

**IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION**

FLYPSI, INC. (D/B/A FLYP),

Plaintiff,

vs.

DIALPAD, INC.,

Defendant.

Civil Action No. 6:21-cv-642-ADA

JURY TRIAL DEMANDED

**REDACTED FOR PUBLIC
FILING**

**PLAINTIFF FLYPSI, INC.'S
RESPONSIVE CLAIM CONSTRUCTION BRIEF**

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Pursuant to the Court’s Order Governing Proceedings – Patent Cases (“OGP”) (Dkt. No. 20), and the Court’s Scheduling Order (Dkt. No. 23), Plaintiff Flypsi, Inc. (“Flyp”) hereby responds to Defendant Dialpad, Inc.’s (“Dialpad”) Opening Claim Construction Brief (Dk. No. 24) (“Opening Brief”) and submits its Responsive Claim Construction Brief. Here, the disputed terms of the Asserted Patents do not require construction and should be given their plain-and-ordinary meaning to a person of ordinary skill in the art.

As the Court is familiar with general claim construction standards and related legal precedents, Flyp will refrain from reciting them. Rather, Flyp will focus on the legal precedents specific to the Parties’ claim construction positions as they arise.

I. INTRODUCTION

Dialpad’s claim construction arguments can be summarized into three groups. First, Dialpad requests construction of the term “primary telephone number.” Second, Dialpad requests construction of the term “voice channel.” Third and finally, Dialpad argues that the terms “switch” and “associated with” are indefinite or subject to means-plus-function treatment (and similarly indefinite as a result). But Dialpad’s arguments in support of these positions either ignore axioms of claim construction to re-write the claims or ignore a wealth of evidence (including Dialpad’s own history and internal documents) about the well-understood terms within the art. Each of Dialpad’s arguments should be rejected as inconsistent with both the law and the evidence.

Both “primary telephone number” and “voice channel” are well-understood terms to both a person of ordinary skill and lay members of the jury. The intrinsic record for both does not indicate any attempt by the patentee to act as its own lexicographer or disavow any scope with respect to either term. As such, both terms should be afforded a heavy presumption that they are given their plain-and-ordinary meaning. Dialpad’s arguments utterly fail to rebut this presumption. For “primary telephone number,” Dialpad’s construction attempts to improperly limit the term to

what is expressly described in the patents as a preferred embodiment and also attempts to rewrite the term in contravention to its well-understood meaning in the art. For “voice channel,” Dialpad makes no attempt to argue lexicography or disavowal, and instead merely attempts to rewrite two words into ten, using phrases found nowhere in the patents. Dialpad’s arguments should be rejected, and both of these terms should be given their plain-and-ordinary meaning.

Dialpad’s arguments regarding “switch” and “associated with” fail to carry its burden to prove indefiniteness by clear and convincing evidence. To meet its burden, Dialpad relies on mere attorney argument (supplied in the form of rhetorical questions) and a single piece of evidence (a dictionary from the previous millennium). An updated version of that same dictionary from this decade, other technical dictionaries, Dialpad’s own internal documents, Dialpad’s prior company name (Switch.co), a qualified expert, and the remainder of the intrinsic and extrinsic record all demonstrate that “switch” is a term that is understood with reasonable certainty in the art. In addition, Dialpad offers no explanation why “associated with” is indefinite when used in connection with the term “switch,” but somehow not indefinite when it is used elsewhere in the claims. To the contrary, the evidence demonstrates that “associated with” is a readily understood term.

Dialpad’s mean-plus-function argument fares no better. Because “switch” and “associated with” are terms that are understood with reasonable certainty in the art, they are not nonce terms. Dialpad’s mere attorney argument cannot overcome the wealth of evidence discussed throughout this response, which demonstrates that “switch” refers to a known class of structures in the art. As a result, Dialpad cannot overcome the presumption against mean-plus-function treatment here.

II. BACKGROUND

A. Flyp

Long before the COVID-19 pandemic, the explosion of Internet-connected mobile devices changed the way many, even most, in the United States communicate with their family, their friends, and their work colleagues. Throughout the 2010s and continuing into the 2020s, personal and professional communications coalesced around the smartphone. While some chose to segregate their personal and professional communications with multiple devices, that solution was both financially and physically cumbersome. Rather, a technological need arose to segregate such communications within a single device and to manage multiple numbers in a clean, centralized environment. And within this field, there was a particular need for a device that would maintain caller identification (“caller ID”) and properly identify a call as originating from the secondary phone number of the caller with multiple numbers, rather than a conference line number or a randomly generated number.

Flyp invented a technological solution that fulfills this technological need in a particular, inventive way. Flyp owns a patent portfolio directed to innovations that claim a particular way of setting up and connecting telephone calls, and delivering information related to such telephone calls using an Internet Protocol (IP) or other data channels, while delivering the voice portion of the call in accordance with telecom voice channel delivery standards. As opposed to the standard mobile phone that is connected to a single phone number, Flyp’s patented systems and methods enable a particular way for mobile-phone users to create and own multiple phone numbers on a single mobile device while maintaining the integrity of caller-identification functions. Thus, from a single mobile phone utilizing Flyp’s app (and patented methods), users can add new phone numbers and control various streams of outbound and inbound calls to those numbers. Users can

select the area code of their choice for local calling in the United States and create alternative and dedicated numbers for business, social activities, shopping, dating, and any other aspect of life.

This invention is unlike—and constituted a technological advance over—other methods for using alternative phone numbers. Many of those methods utilized call forwarding or call conferencing solutions—rather than connecting the call at the switch. In these solutions, caller ID was not maintained, and the recipient caller ID would appear to the one receiving the call as a conference line number or randomly generated number—rather than properly identifying the call as originating from the secondary phone number of the caller with multiple numbers. The need for alternative numbers that identified calls as originating from the secondary phone number was a long-felt need and unique technological problem that Flyp’s invention provides a particular way of solving, thereby improving the functionality of the phone beyond the mere advantages of implementing phone technology using computers. This is also a feature that cannot be implemented manually.

This need to segregate communications within a single device and to manage multiple numbers in a centralized environment was reinforced during the sudden and rapid shift to a “work from anywhere” ethos brought on by the COVID-19 pandemic. The pandemic reinforced the essential role that the Internet and our Internet-connected mobile devices occupy in day-to-day work and life. That is particularly true regarding cloud-based telephone service. Indeed, amid the COVID-19 crisis, the global market for cloud telephony service, estimated at \$13.5 billion in the year 2020, is projected to reach a revised size of \$40 billion by 2027, growing at a compound annual growth rate of 16.8% over the period 2020–2027. (See “\$13.5 Billion Worldwide Cloud Telephony Service Industry to 2027 – Impact of COVID-19 on the Market,” Research & Markets, <https://www.globenewswire.com/en/news-release/2020/10/14/2108292/28124/en/13-5-Billion->

Worldwide-Cloud-Telephony-Service-Industry-to-2027-Impact-of-COVID-19-on-the-Market.html).

But for rampant infringement of its patented technology, Flyp would be well positioned to play a role in this growing market. Simply put, Flyp has developed a unique and inventive technology that enables a particular way for a user to gain access to an additional, alternative phone number on his or her mobile device—as opposed to being bound to the single carrier-assigned number on a mobile device.

B. The Asserted Patents

In this case, Flyp asserts U.S. Patent Nos. 9,667,770 (the “’770 Patent”), 10,051,105 (the “’105 Patent”), 10,334,094 (the “’094 Patent”), and 11,012,554 (the “’054 Patent”) (collectively, the “Asserted Patents”). The Asserted Patents are all entitled “Telephone Network System and Method” and issued to inventors Ivan Zhidov, Peter Rinfret, and Sunir Kochhar. The Asserted Patents all share the same specification and all claim priority to a provisional application filed on July 17, 2013. True and correct copies of the Asserted Patents are attached hereto as Exhibit A, B, C, and D, respectively.

At present, Flyp has asserted the following claims from each patent: ’770 Patent, Claims 1–6; ’105 Patent, Claims 1–11; ’094 Patent, Claims 1–4; and ’554 Patent, Claims 1–4 (collectively, the “Asserted Claims”).

As previewed above, the Asserted Claims all set forth methods for providing telephone service using multiple (“secondary”) phone numbers on a single device while maintaining the integrity of caller-identification functions. Broadly, the claims of the ’770 and ’105 Patents address inbound calls to a secondary number, while the claims of the ’094 and ’554 Patents address outbound calls made from the secondary number.

For inbound calls, claim 1 of the '770 Patent is representative for claim construction purposes:

1. A method of providing telephone service, the method comprising:

associating a secondary telephone number with a primary telephone number in at least one computer memory device, the primary telephone number being assigned to a handset;

acquiring first digital information from the handset over at least one data channel, the first digital information indicating primary call processing rules for handling calls directed to the primary telephone number;

storing the primary call processing rules in the at least one computer memory device;

acquiring second digital information from the handset over the at least one data channel, the second digital information indicating secondary call processing rules for handling calls directed to the secondary telephone number;

storing the secondary call processing rules in the at least one computer memory device;

receiving an incoming call over at least one voice channel at a switch, the switch being associated with a bridge telephone number such that calls directed to the bridge telephone number are automatically routed to the switch, the incoming call being directed to a handset-associated telephone number, the handset-associated telephone number being the primary telephone number or the secondary telephone number, and;

based on the primary call processing rules or the secondary call processing rules:

transmitting pre-call information to the handset over the at least one data channel the pre-call information including the bridge telephone number and the handset-associated telephone number, such that the handset is capable of displaying the handset-associated telephone number to a user and, based on user input, accepting the incoming call by connecting with the switch over the at least one voice channel using the bridge telephone number.

For outbound calls, claim 1 of the '554 Patent is representative for claim construction purposes:

1. A method of providing telephone service, comprising:

automatically storing electronic information that indicates an association of a secondary telephone number and a primary telephone number with a mobile device in a computer memory associated with a server;

automatically transmitting information that indicates an access telephone number to the mobile device via a data channel;

automatically associating the telephone access number with a switch associated with the server;

receiving, at the switch associated with the server, an outgoing call from the mobile device to the access telephone number via a second channel;

receiving, at the server, information from the switch indicating the outgoing call is being made to the access telephone number from the primary telephone number; and

receiving, at the switch, information from the server directing the switch to:

(a) connect the outgoing call to a contact telephone number indicated by the mobile device, and

(b) identify a telephone number from which the outgoing call is being made as the secondary telephone number.

C. The Declaration of Dr. Nettles

As required in the Court's Scheduling Order, Flyp properly and timely identified Dr. Scott Nettles as an expert witness on whom Flyp may rely with respect to claim construction and also identified the scope of the topics for which Flyp expected testimony from Dr. Nettles. *See* Flyp's Disclosure of Extrinsic Evidence.¹

¹ A true and correct copy of Flyp's Disclosure of Extrinsic Evidence is attached hereto as Exhibit S. True and correct copies of the Extrinsic Evidence relied upon herein are attached hereto as Exhibits F through R.

Dr. Nettles is qualified to opine on the terms in dispute here based on his industry and academic experience. Such experience includes over 40 years of industry and academic experience as a professor at the University of Texas and various other universities, as a researcher in fields of wireless and mobile networking and in the design and implementation of router, switch, firewall, and wireless node prototypes, as well as being a testifying expert in numerous patent cases.

A true and correct copy of Dr. Nettles Declaration in Support of Flyp’s Claim Construction positions is attached hereto as Exhibit E (“Nettles Decl.”).

D. Level of Ordinary Skill in the Art

A person of ordinary skill in the art (“POSITA”) would have a Bachelor of Science degree in electrical engineering, computer science, computer engineering, and/or a closely related field, and at least two years of work or research in telecommunications, telephone networks, and/or the development of mobile applications related to the same. More work experience could compensate for less education, and vice versa. Nettles Decl. at ¶¶ 18–22.

III. ARGUMENT

A. Primary Telephone Number

Dialpad’s proposed construction, “a telephone number or identifier that is assigned to a handset or a mobile device at activation,” improperly attempts to limit the term to an explicitly preferred embodiment and must be rejected. Instead, the term should be given its plain-and-ordinary meaning to a POSITA.

In essence, Dialpad reads the term “primary” to mean “assigned ... at activation.” The remainder of Dialpad’s construction, “a telephone number or identifier assigned to a handset or mobile device,” does not deviate meaningfully from the common-sense and plain meaning of “telephone number.” As a result, this dispute boils down to two basic questions: (1) is it accurate to construe “primary” to mean “assigned ... at activation,” and (2) is it necessary to further

construe telephone number as “a telephone number or identifier assigned to a handset or mobile device”? In both cases, the answer is resoundingly “no.”

As this Court has repeatedly recognized, “[a]lthough the specification may aid the court in interpreting the meaning of disputed claim language, particular embodiments and examples appearing in the specification will not generally be read into the claims.” *Comark Commc’ns, Inc. v. Harris Corp.*, 156 F.3d 1182, 1187 (Fed. Cir. 1998). Accordingly, it is well established that “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.” *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 913 (Fed. Cir. 2004).²

Here, the sole evidence relied on by Dialpad for its assertion that a primary telephone number is assigned at activation is found in the Detailed Description of Embodiments of the Invention. There, the patentee explicitly limits its statement to a preferred embodiment stating, “the primary telephone number, **preferably, may** be a SIM number or ESN which is assigned to the handset 340 at the time of activation.” ’770 Patent at 5:2-4.³ The patentee did not present any indication, much less a clear indication, that it intended the claims to be limited to this embodiment. Rather, the patentee explicitly indicated otherwise—that “the primary telephone number **preferably, may** be” assigned at the time of activation. Dialpad has not even attempted to argue

² See *Ancora Techs., Inc. v. LG Electronics Inc.*, Case No. 1:20-cv-34, 2020 WL 4825716, at *2 (W.D. Tex. Aug. 19, 2020) (Albright, J.) (citing *Comark* and *Liebel-Flarsheim* for these established tenants of claim construction); *CloudofChange, LLC v. NCR Corp.*, Case No. 6:19-cv-523, 2020 WL 4004810, at *2 (W.D. Tex. July 15, 2020) (Albright, J.) (same); and *Digital Retail Apps, Inc. v. H-E-B, LP*, Case No. 6:19-cv-167, 2020 WL 376664, at *2 (Jan. 23, 2020) (Albright, J.) (same).

³ See also ’105 Patent at 5:2-4, ’094 Patent at 5:11-13, and ’554 Patent at 5:13-15.

that such a statement evinces a clear indication of an intent to limit the claims, as any such argument would strain credulity and border on objective frivolousness.

Indeed, the patentee’s expression that assignment at time of activation was merely a preferred embodiment is entirely consistent with the knowledge of a POSITA and common sense. Quite often, a primary telephone number is assigned at the time of a phone’s activation. All major carriers, however, allow a user to change his or her primary phone number at some point after activation. Nettles Decl. at ¶ 30. While such a change may have required an in-store visit at the time of filing in 2014, today many carriers allow a user to change his or her primary telephone number online. *Id.* In such a case, it would be impermissible to limit the claims only to the number assigned at the time of activation.

Thus, “primary” should not be construed to mean “assigned ... at activation.” The remaining question is then whether the remainder of Dialpad’s proposed construction is necessary. It is not.

Both a POSITA and the ultimate fact finder in this case would have a clear understanding of the plain-and-ordinary meaning of “telephone number.” Once the timing portion of Dialpad’s proposed construction is rejected, the remainder of Dialpad’s construction is entirely unhelpful. As this Court has recognized in the past, where “there is nothing about the claim term that is confusing ... the term requires no construction.” *Pisony v. Commando Constr., Inc.*, Case No. W-17-cv-55, 2019 WL 928406, at *5 (W.D. Tex. Jan. 23, 2019) (Albright, J.). Here, there is nothing confusing about the term “primary telephone number.” The remainder of Dialpad’s construction—a telephone number or identifier assigned to a handset or mobile device—does nothing to clarify the meaning of the term. Expanding an understandable term from three words to 12 words does nothing to resolve disputed meaning or technical scope and is instead “an obligatory exercise in

redundancy” that should be rejected. *Id.* (citing *U.S. Surgical Corp. v. Ethicon, Inc.*, 103 F.3d 1554, 1568 (Fed. Cir. 1997)).

Finally, Dialpad’s assertion that without its construction “it would be difficult or impossible to distinguish a primary telephone number from a secondary telephone number” is without merit. This assertion is unsupported by any evidence whatsoever. Moreover, this assertion is undercut by Dialpad’s acquiescence that “secondary telephone number” needs no construction. If “secondary telephone number” needs no construction, then “primary telephone number” likewise requires no construction. Dialpad similarly does not request construction for any other telephone number within the claims—like “bridge telephone number,” “handset-associated telephone number,” or “originating telephone number”—which suggests a similar conclusion. No construction is necessary for any of the telephone number terms within the claim.

For these reasons, Dialpad’s proposed construction should be rejected. No construction is necessary and the term “primary telephone number” should be given its plain-and-ordinary meaning.

B. Voice Channel

Dialpad’s proposed construction for voice channel, “a communications path used for voice information and voice calls,” should also be rejected and the term should be given its plain-and-ordinary meaning to a POSITA.

As this Court has also repeatedly recognized, “[t]he general rule is that claim terms are generally given their plain-and-ordinary meaning.” *Ancora*, 2020 WL 4825716, at *2 (citing *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005)).⁴ Moreover, both this Court and the

⁴ See also *CloudfChange*, 2020 WL 4004810, at *2 (same); and *Digital Retail Apps*, Case No. 6:19-cv-167, 2020 WL 376664, at *2 (same).

Federal Circuit apply a “heavy presumption” in favor of construing terms according to their plain-and-ordinary meaning. *eCeipt LLC v. Victoria Secret Stores, LLC*, Case No. 6:20-cv-747, 2021 WL 4037599, at *1 (W.D. Tex. Sept. 3, 2021) (Albright, J.) (quoting *Azure Networks, LLC v. CSR PLC*, 771 F.3d 1336, 1347 (Fed. Cir. 2014) (“There is a heavy presumption that claim terms carry their accustomed meaning in the relevant community at the relevant time.”)).

The “‘only two exceptions to [the] general rule’ that claim terms are construed according to their plain-and-ordinary meaning are when the patentee (1) acts as his/her own lexicographer or (2) disavows the full scope of the claim term either in the specification or during prosecution.” *Ancora*, 2020 WL 4825716, at *2 (citing *Thorner v. Sony Computer Entm’t Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012)). To act as its own lexicographer, “the patentee must ‘clearly set forth a definition of the disputed claim term,’ and ‘clearly express an intent to define the term.’” *Id.* To disavow the full scope of a term, “the patentee’s statements in the specification or prosecution history must represent ‘a clear disavowal of claim scope.’” *Id.*⁵

Neither of these two exceptions apply here. Indeed, Dialpad has not even attempted to argue that the patentee acted as its own lexicographer to define “voice channel,” or attempted to argue disavowal. Because no argument or evidence has been presented satisfying either exception, the heavy presumption in favor of the general rule should govern here.

Here, rather than attempting to argue lexicography or disavowal, Dialpad misleadingly quotes one clause from the specification while failing to cite the full sentence and context in which the clause arises. See Opening Brief at 5 (stating “The Asserted Patent specifications provide that

⁵ See also *CloudfChange*, 2020 WL 4004810, at *2 (recognizing same two limited exceptions to general rule); *Digital Retail Apps*, Case No. 6:19-cv-167, 2020 WL 376664, at *2 (same); and *eCeipt*, 2021 WL 4037599, at *1 (same).

‘communications, when used to carry voice information, are referred to herein as being conducted over a “voice channel.”’). In full, that sentence from the specification reads as follows:

Such CDMA, GSM or like governed communications, when used to carry voice information, are referred to herein as being conducted over a “voice channel.”

’770 Patent at 4:43-46.⁶ A POSITA would understand that CDMA, GSM and like governed standards (like LTE and the more recent 5G) can carry data and text information in addition to voice. Nettles Decl. at ¶¶ 36–37. The specification makes clear that such channels are considered “voice channels” when used to carry voice (as opposed to other types of information). But such channels are not limited to voice, and the term “voice channel” is not limited to those channels that only carry voice, as Dialpad’s proposed construction could be read to suggest. Thus, because neither of the two exceptions to the general rule apply here, the term should be given its plain-and-ordinary meaning.

Moreover, nothing associated with the term “voice channel” is confusing to a POSITA or a member of the jury. Where “there is nothing about the claim term that is confusing ... the term requires no construction.” *Pisony*, 2019 WL 928406, at *5. As with the telephone number terms above, Dialpad has not taken the position that the other channel term in the claims (“data channel”) requires construction. If “data channel” requires no construction, then “voice channel” similarly requires no construction. Both terms are readily understandable to a POSITA and the members of the jury.

Finally, Dialpad’s attempt to transform a readily understood two-word term into a merely more-verbose 10-word construction does nothing to resolve any disputed meaning or technical scope. Dialpad’s construction is instead “an obligatory exercise in redundancy” that this Court and

⁶ See also ’105 Patent at 4:43-46, ’094 Patent at 4:52-55, and ’554 Patent at 4:52-55.

the Federal Circuit have warned against. *Id.* (citing *U.S. Surgical Corp. v. Ethicon, Inc.*, 103 F.3d 1554, 1568 (Fed. Cir. 1997)). Dialpad’s attempt to rewrite the word “channel” to the construction “a communication path” is completely unsupported by any evidence (intrinsic or extrinsic). The phrase “communication path” appears nowhere in the specification or claims. Such an unsupported rewrite of the claim language is improper. *K-2 Corp. v. Salomon S.A.*, 191 F.3d 1356, 1364 (Fed. Cir. 1999) (“Courts do not rewrite claims; instead, we give effect to the terms chosen by the patentee.”); *Alexam, Inc. v. Best Buy Co.*, Case No. 2:10-cv-93, 2012 WL 1188406, at *18 (E.D. Tex. Apr. 9, 2012) (Craven, M.J.) (“The purpose of claim construction is to clarify ambiguities, not to simply rewrite the claims using different words.”). Dialpad’s attempt to expand “voice” into both “voice information and voice calls” is the epitome of unnecessary redundancy, and should be similarly rejected.

For these reasons, Dialpad’s proposed construction should be rejected. No construction is necessary and the term “voice channel” should be given its plain-and-ordinary meaning.

C. Switch and Associated With

The Court should reject Dialpad’s contention that the well-known and easily understood terms “switch” and “associated with” are indefinite, and it should instead give these terms their plain-and-ordinary meanings to a POSITA. Dialpad advances two (incorrect) theories of indefiniteness: (1) a POSITA would not understand with reasonable certainty what the terms “switch” and “associated with” mean within the context of the claims; and (2) the well-known industry term “switch” is subject to means-plus-function treatment and is indefinite because it lacks sufficient structure. As explained below, both theories are wrong.

1. The terms “switch” and “associated with” are simple terms that a POSITA would have understood with reasonable certainty.

Neither “switch” nor “associated with” are indefinite, and Dialpad has not met the high burden of showing otherwise. Definiteness does not demand absolute precision—claims are indefinite only if “read in light of the specification delineating the patent, and the prosecution history, [they] fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention.” *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901 (2014). As it challenges a patent’s validity, a challenger must show indefiniteness by clear and convincing evidence. *Sonix Tech. Co., Ltd. v. Publ’ns Int’l, Ltd.*, 844 F.3d 1370, 1377 (Fed. Cir. 2017).

Conclusory assertions of indefiniteness, however, cannot meet the clear-and-convincing-evidence burden. *See, e.g., Whirlpool Corp. v. Ozcan*, No. 2:15-CV-2103-JRG, 2016 WL 7474517, at *3 (E.D. Tex. Dec. 29, 2016) (finding defendant “failed to meet the high burden necessary to establish that the relevant claims are indefinite” where “[i]nstead of submitting evidence, such as an expert declaration, to demonstrate the understanding of a person of ordinary skill in the art, [defendant] relie[d] entirely on attorney argument based on the patent’s intrinsic evidence”) (Gilstrap, J.). Evidence that claim terms are sufficiently definite may include disclosures in the specification, prior-art patents and publications, and expert testimony. *See Mylan Institutional LLC v. Aurobindo Pharma Ltd.*, 857 F.3d 858, 871 (Fed. Cir. 2017).

a. The term “switch” is a well-known term in the art and is accordingly sufficiently definite.

Switches have been known and understood by POSITAs since virtually the dawn of telecommunications. This is evident in Dialpad’s own engineering documents from when the company was known (rather ironically) as Switch.co. Ex. F at DAP000001341-49; Ex. G at FLYP0004318 (“Switch.co Renames as Dialpad”). Switches have progressed over time from human-operated switchboards at early exchanges (Ex. F at DAP000001342-43), to mechanical

switches that eliminated the need for human operators (*id.* at DAP000001344), to packet-switched network switches (*id.* at DAP000001347), and on to cloud-based software switches (*id.* at DAP000001349-350), Ex. H at DAP000001338 ([REDACTED]); Ex. I at FLYP0004306 (“FreeSWITCH is a Software Defined Telecom Stack enabling the digital transformation from proprietary telecom switches to a versatile software implementation that runs on any commodity hardware.”).

Throughout this evolution, it has been imperative that POSITAs understand what switches are and how they are associated with other elements in a telecommunications network. Nettles Decl. at ¶¶ 39–48. The term “switch” is therefore usually defined in industry dictionaries. *See, e.g.*, Ex. J at FLYP0004300 (defining “switch” as “in telecommunications and networking, a device for establishing connections between one location and another, doing the work of a telephone operator”); Ex. K at FLYP0004317 (defining “switch”); Ex. L at FLYP0004340-41 (defining “switch”); Ex. M at FLYP0004292 (defining “telco switch”); Ex. N at FLYP0004295 (defining “telephone switch”); Ex. Ex. O at FLYP0004336 (“Switches flexibly connect transmitters and receivers across networks of interconnected links, thereby allowing network resources to be shared by large numbers of end users. ... There are a number of types of switches.”). Switches are also described at length in prior-art publications. *See, e.g.*, Ex. P (describing time-division digital switching systems); Ex. Q at 0042 (describing call routing as employing “any number of network elements including routers, switches, hubs, etc.”); Ex. R at 0085 (“In operation 386, the server or switch passes the outbound call through the desired configuration parameters.”).

The specification uses the term “switch” consistent with its use in the art. It describes the element 110 (outlined in red) of Figure 1 as a “telecommunications switch”:

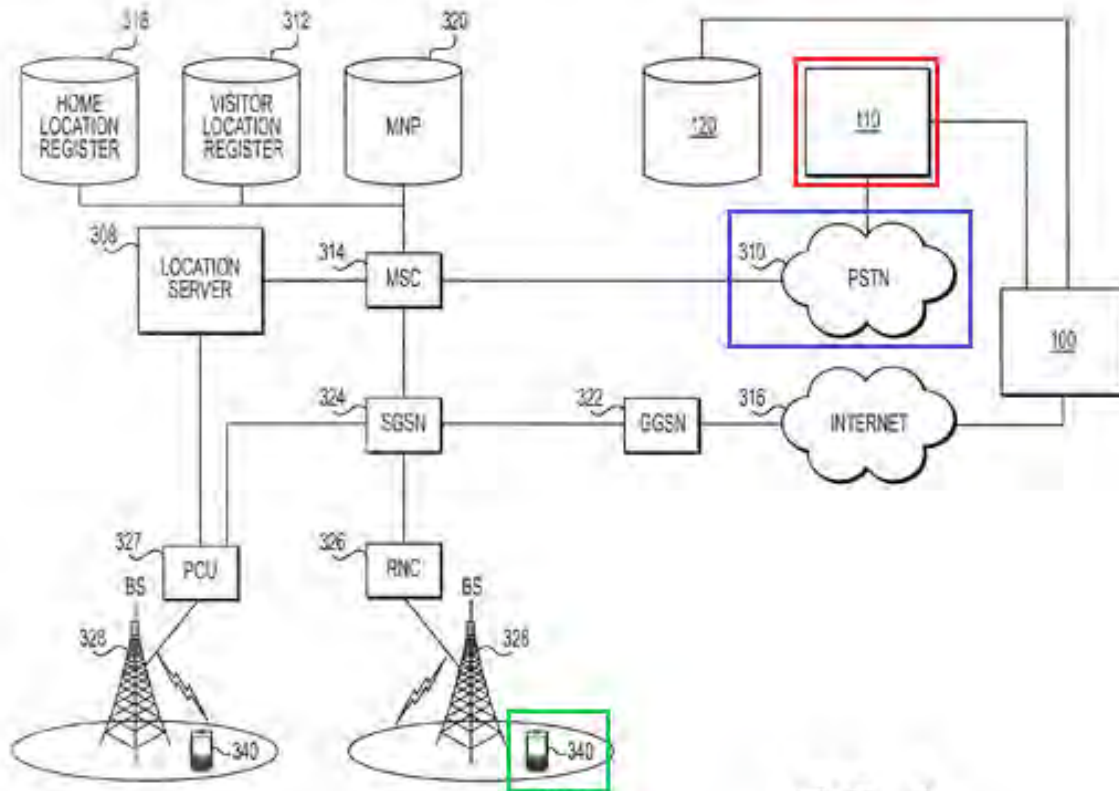


FIG. 1

'770 Patent at Fig. 1, 4:13-18. As the technical dictionaries and prior-art publications would suggest, in this embodiment, Switch 110 facilitates communications between a communications network, PSTN 310 (outlined in blue), and a receiver, handset 340 (outlined in green). *Id.* at 4:13-25. In other words, Switch 110 from Figure 1 is one of the many types of switches known in the art that replace the switchboard operator in routing calls between transmitters and receivers.

