
WBAudio	WPP_WBAUDIO	←	WPP_WBAUDIO, sid, length, audioData
WBAudioEnd	WPP_WBAUDI(OEND	←	WPP_WBAUDIOEND, sid
Registration	WPP_REG	←	WPP_REG, sid, feature bits, EEMAILAddr, customer id
Audio Start	WPP_AUDIO START	← →	WPP_AUDIO START, sid
Audio End	WPP_AUDIO END	← →	WPP_AUDIO END, sid
Caller OK	WPP_CALLEROK	→	WPP_CALLEROK, sid, version, emailAddr, feature bits
Caller ACK	WPP_CALLERACK	←	WPP_CALLERACK, sid, callerStatus, feature bits
Key Pad	WPP_KEYPAD	←	WPP_KEYPAD, size (ON/OFF)
Key	WPP_KEY	→	WPP_KEY, sid, ascii character
WBLIST	WPP_WBLIST	←	WPP_WBLIST, sid, list of WB IDs
WBLIST REQ	WPP_WBLISTREQ	→	WPP_BBLISTREQ, sid

TABLE 7-continued

WebPhone Protocol (WPP) Packet Definitions

Packet	Packet Type	Direction	Data
WB REQ	WPP_WEBBOARDREQ	→	WPP_WEBBOARDREQ, sid, WBid, Client id
WB HIT	WPP_WEBBOARDHIT	→	WPP_WWBOARDHIT, sid, WB id, Client id
ANS FULL	WPP_ANS FULL	→	WPP_ANS FULL, sid

TABLE 8

WebPhone Protocol (WPP) Packet Data Definitions

Element	Data Type	Comment
WPP_*	unsigned char	WPP message identifier
sid	unsigned long	session id unique per call
version	unsigned(3)	version of the webphone (capability, protocol, vendor)
emailAddr	varchar(90)	email address of caller
IPAddr	varchar(80)	IP Address
onlineState	unsigned char	bit 0 (ACTIVE/INACTIVE) bit 1 (Merchant Phone) bit 2 (Connection Server) bit 3 (webboard disabled) bit 4 Not Used bit 5 Not Used bit 6 Not Used bit 7 Not Used
call Type	unsigned char	call type 0: EMAIL/1:IPCALL
party EmailAddr	varchar(90)	email address of person to call
connectStatus	unsigned char	0: NO WEBPHONE 1: ONLINE 2: OFFLINE 3: RECONNECT 4: PERM_RECONNECT
partyIPAddr	varchar(80)	IP Address of person to call
userInfo	varchar(120)	firstName, LastName, alias, emailAddr, street, apt, city, state, country, postalCode, phone, fax, company
audioType	unsigned char	audio compress type 0: GSM 1: TRUESPEECH

TABLE 9

WebPhone Protocol (WPP) Packet Data Definitions

Element	Data Type	Comment
length	unsigned short	length of audio or data in bytes
audioData	512 Bytes	compressed audio data
feature bits	unsigned long	WebPhone feature definition
fileType	unsigned char	file type 0: DATA 1: EMAIL 2: TEXT 3: BINARY
fileName	varchar(13)	name of file to be transmitted.
fileSize	unsigned long	size of file to be transmitted in bytes
fileData	variable	file data
query	varchar(120)	firstName, lastName, company, city, state, country
nparties	unsigned long	number of parties or query records being sent
size	unsigned long	size of file (IMAGE or AUDIO) to be sent
imageType	unsigned char	image type 0: GIF 1: JPG
imageData	512 Bytes	image data

TABLE 9-continued

WebPhone Protocol (WPP) Packet Data Definitions

Element	Data Type	Comment
eemailAddr	varchar(90)	encrypted email Address
onlineStatus	unsigned char	0 OK -1 Error
callerStatus	unsigned char	0 is unpaid 1 if paid
onlineState	unsigned char	bit 0 webboard disabled bit 1 Not Used bit 2 Not Used bit 3 Not Used bit 4 Not Used bit 5 Not Used bit 6 Not Used bit 7 Not Used
WBid	unsigned long	link to WebBoard record
adjpulse	unsigned long	timer offset in secs