This is likewise consistent with the use of “switch” in the claims. Claim 1 of the '770 Patent, which is representative for claim-construction purposes, describes “receiving an incoming call over at least one voice channel at a switch, the switch being associated with a bridge telephone

number such that calls directed to the bridge telephone number are automatically routed to the switch,” and “accepting the incoming call by connecting with the switch over the at least one voice channel using the bridge telephone number.” In other words, the claims describe the switch in the same way as the extrinsic evidence and the specification: as an element in the communications networks that facilitates connections between transmitters and receivers.

Claim terms like “switch” that are ubiquitous and well-understood in the art should be given their plain-and-ordinary meanings. *See, e.g., CludofChange*, 2020 WL 4004810, at *1 (citing *Phillips*, 415 F.3d at 1312). Exceptions to this rule arise when patentees act as their own lexicographer or disavow the full scope of a claim term in the specification or during prosecution. *See id.* (citing *Thorner*, 669 F.3d at 1365). Neither exception is applicable here. There is no express definition of “switch” in the intrinsic record, and the applicant never made any narrowing statements about the meaning of the term during prosecution of the patents.

Dialpad has made no arguments otherwise. Instead, Dialpad has argued or implied through vague rhetorical questions that the term switch is indefinite because it is too broad because it might encompass various types of switches (e.g., mechanical switches or software switches). Opening Brief at 10–11 (complaining “switch” might encompass mechanical switches or software-based switches on network servers). Yet despite having the burden of persuasion by clear and convincing evidence, Dialpad provides no evidence beyond bare attorney argument that a POSITA would not have understood the proper scope of the term with reasonable certainty. *But see Whirlpool Corp.*, 2016 WL 7474517, at *3 (finding attorney argument alone “failed to meet the high burden necessary to establish that the relevant claims are indefinite”). This attorney argument bases its narrow understanding of “switch” as a mechanical switch on a single definition in Newton’s Telecom Dictionary from 1999. Opening Brief at 7. Setting aside that this single definition from

the previous millennium is only further evidence that “switch” is a long-known term in the art, there are many other definitions of “switch” found in industry dictionaries from the intervening two decades that together provide a broader understanding of the term. *See, e.g.*, Ex. J at FLYP0004300; Ex. K at FLYP0004317; Ex. L at FLYP0004340-41; Ex. M; Ex. N; and Ex. O. And in any event, Dialpad’s underlying premise is flawed: the fact that “switch” may describe a broad category of well-known structures in the art, including mechanical switches and software switches, does not mean it is indefinite. This is so because “the inference of indefiniteness simply from the [broad] scope finding is legally incorrect: ‘breadth is not indefiniteness.’” *See, e.g., BASF Corp. v. Johnson Matthey Inc.*, 875 F.3d 1360, 1367 (Fed. Cir. 2017).

Hence, as the evidence shows, a POSITA would understand the term “switch” with reasonable certainty, and as Dialpad has failed to identify any express definition or disavowal of claim scope in the intrinsic record, the Court should find the term “switch” is not indefinite and should construe it as having its full scope in accord with its plain-and-ordinary meaning.

b. A POSITA would understand what “associated with” means.

Given a POSITA’s background understanding of “switch” as described above, Dialpad’s argument that a POSITA would not understand with reasonable certainty how a switch may be “associated with” other elements on a telecommunications network is meritless.

First, Dialpad complains that “[t]here is a questions [sic] of where within the telephone service the associates [sic] are made, what are the associations, and how are they maintained.” Opening Brief at 13. But as with “switch,” Dialpad provides no evidence that a POSITA would be unable to understand the claim terms with reasonable certainty, and this attorney argument alone is not enough to meet Dialpad’s high burden of showing indefiniteness by clear and convincing evidence. *See Whirlpool Corp*, 2016 WL 7474517, at *3. Indeed, Dialpad makes no effort to show that these questions even relate to the claim language, and Dialpad instead appears to be asking

for additional limitations on the claims that are not recited in the claims themselves (e.g., there is no indication that any asserted claim contains language limiting how a particular association is “maintained,” so Dialpad’s question is not relevant). And as Dr. Nettles explains, a POSITA would understand the use of “associated with” in the claims based on the claim language, the description in the specification, and a POSITA’s background knowledge of switching technology. Nettles Decl. at ¶ 52. Moreover, “associated with” is a common phrase that any juror can understand and apply to resolve a factual dispute. *See, e.g., Quest Diagnostics Invs., LLC, v. Lab. Corp. of Am. Holdings*, Case No. 18-1436, 2020 WL 210799, at *5 (D. Del. Jan 14, 2020) (finding “common words with common meaning” not indefinite). Claim construction (or definiteness) need not eliminate all potential factual disputes centered on terms with common meanings. *See id.*

Second, Dialpad offers no explanation why “associated with” is somehow indefinite when used in connection with the term “switch” but not in any other instance where it is used in the claims. For example, claim 1 of each of the ’105 Patent, the ’094 Patent, and the ’554 Patent recites “automatically storing electronic information that indicates an association of a secondary telephone number and a primary telephone number with a [telephone handset/mobile device] in a computer memory **associated with** a server.” Dialpad does not challenge this use of “associated with,” confirming that the phrase “associated with” has an understandable plain-and-ordinary-meaning that Dialpad concedes does not require construction. And the law is clear that the same term used multiple times in the same claim should be given the same construction. *See Digital Biometrics, Inc. v. Identix, Inc.*, 149 F.3d 1335, 1345, 47 U.S.P.Q.2d 1418 (Fed. Cir. 1998) (“the same word appearing in the same claim should be interpreted consistently”). Thus, Dialpad has conceded that the term “associated with” is not indefinite and does not require construction in the asserted claims.

Third, Dialpad complains that “the patent specification includes many more elements than a switch and server for call routing.” Opening Brief at 10. Dialpad points to other potential elements described in certain embodiments that could have been limitations in the asserted claims, like a PSTN, a mobile network, or a mobile switching center. *Id.* However, Dialpad provides no authority for its proposition that patent claims must include every potential limitation from the preferred embodiments. To the contrary, it is improper to require the claims to incorporate every limitation from preferred embodiments. *Thorner*, 669 F.3d at 1366 (“We do not read limitations from the specification into claims; we do not redefine words. Only the patentee can do that.”).

Therefore, given the evidence that a POSITA would understand with reasonable certainty what it means for a switch to be “associated with” other elements on a telecommunications network, the Court should find the term sufficiently definite and give the simple phrase “associated with” its plain-and-ordinary meaning.

2. The terms “switch” and “associated with” are not indefinite means-plus-function terms.

Dialpad’s contention that the term “switch” is indefinite as a means-plus-function term that lacks sufficient structure is wrong because it is not a means-plus-function term and because, in any event, a POSITA would understand the term to denote sufficiently definite structure. When, as here, “‘means’ or ‘step for’ is not present within the claim” this “creates a rebuttable presumption that § 112 ¶ 6 does not apply.” *Ancora Techs., Inc. v. LG Elecs. Inc.*, No. 1-20-CV-00034-ADA, 2020 WL 4825716, at *18 (W.D. Tex. Aug. 19, 2020) (Albright, J.) (citing *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1348 (Fed. Cir. 2015)). Overcoming that presumption requires the party asserting indefiniteness to demonstrate that the term “fails to ‘recite sufficiently definite structure’ or else recites ‘function without reciting sufficient structure for performing that function.’” *Id.* As explained below, Dialpad can demonstrate neither.

a. Given that “switch” is a well-known term in the art, it is not a nonce term defined by its function.

As explained at length above, the term “switch” is well-known in the art and is described at length in prior-art publications and technical dictionaries. The presence of the term in publications from the art, including definitions in technical dictionaries, may show that a disputed term connotes sufficient structure. *See, e.g., Barkan Wireless IP Holdings, L.P. v. Samsung Elecs. Co., Ltd.*, 2:18-CV-28-JRG, 2019 WL 497902, at *23 (E.D. Tex. Feb. 7, 2019) (finding this approach “consistent with principles articulated by the Federal Circuit”). This is no less true when a known structure is named in the art according to its function, like a “switch.” It does not matter if a structure “takes its name from the function it performs” as long as that name “has a reasonably well-understood meaning to [POSITAs].” *Leupold & Stevens, Inc. v. Lightforce USA, Inc.*, No. 3:16-CV-01570-HZ, 2018 WL 648362, at *11 (D. Or. Jan. 31, 2018) (“actuator”).⁷

As explained more fully in Section III.C.1.a, *supra*, a POSITA would understand with reasonable certainty what “switch” means. This is clear from the technical dictionaries, prior-art publications, and the testimony of Dr. Nettles cited above. The Eastern District of Texas was presented with similar circumstances in considering whether the term “controller” should be treated as a means-plus-function term in *Barkan Wireless*. 2019 WL 497902, at *22. On the one hand, the proponent “identified no authority for the proposition that ‘controller’ is a ‘nonce’ term” and “submitted no persuasive evidence that the term ‘controller’ fails to connote structure in the relevant art.” *Id.* On the other hand, the patentee “submitted technical dictionary definitions of ‘controller,’ thereby reinforcing that the term ‘controller’ refers to a known class of structures.”

⁷ *See also, e.g., Delta T LLC v. MacroAir Techs., Inc.*, No. 20-728-GW-JPRX, 2021 WL 3721455, at *22 (C.D. Cal. Mar. 29, 2021) (“motor controller”); *J & M Mfg. Co., Inc. v. Unverferth Mfg. Co., Inc.*, 1:12-CV-931, 2014 WL 6684714, at *10 (S.D. Ohio Nov. 25, 2014) (“hinge assembly”).

Id. at 22–23. Based on this record, the *Barkan Wireless* court determined “that [the proponents] have failed to rebut the presumption against means-plus-function treatment.” *Id.* at 23.

This situation is similar and should be resolved in the same way. On the one hand, Dialpad provides no authority that suggests “switch” is a nonce term that should be given means-plus-function treatment. It identifies no evidence, beyond bare attorney argument, that suggests the term “switch” does not connote structure in the relevant art. On the other hand, Flyp identifies technical dictionary definitions and prior-art publications that show the term “switch” refers to a known class of structures in the art. *See* Section III.C.1.a, *supra*. And Flyp has further supplied testimony from Dr. Nettles confirming that a POSITA would have understood the term “switch” to connote structure. Nettles Decl. at ¶¶ 39–51. The Court should accordingly decline to apply means-plus-function construction to this term and instead should apply its plain-and-ordinary meaning.

b. A POSITA would have understood “switch” as a sufficiently definite structure that can be “associated with” other elements.

That the claims describe a “switch” as being “associated with” other elements on a telecommunications network does not imply a lack of structure, as Dialpad contends. Rather, as Dr. Nettles explains, the claims use “switch” consistent with its plain-and-ordinary meaning as a class of structures well known in the art. Nettles Decl. at ¶¶ 39–48. And in typical telecommunications networks, those structures are ordinarily associated with other elements on the network, including bridges, servers, and telephone numbers. *Id.* at ¶ 48.

Dialpad contends this is not enough, because “the switch is not specified to be part of the PSTN or wireless network, nor is it specified to not be part of the PSTN or wireless network.” Opening Brief at 7–8. But Dialpad provides no evidence or authority to suggest that a POSITA would not understand the location in the switch relative to the elements it is associated with for any given implementation. Nor does Dialpad provide any authority to suggest that the meaning of

“switch” is indefinite unless it is narrowed to being in one or other of the PSTN or the wireless network. *But see BASF Corp.*, 875 F.3d at 1367 (“breadth is not indefiniteness”).

The term “associated with” accordingly does not render “switch” a means-plus-function term, nor does it render the claims indefinite. The Court should therefore decline to treat “switch” as a means-plus-function term and should instead apply its plain-and-ordinary meaning.

IV. CONCLUSION

For the reasons above, Defendant’s claim construction positions should be rejected. The terms of the Asserted Patents do not require construction and should be given their plain-and-ordinary meaning to a person of ordinary skill in the art.

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Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing document was filed electronically in compliance with Local Rule CV-5. Therefore, this document was served on all counsel who are deemed to have consented to electronic service. Administrative Policies and Procedures for Electronic Filing in Civil and Criminal Cases, Western District of Texas, Section 14.

/s/ Michael A. Bittner
Michael A. Bittner

Exhibit A



US009667770B2

(12) **United States Patent**
Zhidov et al.

(10) **Patent No.:** **US 9,667,770 B2**

(45) **Date of Patent:** **May 30, 2017**

(54) **TELEPHONE NETWORK SYSTEM AND METHOD**

H04W 76/02; H04M 1/72547; H04M 3/42042; H04M 3/42272; H04M 3/436; H04M 3/565; H04M 2203/5054; H04L 65/1069

(71) Applicant: **Flypsi, Inc.**, Denton, TX (US)

See application file for complete search history.

(72) Inventors: **Ivan Zhidov**, Chickasa, OK (US);
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Sunir Kochhar, Oro Valley, AZ (US)

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(73) Assignee: **Flypsi, Inc.**, Denton, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 82 days.

(21) Appl. No.: **14/307,052**

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(65) **Prior Publication Data**

US 2015/0024718 A1 Jan. 22, 2015

(Continued)

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Office Action for Canadian Patent Application No. 2918352 mailed Feb. 11, 2016 (5 pages).

(63) Continuation-in-part of application No. 13/944,853, filed on Jul. 17, 2013.

(Continued)

(51) **Int. Cl.**

H04M 1/725 (2006.01)

H04M 3/42 (2006.01)

H04M 3/436 (2006.01)

H04W 76/02 (2009.01)

H04L 29/06 (2006.01)

H04M 3/56 (2006.01)

Primary Examiner — Nam Huynh

(52) **U.S. Cl.**

CPC ... **H04M 1/72547** (2013.01); **H04M 3/42042** (2013.01); **H04M 3/42272** (2013.01); **H04L 65/1069** (2013.01); **H04M 3/436** (2013.01); **H04M 3/565** (2013.01); **H04M 2203/5054** (2013.01); **H04W 76/02** (2013.01)

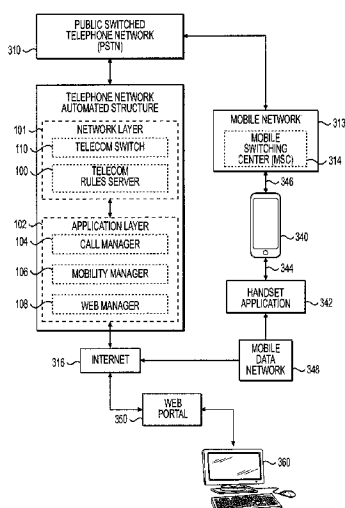
(57) **ABSTRACT**

Systems for and methods of delivering telephone calls using the combination of a data channel and a voice channel are disclosed. A data channel connection with the telephone handset may provide pre-call information used to set up incoming and outgoing calls which are ultimately connected using a voice channel. Use of the pre-call information may permit the same handset to be associated with multiple secondary telephone numbers from which calls appear to have been made and to which calls appear to have been placed.

(58) **Field of Classification Search**

CPC H04W 4/16; H04W 4/00; H04W 4/02;

6 Claims, 6 Drawing Sheets



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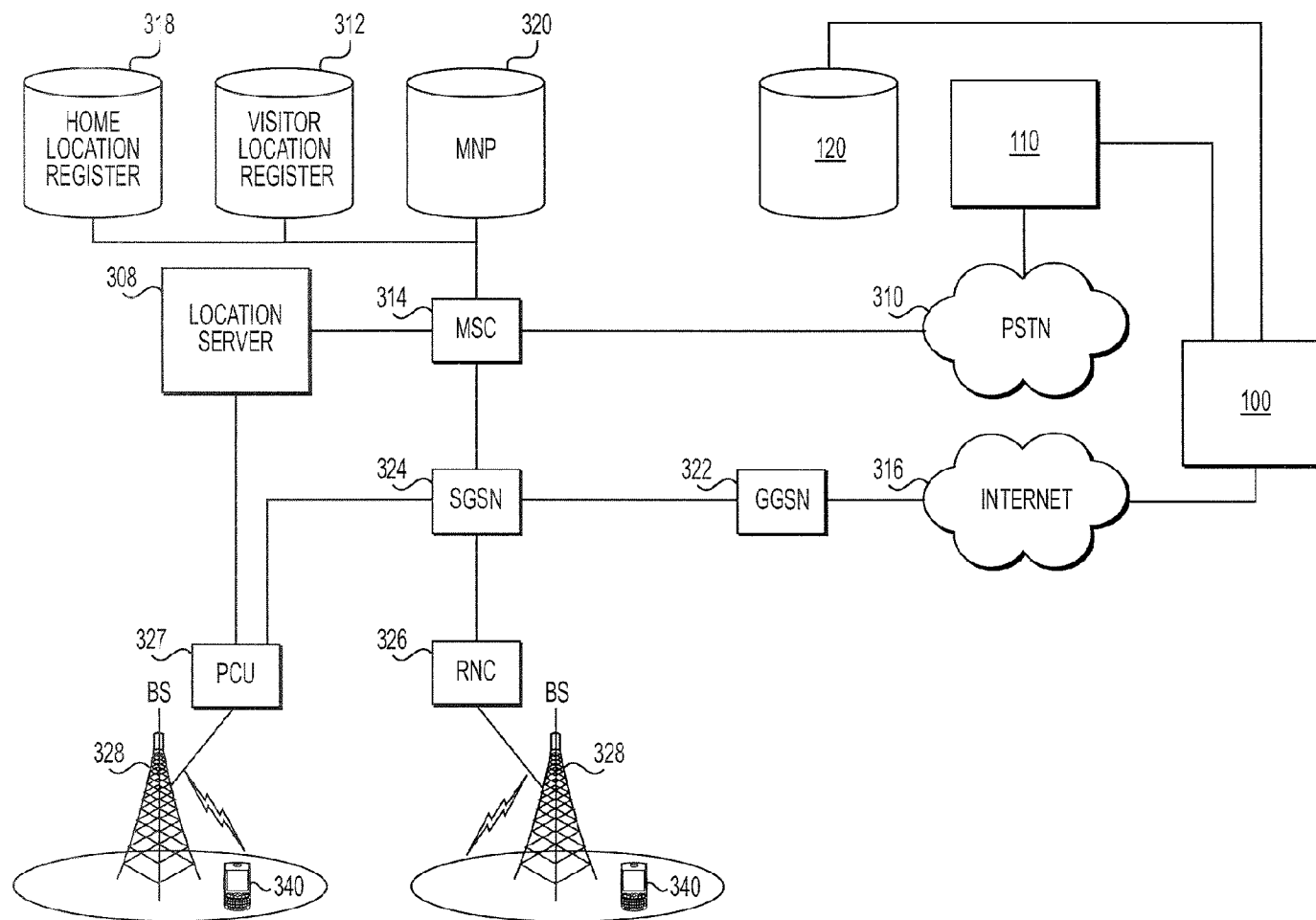
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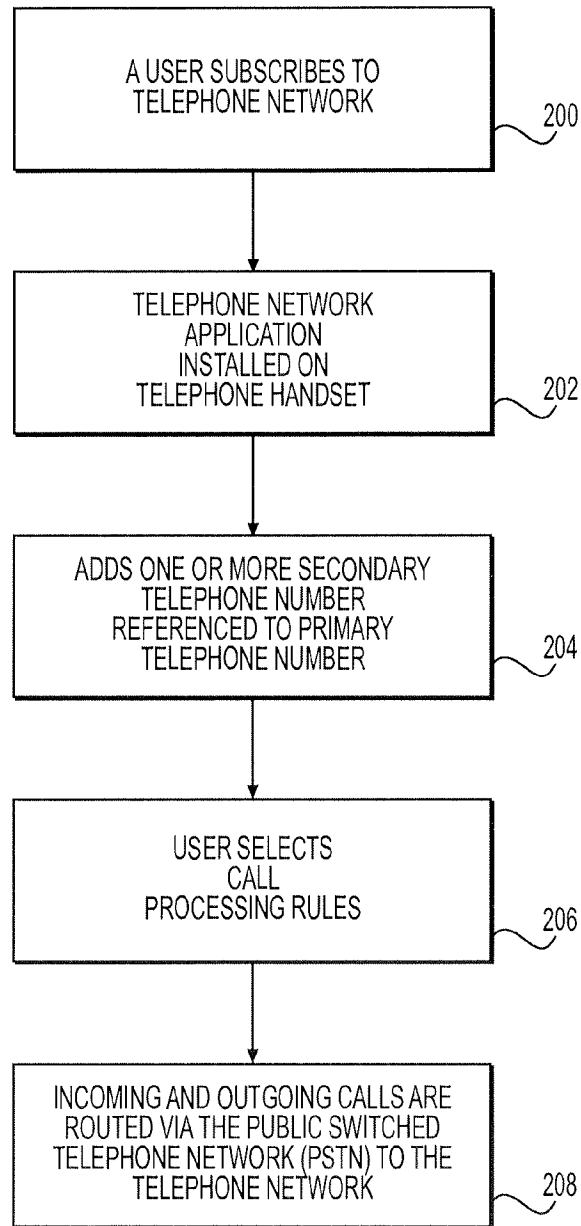
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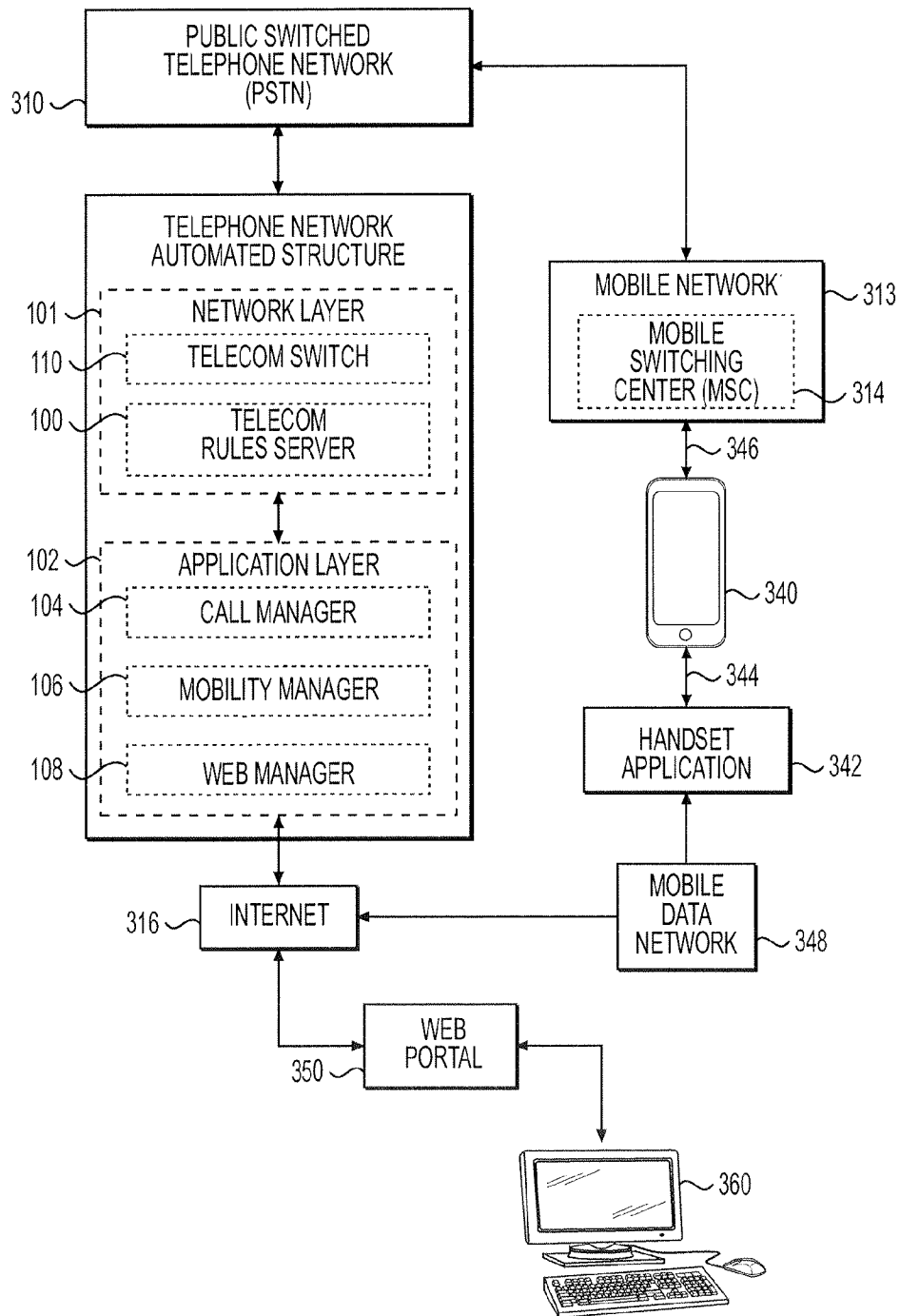
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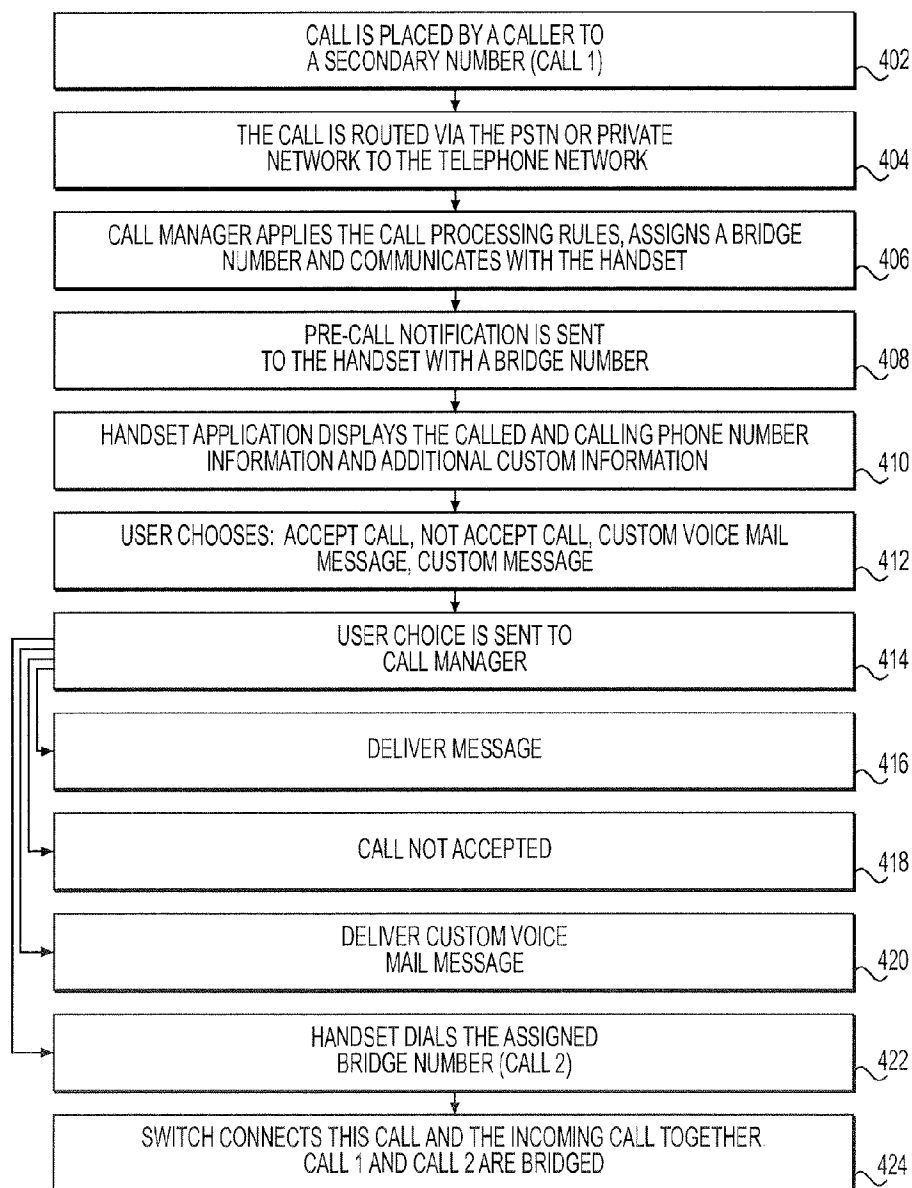
**FIG. 1**

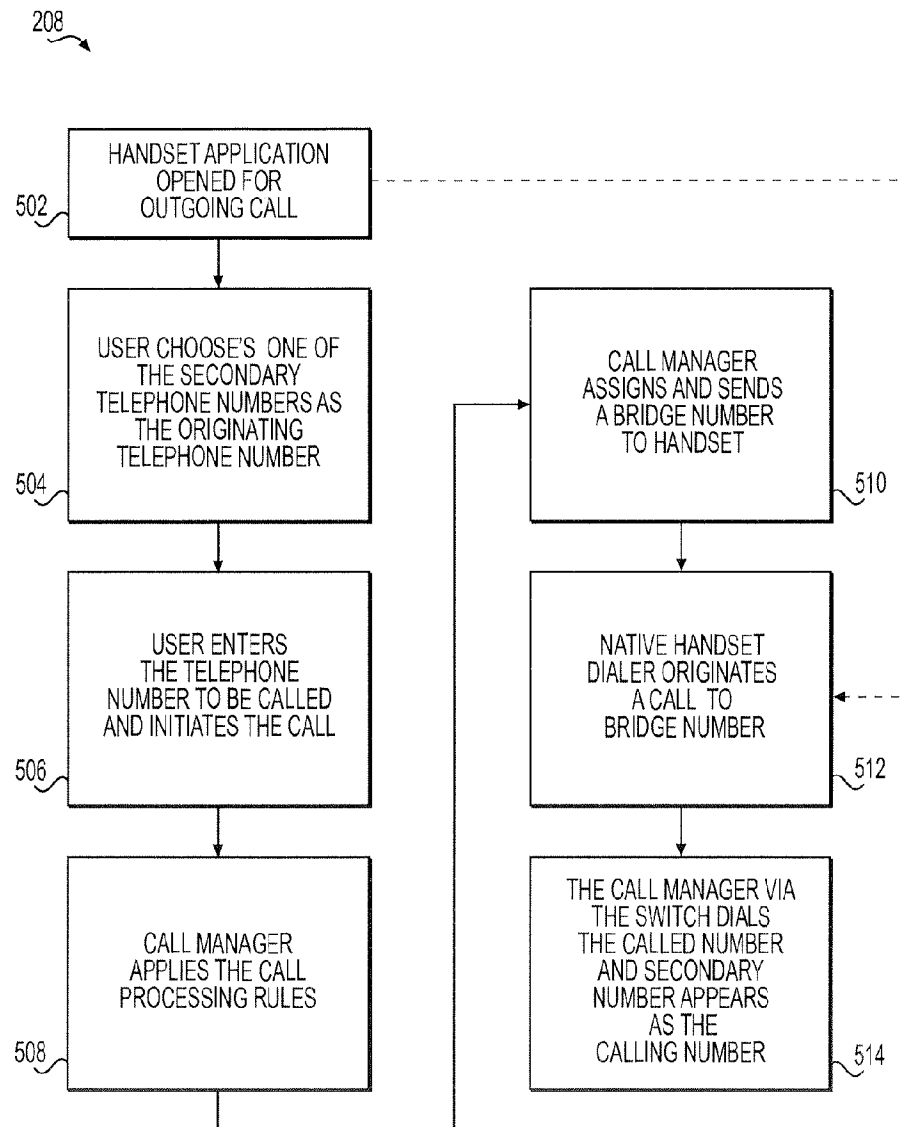
**FIG. 2**

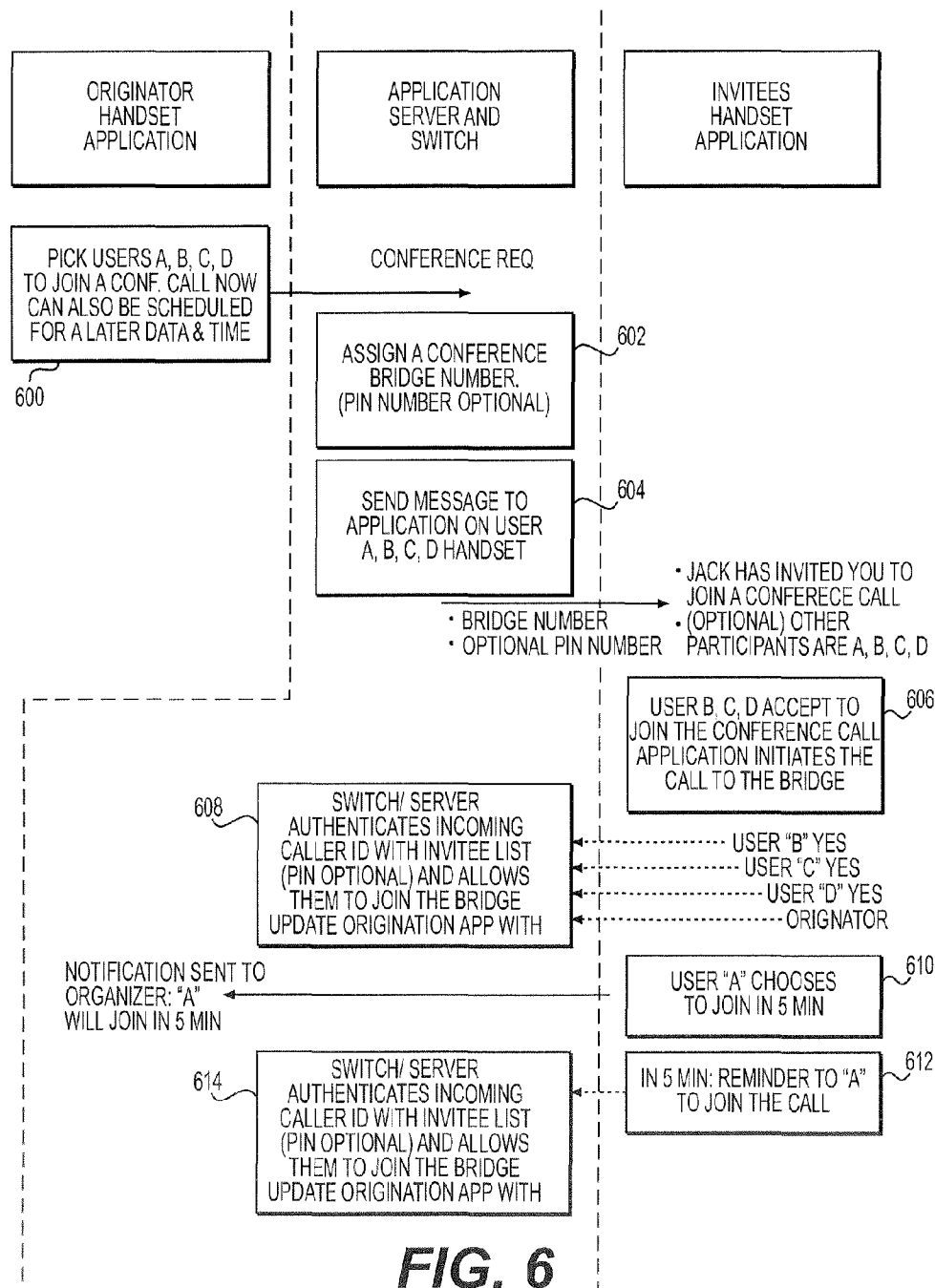
**FIG. 3**

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**FIG. 4**

**FIG. 5**



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TELEPHONE NETWORK SYSTEM AND METHOD**CROSS-REFERENCE TO RELATED APPLICATIONS**

The present invention and application relates to, is a continuation-in-part of, and claims the benefit of the earlier filing date and priority of U.S. patent application Ser. No. 13/944,853, filed on Jul. 17, 2013, entitled "A Method Of A Data Channel Telephone Network System."

FIELD OF THE INVENTION

The present invention relates to systems and methods for setting up and connecting telephone calls, and delivering information related to such telephone calls using an Internet Protocol (IP) or other data channel while delivering the voice portion of the call in accordance with CDMA, GSM or like voice channel delivery standards.

BACKGROUND OF THE INVENTION

The volume of telephone calls and text messaging has increased dramatically and users are finding it more and more difficult to manage that volume of calls and messages. The current systems to aid in managing some types of calls only provide minimal assistance to the user. It is therefore an advantage of some, but not necessarily all, embodiments of the present invention to provide systems and methods for assisting callers and call recipients with the management of calls and messages.

Additional advantages of various embodiments of the invention are set forth, in part, in the description that follows and, in part, will be apparent to one of ordinary skill in the art from the description and/or from the practice of the invention.

SUMMARY OF THE INVENTION

Responsive to the foregoing challenges, Applicant has developed an innovative method of providing telephone service by transmitting call handling information between a handset and a switch using an IP channel or similar protocol channel and by transmitting a voice call associated with the call handling information between the handset and the switch using a voice channel provided in accordance with a voice channel protocol, e.g., in accordance with CDMA or GSM, 3G, 4G, LTE or like future protocol channels standards.

Applicant has further developed an innovative method of providing telephone service comprising: automatically storing electronic information that indicates an association of a secondary telephone number and a primary telephone number with a telephone handset in a computer memory associated with a server; automatically storing electronic information that indicates a selection of call processing rules for the primary telephone number in the computer memory; automatically storing electronic information that indicates a selection of call processing rules for the secondary telephone number in the computer memory; receiving an electronic indication of an incoming call to the secondary telephone number at the server, said electronic indication of an incoming call being received from a switch associated with the server; automatically accessing the call processing rules for the secondary telephone number under the control of the server responsive to the receipt of the electronic indication

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of the incoming call to the secondary telephone number; automatically handling the incoming call in accordance with the accessed call processing rules for the secondary telephone number; transmitting pre-call information via a data channel to the handset under the control of the server, said pre-call information including a bridge telephone number for connecting the handset to the incoming call at the switch; and receiving, at the server via the data channel, an electronic indication of a selection of a call processing rule for handling the incoming call to the secondary telephone number, or establishing a voice channel connection between the handset and the switch as a result of the handset calling the switch using the bridge number.

Applicant has further developed an innovative method of providing telephone service, comprising: automatically storing electronic information that indicates an association of a secondary telephone number and a primary telephone number with a telephone handset in a computer memory associated with a server; automatically associating a unique bridge telephone number with each of a plurality of contact telephone numbers in the computer memory; automatically transmitting information that indicates the association of the unique bridge telephone number with each of a plurality of contact telephone numbers to the handset via the data channel; automatically associating each primary telephone number and bridge telephone number pairing with a corresponding secondary telephone number and contact telephone number pairing in the computer memory; receiving, at a switch associated with the server, an outgoing call from the handset to the bridge telephone number via a voice channel; receiving, at the server, information from the switch indicating the outgoing call is being made to the bridge telephone number from the primary telephone number; receiving, at the switch, information from the server directing the switch to: (a) connect the outgoing call to a contact telephone number associated with the primary telephone number and bridge telephone number pairing, and (b) identify the telephone number from which the outgoing call is being made as the secondary telephone number.

Applicant has still further developed an innovative method of providing telephone service, comprising: enrolling a telephone handset in a telecommunications system having a server and a switch, wherein said telephone handset is associated with a primary telephone number in a database associated with the server and switch; electronically transmitting an application from the server to the telephone handset via a data channel responsive to telephone handset enrollment, wherein said application is: adapted to send instructions to have one or more secondary telephone numbers referenced to the primary telephone number in the database, adapted to present visually perceptible call processing rules on the telephone handset, and adapted to transmit information indicating a selection of call processing rules from the telephone handset to the server; electronically receiving instructions from the telephone handset via the data channel to reference the one or more secondary telephone numbers to the primary telephone number; storing telephone handset information, including the primary telephone number and the one or more secondary telephone numbers referenced to the primary telephone number, in the database; electronically receiving instructions from the telephone handset via the data channel to store user selected call processing rules for the telephone handset in the database, wherein the user selected call processing rules include instructions to route calls over a voice channel in a manner that will indicate that the calls are made to or from the one or more secondary telephone numbers; electronically trans-

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mitting information to the telephone handset via the data channel, said information being adapted to cause a pre-call information to be displayed on the telephone handset responsive to initiation of an outgoing call using the one or more secondary telephone numbers or an incoming call to the one or more secondary telephone numbers; electronically receiving from the telephone handset via the data channel call handling information indicating a user selected call processing rule to be used to process the outgoing or incoming call; and automatically handling the outgoing or incoming call based on the call handling information.

Applicant has still further developed an innovative method of providing telephone service, comprising: associating a telephone handset with primary and secondary telephone numbers in a database; receiving, from the telephone handset via a data channel, digital information indicating primary call processing rules for handling calls to the first telephone number; storing the primary call processing rules digitally; receiving, from the telephone handset via the data channel, digital information indicating secondary call processing rules for handling calls to the secondary telephone number; storing the secondary call processing rules digitally; receiving a call request to the secondary telephone number; transmitting pre-call information to the telephone handset via the data channel responsive to receipt of the call request, wherein said pre-call information is based on the secondary call processing rules; responsive to the pre-call information, receiving information indicative of a user input to the telephone handset over the data channel; and processing the call based on the stored alternative call processing rules and user input to the telephone handset, wherein said processing includes an option of connecting the call over a voice channel.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only, and are not restrictive of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to assist the understanding of this invention, reference will now be made to the appended drawings, in which like reference characters refer to like elements.

FIG. 1 is a schematic diagram illustrating a network architecture that may be used to provide telephone service in accordance with embodiments of the present invention.

FIG. 2 is a block diagram illustrating a method of providing telephone calls in accordance with embodiments of the present invention.

FIG. 3 is a block diagram illustrating data channel and voice channel connections used to provide telephone service in accordance with embodiments of the present invention.

FIG. 4 is a block diagram illustrating a method of setting up and connecting an incoming call in accordance with one embodiment of the present invention.

FIG. 5 is a block diagram illustrating a method of setting up and connecting an outgoing call in accordance with one embodiment of the present invention.

FIG. 6 is a call sequence diagram illustrating a method of setting up and connecting a conference call in accordance with one embodiment of the present invention.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

Reference will now be made in detail to embodiments of the present invention, examples of which are illustrated in

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the accompanying drawings. It is to be understood that other embodiments may be utilized and structural changes may be made without departing from the scope of the present invention.

It should be noted that in connection with the described embodiments, reference is made to a data channel. A preferred data channel may be an Internet Protocol (IP) channel, which is not a conventional telephone voice channel. However, other data, non-conventional voice, channels over which information may be transmitted between a telephone handset and a server may be used in alternative embodiments of the invention.

With reference to FIG. 1, embodiments of the present invention may be implemented using a system having a server 100, associated computer memory, such as a database 120, and an associated telecommunications switch 110 which communicate through a network with a telephone handset 340. The server 100 may be connected to the database 120 and the switch 110. The server 100 may also be connected via the Internet 316 through one or more nodes, such as a Gateway GPRS Support Node (GGSN) 322 and a Servicing GPRS Support Node (SGSN) 324, to a mobile network 313. The switch 110 may be connected through the PSTN 310 to the mobile network 313 at a Mobile Switching Center (MSC) 314. In turn, the MSC 314 may be connected to a Home Location Register database (HLR) 318, a Visitor Location Register database (312), a Mobile Number Portability database (MNP) 320, a location server 308, and the SGSN 324. The SGSN 324 may be connected to one or more Radio Network Controllers (RNC) 326 and/or one or more Processor Control Units (PCU) 327, which in turn may be connected to one or more Base Stations (BS) 328 and to one or more mobile devices referred to collectively as "handsets" 340.

The communications between the server 100 and the handset 340 over the Internet 316 may utilize IP as a protocol opposed to protocols used to establish communications according to CDMA, GSM, or like standards. Such IP governed communications are referred to herein as being conducted over a "data channel." Conversely, communications between the switch 110 and the handset over the PSTN 310 may be transmitted and received in accordance with CDMA, GSM or like standards as opposed to using IP. Such CDMA, GSM or like governed communications, when used to carry voice information, are referred to herein as being conducted over a "voice channel."

With reference to FIGS. 1 and 2, method embodiments of the invention may be facilitated starting with step 200 in which a handset 340 may be used to subscribe to the telephone network that includes the server 100 and switch 110 used to provide telephone service in accordance with embodiments of the invention. A user may subscribe to the telephone network in step 200 by enrolling the telephone handset 340 using a data channel connection between the handset and the server 100. Responsive to a data channel request received from the handset 340, a handset application may be transmitted to the handset from the server 100, and installed and stored in memory associated with the handset in step 202. Once the handset application is installed on the handset 340, the handset may connect to the server 100 by operation of the handset application as needed over a data channel connection which may include the BS 328, RNC 326 or PCU 327, SGSN 324, GGSN 322, and Internet 316.

In connection with step 204, the server 100 may transmit information to the handset 340 via the data channel, which, through automatic operation of the handset application, permits the user to select one or more secondary telephone

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numbers to be referenced to a primary telephone number for the handset. The primary telephone number, preferably, may be a SIM number or ESN which is assigned to the handset 340 at the time of activation. Once selected, the handset 340 may automatically transmit information which to the server 100 over the data channel which requests that the secondary telephone numbers be associated with the primary telephone number. In response, the server 100 may store (i.e., reference) information indicating the association of the one or more selected secondary telephone numbers in computer memory associated with the server such as the database 120. In an alternative embodiment, the server 100 may automatically assign one or more secondary telephone numbers to the handset 340, as opposed to them being selected.

In step 206 of FIG. 2, the handset 340 may be used to access the handset application installed thereon to select call processing rules for handling incoming and outgoing voice channel calls to and from the handset 340. Information indicating call processing rules may be transmitted from the handset 340 to the server 100 via the data channel by automatic operation of the handset application. Custom call processing rules may be selected for, and associated with, each of the primary telephone number and the one or more secondary telephone numbers associated with the primary telephone number. The call processing rules information may be automatically stored in a computer memory, such as database 120, by the server 100. An indication of the association of particular call processing rules with a particular handset 340 and particular primary and/or secondary telephone numbers may also be stored in the database 120. The call processing rules may include preset responses for incoming calls, such as custom stored voice message(s) and/or custom stored text message(s) to be associated with the primary and/or one or more secondary telephone numbers. The call processing rules may further permit the handset 340 to be used to control the availability of the secondary telephone numbers as well as activation of additional secondary telephone numbers and deactivation of existing secondary telephone numbers. Information indicating the call processing rules for the primary telephone number and secondary telephone numbers may be stored automatically in memory associated with the handset 340. The call processing rules may further include stock rules used for all telephone numbers, such as an option to accept or not accept (i.e., drop) an incoming call. With reference to step 208, the application stored on the handset 340 may enable it to be used to receive incoming calls from, and place outgoing calls to, a recipient telephone (not shown) which is connected to the PSTN 310, as explained in more detail below.

With reference to FIGS. 3 and 4, the handset 340 may be used to receive incoming (terminating) calls to a secondary telephone number, using a telephone network automated structure having a network layer 101 and an application layer 102 associated therewith. An incoming call to the secondary telephone number may be placed in step 402 by a calling party. The incoming call is routed from the caller's telephone to the PSTN 310. In step 404, the incoming call may be routed over the PSTN 310 to the switch 110. Responsive to receipt of the incoming call at the switch 110, a Call Manager 104 application, which cooperates with a Mobility Manager 106 application, and a Web Manager 108 application, which are all associated with the server 100, may access the call processing rules in the database 120 which are associated with the secondary telephone number that is being called. Subject to the accessed call processing rules, the Call Manager 104 may assign or look up a bridge

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telephone number to be used for completion of the call in step 406. The bridge telephone number may be associated with the switch 110, and calls to the bridge telephone number may be automatically routed to this switch.

The call processing rules may provide for call routing via a call distribution algorithm where the call could be routed to one or many telephone numbers. The call processing rules may be user selectable and configurable, and may apply to voice, text and/or other data messaging. The call processing rules may govern how calls are handled and may provide automated call routing or call dropping based on location data of the calling and/or called party. The call processing rules may further govern handling calls based on incoming caller ID, which may identify a calling party as being on an accepted caller ID list or a non-accepted caller ID list. The call processing rules may further provide call routing based on weekday, weekend, holiday, time of day, biometrics data, and accelerometer data information. The call processing rules may still further provide call routing based on an interface with a handset 340 calendar to check availability to accept calls. Such calendars may include, for example, Outlook, Google Calendar, and other user calendars.

If the call processing rules indicate that the secondary telephone number is not available to this particular caller, or to all callers, however, the Call Manager 104 may apply such rule or rules and reject the incoming call at the conclusion of step 406. Application of the call processing rules for a call rejection may result in the call simply not being answered, being dropped, or automated return of a voice, text, or other type of message to the calling telephone number or a communication device associated therewith.

On the other hand, if the call processing rules permit completion of the call, in step 408 the Call Manager 104 may transmit pre-call notification information to the handset 340, which includes the assigned/looked up bridge telephone number, via the data channel connection, i.e., over the Internet 316 and the Mobile Data Network 348. The pre-call information may include information used by the application installed on the handset 340 to cause a display of the calling telephone number, the calling party name, calling party location, such as GPS location, and/or the called secondary telephone number, as well as other information in step 410. The incoming pre-call information may be received at the handset 340 before or during the call ringing on the handset.

In step 412, responsive to receipt of the incoming pre-call notification information, the handset application may cause the handset 340 to display call handling choices for the call. For example, the handset 340 may be directed under the control of the handset application to display receive call, drop call, custom voice mail message, and/or custom text message choices. The choices may be selected through interaction with the handset 340, all before the call is connected or dropped. In step 414, the selection of either delivering a responsive text message (416), not accepting, i.e., "dropping" the call (418), or responding to the call with a custom voice message (420) may be transmitted from the handset 340 to the server 100 via the data channel. Thereafter, the Call Manager 104 may automatically implement the drop call or respond with text or voice message instructions received over the data channel, and the call attempt may be terminated thereafter.

If the call is accepted in step 414, however, the handset application may automatically cause the handset 340 to call the bridge telephone number in step 422 over a voice channel. The return call from the handset 340 to the bridge telephone number may be routed over the PSTN 310 to the switch 110 using a voice channel connection. In step 424,

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once the call to the bridge telephone number is received at the switch **110**, the switch may “bridge” the incoming voice channel call to the bridge telephone number with the incoming voice channel call to the secondary telephone number to thereby connect the incoming call from the calling party to the handset **340** via a voice channel. Further, the switch **110** may automatically send signaling information to the calling party telephone which causes the secondary telephone number to be displayed as the number to which the call has been completed.

With continued reference to FIG. **3**, the web manager **108** may be used to process Internet **316** transactions for the server **110**. The system may also employ a web portal **350** to link a digital device **360** other than a handheld **340** to the telecommunications system for calling in accordance with embodiments of the invention. For example, embodiments of the invention may be used with digital devices **360** such as a desktop computer, laptop computer, iPad, tablet, iPod **790**, or the like.

With reference to FIGS. **3** and **5**, the handset **340** may be used to place outgoing (originating) calls from a secondary telephone number, using the telephone network automated structure shown in FIG. **3** and described above. If the party to be called has not yet been called using a secondary telephone number, an outgoing call from the handset **340** may be initiated to such party in step **502** by opening the handset application installed thereon. Once the handset application is open, the handset **340** may be used to choose a secondary telephone number as the originating telephone number in step **504**. A list of such secondary telephone numbers may be stored in memory associated with the handset.

In step **506**, the handset **340** may be used to enter, or select from an address file, a contact telephone number to be called in order to initiate a call to such telephone number. The handset application may cause the handset **340** to transmit information to the server **100** Call Manager **104** via the data channel automatically as a result of the selection of the secondary telephone number and the contact telephone number. The transmitted information may indicate the secondary telephone number from which the call is to appear to the called party to have been placed, and the contact telephone number to be called.

In step **508**, responsive to receipt of the data channel communication from the handset **340** requesting set up of a call from it to the telephone number to be called, the Call Manager **104** may access the call processing rules in the database **120** which are associated with the secondary telephone number from which the call is to appear to have been placed. In step **510**, subject to the accessed call processing rules, the Call Manager **104** may assign a bridge telephone number to be used to connect the call from the handset **340** to the switch **110** and send pre-call information including the bridge telephone number to the handset via the data channel.

The bridge telephone number may be associated with the switch **110**, and calls to the bridge telephone number may be automatically routed to this switch. Once the bridge telephone number is assigned, the server **100** under the control of the Call Manager **104**, may store information in the database **120** which associates the bridge telephone number with the primary telephone number for the handset **340**, the secondary telephone number selected for the call, and the contact telephone number to be called. More specifically, the stored information may indicate that each combination of primary telephone number and bridge telephone number are uniquely associated with each combination of secondary telephone number and contact telephone number. In other

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words, each combination of primary telephone number and bridge telephone number for the handset **340** map to a unique combination of secondary telephone number and contact telephone number in the database **120** memory.

In step **512**, responsive to receipt of the bridge telephone number information over the data channel, the handset application may cause the handset **340** to automatically call the bridge telephone number via a voice channel. The return call from the handset **340** to the bridge telephone number may be routed over the PSTN **310** to the switch **110** using a voice channel connection.

In step **514**, the Call Manager **104** may instruct the switch **110** to place a voice channel call to the telephone number to be called using the secondary telephone number as the originating telephone number from the switch. Once the call to the bridge telephone number from the handset **340** is received at the switch **110**, the switch may “bridge” the incoming voice channel call to the bridge telephone number with the outgoing voice channel call from the secondary telephone number to the contact telephone number to thereby connect the outgoing call from the handset **340** to the party being called via a voice channel. Further, the switch **110** may automatically send signaling information to the called party telephone which causes the secondary telephone number to be displayed as the number from which the call appears to have been placed. Because each pairing of a primary telephone number and a bridge telephone number maps to a unique contact telephone number and secondary telephone number pairing, the call can be completed at the switch **110** to the correct contact telephone number while showing the desired secondary telephone number as the originating number.

With continued reference to FIG. **5**, in the event that the contact telephone has been previously called using the secondary telephone number on the handset **340**, the user may directly select the bridge telephone number associated with the secondary telephone number and contact telephone number in step **506** either using the handset application in step **502**, or without opening the handset application in step **512**. Alternatively, the handset may have a stored “shortcut” which, when the user selects the contact telephone number to be called from the secondary telephone number, results in the associated bridge telephone number being dialed. In either case, the handset **340** may dial the bridge telephone number to connect with the Call Manager **104** in step **512**. In step **514**, the Call Manager **104** may look up the secondary telephone number and the contact telephone number associated with the paired bridge telephone number and primary telephone number for the handset **340**. Thereafter, the switch **110** may dial the contact telephone number and bridge the call from the handset **340** in a manner that makes the secondary telephone number appear to be the telephone number from which the call is being placed.

FIG. **6** is a call flow diagram illustrating a method of setting up and connecting a multi-party conference call in accordance with an embodiment of the present invention. With reference to FIGS. **3** and **6**, the communication sequence for a conference call is illustrated between the handset application stored on the handset **340**, the Call Manager **104** application associated with the server **100** and switch **110**, and a conference call invitee handset. In step **600**, the application on the handset **340** may be used to select invitees (users) for a conference call. The telephone numbers of the invitees may be selected from an address book or manually entered. Further, the conference call may be selected to be initiated immediately, or at some future date and time.

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Once the invitees are selected, the handset **340** may be instructed by the handset application to transmit a conference request to the server **100** via a data channel. In step **602**, the Call Manager **104** operating on the server **100** may assign a conference bridge telephone number to the conference call in response to receipt of the conference request. In step **604**, the Call Manager **104** may cause the server **100** to send conference invitation messages to each of the invitee handsets, and more specifically, applications stored on the invitee handsets, via a data channel. The invitation messages may include the assigned bridge telephone number for the conference call and an optional PIN or code number for the conference call. The invitation message may provide a notice, for example, "Jack has invited you to join a conference call," and further include identification of other invited participants.

In step **606**, each invitee handset may be used to accept to join the conference call, join at a later time, or decline to join. If the acceptance is for a future scheduled conference call, an indication of the acceptance (including acceptance to join late) may be transmitted from each invitee handset under the control of the application installed thereon, to the server **100** Call Manager **104** via the data channel. Further, if the invitation is declined altogether, an indication thereof may be transmitted from each invitee handset to the server **100**. Thereafter, the Call Manager **104** may transmit information to the originating handset **340**, and optionally the invitee handsets, via the data channel, which indicates acceptance of a future conference call, acceptance to join late (step **610**), or declination of the conference call invitation.

If the conference call invitation is accepted and it is time for the call, each accepting invitee handset may automatically or manually dial the bridge telephone number using a voice channel. The switch **110** may receive the voice channel calls to the bridge telephone number and may authenticate the invitees right to join the conference call in step **608** by comparing the invitee's telephone number with that of the invitee list, as well as comparing any PIN input by the invitee with the PIN selected for the conference call. If the authentication is successful, the invitee handset is connected to the call via the voice channel. An automatic update may be transmitted via the data channel from the server to the originating handset **340** indicating that a particular invitee handset has joined the conference call.

If an invitee chose to join late, the server **100** may automatically transmit a reminder to the affected invitee handset to join the call at the agreed time in step **612**. Thereafter, the late joining invitee handset may dial the bridge telephone number automatically or manually using a voice channel. The switch **110** may receive the voice channel call to the bridge telephone number, authenticate the late joining invitee handset, and connect the handset to the conference call in step **614**.

The foregoing has described the principles, embodiments and modes of operation of the present invention. However, the invention should not be construed as being limited to the particular embodiments discussed. The above described embodiments should be regarded as illustrative rather than restrictive, and it should be appreciated that variations may be made in those embodiments by workers skilled in the art without departing from the scope of the present invention as defined by the following claims.