TABLE 10

Feature Definition

feature bit 0	0 = 1 line	1 = 4 lines
bit 1	0 = Limited Call Time	1 = Unrestricted Call Time
bit 2	0 = Limited VMail OGM	1 = Unlimited Vmail OGM
bit 3	0 = Limited Directory Entries	1 = Unlimited Dir Entries
bit 4	0 = Webboard Not Disabled	1 = Allowed to Disable
bit 5	0 = Conferencing (audio) Disabled	1 = Conferencing Enabled
bit 6	0 = Conferencing (video) Disabled	1 = Conferencing Enabled
bit 7	0 = Whiteboard Disabled	1 = Whiteboard Enabled
bit 8	0 = Offline voicemail Disabled	1 = Offline voicemail Enabled
bit 9–27	Reserved	
bit 28–30	Type of Phone 0 - Normal webphone 1 - Agent 2 - Business webphone 3 - Gateway 4 - ACD 5 - 7 reserved	
bit 31	1 = Disable all WebPhone feattures	

TABLE 11

Offset	Name	Size	Description
	Reserved		Reserved
+1	SessionID	4	Unique value for duration of this connection
+5	Version	6	WebPhone version and distributor stamp

TABLE 11-continued

Offset	Name	Size	Description
+11	Codec	1	Audio compression algorithm selected
+12	FirstName	10	Given name, middle initial
+22	LastName	25	Surname
+47	Alias	20	Nickname
+67	EmailAddr	90	Caller's electronic mail address
+157	IpAddr	80	Caller's WebPhone's Internet address
+237	Street	50	Street address of user
+287	Apt	20	Apartment or suite number
+307	City	20	City name
+327	State	20	State or province
+347	Country	20	Country name
+367	ZipCode	20	Zip or postal code
+387	Phone	25	Telephone number
+412	Fax	25	Facsimile telepone number
+437	Company	25	Employer or organization name
+487	File Name	25	Name of file
+512	Action Code	25	Action descriptor
+537	File Type	10	File type descriptor
+547	Status	25	Status of WebPhone utility

We claim:

1. 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 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.

2. The computer program product of claim **1** wherein the program code for establishing a point-to-point communication link further comprises:

d.1 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.

3. The computer program product of claim **2** wherein the program code for establishing a point-to-point communication link further comprise:

d.2 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; and

d.3 program code means for receiving a network protocol address of the second process from the server process, when the second process is connected to the computer network.

4. The computer program product of claim **2** wherein the program code for establishing a point-to-point communication link further comprises:

d.2 program code means for transmitting an E-mail message containing a network protocol address from the first process to the server process over the computer network;

d.3 program code means for receiving a second network protocol address from the second process over the computer network.

5. In a computer system having a display and an audio transducer, the computer system capable of executing a first process and communicating with other processes and a server process over a computer network, a method for establishing point-to-point communications with other processes comprising:

A. determining the currently assigned network protocol address of the first process upon connection to the computer network;

B. establishing a communication connection with the server process once the assigned network protocol of the first process is known;

C. forwarding the assigned network protocol address of the first process to the server process upon establishing a communication connection with the server process; and

D. establishing a point-to-point communication with another process over the computer network.

6. The method of claim **5** wherein the program step D comprises:

D.1 transmitting, from the first process to the server process, a query as to whether a second process is connected to the computer network; and

D.2 receiving a network protocol address of the second process from the server process, when the second process is connected to the computer network.

7. The method of claim **5** wherein the program step D comprises:

D.1 transmitting an E-mail message containing a network protocol address from the first process to the server process over the computer network;

D.2 receiving a second network protocol address from a second process over the computer network.

8. 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, the method comprising the steps of:

A. generating a user-interface element representing a first communication line;

B. generating a user interface element representing a first callee process;

C. guerving the server process to determine if the first callee process is accessible; and

D. establishing a point-to-point communication link from the caller process to the first callee process, in response to a user associating the element representing the first callee process with the element representing the first communication line.