What is claimed:

1. A method of providing telephone service, the method comprising:

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associating a secondary telephone number with a primary telephone number in at least one computer memory device, the primary telephone number being assigned to a handset;

acquiring first digital information from the handset over at least one data channel, the first digital information indicating primary call processing rules for handling calls directed to the primary telephone number;

storing the primary call processing rules in the at least one computer memory device;

acquiring second digital information from the handset over the at least one data channel, the second digital information indicating secondary call processing rules for handling calls directed to the secondary telephone number;

storing the secondary call processing rules in the at least one computer memory device;

receiving an incoming call over at least one voice channel at a switch, the switch being associated with a bridge telephone number such that calls directed to the bridge telephone number are automatically routed to the switch, the incoming call being directed to a handset-associated telephone number, the handset-associated telephone number being the primary telephone number or the secondary telephone number, and;

based on the primary call processing rules or the secondary call processing rules:

transmitting pre-call information to the handset over the at least one data channel the pre-call information including the bridge telephone number and the handset-associated telephone number, such that the handset is capable of displaying the handset-associated telephone number to a user and, based on user input, accepting the incoming call by connecting with the switch over the at least one voice channel using the bridge telephone number.

2. The method of claim 1, wherein the handset-associated telephone number is the secondary telephone number, and the pre-call information is transmitted based on the secondary call processing rules.

3. The method of claim 1, wherein the pre-call information includes a plurality of call handling choices for display by the handset and selection via the user input.

4. The method of claim 1, further comprising:

receiving an outgoing call request from the handset over the at least one data channel, the outgoing call request including an originating telephone number and a contact telephone number to be called, the originating telephone number being the primary telephone number or the secondary telephone number;

connecting with the handset at the switch over the at least one voice channel using the bridge telephone number; and

transmitting an outgoing call over the at least one voice channel from the switch, the outgoing call being directed to the contact telephone number and indicating the originating telephone number.

5. The method of claim 1, wherein the at least one data channel includes an Internet protocol (IP) channel.

6. The method of claim 5, wherein the at least one voice channel is established in accordance with at least one of a Code Division Multiple Access (CDMA) standard and a Global System for Mobiles (GSM) standard.

* * * * *

Exhibit A



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(12) **United States Patent**
Zhidov et al.

(10) **Patent No.:** **US 9,667,770 B2**

(45) **Date of Patent:** **May 30, 2017**

(54) **TELEPHONE NETWORK SYSTEM AND METHOD**

H04W 76/02; H04M 1/72547; H04M 3/42042; H04M 3/42272; H04M 3/436; H04M 3/565; H04M 2203/5054; H04L 65/1069

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See application file for complete search history.

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(73) Assignee: **Flypsi, Inc.**, Denton, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 82 days.

(21) Appl. No.: **14/307,052**

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(Continued)

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(63) Continuation-in-part of application No. 13/944,853, filed on Jul. 17, 2013.

(Continued)

(51) **Int. Cl.**

Primary Examiner — Nam Huynh

H04M 1/725 (2006.01)

H04M 3/42 (2006.01)

H04M 3/436 (2006.01)

H04W 76/02 (2009.01)

H04L 29/06 (2006.01)

H04M 3/56 (2006.01)

(52) **U.S. Cl.**

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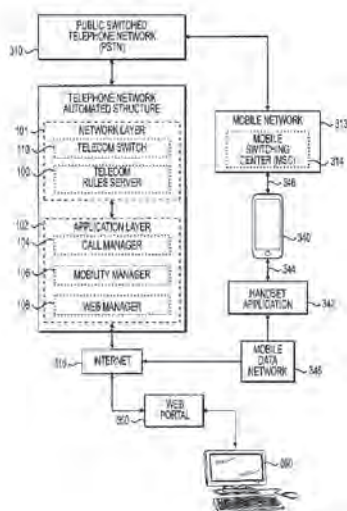
(57) **ABSTRACT**

Systems for and methods of delivering telephone calls using the combination of a data channel and a voice channel are disclosed. A data channel connection with the telephone handset may provide pre-call information used to set up incoming and outgoing calls which are ultimately connected using a voice channel. Use of the pre-call information may permit the same handset to be associated with multiple secondary telephone numbers from which calls appear to have been made and to which calls appear to have been placed.

(58) **Field of Classification Search**

CPC H04W 4/16; H04W 4/00; H04W 4/02;

6 Claims, 6 Drawing Sheets



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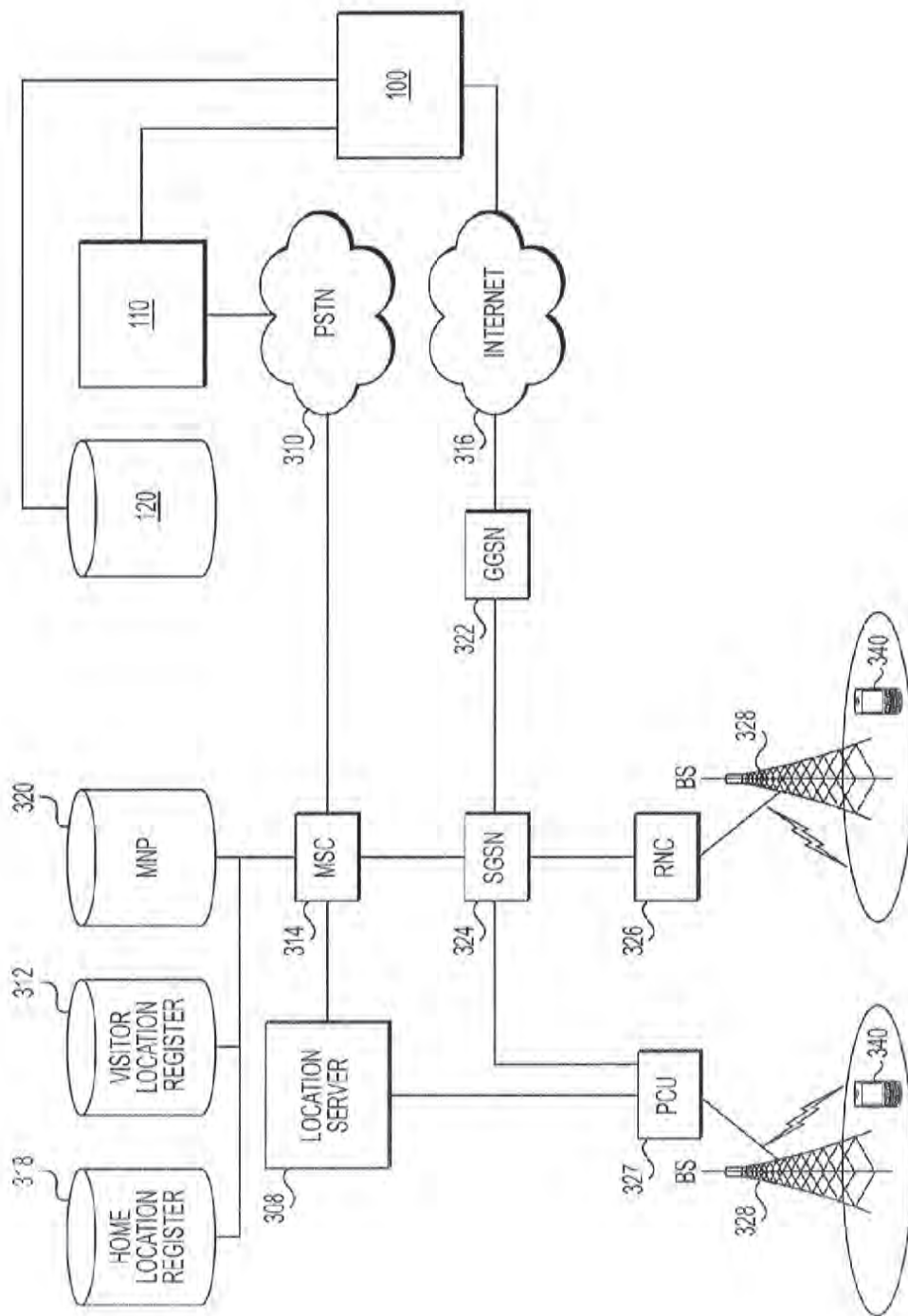
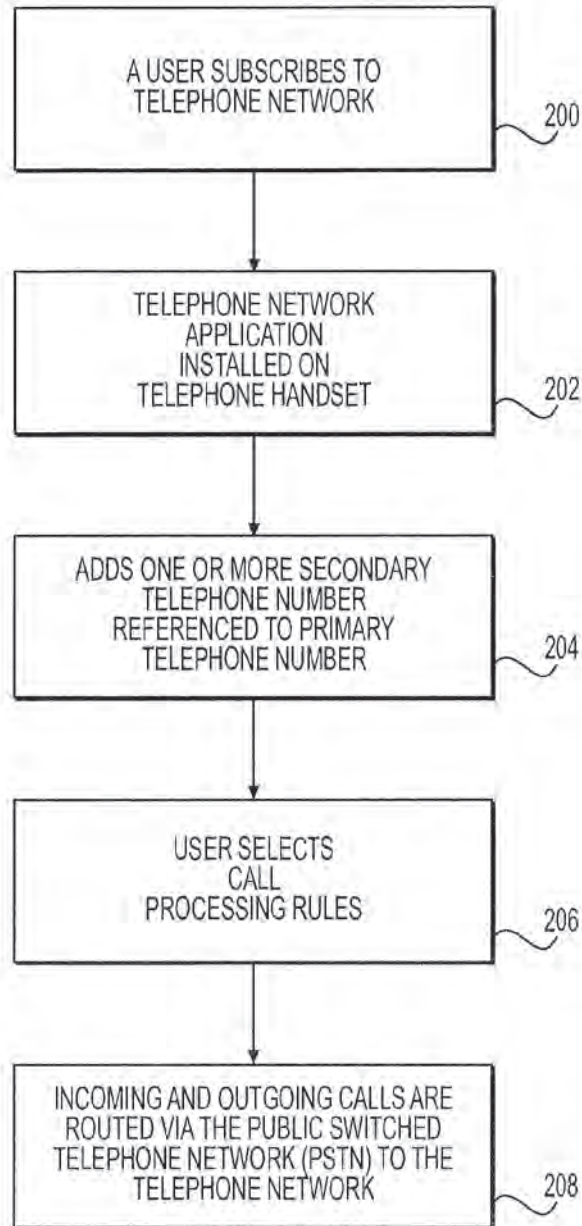
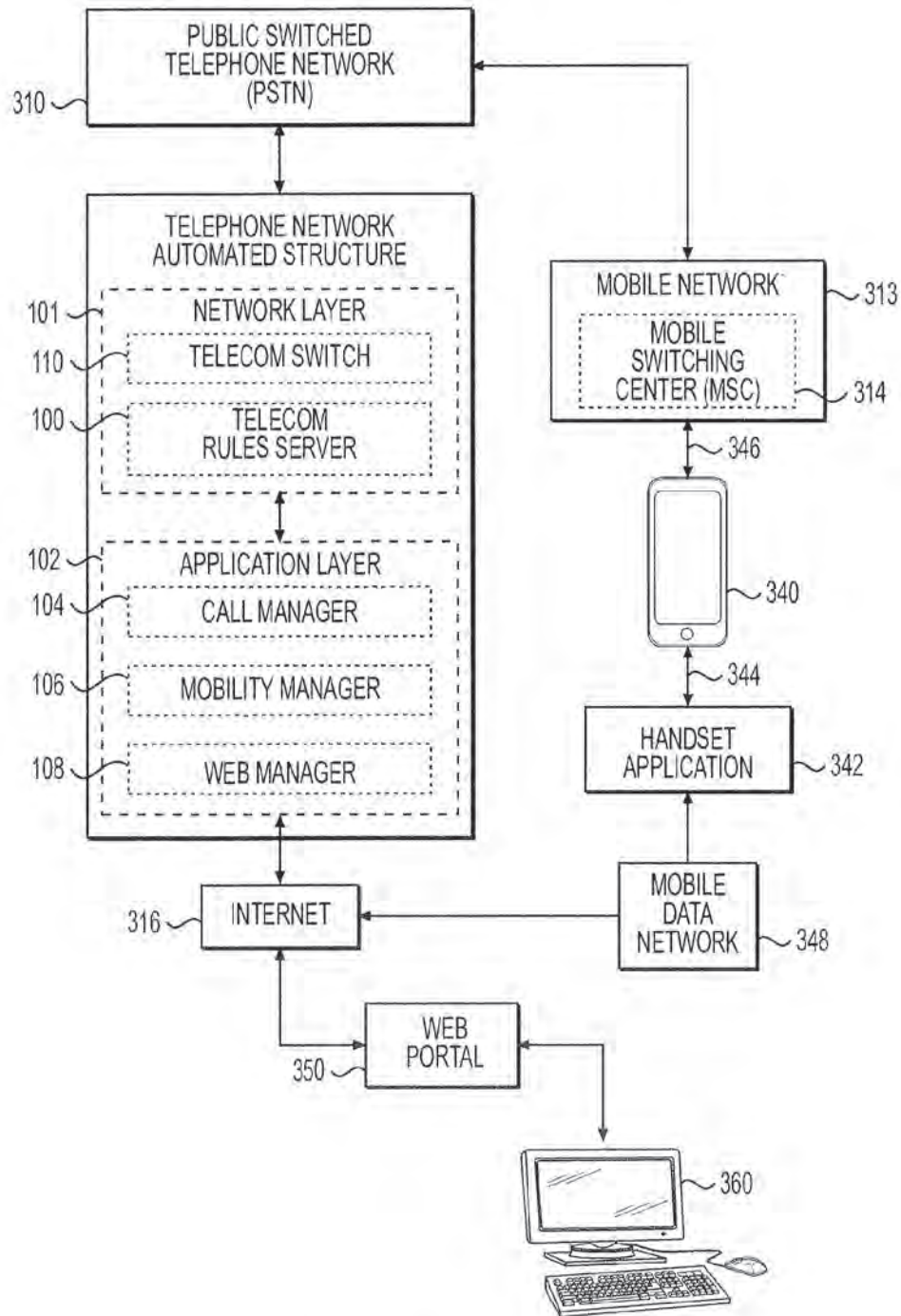


FIG. 1

**FIG. 2**

**FIG. 3**

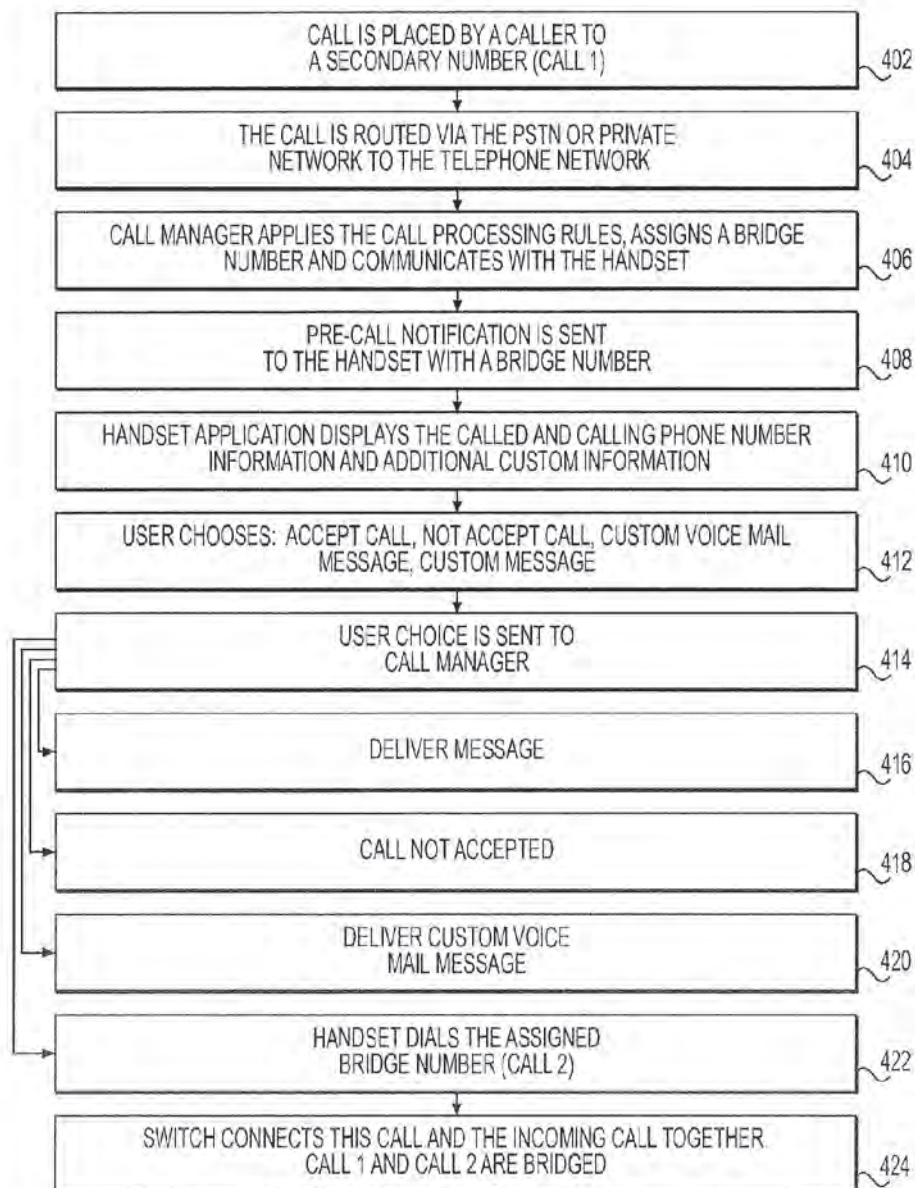
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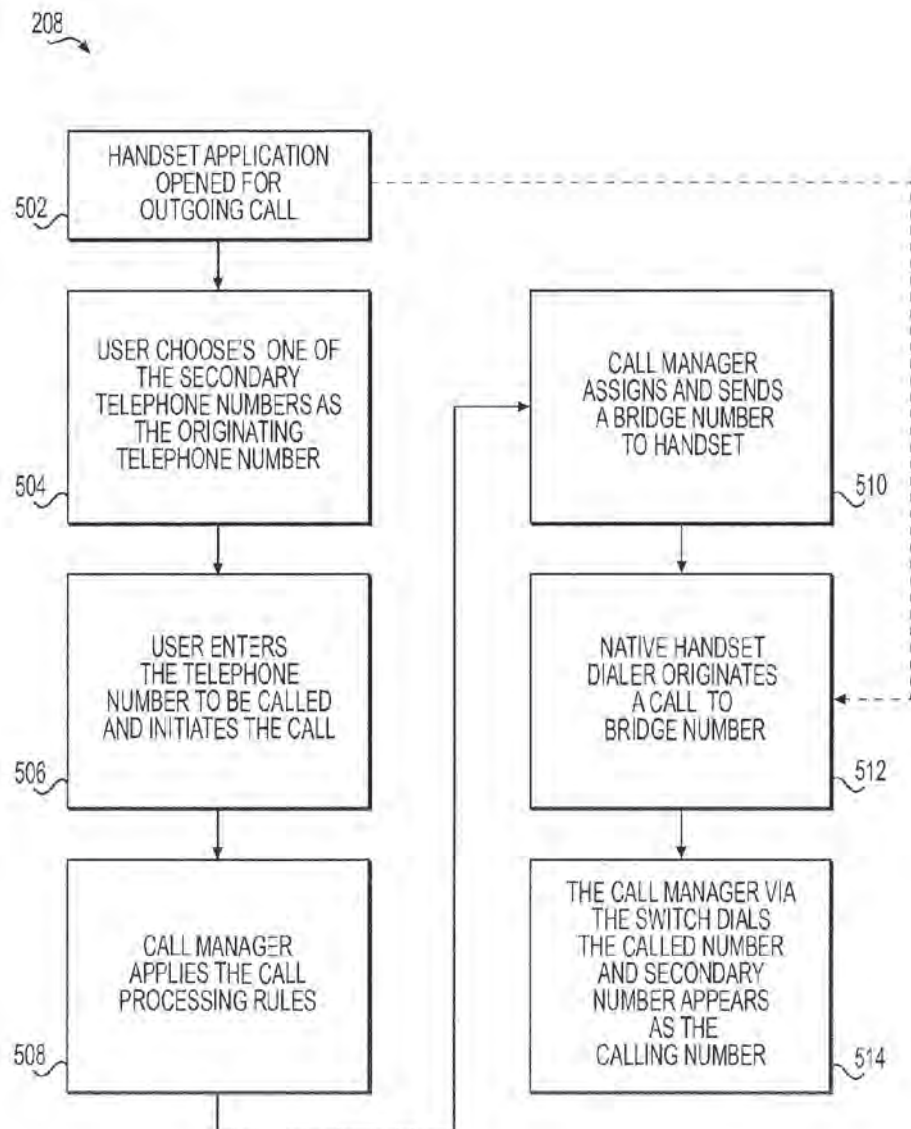
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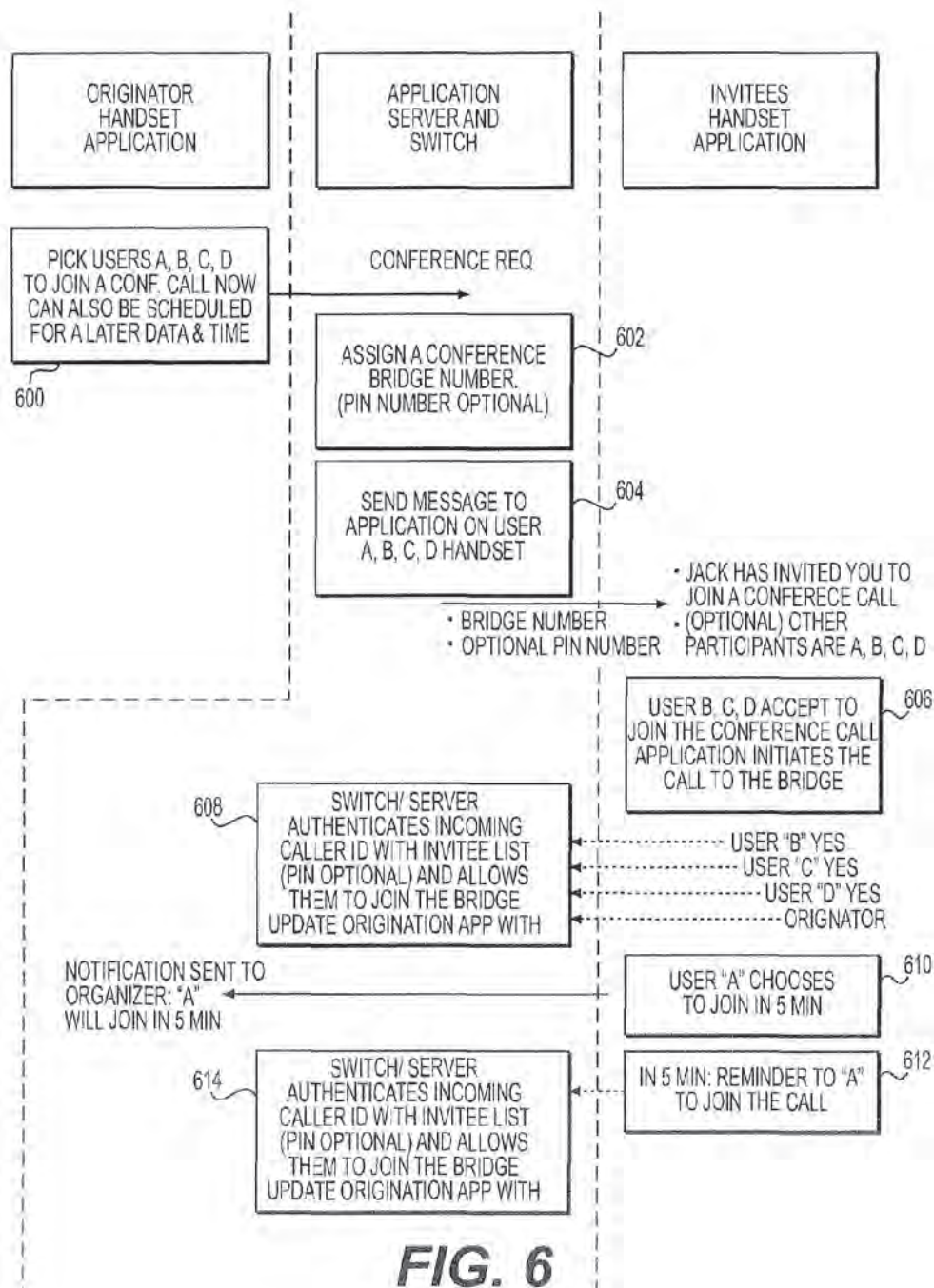
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**FIG. 4**

**FIG. 5**



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TELEPHONE NETWORK SYSTEM AND METHOD**CROSS-REFERENCE TO RELATED APPLICATIONS**

The present invention and application relates to, is a continuation-in-part of, and claims the benefit of the earlier filing date and priority of U.S. patent application Ser. No. 13/944,853, filed on Jul. 17, 2013, entitled "A Method Of A Data Channel Telephone Network System."

FIELD OF THE INVENTION

The present invention relates to systems and methods for setting up and connecting telephone calls, and delivering information related to such telephone calls using an Internet Protocol (IP) or other data channel while delivering the voice portion of the call in accordance with CDMA, GSM or like voice channel delivery standards.

BACKGROUND OF THE INVENTION

The volume of telephone calls and text messaging has increased dramatically and users are finding it more and more difficult to manage that volume of calls and messages. The current systems to aid in managing some types of calls only provide minimal assistance to the user. It is therefore an advantage of some, but not necessarily all, embodiments of the present invention to provide systems and methods for assisting callers and call recipients with the management of calls and messages.

Additional advantages of various embodiments of the invention are set forth, in part, in the description that follows and, in part, will be apparent to one of ordinary skill in the art from the description and/or from the practice of the invention.

SUMMARY OF THE INVENTION

Responsive to the foregoing challenges, Applicant has developed an innovative method of providing telephone service by transmitting call handling information between a handset and a switch using an IP channel or similar protocol channel and by transmitting a voice call associated with the call handling information between the handset and the switch using a voice channel provided in accordance with a voice channel protocol, e.g., in accordance with CDMA or GSM, 3G, 4G, LTE or like future protocol channels standards.

Applicant has further developed an innovative method of providing telephone service comprising: automatically storing electronic information that indicates an association of a secondary telephone number and a primary telephone number with a telephone handset in a computer memory associated with a server; automatically storing electronic information that indicates a selection of call processing rules for the primary telephone number in the computer memory; automatically storing electronic information that indicates a selection of call processing rules for the secondary telephone number in the computer memory; receiving an electronic indication of an incoming call to the secondary telephone number at the server, said electronic indication of an incoming call being received from a switch associated with the server; automatically accessing the call processing rules for the secondary telephone number under the control of the server responsive to the receipt of the electronic indication

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of the incoming call to the secondary telephone number; automatically handling the incoming call in accordance with the accessed call processing rules for the secondary telephone number; transmitting pre-call information via a data channel to the handset under the control of the server, said pre-call information including a bridge telephone number for connecting the handset to the incoming call at the switch; and receiving, at the server via the data channel, an electronic indication of a selection of a call processing rule for handling the incoming call to the secondary telephone number, or establishing a voice channel connection between the handset and the switch as a result of the handset calling the switch using the bridge number.

Applicant has further developed an innovative method of providing telephone service, comprising: automatically storing electronic information that indicates an association of a secondary telephone number and a primary telephone number with a telephone handset in a computer memory associated with a server; automatically associating a unique bridge telephone number with each of a plurality of contact telephone numbers in the computer memory; automatically transmitting information that indicates the association of the unique bridge telephone number with each of a plurality of contact telephone numbers to the handset via the data channel; automatically associating each primary telephone number and bridge telephone number pairing with a corresponding secondary telephone number and contact telephone number pairing in the computer memory; receiving, at a switch associated with the server, an outgoing call from the handset to the bridge telephone number via a voice channel; receiving, at the server, information from the switch indicating the outgoing call is being made to the bridge telephone number from the primary telephone number; receiving, at the switch, information from the server directing the switch to: (a) connect the outgoing call to a contact telephone number associated with the primary telephone number and bridge telephone number pairing, and (b) identify the telephone number from which the outgoing call is being made as the secondary telephone number.

Applicant has still further developed an innovative method of providing telephone service, comprising: enrolling a telephone handset in a telecommunications system having a server and a switch, wherein said telephone handset is associated with a primary telephone number in a database associated with the server and switch; electronically transmitting an application from the server to the telephone handset via a data channel responsive to telephone handset enrollment, wherein said application is: adapted to send instructions to have one or more secondary telephone numbers referenced to the primary telephone number in the database, adapted to present visually perceptible call processing rules on the telephone handset, and adapted to transmit information indicating a selection of call processing rules from the telephone handset to the server; electronically receiving instructions from the telephone handset via the data channel to reference the one or more secondary telephone numbers to the primary telephone number; storing telephone handset information, including the primary telephone number and the one or more secondary telephone numbers referenced to the primary telephone number, in the database; electronically receiving instructions from the telephone handset via the data channel to store user selected call processing rules for the telephone handset in the database, wherein the user selected call processing rules include instructions to route calls over a voice channel in a manner that will indicate that the calls are made to or from the one or more secondary telephone numbers; electronically trans-

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mitting information to the telephone handset via the data channel, said information being adapted to cause a pre-call information to be displayed on the telephone handset responsive to initiation of an outgoing call using the one or more secondary telephone numbers or an incoming call to the one or more secondary telephone numbers; electronically receiving from the telephone handset via the data channel call handling information indicating a user selected call processing rule to be used to process the outgoing or incoming call; and automatically handling the outgoing or incoming call based on the call handling information.

Applicant has still further developed an innovative method of providing telephone service, comprising: associating a telephone handset with primary and secondary telephone numbers in a database; receiving, from the telephone handset via a data channel, digital information indicating primary call processing rules for handling calls to the first telephone number; storing the primary call processing rules digitally; receiving, from the telephone handset via the data channel, digital information indicating secondary call processing rules for handling calls to the secondary telephone number; storing the secondary call processing rules digitally; receiving a call request to the secondary telephone number; transmitting pre-call information to the telephone handset via the data channel responsive to receipt of the call request, wherein said pre-call information is based on the secondary call processing rules; responsive to the pre-call information, receiving information indicative of a user input to the telephone handset over the data channel; and processing the call based on the stored alternative call processing rules and user input to the telephone handset, wherein said processing includes an option of connecting the call over a voice channel.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only, and are not restrictive of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to assist the understanding of this invention, reference will now be made to the appended drawings, in which like reference characters refer to like elements.

FIG. 1 is a schematic diagram illustrating a network architecture that may be used to provide telephone service in accordance with embodiments of the present invention.

FIG. 2 is a block diagram illustrating a method of providing telephone calls in accordance with embodiments of the present invention.

FIG. 3 is a block diagram illustrating data channel and voice channel connections used to provide telephone service in accordance with embodiments of the present invention.

FIG. 4 is a block diagram illustrating a method of setting up and connecting an incoming call in accordance with one embodiment of the present invention.

FIG. 5 is a block diagram illustrating a method of setting up and connecting an outgoing call in accordance with one embodiment of the present invention.

FIG. 6 is a call sequence diagram illustrating a method of setting up and connecting a conference call in accordance with one embodiment of the present invention.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

Reference will now be made in detail to embodiments of the present invention, examples of which are illustrated in

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the accompanying drawings. It is to be understood that other embodiments may be utilized and structural changes may be made without departing from the scope of the present invention.

It should be noted that in connection with the described embodiments, reference is made to a data channel. A preferred data channel may be an Internet Protocol (IP) channel, which is not a conventional telephone voice channel. However, other data, non-conventional voice, channels over which information may be transmitted between a telephone handset and a server may be used in alternative embodiments of the invention.

With reference to FIG. 1, embodiments of the present invention may be implemented using a system having a server 100, associated computer memory, such as a database 120, and an associated telecommunications switch 110 which communicate through a network with a telephone handset 340. The server 100 may be connected to the database 120 and the switch 110. The server 100 may also be connected via the Internet 316 through one or more nodes, such as a Gateway GPRS Support Node (GGSN) 322 and a Servicing GPRS Support Node (SGSN) 324, to a mobile network 313. The switch 110 may be connected through the PSTN 310 to the mobile network 313 at a Mobile Switching Center (MSC) 314. In turn, the MSC 314 may be connected to a Home Location Register database (HLR) 318, a Visitor Location Register database (312), a Mobile Number Portability database (MNP) 320, a location server 308, and the SGSN 324. The SGSN 324 may be connected to one or more Radio Network Controllers (RNC) 326 and/or one or more Processor Control Units (PCU) 327, which in turn may be connected to one or more Base Stations (BS) 328 and to one or more mobile devices referred to collectively as "handsets" 340.

The communications between the server 100 and the handset 340 over the Internet 316 may utilize IP as a protocol opposed to protocols used to establish communications according to CDMA, GSM, or like standards. Such IP governed communications are referred to herein as being conducted over a "data channel." Conversely, communications between the switch 110 and the handset over the PSTN 310 may be transmitted and received in accordance with CDMA, GSM or like standards as opposed to using IP. Such CDMA, GSM or like governed communications, when used to carry voice information, are referred to herein as being conducted over a "voice channel."

With reference to FIGS. 1 and 2, method embodiments of the invention may be facilitated starting with step 200 in which a handset 340 may be used to subscribe to the telephone network that includes the server 100 and switch 110 used to provide telephone service in accordance with embodiments of the invention. A user may subscribe to the telephone network in step 200 by enrolling the telephone handset 340 using a data channel connection between the handset and the server 100. Responsive to a data channel request received from the handset 340, a handset application may be transmitted to the handset from the server 100, and installed and stored in memory associated with the handset in step 202. Once the handset application is installed on the handset 340, the handset may connect to the server 100 by operation of the handset application as needed over a data channel connection which may include the BS 328, RNC 326 or PCU 327, SGSN 324, GGSN 322, and Internet 316.

In connection with step 204, the server 100 may transmit information to the handset 340 via the data channel, which, through automatic operation of the handset application, permits the user to select one or more secondary telephone

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numbers to be referenced to a primary telephone number for the handset. The primary telephone number, preferably, may be a SIM number or ESN which is assigned to the handset 340 at the time of activation. Once selected, the handset 340 may automatically transmit information which to the server 100 over the data channel which requests that the secondary telephone numbers be associated with the primary telephone number. In response, the server 100 may store (i.e., reference) information indicating the association of the one or more selected secondary telephone numbers in computer memory associated with the server such as the database 120. In an alternative embodiment, the server 100 may automatically assign one or more secondary telephone numbers to the handset 340, as opposed to them being selected.

In step 206 of FIG. 2, the handset 340 may be used to access the handset application installed thereon to select call processing rules for handling incoming and outgoing voice channel calls to and from the handset 340. Information indicating call processing rules may be transmitted from the handset 340 to the server 100 via the data channel by automatic operation of the handset application. Custom call processing rules may be selected for, and associated with, each of the primary telephone number and the one or more secondary telephone numbers associated with the primary telephone number. The call processing rules information may be automatically stored in a computer memory, such as database 120, by the server 100. An indication of the association of particular call processing rules with a particular handset 340 and particular primary and/or secondary telephone numbers may also be stored in the database 120. The call processing rules may include preset responses for incoming calls, such as custom stored voice message(s) and/or custom stored text message(s) to be associated with the primary and/or one or more secondary telephone numbers. The call processing rules may further permit the handset 340 to be used to control the availability of the secondary telephone numbers as well as activation of additional secondary telephone numbers and deactivation of existing secondary telephone numbers. Information indicating the call processing rules for the primary telephone number and secondary telephone numbers may be stored automatically in memory associated with the handset 340. The call processing rules may further include stock rules used for all telephone numbers, such as an option to accept or not accept (i.e., drop) an incoming call. With reference to step 208, the application stored on the handset 340 may enable it to be used to receive incoming calls from, and place outgoing calls to, a recipient telephone (not shown) which is connected to the PSTN 310, as explained in more detail below.

With reference to FIGS. 3 and 4, the handset 340 may be used to receive incoming (terminating) calls to a secondary telephone number, using a telephone network automated structure having a network layer 101 and an application layer 102 associated therewith. An incoming call to the secondary telephone number may be placed in step 402 by a calling party. The incoming call is routed from the caller's telephone to the PSTN 310. In step 404, the incoming call may be routed over the PSTN 310 to the switch 110. Responsive to receipt of the incoming call at the switch 110, a Call Manager 104 application, which cooperates with a Mobility Manager 106 application, and a Web Manager 108 application, which are all associated with the server 100, may access the call processing rules in the database 120 which are associated with the secondary telephone number that is being called. Subject to the accessed call processing rules, the Call Manager 104 may assign or look up a bridge

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telephone number to be used for completion of the call in step 406. The bridge telephone number may be associated with the switch 110, and calls to the bridge telephone number may be automatically routed to this switch.

The call processing rules may provide for call routing via a call distribution algorithm where the call could be routed to one or many telephone numbers. The call processing rules may be user selectable and configurable, and may apply to voice, text and/or other data messaging. The call processing rules may govern how calls are handled and may provide automated call routing or call dropping based on location data of the calling and/or called party. The call processing rules may further govern handling calls based on incoming caller ID, which may identify a calling party as being on an accepted caller ID list or a non-accepted caller ID list. The call processing rules may further provide call routing based on weekday, weekend, holiday, time of day, biometrics data, and accelerometer data information. The call processing rules may still further provide call routing based on an interface with a handset 340 calendar to check availability to accept calls. Such calendars may include, for example, Outlook, Google Calendar, and other user calendars.

If the call processing rules indicate that the secondary telephone number is not available to this particular caller, or to all callers, however, the Call Manager 104 may apply such rule or rules and reject the incoming call at the conclusion of step 406. Application of the call processing rules for a call rejection may result in the call simply not being answered, being dropped, or automated return of a voice, text, or other type of message to the calling telephone number or a communication device associated therewith.

On the other hand, if the call processing rules permit completion of the call, in step 408 the Call Manager 104 may transmit pre-call notification information to the handset 340, which includes the assigned/looked up bridge telephone number, via the data channel connection, i.e., over the Internet 316 and the Mobile Data Network 348. The pre-call information may include information used by the application installed on the handset 340 to cause a display of the calling telephone number, the calling party name, calling party location, such as GPS location, and/or the called secondary telephone number, as well as other information in step 410. The incoming pre-call information may be received at the handset 340 before or during the call ringing on the handset.

In step 412, responsive to receipt of the incoming pre-call notification information, the handset application may cause the handset 340 to display call handling choices for the call. For example, the handset 340 may be directed under the control of the handset application to display receive call, drop call, custom voice mail message, and/or custom text message choices. The choices may be selected through interaction with the handset 340, all before the call is connected or dropped. In step 414, the selection of either delivering a responsive text message (416), not accepting, i.e., "dropping" the call (418), or responding to the call with a custom voice message (420) may be transmitted from the handset 340 to the server 100 via the data channel. Thereafter, the Call Manager 104 may automatically implement the drop call or respond with text or voice message instructions received over the data channel, and the call attempt may be terminated thereafter.

If the call is accepted in step 414, however, the handset application may automatically cause the handset 340 to call the bridge telephone number in step 422 over a voice channel. The return call from the handset 340 to the bridge telephone number may be routed over the PSTN 310 to the switch 110 using a voice channel connection. In step 424,

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once the call to the bridge telephone number is received at the switch 110, the switch may "bridge" the incoming voice channel call to the bridge telephone number with the incoming voice channel call to the secondary telephone number to thereby connect the incoming call from the calling party to the handset 340 via a voice channel. Further, the switch 110 may automatically send signaling information to the calling party telephone which causes the secondary telephone number to be displayed as the number to which the call has been completed.

With continued reference to FIG. 3, the web manager 108 may be used to process Internet 316 transactions for the server 110. The system may also employ a web portal 350 to link a digital device 360 other than a handheld 340 to the telecommunications system for calling in accordance with embodiments of the invention. For example, embodiments of the invention may be used with digital devices 360 such as a desktop computer, laptop computer, iPad, tablet, iPod 790, or the like.

With reference to FIGS. 3 and 5, the handset 340 may be used to place outgoing (originating) calls from a secondary telephone number, using the telephone network automated structure shown in FIG. 3 and described above. If the party to be called has not yet been called using a secondary telephone number, an outgoing call from the handset 340 may be initiated to such party in step 502 by opening the handset application installed thereon. Once the handset application is open, the handset 340 may be used to choose a secondary telephone number as the originating telephone number in step 504. A list of such secondary telephone numbers may be stored in memory associated with the handset.

In step 506, the handset 340 may be used to enter, or select from an address file, a contact telephone number to be called in order to initiate a call to such telephone number. The handset application may cause the handset 340 to transmit information to the server 100 Call Manager 104 via the data channel automatically as a result of the selection of the secondary telephone number and the contact telephone number. The transmitted information may indicate the secondary telephone number from which the call is to appear to the called party to have been placed, and the contact telephone number to be called.

In step 508, responsive to receipt of the data channel communication from the handset 340 requesting set up of a call from it to the telephone number to be called, the Call Manager 104 may access the call processing rules in the database 120 which are associated with the secondary telephone number from which the call is to appear to have been placed. In step 510, subject to the accessed call processing rules, the Call Manager 104 may assign a bridge telephone number to be used to connect the call from the handset 340 to the switch 110 and send pre-call information including the bridge telephone number to the handset via the data channel.

The bridge telephone number may be associated with the switch 110, and calls to the bridge telephone number may be automatically routed to this switch. Once the bridge telephone number is assigned, the server 100 under the control of the Call Manager 104, may store information in the database 120 which associates the bridge telephone number with the primary telephone number for the handset 340, the secondary telephone number selected for the call, and the contact telephone number to be called. More specifically, the stored information may indicate that each combination of primary telephone number and bridge telephone number are uniquely associated with each combination of secondary telephone number and contact telephone number. In other

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words, each combination of primary telephone number and bridge telephone number for the handset 340 map to a unique combination of secondary telephone number and contact telephone number in the database 120 memory.

In step 512, responsive to receipt of the bridge telephone number information over the data channel, the handset application may cause the handset 340 to automatically call the bridge telephone number via a voice channel. The return call from the handset 340 to the bridge telephone number may be routed over the PSTN 310 to the switch 110 using a voice channel connection.

In step 514, the Call Manager 104 may instruct the switch 110 to place a voice channel call to the telephone number to be called using the secondary telephone number as the originating telephone number from the switch. Once the call to the bridge telephone number from the handset 340 is received at the switch 110, the switch may "bridge" the incoming voice channel call to the bridge telephone number with the outgoing voice channel call from the secondary telephone number to the contact telephone number to thereby connect the outgoing call from the handset 340 to the party being called via a voice channel. Further, the switch 110 may automatically send signaling information to the called party telephone which causes the secondary telephone number to be displayed as the number from which the call appears to have been placed. Because each pairing of a primary telephone number and a bridge telephone number maps to a unique contact telephone number and secondary telephone number pairing, the call can be completed at the switch 110 to the correct contact telephone number while showing the desired secondary telephone number as the originating number.

With continued reference to FIG. 5, in the event that the contact telephone has been previously called using the secondary telephone number on the handset 340, the user may directly select the bridge telephone number associated with the secondary telephone number and contact telephone number in step 506 either using the handset application in step 502, or without opening the handset application in step 512. Alternatively, the handset may have a stored "shortcut" which, when the user selects the contact telephone number to be called from the secondary telephone number, results in the associated bridge telephone number being dialed. In either case, the handset 340 may dial the bridge telephone number to connect with the Call Manager 104 in step 512. In step 514, the Call Manager 104 may look up the secondary telephone number and the contact telephone number associated with the paired bridge telephone number and primary telephone number for the handset 340. Thereafter, the switch 110 may dial the contact telephone number and bridge the call from the handset 340 in a manner that makes the secondary telephone number appear to be the telephone number from which the call is being placed.

FIG. 6 is a call flow diagram illustrating a method of setting up and connecting a multi-party conference call in accordance with an embodiment of the present invention. With reference to FIGS. 3 and 6, the communication sequence for a conference call is illustrated between the handset application stored on the handset 340, the Call Manager 104 application associated with the server 100 and switch 110, and a conference call invitee handset. In step 600, the application on the handset 340 may be used to select invitees (users) for a conference call. The telephone numbers of the invitees may be selected from an address book or manually entered. Further, the conference call may be selected to be initiated immediately, or at some future date and time.

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Once the invitees are selected, the handset 340 may be instructed by the handset application to transmit a conference request to the server 100 via a data channel. In step 602, the Call Manager 104 operating on the server 100 may assign a conference bridge telephone number to the conference call in response to receipt of the conference request. In step 604, the Call Manager 104 may cause the server 100 to send conference invitation messages to each of the invitee handsets, and more specifically, applications stored on the invitee handsets, via a data channel. The invitation messages may include the assigned bridge telephone number for the conference call and an optional PIN or code number for the conference call. The invitation message may provide a notice, for example, "Jack has invited you to join a conference call," and further include identification of other invited participants.

In step 606, each invitee handset may be used to accept to join the conference call, join at a later time, or decline to join. If the acceptance is for a future scheduled conference call, an indication of the acceptance (including acceptance to join late) may be transmitted from each invitee handset under the control of the application installed thereon, to the server 100 Call Manager 104 via the data channel. Further, if the invitation is declined altogether, an indication thereof may be transmitted from each invitee handset to the server 100. Thereafter, the Call Manager 104 may transmit information to the originating handset 340, and optionally the invitee handsets, via the data channel, which indicates acceptance of a future conference call, acceptance to join late (step 610), or declination of the conference call invitation.

If the conference call invitation is accepted and it is time for the call, each accepting invitee handset may automatically or manually dial the bridge telephone number using a voice channel. The switch 110 may receive the voice channel calls to the bridge telephone number and may authenticate the invitees right to join the conference call in step 608 by comparing the invitee's telephone number with that of the invitee list, as well as comparing any PIN input by the invitee with the PIN selected for the conference call. If the authentication is successful, the invitee handset is connected to the call via the voice channel. An automatic update may be transmitted via the data channel from the server to the originating handset 340 indicating that a particular invitee handset has joined the conference call.

If an invitee chose to join late, the server 100 may automatically transmit a reminder to the affected invitee handset to join the call at the agreed time in step 612. Thereafter, the late joining invitee handset may dial the bridge telephone number automatically or manually using a voice channel. The switch 110 may receive the voice channel call to the bridge telephone number, authenticate the late joining invitee handset, and connect the handset to the conference call in step 614.

The foregoing has described the principles, embodiments and modes of operation of the present invention. However, the invention should not be construed as being limited to the particular embodiments discussed. The above described embodiments should be regarded as illustrative rather than restrictive, and it should be appreciated that variations may be made in those embodiments by workers skilled in the art without departing from the scope of the present invention as defined by the following claims.

What is claimed:

1. A method of providing telephone service, the method comprising:

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associating a secondary telephone number with a primary telephone number in at least one computer memory device, the primary telephone number being assigned to a handset;

acquiring first digital information from the handset over at least one data channel, the first digital information indicating primary call processing rules for handling calls directed to the primary telephone number;

storing the primary call processing rules in the at least one computer memory device;

acquiring second digital information from the handset over the at least one data channel, the second digital information indicating secondary call processing rules for handling calls directed to the secondary telephone number;

storing the secondary call processing rules in the at least one computer memory device;

receiving an incoming call over at least one voice channel at a switch, the switch being associated with a bridge telephone number such that calls directed to the bridge telephone number are automatically routed to the switch, the incoming call being directed to a handset-associated telephone number, the handset-associated telephone number being the primary telephone number or the secondary telephone number, and;

based on the primary call processing rules or the secondary call processing rules:

transmitting pre-call information to the handset over the at least one data channel the pre-call information including the bridge telephone number and the handset-associated telephone number, such that the handset is capable of displaying the handset-associated telephone number to a user and, based on user input, accepting the incoming call by connecting with the switch over the at least one voice channel using the bridge telephone number.

2. The method of claim 1, wherein the handset-associated telephone number is the secondary telephone number, and the pre-call information is transmitted based on the secondary call processing rules.

3. The method of claim 1, wherein the pre-call information includes a plurality of call handling choices for display by the handset and selection via the user input.

4. The method of claim 1, further comprising:

receiving an outgoing call request from the handset over the at least one data channel, the outgoing call request including an originating telephone number and a contact telephone number to be called, the originating telephone number being the primary telephone number or the secondary telephone number;

connecting with the handset at the switch over the at least one voice channel using the bridge telephone number; and

transmitting an outgoing call over the at least one voice channel from the switch, the outgoing call being directed to the contact telephone number and indicating the originating telephone number.

5. The method of claim 1, wherein the at least one data channel includes an Internet protocol (IP) channel.

6. The method of claim 5, wherein the at least one voice channel is established in accordance with at least one of a Code Division Multiple Access (CDMA) standard and a Global System for Mobiles (GSM) standard.

* * * * *

Exhibit C



US010334094B1

(12) **United States Patent**
Zhidov et al.

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(45) **Date of Patent:** **Jun. 25, 2019**

(54) **TELEPHONE NETWORK SYSTEM AND METHOD**

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See application file for complete search history.

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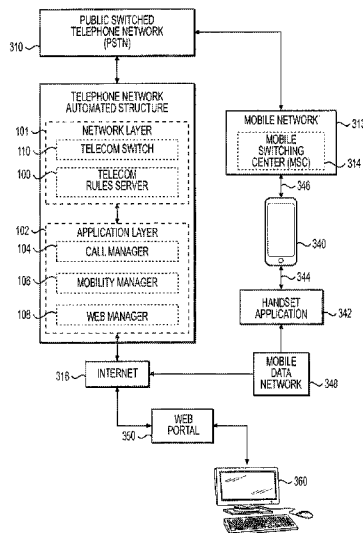
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(57) ABSTRACT

Systems for and methods of delivering telephone calls using the combination of a data channel and a voice channel are disclosed. A data channel connection with the telephone handset may provide pre-call information used to set up incoming and outgoing calls which are ultimately connected using a voice channel. Use of the pre-call information may permit the same handset to be associated with multiple secondary telephone numbers from which calls appear to have been made and to which calls appear to have been placed.

12 Claims, 6 Drawing Sheets



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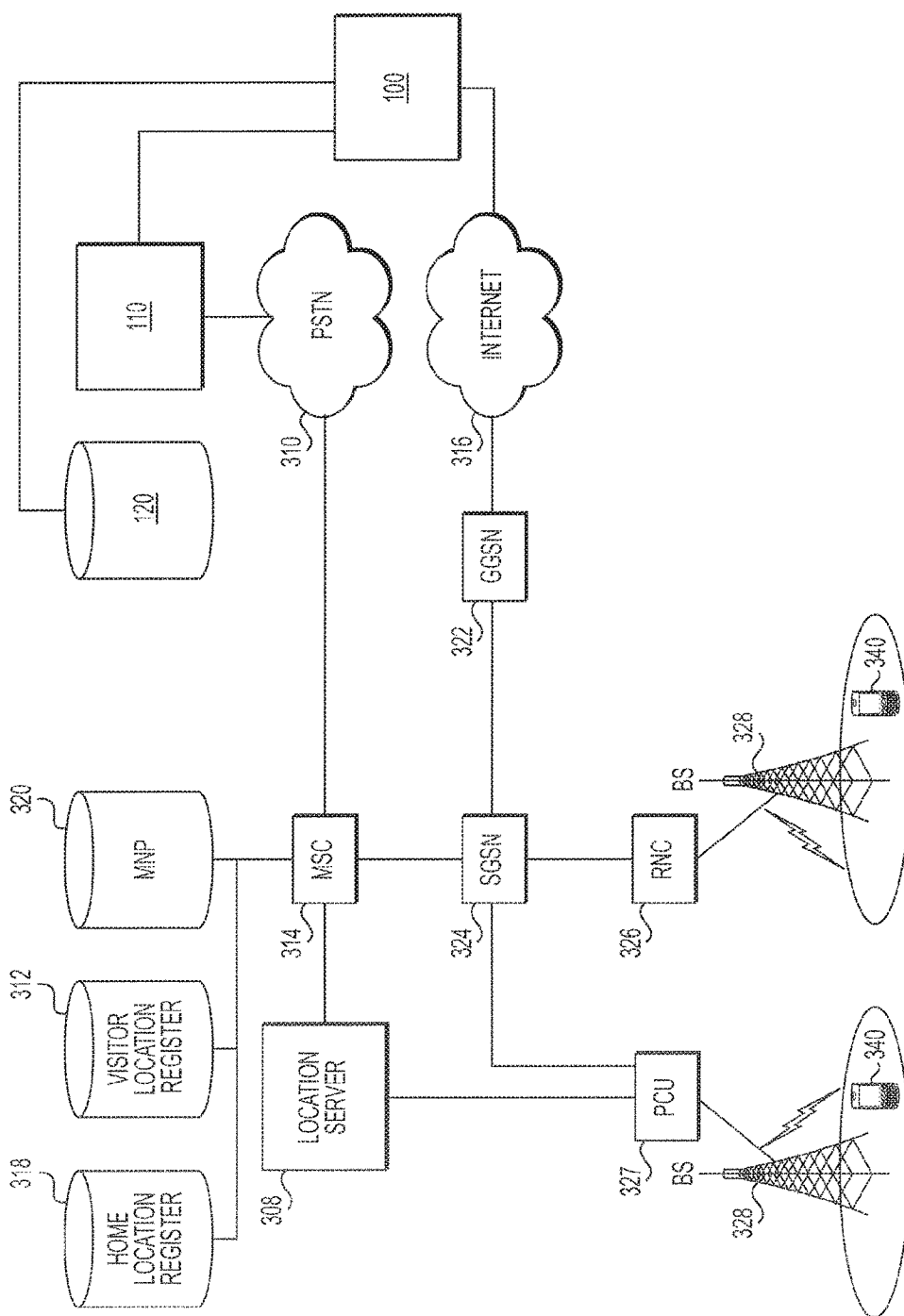
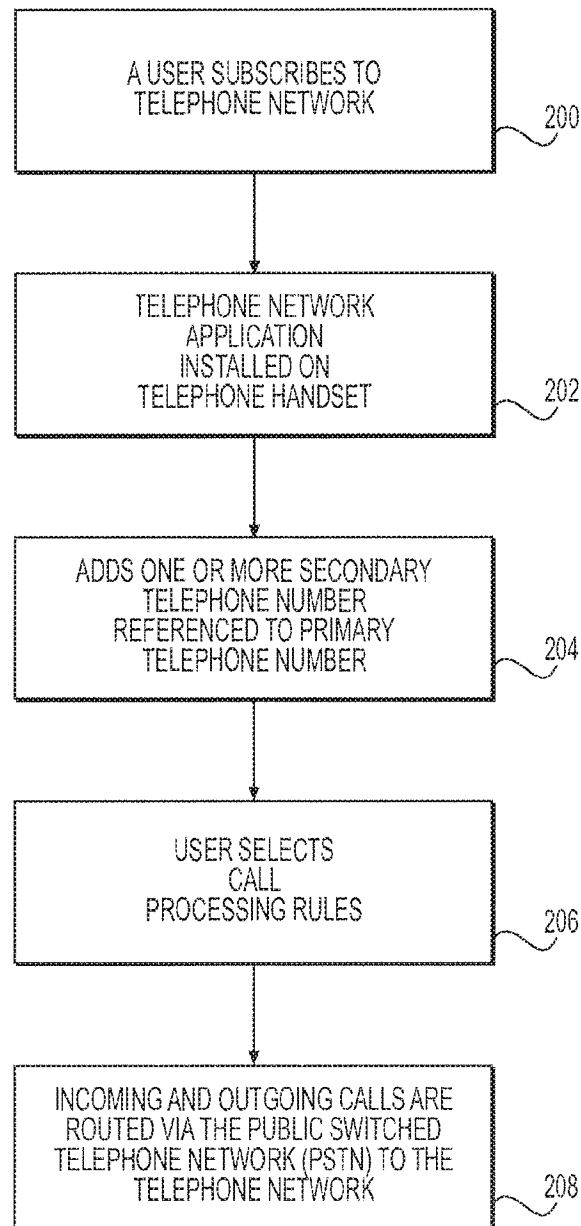
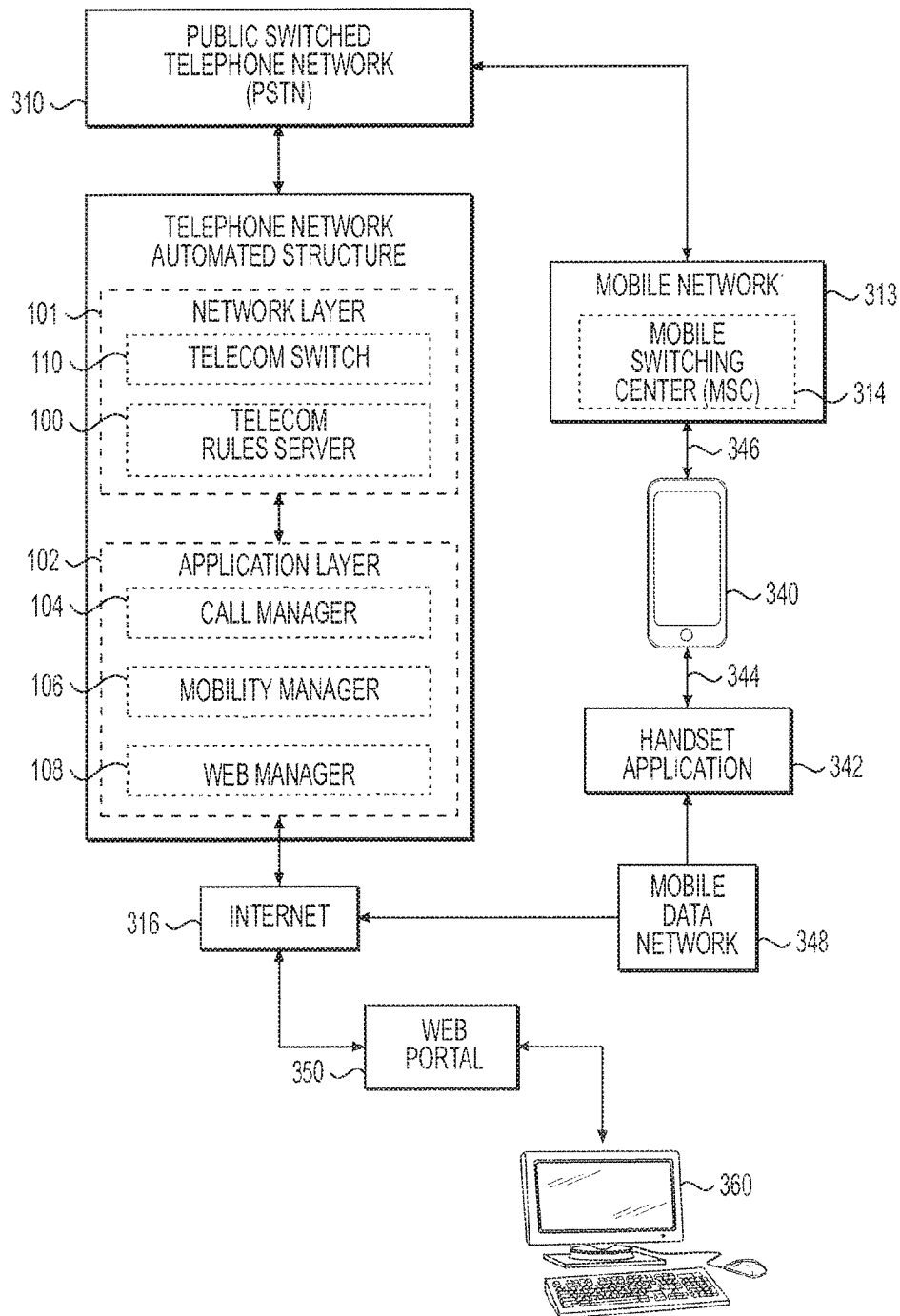
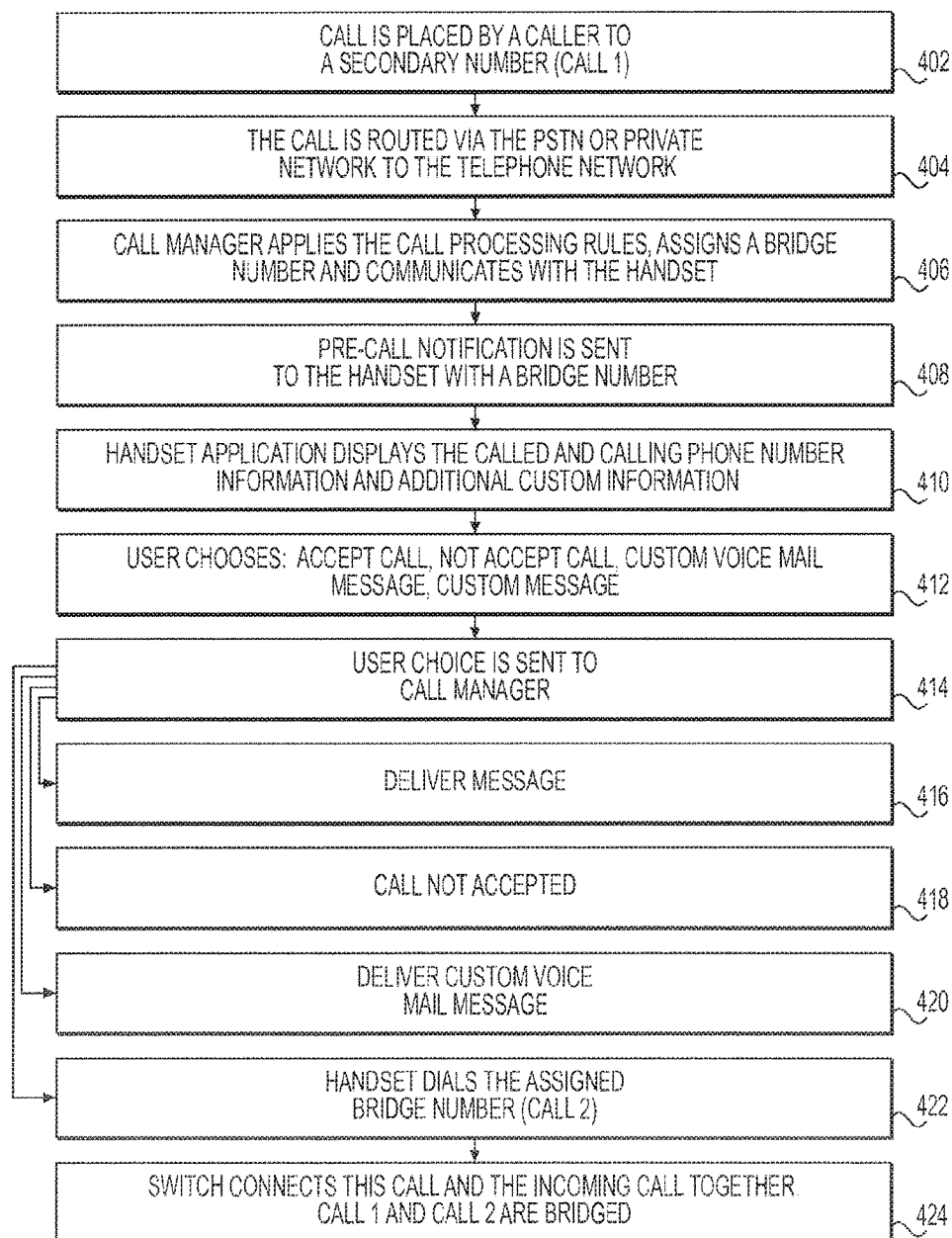