9. The method of claim **8** wherein step C further comprises the steps of:

C.1 querying the server process as to the on-line status of the first callee process; and

C.2 receiving a network protocol address of the first callee process over the computer network from the server process.

10. The method of claim 8 further comprising the step of:

E. generating a user-interface element representing a second communication line.

11. The method of claim 8 further comprising the step of:

F. terminating the point-to-point communication from the caller process to the first callee process, in response to the user disassociating the element representing the first callee process from the element representing the first communication line; and

G. establishing a different point-to-point communication from the caller process to the first callee process, in response to the user associating the element representing the first callee process with the element representing the second communication line.

12. The method of claim 8 further comprising the steps of:

E. generating a user interface element representing a second callee process; and

F. establishing a conference point-to-point communication between the caller process and the first and second callee processes, in response to the user associating the element representing the second callee process with the element representing the first communication line.

13. The method of claim 8 further comprising the step of:

G. removing the second callee process from the conference point-to-point communication in response to the user disassociating the element representing the second callee process from the element representing the first communication line.

14. The method of claim 8 further comprising the steps of:

E. generating a user interface element representing a communication line having a temporarily disabled status; and

F. 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.

15. The method of claim 14 wherein the element generated in step E represents a communication line on hold status.

16. The method of claim 15 wherein the element generated in step E represents a communication line on mute status.

17. The method of claim 8 wherein the display further comprises a visual display.

18. The method of claim 17 wherein the user interface is a graphic user interface and the user-interface elements generated in steps A and B are graphic elements.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO :6,009,469

DATED :December 28, 1999

INVENTOR(S) :Shane D. Mattaway, Glenn W. Hutton and Craig B. Strickland

It is certified that errors appear in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

IN THE CLAIMS:

In claim 1, column 41, line 23, after "having a display", please delete "and an audio transducer";

In claim 1, column 41, line 43, after "program code", please delete "means";

In claim 3, column 41, line 60, after "program code", please delete "means";

In claim 4, column 42, line 1, after "program code", please delete "means";

In claim 4, column 42, line 5, after "program code", please delete "means";

In claim 5, column 42, lines 8 and 9, after "having a display", please delete "and an audio transducer";

Signed and Sealed this

Eighth Day of May, 2001

Attest:

Nicholas P. Godici

NICHOLAS P. GODICI

Attesting Officer

Acting Director of the United States Patent and Trademark Office

US006009469C1

(12) EX PARTE REEXAMINATION CERTIFICATE (8207th)

United States Patent
Mattaway et al.

(10) **Number: US 6,009,469 C1**
(45) **Certificate Issued: May 10, 2011**

(54) **GRAPHIC USER INTERFACE FOR INTERNET TELEPHONY APPLICATION**

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(73) Assignee: **Net2Phone, Inc.**, Newark, NJ (US)

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(51) **Int. Cl.**

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H04M 1/65	(2006.01)
H04M 1/66	(2006.01)

(52) **U.S. Cl.** **709/227**
(58) **Field of Classification Search** ..... None
See application file for complete search history.

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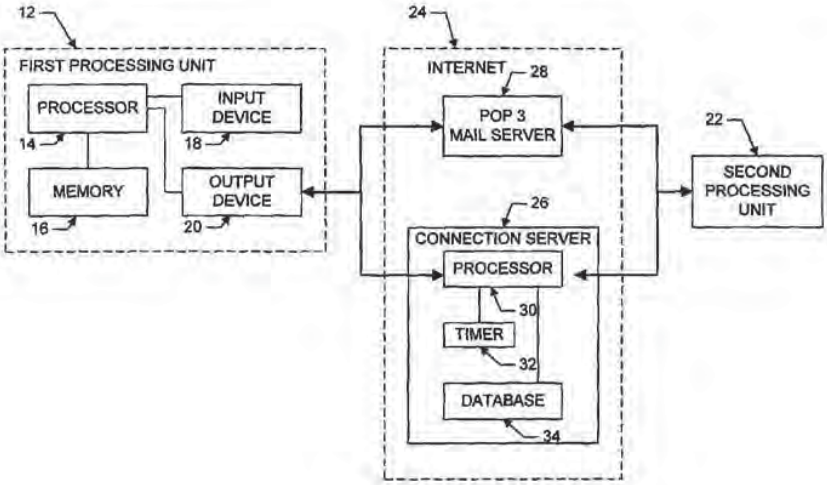
(57) **ABSTRACT**