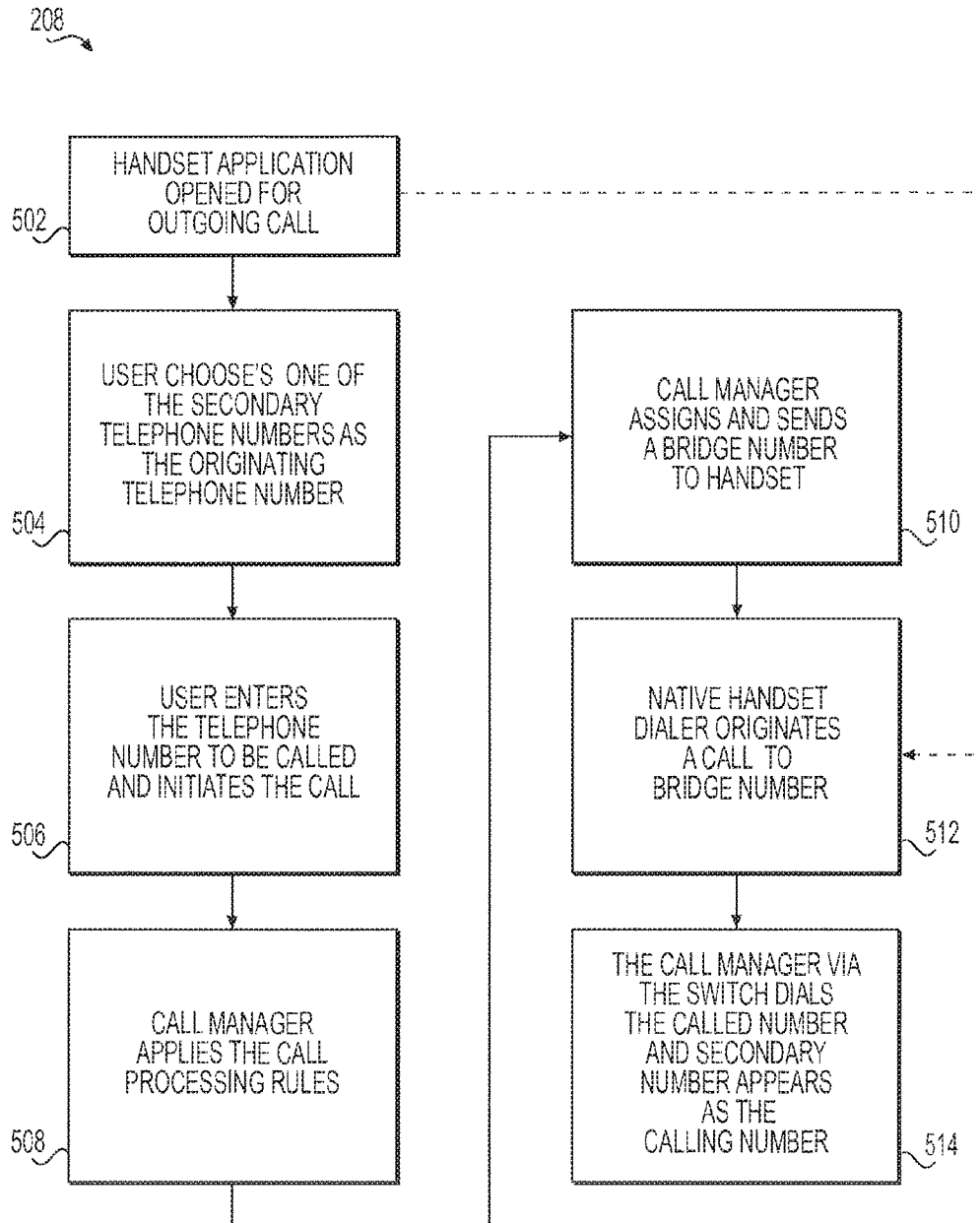
FIG. 1

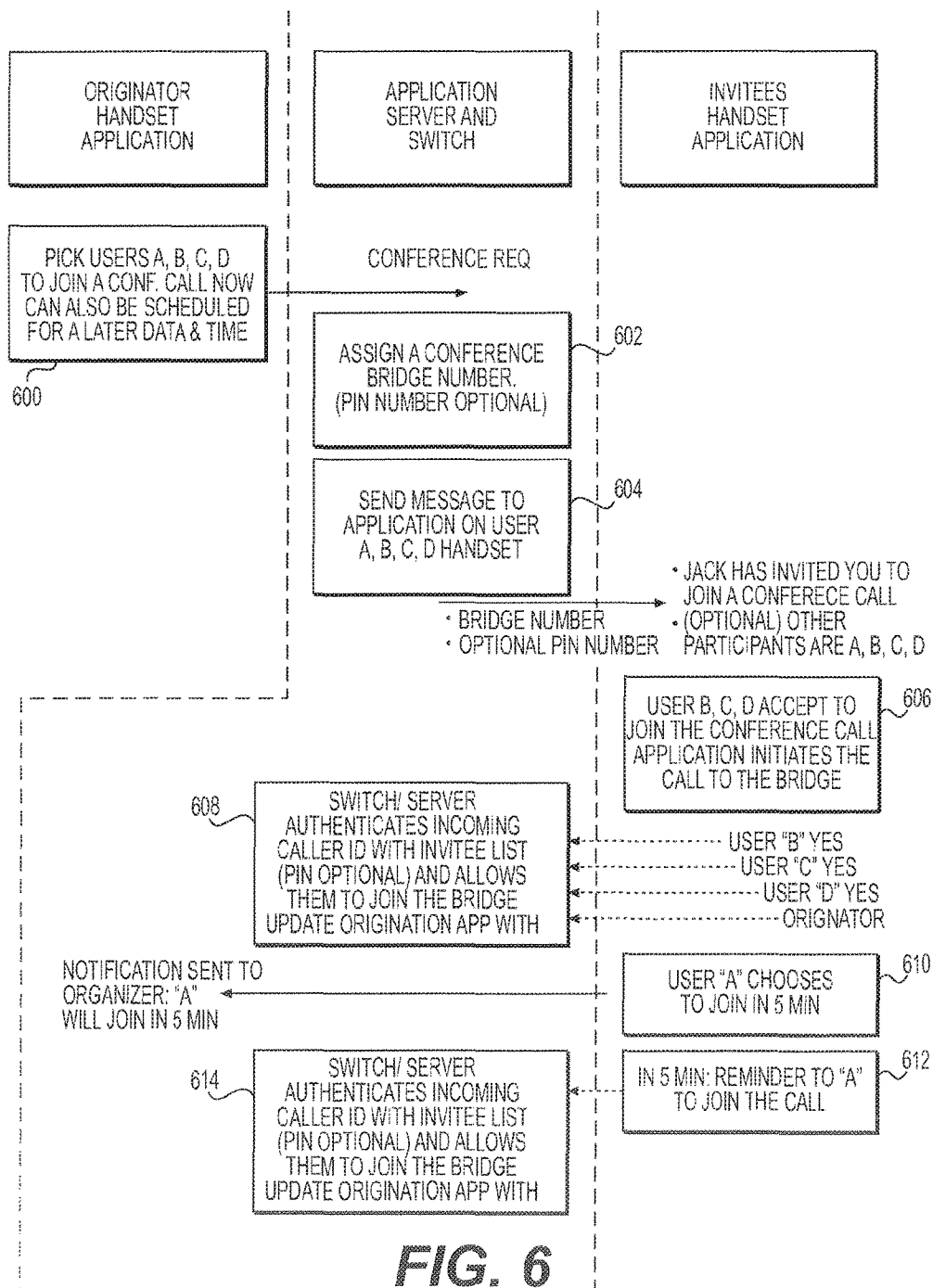
**FIG. 2**

**FIG. 3**

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**FIG. 4**

**FIG. 5**



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TELEPHONE NETWORK SYSTEM AND METHOD**CROSS-REFERENCE TO RELATED APPLICATIONS**

The present application claims the benefit, under 35 U.S.C. § 120, as a continuation of U.S. patent application Ser. No. 15/582,091, now U.S. Pat. No. 10,051,105, filed Apr. 28, 2017, entitled "Telephone Network System and Method," which is a continuation of and which claims priority benefit, under 35 U.S.C. § 120, to U.S. patent application Ser. No. 14/307,052, now U.S. Pat. No. 9,667,770, filed Jun. 17, 2014, entitled "Telephone Network System and Method," which is a continuation-in-part of and which claims priority benefit, under 35 U.S.C. § 120, to U.S. patent application Ser. No. 13/944,853, filed on Jul. 17, 2013, entitled "A Method Of A Data Channel Telephone Network System," the disclosure of each of which is incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

The present invention relates to systems and methods for setting up and connecting telephone calls, and delivering information related to such telephone calls using an Internet Protocol (IP) or other data channel while delivering the voice portion of the call in accordance with CDMA, GSM or like voice channel delivery standards.

BACKGROUND OF THE INVENTION

The volume of telephone calls and text messaging has increased dramatically and users are finding it more and more difficult to manage that volume of calls and messages. The current systems to aid in managing some types of calls only provide minimal assistance to the user. It is therefore an advantage of some, but not necessarily all, embodiments of the present invention to provide systems and methods for assisting callers and call recipients with the management of calls and messages.

Additional advantages of various embodiments of the invention are set forth, in part, in the description that follows and, in part, will be apparent to one of ordinary skill in the art from the description and/or from the practice of the invention.

SUMMARY OF THE INVENTION

Responsive to the foregoing challenges, Applicant has developed an innovative method of providing telephone service by transmitting call handling information between a handset and a switch using an IP channel or similar protocol channel and by transmitting a voice call associated with the call handling information between the handset and the switch using a voice channel provided in accordance with a voice channel protocol, e.g., in accordance with CDMA or GSM, 3G, 4G, LTE or like future protocol channels standards.

Applicant has further developed an innovative method of providing telephone service comprising: automatically storing electronic information that indicates an association of a secondary telephone number and a primary telephone number with a telephone handset in a computer memory associated with a server; automatically storing electronic information that indicates a selection of call processing rules for the primary telephone number in the computer memory;

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automatically storing electronic information that indicates a selection of call processing rules for the secondary telephone number in the computer memory; receiving an electronic indication of an incoming call to the secondary telephone number at the server, said electronic indication of an incoming call being received from a switch associated with the server; automatically accessing the call processing rules for the secondary telephone number under the control of the server responsive to the receipt of the electronic indication of the incoming call to the secondary telephone number; automatically handling the incoming call in accordance with the accessed call processing rules for the secondary telephone number; transmitting pre-call information via a data channel to the handset under the control of the server, said pre-call information including a bridge telephone number for connecting the handset to the incoming call at the switch; and receiving, at the server via the data channel, an electronic indication of a selection of a call processing rule for handling the incoming call to the secondary telephone number, or establishing a voice channel connection between the handset and the switch as a result of the handset calling the switch using the bridge number.

Applicant has further developed an innovative method of providing telephone service, comprising: automatically storing electronic information that indicates an association of a secondary telephone number and a primary telephone number with a telephone handset in a computer memory associated with a server; automatically associating a unique bridge telephone number with each of a plurality of contact telephone numbers in the computer memory; automatically transmitting information that indicates the association of the unique bridge telephone number with each of a plurality of contact telephone numbers to the handset via the data channel; automatically associating each primary telephone number and bridge telephone number pairing with a corresponding secondary telephone number and contact telephone number pairing in the computer memory; receiving, at a switch associated with the server, an outgoing call from the handset to the bridge telephone number via a voice channel; receiving, at the server, information from the switch indicating the outgoing call is being made to the bridge telephone number from the primary telephone number; receiving, at the switch, information from the server directing the switch to: (a) connect the outgoing call to a contact telephone number associated with the primary telephone number and bridge telephone number pairing, and (b) identify the telephone number from which the outgoing call is being made as the secondary telephone number.

Applicant has still further developed an innovative method of providing telephone service, comprising: enrolling a telephone handset in a telecommunications system having a server and a switch, wherein said telephone handset is associated with a primary telephone number in a database associated with the server and switch; electronically transmitting an application from the server to the telephone handset via a data channel responsive to telephone handset enrollment, wherein said application is: adapted to send instructions to have one or more secondary telephone numbers referenced to the primary telephone number in the database, adapted to present visually perceptible call processing rules on the telephone handset, and adapted to transmit information indicating a selection of call processing rules from the telephone handset to the server; electronically receiving instructions from the telephone handset via the data channel to reference the one or more secondary telephone numbers to the primary telephone number; storing telephone handset information, including the primary tele-

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phone number and the one or more secondary telephone numbers referenced to the primary telephone number, in the database; electronically receiving instructions from the telephone handset via the data channel to store user selected call processing rules for the telephone handset in the database, wherein the user selected call processing rules include instructions to route calls over a voice channel in a manner that will indicate that the calls are made to or from the one or more secondary telephone numbers; electronically transmitting information to the telephone handset via the data channel, said information being adapted to cause a pre-call information to be displayed on the telephone handset responsive to initiation of an outgoing call using the one or more secondary telephone numbers or an incoming call to the one or more secondary telephone numbers; electronically receiving from the telephone handset via the data channel call handling information indicating a user selected call processing rule to be used to process the outgoing or incoming call; and automatically handling the outgoing or incoming call based on the call handling information.

Applicant has still further developed an innovative method of providing telephone service, comprising: associating a telephone handset with primary and secondary telephone numbers in a database; receiving, from the telephone handset via a data channel, digital information indicating primary call processing rules for handling calls to the first telephone number; storing the primary call processing rules digitally; receiving, from the telephone handset via the data channel, digital information indicating secondary call processing rules for handling calls to the secondary telephone number; storing the secondary call processing rules digitally; receiving a call request to the secondary telephone number; transmitting pre-call information to the telephone handset via the data channel responsive to receipt of the call request, wherein said pre-call information is based on the secondary call processing rules; responsive to the pre-call information, receiving information indicative of a user input to the telephone handset over the data channel; and processing the call based on the stored alternative call processing rules and user input to the telephone handset, wherein said processing includes an option of connecting the call over a voice channel.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only, and are not restrictive of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to assist the understanding of this invention, reference will now be made to the appended drawings, in which like reference characters refer to like elements.

FIG. 1 is a schematic diagram illustrating a network architecture that may be used to provide telephone service in accordance with embodiments of the present invention.

FIG. 2 is a block diagram illustrating a method of providing telephone calls in accordance with embodiments of the present invention.

FIG. 3 is a block diagram illustrating data channel and voice channel connections used to provide telephone service in accordance with embodiments of the present invention.

FIG. 4 is a block diagram illustrating a method of setting up and connecting an incoming call in accordance with one embodiment of the present invention.

FIG. 5 is a block diagram illustrating a method of setting up and connecting an outgoing call in accordance with one embodiment of the present invention.

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FIG. 6 is a call sequence diagram illustrating a method of setting up and connecting a conference call in accordance with one embodiment of the present invention.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

Reference will now be made in detail to embodiments of the present invention, examples of which are illustrated in the accompanying drawings. It is to be understood that other embodiments may be utilized and structural changes may be made without departing from the scope of the present invention.

It should be noted that in connection with the described embodiments, reference is made to a data channel. A preferred data channel may be an Internet Protocol (IP) channel, which is not a conventional telephone voice channel. However, other data, non-conventional voice, channels over which information may be transmitted between a telephone handset and a server may be used in alternative embodiments of the invention.

With reference to FIG. 1, embodiments of the present invention may be implemented using a system having a server 100, associated computer memory, such as a database 120, and an associated telecommunications switch 110 which communicate through a network with a telephone handset 340. The server 100 may be connected to the database 120 and the switch 110. The server 100 may also be connected via the Internet 316 through one or more nodes, such as a Gateway GPRS Support Node (GGSN) 322 and a Servicing GPRS Support Node (SGSN) 324, to a mobile network 313. The switch 110 may be connected through the PSTN 310 to the mobile network 313 at a Mobile Switching Center (MSC) 314. In turn, the MSC 314 may be connected to a Home Location Register database (HLR) 318, a Visitor Location Register database (312), a Mobile Number Portability database (MNP) 320, a location server 308, and the SGSN 324. The SGSN 324 may be connected to one or more Radio Network Controllers (RNC) 326 and/or one or more Processor Control Units (PCU) 327, which in turn may be connected to one or more Base Stations (BS) 328 and to one or more mobile devices referred to collectively as "handsets" 340.

The communications between the server 100 and the handset 340 over the Internet 316 may utilize IP as a protocol opposed to protocols used to establish communications according to CDMA, GSM, or like standards. Such IP governed communications are referred to herein as being conducted over a "data channel." Conversely, communications between the switch 110 and the handset over the PSTN 310 may be transmitted and received in accordance with CDMA, GSM or like standards as opposed to using IP. Such CDMA, GSM or like governed communications, when used to carry voice information, are referred to herein as being conducted over a "voice channel."

With reference to FIGS. 1 and 2, method embodiments of the invention may be facilitated starting with step 200 in which a handset 340 may be used to subscribe to 10 the telephone network that includes the server 100 and switch 110 used to provide telephone service in accordance with embodiments of the invention. A user may subscribe to the telephone network in step 200 by enrolling the telephone handset 340 using a data channel connection between the handset and the server 100. Responsive to a data channel request received from the handset 340, a handset application may be transmitted to the handset from the server 100, and installed and stored in memory associated with the handset

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in step 202. Once the handset application is installed on the handset 340, the handset may connect to the server 100 by operation of the handset application as needed over a data channel connection which may include the BS 328, RNC 326 or PCU 327, SGSN 324, GGSN 322, and Internet 316.

In connection with step 204, the server 100 may transmit information to the handset 340 via the data channel, which, through automatic operation of the handset application, permits the user to select one or more secondary telephone numbers to be referenced to a primary telephone number for the handset. The primary telephone number, preferably, may be a SIM number or ESN which is assigned to the handset 340 at the time of activation. Once selected, the handset 340 may automatically transmit information which to the server 100 over the data channel which requests that the secondary telephone numbers be associated with the primary telephone number. In response, the server 100 may store (i.e., reference) information indicating the association of the one or more selected secondary telephone numbers in computer memory associated with the server such as the database 120. In an alternative embodiment, the server 100 may automatically assign one or more secondary telephone numbers to the handset 340, as opposed to them being selected.

In step 206 of FIG. 2, the handset 340 may be used to access the handset application installed thereon to select call processing rules for handling incoming and outgoing voice channel calls to and from the handset 340. Information indicating call processing rules may be transmitted from the handset 340 to the server 100 via the data channel by automatic operation of the handset application. Custom call processing rules may be selected for, and associated with, each of the primary telephone number and the one or more secondary telephone numbers associated with the primary telephone number. The call processing rules information may be automatically stored in a computer memory, such as database 120, by the server 100. An indication of the association of particular call processing rules with a particular handset 340 and particular primary and/or secondary telephone numbers may also be stored in the database 120. The call processing rules may include preset responses for incoming calls, such as custom stored voice message(s) and/or custom stored text message(s) to be associated with the primary and/or one or more secondary telephone numbers. The call processing rules may further permit the handset 340 to be used to control the availability of the secondary telephone numbers as well as activation of additional secondary telephone numbers and deactivation of existing secondary telephone numbers. Information indicating the call processing rules for the primary telephone number and secondary telephone numbers may be stored automatically in memory associated with the handset 340. The call processing rules may further include stock rules used for all telephone numbers, such as an option to accept or not accept (i.e., drop) an incoming call. With reference to step 208, the application stored on the handset 340 may enable it to be used to receive incoming calls from, and place outgoing calls to, a recipient telephone (not shown) which is connected to the PSTN 310, as explained in more detail below.

With reference to FIGS. 3 and 4, the handset 340 may be used to receive incoming (terminating) calls to a secondary telephone number, using a telephone network automated structure having a network layer 101 and an application layer 102 associated therewith. An incoming call to the secondary telephone number may be placed in step 402 by a calling party. The incoming call is routed from the caller's telephone to the PSTN 310. In step 404, the incoming call

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may be routed over the PSTN 310 to the switch 110. Responsive to receipt of the incoming call at the switch 110, a Call Manager 104 application, which cooperates with a Mobility Manager 106 application, and a Web Manager 108 application, which are all associated with the server 100, may access the call processing rules in the database 120 which are associated with the secondary telephone number that is being called. Subject to the accessed call processing rules, the Call Manager 104 may assign or look up a bridge telephone number to be used for completion of the call in step 406. The bridge telephone number may be associated with the switch 110, and calls to the bridge telephone number may be automatically routed to this switch.

The call processing rules may provide for call routing via a call distribution algorithm where the call could be routed to one or many telephone numbers. The call processing rules may be user selectable and configurable, and may apply to voice, text and/or other data messaging. The call processing rules may govern how calls are handled and may provide automated call routing or call dropping based on location data of the calling and/or called party. The call processing rules may further govern handling calls based on incoming caller ID, which may identify a calling party as being on an accepted caller ID list or a non-accepted caller ID list. The call processing rules may further provide call routing based on weekday, weekend, holiday, time of day, biometrics data, and accelerometer data information. The call processing rules may still further provide call routing based on an interface with a handset 340 calendar to check availability to accept calls. Such calendars may include, for example, Outlook, Google Calendar, and other user calendars.

If the call processing rules indicate that the secondary telephone number is not available to this particular caller, or to all callers, however, the Call Manager 104 may apply such rule or rules and reject the incoming call at the conclusion of step 406. Application of the call processing rules for a call rejection may result in the call simply not being answered, being dropped, or automated return of a voice, text, or other type of message to the calling telephone number or a communication device associated therewith.

On the other hand, if the call processing rules permit completion of the call, in step 408 the Call Manager 104 may transmit pre-call notification information to the handset 340, which includes the assigned/looked up bridge telephone number, via the data channel connection, i.e., over the Internet 316 and the Mobile Data Network 348. The pre-call information may include information used by the application installed on the handset 340 to cause a display of the calling telephone number, the calling party name, calling party location, such as GPS location, and/or the called secondary telephone number, as well as other information in step 410. The incoming pre-call information may be received at the handset 340 before or during the call ringing on the handset.

In step 412, responsive to receipt of the incoming pre-call notification information, the handset application may cause the handset 340 to display call handling choices for the call. For example, the handset 340 may be directed under the control of the handset application to display receive call, drop call, custom voice mail message, and/or custom text message choices. The choices may be selected through interaction with the handset 340, all before the call is connected or dropped. In step 414, the selection of either delivering a responsive text message (416), not accepting, i.e., "dropping" the call (418), or responding to the call with a custom voice message (420) may be transmitted from the handset 340 to the server 100 via the data channel. Thereafter, the Call Manager 104 may automatically implement

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the drop call or respond with text or voice message instructions received over the data channel, and the call attempt may be terminated thereafter.

If the call is accepted in step 414, however, the handset application may automatically cause the handset 340 to call the bridge telephone number in step 422 over a voice channel. The return call from the handset 340 to the bridge telephone number may be routed over the PSTN 310 to the switch 110 using a voice channel connection. In step 424, once the call to the bridge telephone number is received at the switch 110, the switch may "bridge" the incoming voice channel call to the bridge telephone number with the incoming voice channel call to the secondary telephone number to thereby connect the incoming call from the calling party to the handset 340 via a voice channel. Further, the switch 110 may automatically send signaling information to the calling party telephone which causes the secondary telephone number to be displayed as the number to which the call has been completed.

With continued reference to FIG. 3, the web manager 108 may be used to process Internet 316 transactions for the server 110. The system may also employ a web portal 350 to link a digital device 360 other than a handheld 340 to the telecommunications system for calling in accordance with embodiments of the invention. For example, embodiments of the invention may be used with digital devices 360 such as a desktop computer, laptop computer, iPad, tablet, iPod 790, or the like.

With reference to FIGS. 3 and 5, the handset 340 may be used to place outgoing (originating) calls from a secondary telephone number, using the telephone network automated structure shown in FIG. 3 and described above. If the party to be called has not yet been called using a secondary telephone number, an outgoing call from the handset 340 may be initiated to such party in step 502 by opening the handset application installed thereon. Once the handset application is open, the handset 340 may be used to choose a secondary telephone number as the originating telephone number in step 504. A list of such secondary telephone numbers may be stored in memory associated with the handset.

In step 506, the handset 340 may be used to enter, or select from an address file, a contact telephone number to be called in order to initiate a call to such telephone number. The handset application may cause the handset 340 to transmit information to the server 100 Call Manager 104 via the data channel automatically as a result of the selection of the secondary telephone number and the contact telephone number. The transmitted information may indicate the secondary telephone number from which the call is to appear to the called party to have been placed, and the contact telephone number to be called.