A communication utility for establishing real-time, point-to-point communications between processes over a computer network includes apparatus for querying a server as to the network protocol address of another client process, and apparatus for directly establishing a communication link with the client process upon receipt of the network protocol address from the server. In one embodiment, the utility includes a sophisticated user interface having features similar to typical telephony hardware but implementing greater flexibility with software.



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EX PARTE REEXAMINATION CERTIFICATE ISSUED UNDER 35 U.S.C. 307

THE PATENT IS HEREBY AMENDED AS INDICATED BELOW.

Matter enclosed in heavy brackets [ ] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in italics indicates additions made to the patent.

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

The patentability of claims **5** and **6** is confirmed.

Claim **8** is cancelled.

Claims **1**, **9**, **14**, **16** and **17** are determined to be patentable as amended.

Claims **2**, **3**, **15** and **18**, dependent on an amended claim, are determined to be patentable.

Claims **4**, **7** and **10-13** were not reexamined.

1. 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, 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, responsive to user input commands, for establishing a point-to-point communications with another process over the computer network.

9. **[**The**]** *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, the* method **[**of claim **8]** *comprising the steps of:*

A. generating a user-interface element representing a first communication line;

B. generating a user interface element representing a first callee process;

C. querying the server process to determine if the first callee process is accessible; and

D. establishing a point-to-point communication link from the caller process to the first callee process, in response to a user associating the element representing the first callee process with the element representing the first communication line, wherein step C further comprises the steps of:

C.1 querying the server process as to the on-line status of the first callee process; and

C.2 receiving a network protocol address of the first callee process over the computer network from the server process.

14. The method of claim **[8]** *9*, further comprising the steps of:

E. generating a user interface element representing a communication line having a temporarily disabled status; and

F. 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.

16. **[**The**]** *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, the* method **[**of claim **15]** *comprising the steps of:*

A. generating a user-interface element representing a first communication line;

B. generating a user interface element representing a first callee process;

C. querying the server process to determine if the first callee process is accessible;

D. establishing a point-to-point communication link from the caller process to the first callee process, in response to a user associating the element representing the first callee process with the element representing the first communication line;

E. generating a user interface element representing a communication line having a temporarily disabled status; and

F. 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 in step E represents a communication line on hold status, and wherein the element generated in step E represents a communication line on mute status.

17. The method of claim **[8]** *9* wherein the display further comprises a visual display.

* * * * *

EXHIBIT F

US006701365B1

(12) **United States Patent**
Hutton et al.

(10) **Patent No.: US 6,701,365 B1**
(45) **Date of Patent: Mar. 2, 2004**

(54) **POINT-TO-POINT INTERNET PROTOCOL**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/345,222**

(22) Filed: **Jun. 30, 1999**

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(58) **Field of Search** 370/338, 524; 709/202, 204, 227, 228, 230, 236, 238, 245

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(57) **ABSTRACT**

A point-to-point Internet protocol exchanges Internet Protocol (IP) addresses between processing units to establish a point-to-point communication link between the processing units through the Internet. A first point-to-point Internet protocol includes the steps of (a) storing in a database a respective IP address of a set of processing units that have an on-line status with respect to the Internet; (b) transmitting a query from a first processing unit to a connection server to determine the on-line status of a second processing unit; and (c) retrieving the IP address of the second unit from the database using the connection server, in response to the determination of a positive on-line status of the second processing unit, for establishing a point-to-point communication link between the first and second processing units through the Internet. A second point-to-point Internet protocol includes the steps of (a) transmitting an E-mail signal, including a first IP address, from a first processing unit; (b) processing the E-mail signal through the Internet to deliver the E-mail signal to a second processing unit; 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.

3 Claims, 6 Drawing Sheets