In step 508, responsive to receipt of the data channel communication from the handset 340 requesting set up of a call from it to the telephone number to be called, the Call Manager 104 may access the call processing rules in the database 120 which are associated with the secondary telephone number from which the call is to appear to have been placed. In step 510, subject to the accessed call processing rules, the Call Manager 104 may assign a bridge telephone number to be used to connect the call from the handset 340 to the switch 110 and send pre-call information including the bridge telephone number to the handset via the data channel.

The bridge telephone number may be associated with the switch 110, and calls to the bridge telephone number may be automatically routed to this switch. Once the bridge telephone number is assigned, the server 100 under the control

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of the Call Manager 104, may store information in the database 120 which associates the bridge telephone number with the primary telephone number for the handset 340, the secondary telephone number selected for the call, and the contact telephone number to be called. More specifically, the stored information may indicate that each combination of primary telephone number and bridge telephone number are uniquely associated with each combination of secondary telephone number and contact telephone number. In other words, each combination of primary telephone number and bridge telephone number for the handset 340 map to a unique combination of secondary telephone number and contact telephone number in the database 120 memory.

In step 512, responsive to receipt of the bridge telephone number information over the data channel, the handset application may cause the handset 340 to automatically call the bridge telephone number via a voice channel. The return call from the handset 340 to the bridge telephone number may be routed over the PSTN 310 to the switch 110 using a voice channel connection.

In step 514, the Call Manager 104 may instruct the switch 110 to place a voice channel call to the telephone number to be called using the secondary telephone number as the originating telephone number from the switch. Once the call to the bridge telephone number from the handset 340 is received at the switch 110, the switch may "bridge" the incoming voice channel call to the bridge telephone number with the outgoing voice channel call from the secondary telephone number to the contact telephone number to thereby connect the outgoing call from the handset 340 to the party being called via a voice channel. Further, the switch 110 may automatically send signaling information to the called party telephone which causes the secondary telephone number to be displayed as the number from which the call appears to have been placed. Because each pairing of a primary telephone number and a bridge telephone number maps to a unique contact telephone number and secondary telephone number pairing, the call can be completed at the switch 110 to the correct contact telephone number while showing the desired secondary telephone number as the originating number.

With continued reference to FIG. 5, in the event that the contact telephone has been previously called using the secondary telephone number on the handset 340, the user may directly select the bridge telephone number associated with the secondary telephone number and contact telephone number in step 506 either using the handset application in step 502, or without opening the handset application in step 512. Alternatively, the handset may have a stored "shortcut" which, when the user selects the contact telephone number to be called from the secondary telephone number, results in the associated bridge telephone number being dialed. In either case, the handset 340 may dial the bridge telephone number to connect with the Call Manager 104 in step 512. In step 514, the Call Manager 104 may look up the secondary telephone number and the contact telephone number associated with the paired bridge telephone number and primary telephone number for the handset 340. Thereafter, the switch 110 may dial the contact telephone number and bridge the call from the handset 340 in a manner that makes the secondary telephone number appear to be the telephone number from which the call is being placed.

FIG. 6 is a call flow diagram illustrating a method of setting up and connecting a multi-party conference call in accordance with an embodiment of the present invention. With reference to FIGS. 3 and 6, the communication sequence for a conference call is illustrated between the

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handset application stored on the handset **340**, the Call Manager **104** application associated with the server **100** and switch **110**, and a conference call invitee handset. In step **600**, the application on the handset **340** may be used to select invitees (users) for a conference call. The telephone numbers of the invitees may be selected from an address book or manually entered. Further, the conference call may be selected to be initiated immediately, or at some future date and time.

Once the invitees are selected, the handset **340** may be instructed by the handset application to transmit a conference request to the server **100** via a data channel. In step **602**, the Call Manager **104** operating on the server **100** may assign a conference bridge telephone number to the conference call in response to receipt of the conference request. In step **604**, the Call Manager **104** may cause the server **100** to send conference invitation messages to each of the invitee handsets, and more specifically, applications stored on the invitee handsets, via a data channel. The invitation messages may include the assigned bridge telephone number for the conference call and an optional PIN or code number for the conference call. The invitation message may provide a notice, for example, "Jack has invited you to join a conference call," and further include identification of other invited participants.

In step **606**, each invitee handset may be used to accept to join the conference call, join at a later time, or decline to join. If the acceptance is for a future scheduled conference call, an indication of the acceptance (including acceptance to join late) may be transmitted from each invitee handset under the control of the application installed thereon, to the server **100** Call Manager **104** via the data channel. Further, if the invitation is declined altogether, an indication thereof may be transmitted from each invitee handset to the server **100**. Thereafter, the Call Manager **104** may transmit information to the originating handset **340**, and optionally the invitee handsets, via the data channel, which indicates acceptance of a future conference call, acceptance to join late (step **610**), or declination of the conference call invitation.

If the conference call invitation is accepted and it is time for the call, each accepting invitee handset may automatically or manually dial the bridge telephone number using a voice channel. The switch **110** may receive the voice channel calls to the bridge telephone number and may authenticate the invitees right to join the conference call in step **608** by comparing the invitee's telephone number with that of the invitee list, as well as comparing any PIN input by the invitee with the PIN selected for the conference call. If the authentication is successful, the invitee handset is connected to the call via the voice channel. An automatic update may be transmitted via the data channel from the server to the originating handset **340** indicating that a particular invitee handset has joined the conference call.

If an invitee chose to join late, the server **100** may automatically transmit a reminder to the affected invitee handset to join the call at the agreed time in step **612**. Thereafter, the late joining invitee handset may dial the bridge telephone number automatically or manually using a voice channel. The switch **110** may receive the voice channel call to the bridge telephone number, authenticate the late joining invitee handset, and connect the handset to the conference call in step **614**.

The foregoing has described the principles, embodiments and modes of operation of the present invention. However, the invention should not be construed as being limited to the particular embodiments discussed. The above described

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embodiments should be regarded as illustrative rather than restrictive, and it should be appreciated that variations may be made in those embodiments by workers skilled in the art without departing from the scope of the present invention as defined by the following claims.

What is claimed:

1. A method of providing telephone service, comprising: automatically storing electronic information that indicates an association of a secondary telephone number and a primary telephone number with a telephone handset in a computer memory associated with a server; automatically associating a bridge or access telephone number with each of a plurality of contact telephone numbers in the computer memory; automatically transmitting information that indicates the association of the bridge or access telephone number with each of a plurality of contact telephone numbers to the handset via a data channel; automatically associating each primary telephone number and bridge or access telephone number pairing with a corresponding secondary telephone number and contact telephone number pairing in the computer memory; receiving, at a switch associated with the server, an outgoing call from the handset to the bridge or access telephone number via a second channel; receiving, at the server, information from the switch indicating the outgoing call is being made to the bridge or access telephone number from the primary telephone number; and receiving, at the switch, information from the server directing the switch to: (a) connect the outgoing call to a contact telephone number associated with the primary telephone number and bridge or access telephone number pairing, and (b) identify a telephone number from which the outgoing call is being made as the secondary telephone number.
2. The method of claim 1, wherein the data channel is an Internet protocol (IP) channel.
3. The method of claim 2, wherein the second channel is established in accordance with a CDMA or GSM standard.
4. The method of claim 1, wherein the second channel is not an Internet Protocol (IP) channel.
5. An apparatus, comprising: a memory; and a processor operatively coupled to the memory, the processor configured to automatically store electronic information that indicates an association of a secondary telephone number and a primary telephone number with a telephone handset in a computer memory associated with a server, the processor configured to automatically associate a bridge or access telephone number with each of a plurality of contact telephone numbers in the computer memory, the processor configured to automatically transmit information that indicates the association of the bridge or access telephone number with each of a plurality of contact telephone numbers to the handset via a data channel, the processor configured to automatically associate each primary telephone number and bridge or access telephone number pairing with a corresponding secondary telephone number and contact telephone number pairing in the computer memory, the processor configured to receive, at the server, information from a switch associated with the server and in response to the switch receiving an outgoing call from the handset to the bridge or access telephone number

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via a second channel, the information indicating the outgoing call is being made to the bridge or access telephone number from the primary telephone number, the processor configured to send, to the switch, information from the server directing the switch to: (a) connect the outgoing call to a contact telephone number associated with the primary telephone number and bridge or access telephone number pairing, and (b) identify a telephone number from which the outgoing call is being made as the secondary telephone number.

6. The apparatus of claim 5, wherein the data channel is an Internet Protocol (IP) channel.

7. The apparatus of claim 5, wherein the second channel is established in accordance with a CDMA or GSM standard.

8. The apparatus of claim 5, wherein the second channel is not an Internet Protocol (IP) channel.

9. A non-transitory processor-readable medium storing code representing instructions to be executed by a processor, the code comprising code to cause the processor to:

automatically store electronic information that indicates an association of a secondary telephone number and a primary telephone number with a telephone handset in a computer memory associated with a server;

automatically associate a bridge or access telephone number with each of a plurality of contact telephone numbers in the computer memory;

automatically transmit information that indicates the association of the bridge or access telephone number with each of a plurality of contact telephone numbers to the handset via a data channel;

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automatically associate each primary telephone number and bridge or access telephone number pairing with a corresponding secondary telephone number and contact telephone number pairing in the computer memory; receive, at the server, information from a switch associated with the server and in response to the switch receiving an outgoing call from the handset to the bridge or access telephone number via a second channel, the information indicating the outgoing call is being made to the bridge or access telephone number from the primary telephone number; and send, to the switch, information from the server directing the switch to: (a) connect the outgoing call to a contact telephone number associated with the primary telephone number and bridge or access telephone number pairing, and (b) identify a telephone number from which the outgoing call is being made as the secondary telephone number.

10. The non-transitory processor-readable medium of claim 9, wherein the data channel is an Internet Protocol (IP) channel.

11. The non-transitory processor-readable medium of claim 9, wherein the second channel is established in accordance with a CDMA or GSM standard.

12. The non-transitory processor-readable medium of claim 9, wherein the second channel is not an Internet Protocol (IP) channel.

* * * * *

Exhibit D



US011012554B2

(12) **United States Patent**
Zhidov et al.

(10) **Patent No.:** **US 11,012,554 B2**

(45) **Date of Patent:** ***May 18, 2021**

(54) **TELEPHONE NETWORK SYSTEM AND METHOS**

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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.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **17/039,566**

(22) Filed: **Sep. 30, 2020**

(65) **Prior Publication Data**

US 2021/0021701 A1 Jan. 21, 2021

Related U.S. Application Data

(60) Division of application No. 16/444,753, filed on Jun. 18, 2019, now abandoned, which is a division of application No. 16/031,806, filed on Jul. 10, 2018, now Pat. No. 10,334,094, which is a continuation of application No. 15/582,091, filed on Apr. 28, 2017, now Pat. No. 10,051,105, which is a continuation of application No. 14/307,052, filed on Jun. 17, 2014, now Pat. No. 9,667,770, which is a continuation-in-part of application No. 13/944,853, filed on Jul. 17, 2013, now abandoned.

(51) **Int. Cl.**

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H04M 3/42 (2006.01)

H04W 76/10 (2018.01)

H04M 3/56 (2006.01)

H04M 3/436 (2006.01)

H04L 29/06 (2006.01)

(52) **U.S. Cl.**

CPC ... **H04M 1/72547** (2013.01); **H04M 3/42042** (2013.01); **H04M 3/42263** (2013.01); **H04M 3/42272** (2013.01); **H04L 65/1069** (2013.01); **H04M 3/436** (2013.01); **H04M 3/565** (2013.01); **H04M 2203/5054** (2013.01); **H04W 76/10** (2018.02)

(58) **Field of Classification Search**

CPC . H04W 76/19; H04W 36/0055; H04W 76/18; H04W 36/08; H04W 76/27; H04W 36/0085; H04W 8/18; H04M 3/42042; H04M 2203/2011; H04M 3/42059; H04M 3/42102; H04M 3/42263; H04M 3/42272; H04M 3/42229; H04M 3/4365

See application file for complete search history.

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* cited by examiner

Primary Examiner — Nam T Huynh

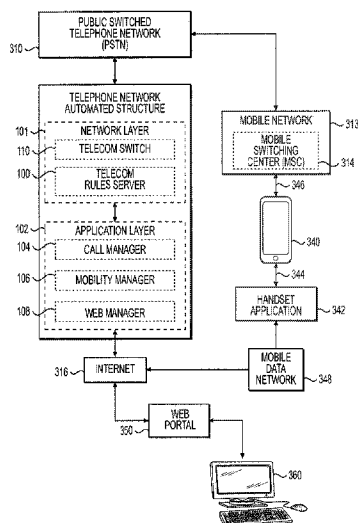
(74) Attorney, Agent, or Firm — West & Associates, A PC; Stuart J. West

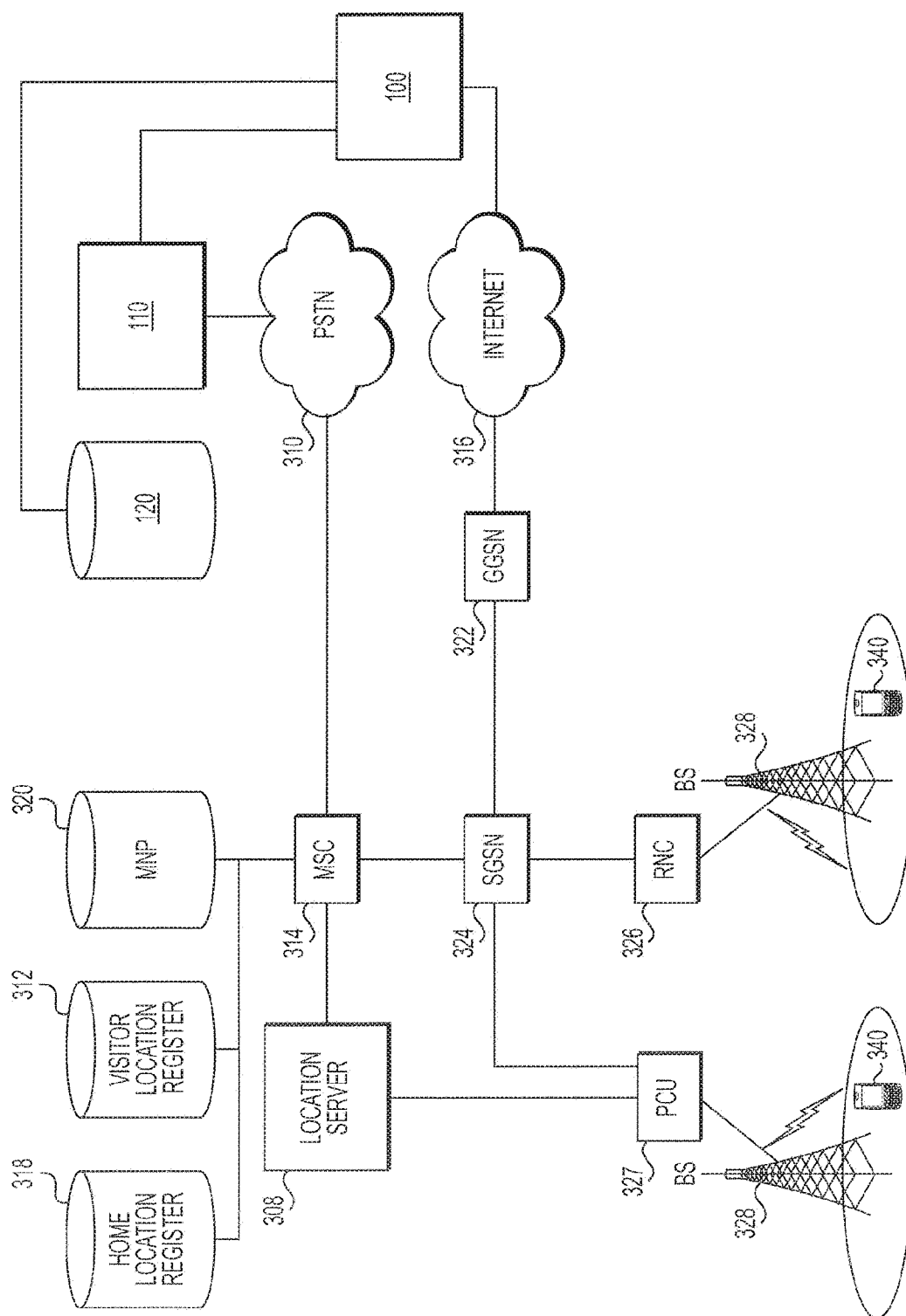
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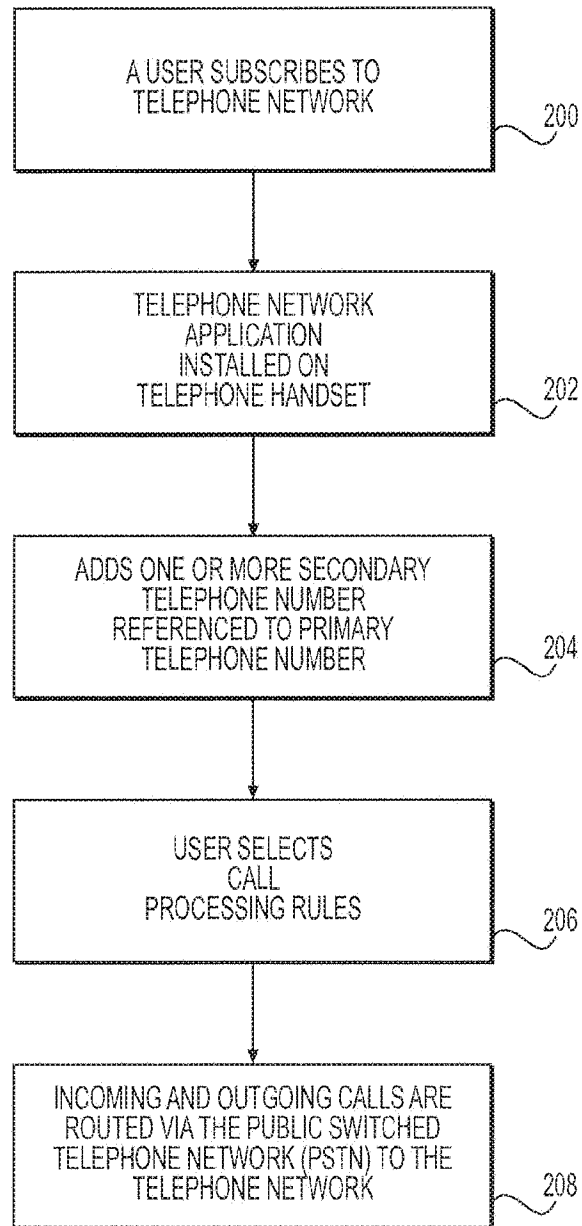
ABSTRACT

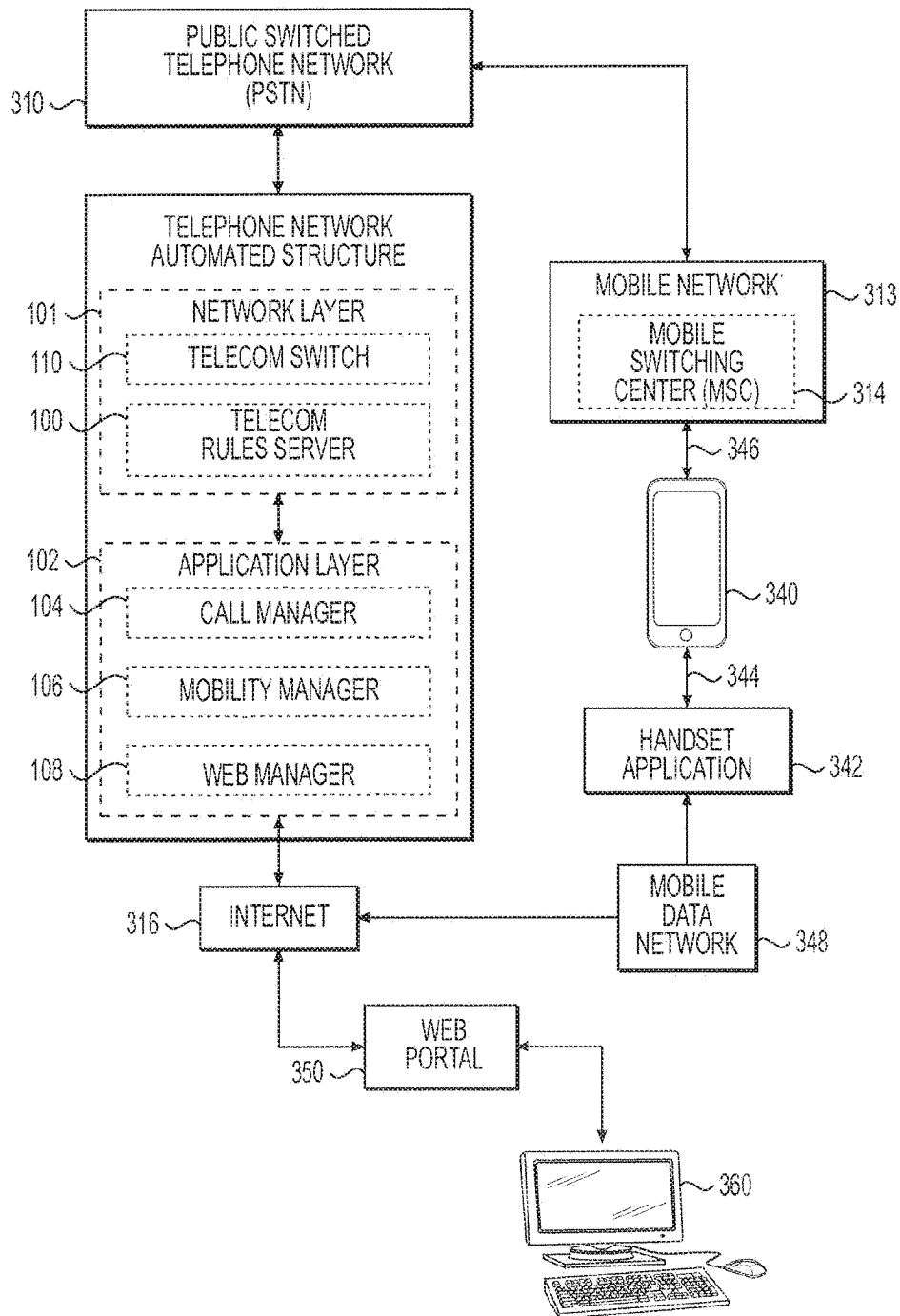
Systems for and methods of delivering telephone calls using the combination of a data channel and a voice channel are disclosed. A data channel connection with the telephone handset may provide pre-call information used to set up incoming and outgoing calls which are ultimately connected using a voice channel. Use of the pre-call information may permit the same handset to be associated with multiple secondary telephone numbers from which calls appear to have been made and to which calls appear to have been placed.

12 Claims, 6 Drawing Sheets



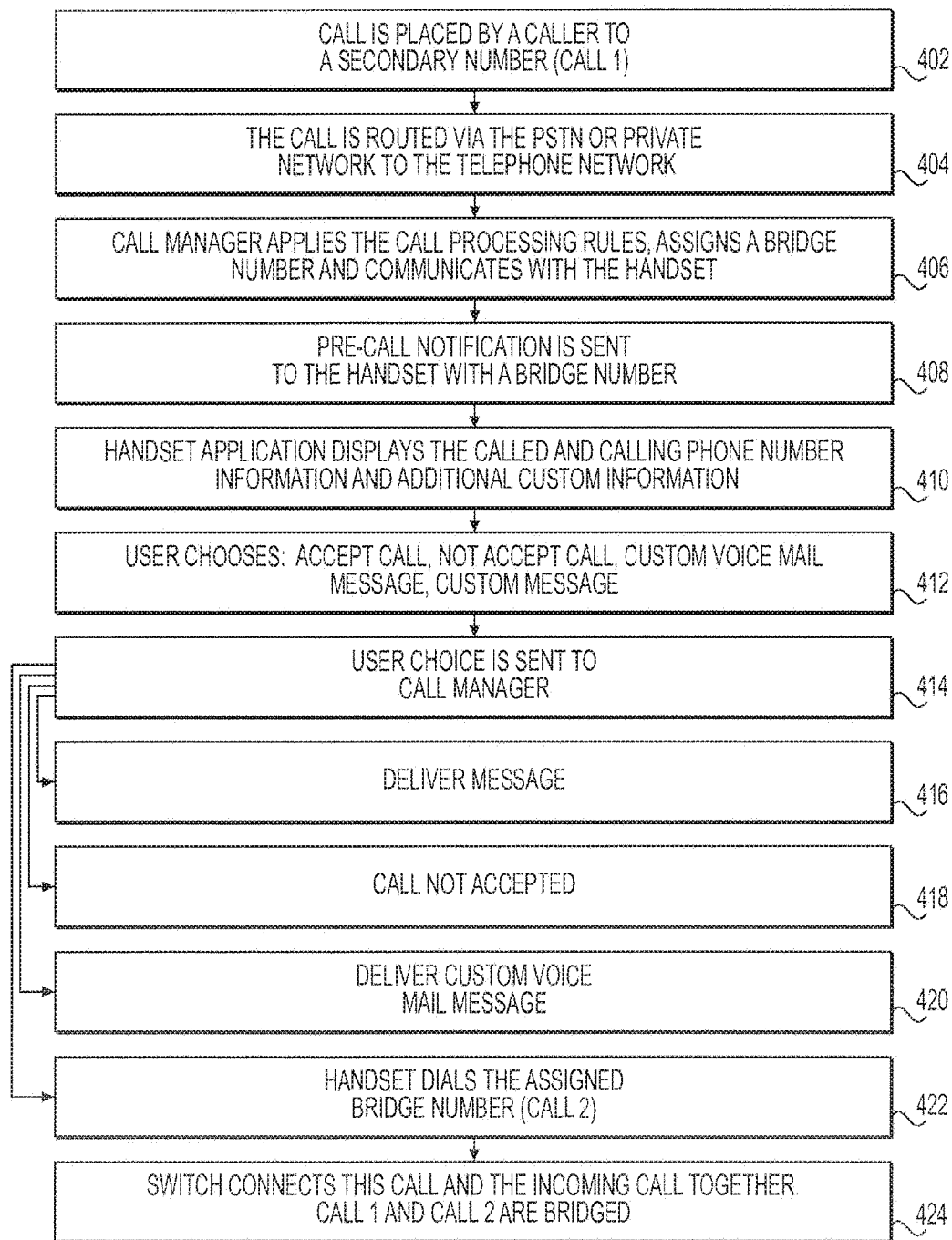
**FIG. 1**

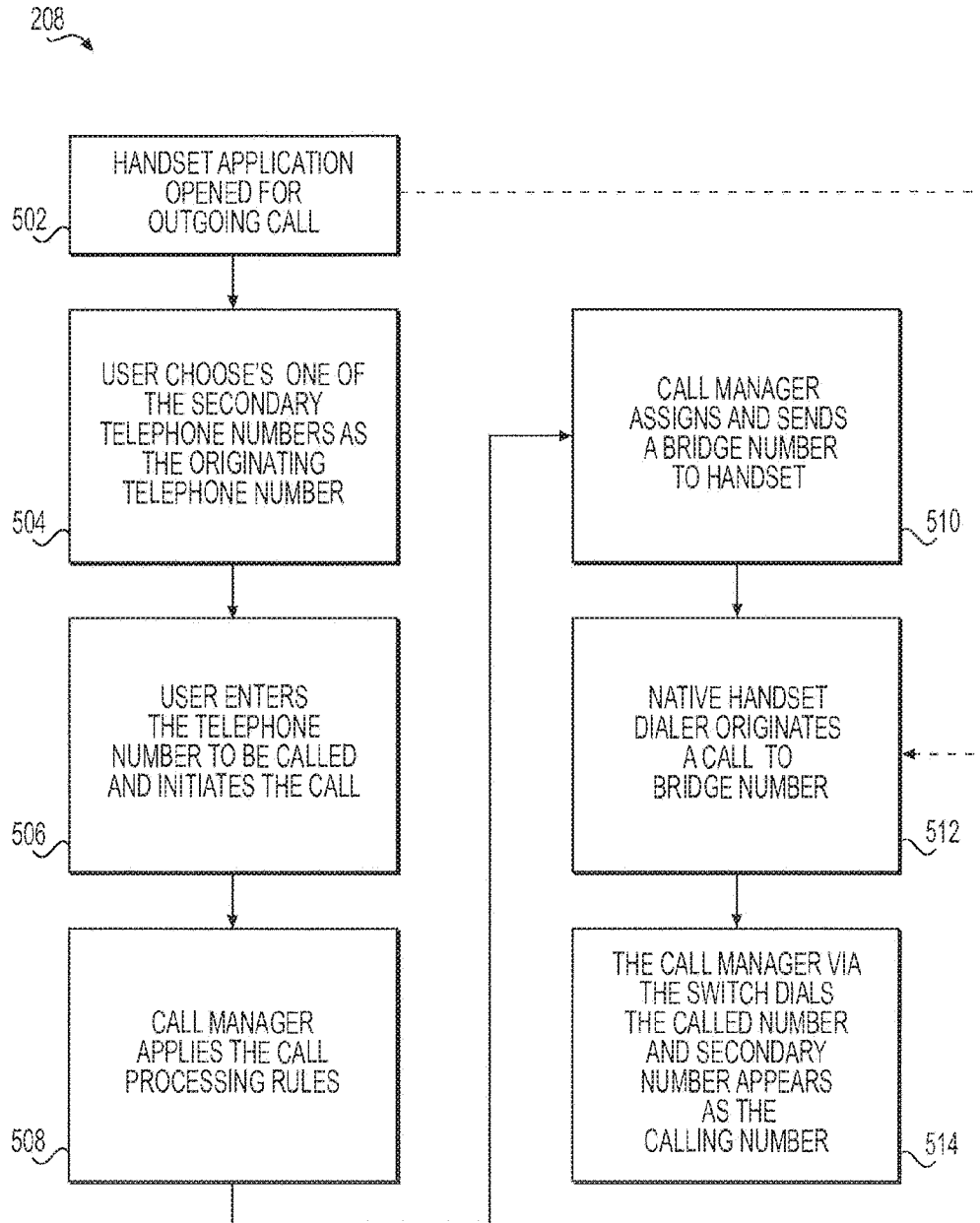
**FIG. 2**

**FIG. 3**

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**FIG. 4**

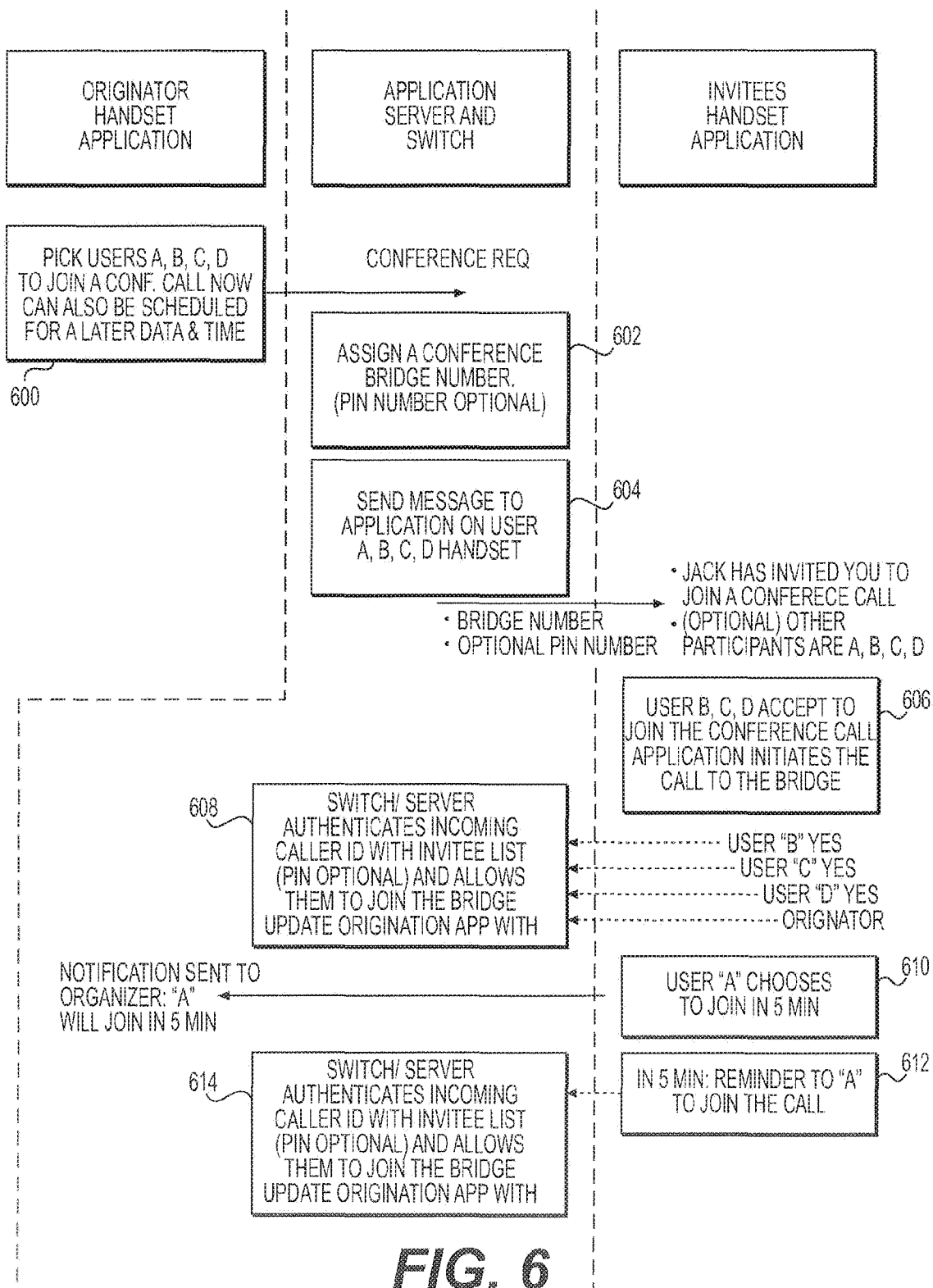
**FIG. 5**

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**TELEPHONE NETWORK SYSTEM AND
METHODS****CROSS-REFERENCE TO RELATED
APPLICATION(S)**

This application is a divisional application and claims the benefit of priority to co-pending U.S. patent application Ser. No. 16/444,753, filed Jun. 18, 2019, by Zhidov, et al., which is a divisional application of U.S. patent application Ser. No. 16/031,806 (now U.S. Pat. No. 10,334,094), filed Jul. 10, 2018 by Zhidov, et al., which is a continuation application of U.S. patent application Ser. No. 15/582,091 (now U.S. Pat. No. 10,051,105), filed Apr. 28, 2017, by Zhidov, et al., which is a continuation application of U.S. patent application Ser. No. 14/307,052 (now U.S. Pat. No. 9,667,770), filed Jun. 17, 2014, by Zhidov, et al., which is a continuation-in-part application of US patent application Ser. No. 13/944,853, filed Jul. 17, 2013, by Zhidov, et al., the complete contents of each of which is hereby incorporated herein by reference.

BACKGROUND**Technical Field**

The present invention relates to systems and methods for setting up and connecting telephone calls, and delivering information related to such telephone calls using an Internet Protocol (IP) or other data channel while delivering the voice portion of the call in accordance with CDMA, GSM or like voice channel delivery standards.

Background

The volume of telephone calls and text messaging has increased dramatically and users are finding it more and more difficult to manage that volume of calls and messages. The current systems to aid in managing some types of calls only provide minimal assistance to the user. It is therefore an advantage of some, but not necessarily all, embodiments of the present invention to provide systems and methods for assisting callers and call recipients with the management of calls and messages.

Additional advantages of various embodiments of the invention are set forth, in part, in the description that follows and, in part, will be apparent to one of ordinary skill in the art from the description and/or from the practice of the invention.

SUMMARY

Responsive to the foregoing challenges, Applicant has developed an innovative method of providing telephone service by transmitting call handling information between a handset and a switch using an IP channel or similar protocol channel and by transmitting a voice call associated with the call handling information between the handset and the switch using a voice channel provided in accordance with a voice channel protocol, e.g., in accordance with CDMA or GSM, 3G, 4G, LTE or like future protocol channels standards.

Applicant has further developed an innovative method of providing telephone service comprising: automatically storing electronic information that indicates an association of a secondary telephone number and a primary telephone number with a telephone handset in a computer memory asso-

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ciated with a server; automatically storing electronic information that indicates a selection of call processing rules for the primary telephone number in the computer memory; automatically storing electronic information that indicates a selection of call processing rules for the secondary telephone number in the computer memory; receiving an electronic indication of an incoming call to the secondary telephone number at the server, said electronic indication of an incoming call being received from a switch associated with the server; automatically accessing the call processing rules for the secondary telephone number under the control of the server responsive to the receipt of the electronic indication of the incoming call to the secondary telephone number; automatically handling the incoming call in accordance with the accessed call processing rules for the secondary telephone number; transmitting pre-call information via a data channel to the handset under the control of the server, said pre-call information including a bridge telephone number for connecting the handset to the incoming call at the switch; and receiving, at the server via the data channel, an electronic indication of a selection of a call processing rule for handling the incoming call to the secondary telephone number, or establishing a voice channel connection between the handset and the switch as a result of the handset calling the switch using the bridge number.

Applicant has further developed an innovative method of providing telephone service, comprising: automatically storing electronic information that indicates an association of a secondary telephone number and a primary telephone number with a telephone handset in a computer memory associated with a server; automatically associating a unique bridge telephone number with each of a plurality of contact telephone numbers in the computer memory; automatically transmitting information that indicates the association of the unique bridge telephone number with each of a plurality of contact telephone numbers to the handset via the data channel; automatically associating each primary telephone number and bridge telephone number pairing with a corresponding secondary telephone number and contact telephone number pairing in the computer memory; receiving, at a switch associated with the server, an outgoing call from the handset to the bridge telephone number via a voice channel; receiving, at the server, information from the switch indicating the outgoing call is being made to the bridge telephone number from the primary telephone number; receiving, at the switch, information from the server directing the switch to: (a) connect the outgoing call to a contact telephone number associated with the primary telephone number and bridge telephone number pairing, and (b) identify the telephone number from which the outgoing call is being made as the secondary telephone number.

Applicant has still further developed an innovative method of providing telephone service, comprising: enrolling a telephone handset in a telecommunications system having a server and a switch, wherein said telephone handset is associated with a primary telephone number in a database associated with the server and switch; electronically transmitting an application from the server to the telephone handset via a data channel responsive to telephone handset enrollment, wherein said application is: adapted to send instructions to have one or more secondary telephone numbers referenced to the primary telephone number in the database, adapted to present visually perceptible call processing rules on the telephone handset, and adapted to transmit information indicating a selection of call processing rules from the telephone handset to the server; electronically receiving instructions from the telephone handset via the

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data channel to reference the one or more secondary telephone numbers to the primary telephone number; storing telephone handset information, including the primary telephone number and the one or more secondary telephone numbers referenced to the primary telephone number, in the database; electronically receiving instructions from the telephone handset via the data channel to store user selected call processing rules for the telephone handset in the database, wherein the user selected call processing rules include instructions to route calls over a voice channel in a manner that will indicate that the calls are made to or from the one or more secondary telephone numbers; electronically transmitting information to the telephone handset via the data channel, said information being adapted to cause a pre-call information to be displayed on the telephone handset responsive to initiation of an outgoing call using the one or more secondary telephone numbers or an incoming call to the one or more secondary telephone numbers; electronically receiving from the telephone handset via the data channel call handling information indicating a user selected call processing rule to be used to process the outgoing or incoming call; and automatically handling the outgoing or incoming call based on the call handling information.

Applicant has still further developed an innovative method of providing telephone service, comprising: associating a telephone handset with primary and secondary telephone numbers in a database; receiving, from the telephone handset via a data channel, digital information indicating primary call processing rules for handling calls to the first telephone number; storing the primary call processing rules digitally; receiving, from the telephone handset via the data channel, digital information indicating secondary call processing rules for handling calls to the secondary telephone number; storing the secondary call processing rules digitally; receiving a call request to the secondary telephone number; transmitting pre-call information to the telephone handset via the data channel responsive to receipt of the call request, wherein said pre-call information is based on the secondary call processing rules; responsive to the pre-call information, receiving information indicative of a user input to the telephone handset over the data channel; and processing the call based on the stored alternative call processing rules and user input to the telephone handset, wherein said processing includes an option of connecting the call over a voice channel.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only, and are not restrictive of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to assist the understanding of this invention, reference will now be made to the appended drawings, in which like reference characters refer to like elements.

FIG. 1 is a schematic diagram illustrating a network architecture that may be used to provide telephone service in accordance with embodiments of the present invention.

FIG. 2 is a block diagram illustrating a method of providing telephone calls in accordance with embodiments of the present invention.

FIG. 3 is a block diagram illustrating data channel and voice channel connections used to provide telephone service in accordance with embodiments of the present invention.

FIG. 4 is a block diagram illustrating a method of setting up and connecting an incoming call in accordance with one embodiment of the present invention.

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FIG. 5 is a block diagram illustrating a method of setting up and connecting an outgoing call in accordance with one embodiment of the present invention.

FIG. 6 is a call sequence diagram illustrating a method of setting up and connecting a conference call in accordance with one embodiment of the present invention.

DETAILED DESCRIPTION

Reference will now be made in detail to embodiments of the present invention, examples of which are illustrated in the accompanying drawings. It is to be understood that other embodiments may be utilized and structural changes may be made without departing from the scope of the present invention.

It should be noted that in connection with the described embodiments, reference is made to a data channel. A preferred data channel may be an Internet Protocol (IP) channel, which is not a conventional telephone voice channel. However, other data, non-conventional voice, channels over which information may be transmitted between a telephone handset and a server may be used in alternative embodiments of the invention.

With reference to FIG. 1, embodiments of the present invention may be implemented using a system having a server 100, associated computer memory, such as a database 120, and an associated telecommunications switch 110 which communicate through a network with a telephone handset 340. The server 100 may be connected to the database 120 and the switch 110. The server 100 may also be connected via the Internet 316 through one or more nodes, such as a Gateway GPRS Support Node (GGSN) 322 and a Servicing GPRS Support Node (SGSN) 324, to a mobile network 313. The switch 110 may be connected through the PSTN 310 to the mobile network 313 at a Mobile Switching Center (MSC) 314. In turn, the MSC 314 may be connected to a Home Location Register database (HLR) 318, a Visitor Location Register database (312), a Mobile Number Portability database (MNP) 320, a location server 308, and the SGSN 324. The SGSN 324 may be connected to one or more Radio Network Controllers (RNC) 326 and/or one or more Processor Control Units (PCU) 327, which in turn may be connected to one or more Base Stations (BS) 328 and to one or more mobile devices referred to collectively as "handsets" 340.

The communications between the server 100 and the handset 340 over the Internet 316 may utilize IP as a protocol opposed to protocols used to establish communications according to CDMA, GSM, or like standards. Such IP governed communications are referred to herein as being conducted over a "data channel." Conversely, communications between the switch 110 and the handset over the PSTN 310 may be transmitted and received in accordance with CDMA, GSM or like standards as opposed to using IP. Such CDMA, GSM or like governed communications, when used to carry voice information, are referred to herein as being conducted over a "voice channel."

With reference to FIGS. 1 and 2, method embodiments of the invention may be facilitated starting with step 200 in which a handset 340 may be used to subscribe to the telephone network that includes the server 100 and switch 110 used to provide telephone service in accordance with embodiments of the invention. A user may subscribe to the telephone network in step 200 by enrolling the telephone handset 340 using a data channel connection between the handset and the server 100. Responsive to a data channel request received from the handset 340, a handset application

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may be transmitted to the handset from the server 100, and installed and stored in memory associated with the handset in step 202. Once the handset application is installed on the handset 340, the handset may connect to the server 100 by operation of the handset application as needed over a data channel connection which may include the BS 328, RNC 326 or PCU 327, SGSN 324, GGSN 322, and Internet 316.

In connection with step 204, the server 100 may transmit information to the handset 340 via the data channel, which, through automatic operation of the handset application, permits the user to select one or more secondary telephone numbers to be referenced to a primary telephone number for the handset. The primary telephone number, preferably, may be a SIM number or ESN which is assigned to the handset 340 at the time of activation. Once selected, the handset 340 may automatically transmit information which to the server 100 over the data channel which requests that the secondary telephone numbers be associated with the primary telephone number. In response, the server 100 may store (i.e., reference) information indicating the association of the one or more selected secondary telephone numbers in computer memory associated with the server such as the database 120. In an alternative embodiment, the server 100 may automatically assign one or more secondary telephone numbers to the handset 340, as opposed to them being selected.

In step 206 of FIG. 2, the handset 340 may be used to access the handset application installed thereon to select call processing rules for handling incoming and outgoing voice channel calls to and from the handset 340. Information indicating call processing rules may be transmitted from the handset 340 to the server 100 via the data channel by automatic operation of the handset application. Custom call processing rules may be selected for, and associated with, each of the primary telephone number and the one or more secondary telephone numbers associated with the primary telephone number. The call processing rules information may be automatically stored in a computer memory, such as database 120, by the server 100. An indication of the association of particular call processing rules with a particular handset 340 and particular primary and/or secondary telephone numbers may also be stored in the database 120. The call processing rules may include preset responses for incoming calls, such as custom stored voice message(s) and/or custom stored text message(s) to be associated with the primary and/or one or more secondary telephone numbers. The call processing rules may further permit the handset 340 to be used to control the availability of the secondary telephone numbers as well as activation of additional secondary telephone numbers and deactivation of existing secondary telephone numbers. Information indicating the call processing rules for the primary telephone number and secondary telephone numbers may be stored automatically in memory associated with the handset 340. The call processing rules may further include stock rules used for all telephone numbers, such as an option to accept or not accept (i.e., drop) an incoming call. With reference to step 208, the application stored on the handset 340 may enable it to be used to receive incoming calls from, and place outgoing calls to, a recipient telephone (not shown) which is connected to the PSTN 310, as explained in more detail below.

With reference to FIGS. 3 and 4, the handset 340 may be used to receive incoming (terminating) calls to a secondary telephone number, using a telephone network automated structure having a network layer 101 and an application layer 102 associated therewith. An incoming call to the secondary telephone number may be placed in step 402 by

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a calling party. The incoming call is routed from the caller's telephone to the PSTN 310. In step 404, the incoming call may be routed over the PSTN 310 to the switch 110. Responsive to receipt of the incoming call at the switch 110, a Call Manager 104 application, which cooperates with a Mobility Manager 106 application, and a Web Manager 108 application, which are all associated with the server 100, may access the call processing rules in the database 120 which are associated with the secondary telephone number that is being called. Subject to the accessed call processing rules, the Call Manager 104 may assign or look up a bridge telephone number to be used for completion of the call in step 406. The bridge telephone number may be associated with the switch 110, and calls to the bridge telephone number may be automatically routed to this switch.

The call processing rules may provide for call routing via a call distribution algorithm where the call could be routed to one or many telephone numbers. The call processing rules may be user selectable and configurable, and may apply to voice, text and/or other data messaging. The call processing rules may govern how calls are handled and may provide automated call routing or call dropping based on location data of the calling and/or called party. The call processing rules may further govern handling calls based on incoming caller ID, which may identify a calling party as being on an accepted caller ID list or a non-accepted caller ID list. The call processing rules may further provide call routing based on weekday, weekend, holiday, time of day, biometrics data, and accelerometer data information. The call processing rules may still further provide call routing based on an interface with a handset 340 calendar to check availability to accept calls. Such calendars may include, for example, Outlook, Google Calendar, and other user calendars.

If the call processing rules indicate that the secondary telephone number is not available to this particular caller, or to all callers, however, the Call Manager 104 may apply such rule or rules and reject the incoming call at the conclusion of step 406. Application of the call processing rules for a call rejection may result in the call simply not being answered, being dropped, or automated return of a voice, text, or other type of message to the calling telephone number or a communication device associated therewith.

On the other hand, if the call processing rules permit completion of the call, in step 408 the Call Manager 104 may transmit pre-call notification information to the handset 340, which includes the assigned/looked up bridge telephone number, via the data channel connection, i.e., over the Internet 316 and the Mobile Data Network 348. The pre-call information may include information used by the application installed on the handset 340 to cause a display of the calling telephone number, the calling party name, calling party location, such as GPS location, and/or the called secondary telephone number, as well as other information in step 410. The incoming pre-call information may be received at the handset 340 before or during the call ringing on the handset.

In step 412, responsive to receipt of the incoming pre-call notification information, the handset application may cause the handset 340 to display call handling choices for the call. For example, the handset 340 may be directed under the control of the handset application to display receive call, drop call, custom voice mail message, and/or custom text message choices. The choices may be selected through interaction with the handset 340, all before the call is connected or dropped. In step 414, the selection of either delivering a responsive text message (416), not accepting, i.e., "dropping" the call (418), or responding to the call with a custom voice message (420) may be transmitted from the

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handset **340** to the server **100** via the data channel. Thereafter, the Call Manager **104** may automatically implement the drop call or respond with text or voice message instructions received over the data channel, and the call attempt may be terminated thereafter.

If the call is accepted in step **414**, however, the handset application may automatically cause the handset **340** to call the bridge telephone number in step **422** over a voice channel. The return call from the handset **340** to the bridge telephone number may be routed over the PSTN **310** to the switch **110** using a voice channel connection. In step **424**, once the call to the bridge telephone number is received at the switch **110**, the switch may “bridge” the incoming voice channel call to the bridge telephone number with the incoming voice channel call to the secondary telephone number to thereby connect the incoming call from the calling party to the handset **340** via a voice channel. Further, the switch **110** may automatically send signaling information to the calling party telephone which causes the secondary telephone number to be displayed as the number to which the call has been completed.

With continued reference to FIG. **3**, the web manager **108** may be used to process Internet **316** transactions for the server **110**. The system may also employ a web portal **350** to link a digital device **360** other than a handheld **340** to the telecommunications system for calling in accordance with embodiments of the invention. For example, embodiments of the invention may be used with digital devices **360** such as a desktop computer, laptop computer, iPad, tablet, iPod **790**, or the like.

With reference to FIGS. **3** and **5**, the handset **340** may be used to place outgoing (originating) calls from a secondary telephone number, using the telephone network automated structure shown in FIG. **3** and described above. If the party to be called has not yet been called using a secondary telephone number, an outgoing call from the handset **340** may be initiated to such party in step **502** by opening the handset application installed thereon. Once the handset application is open, the handset **340** may be used to choose a secondary telephone number as the originating telephone number in step **504**. A list of such secondary telephone numbers may be stored in memory associated with the handset.

In step **506**, the handset **340** may be used to enter, or select from an address file, a contact telephone number to be called in order to initiate a call to such telephone number. The handset application may cause the handset **340** to transmit information to the server **100** Call Manager **104** via the data channel automatically as a result of the selection of the secondary telephone number and the contact telephone number. The transmitted information may indicate the secondary telephone number from which the call is to appear to the called party to have been placed, and the contact telephone number to be called.

In step **508**, responsive to receipt of the data channel communication from the handset **340** requesting set up of a call from it to the telephone number to be called, the Call Manager **104** may access the call processing rules in the database **120** which are associated with the secondary telephone number from which the call is to appear to have been placed. In step **510**, subject to the accessed call processing rules, the Call Manager **104** may assign a bridge telephone number to be used to connect the call from the handset **340** to the switch **110** and send pre-call information including the bridge telephone number to the handset via the data channel.

The bridge telephone number may be associated with the switch **110**, and calls to the bridge telephone number may be

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automatically routed to this switch. Once the bridge telephone number is assigned, the server **100** under the control of the Call Manager **104**, may store information in the database **120** which associates the bridge telephone number with the primary telephone number for the handset **340**, the secondary telephone number selected for the call, and the contact telephone number to be called. More specifically, the stored information may indicate that each combination of primary telephone number and bridge telephone number are uniquely associated with each combination of secondary telephone number and contact telephone number. In other words, each combination of primary telephone number and bridge telephone number for the handset **340** map to a unique combination of secondary telephone number and contact telephone number in the database **120** memory.

In step **512**, responsive to receipt of the bridge telephone number information over the data channel, the handset application may cause the handset **340** to automatically call the bridge telephone number via a voice channel. The return call from the handset **340** to the bridge telephone number may be routed over the PSTN **310** to the switch **110** using a voice channel connection.

In step **514**, the Call Manager **104** may instruct the switch **110** to place a voice channel call to the telephone number to be called using the secondary telephone number as the originating telephone number from the switch. Once the call to the bridge telephone number from the handset **340** is received at the switch **110**, the switch may “bridge” the incoming voice channel call to the bridge telephone number with the outgoing voice channel call from the secondary telephone number to the contact telephone number to thereby connect the outgoing call from the handset **340** to the party being called via a voice channel. Further, the switch **110** may automatically send signaling information to the called party telephone which causes the secondary telephone number to be displayed as the number from which the call appears to have been placed. Because each pairing of a primary telephone number and a bridge telephone number maps to a unique contact telephone number and secondary telephone number pairing, the call can be completed at the switch **110** to the correct contact telephone number while showing the desired secondary telephone number as the originating number.

With continued reference to FIG. **5**, in the event that the contact telephone has been previously called using the secondary telephone number on the handset **340**, the user may directly select the bridge telephone number associated with the secondary telephone number and contact telephone number in step **506** either using the handset application in step **502**, or without opening the handset application in step **512**. Alternatively, the handset may have a stored “shortcut” which, when the user selects the contact telephone number to be called from the secondary telephone number, results in the associated bridge telephone number being dialed. In either case, the handset **340** may dial the bridge telephone number to connect with the Call Manager **104** in step **512**. In step **514**, the Call Manager **104** may look up the secondary telephone number and the contact telephone number associated with the paired bridge telephone number and primary telephone number for the handset **340**. Thereafter, the switch **110** may dial the contact telephone number and bridge the call from the handset **340** in a manner that makes the secondary telephone number appear to be the telephone number from which the call is being placed.

FIG. **6** is a call flow diagram illustrating a method of setting up and connecting a multi-party conference call in accordance with an embodiment of the present invention.

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With reference to FIGS. 3 and 6, the communication sequence for a conference call is illustrated between the handset application stored on the handset 340, the Call Manager 104 application associated with the server 100 and switch 110, and a conference call invitee handset. In step 600, the application on the handset 340 may be used to select invitees (users) for a conference call. The telephone numbers of the invitees may be selected from an address book or manually entered. Further, the conference call may be selected to be initiated immediately, or at some future date and time.

Once the invitees are selected, the handset 340 may be instructed by the handset application to transmit a conference request to the server 100 via a data channel. In step 602, the Call Manager 104 operating on the server 100 may assign a conference bridge telephone number to the conference call in response to receipt of the conference request. In step 604, the Call Manager 104 may cause the server 100 to send conference invitation messages to each of the invitee handsets, and more specifically, applications stored on the invitee handsets, via a data channel. The invitation messages may include the assigned bridge telephone number for the conference call and an optional PIN or code number for the conference call. The invitation message may provide a notice, for example, "Jack has invited you to join a conference call," and further include identification of other invited participants.

In step 606, each invitee handset may be used to accept to join the conference call, join at a later time, or decline to join. If the acceptance is for a future scheduled conference call, an indication of the acceptance (including acceptance to join late) may be transmitted from each invitee handset under the control of the application installed thereon, to the server 100 Call Manager 104 via the data channel. Further, if the invitation is declined altogether, an indication thereof may be transmitted from each invitee handset to the server 100. Thereafter, the Call Manager 104 may transmit information to the originating handset 340, and optionally the invitee handsets, via the data channel, which indicates acceptance of a future conference call, acceptance to join late (step 610), or declination of the conference call invitation.

If the conference call invitation is accepted and it is time for the call, each accepting invitee handset may automatically or manually dial the bridge telephone number using a voice channel. The switch 110 may receive the voice channel calls to the bridge telephone number and may authenticate the invitees right to join the conference call in step 608 by comparing the invitee's telephone number with that of the invitee list, as well as comparing any PIN input by the invitee with the PIN selected for the conference call. If the authentication is successful, the invitee handset is connected to the call via the voice channel. An automatic update may be transmitted via the data channel from the server to the originating handset 340 indicating that a particular invitee handset has joined the conference call.

If an invitee chose to join late, the server 100 may automatically transmit a reminder to the affected invitee handset to join the call at the agreed time in step 612. Thereafter, the late joining invitee handset may dial the bridge telephone number automatically or manually using a voice channel. The switch 110 may receive the voice channel call to the bridge telephone number, authenticate the late joining invitee handset, and connect the handset to the conference call in step 614.

The foregoing has described the principles, embodiments and modes of operation of the present invention. However,

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the invention should not be construed as being limited to the particular embodiments discussed. The above described embodiments should be regarded as illustrative rather than restrictive, and it should be appreciated that variations may be made in those embodiments by workers skilled in the art without departing from the scope of the present invention as defined by the following claims.

What is claimed:

1. A method of providing telephone service, comprising:
 - automatically storing electronic information that indicates an association of a secondary telephone number and a primary telephone number with a mobile device in a computer memory associated with a server;
 - automatically transmitting information that indicates an access telephone number to the mobile device via a data channel;
 - automatically associating the telephone access number with a switch associated with the server;
 - receiving, at the switch associated with the server, an outgoing call from the mobile device to the access telephone number via a second channel;
 - receiving, at the server, information from the switch indicating the outgoing call is being made to the access telephone number from the primary telephone number; and
 - receiving, at the switch, information from the server directing the switch to:
 - (a) connect the outgoing call to a contact telephone number indicated by the mobile device, and
 - (b) identify a telephone number from which the outgoing call is being made as the secondary telephone number.
2. The method of claim 1, wherein the data channel is an Internet protocol (IP) channel.
3. The method of claim 2, wherein the second channel is established in accordance with a CDMA or GSM standard.
4. The method of claim 1, wherein the second channel is not an Internet Protocol (IP) channel.
5. An apparatus, comprising:
 - a memory; and
 - a processor operatively coupled to the memory;
 the processor configured to automatically store electronic information that indicates an association of a secondary telephone number and a primary telephone number with a mobile device in a computer memory associated with a server;
 the processor configured to automatically transmit information that indicates an access telephone number to the mobile device via a data channel;
 the processor configured to automatically associate the telephone access number with a switch associated with the server;
 the processor configured to receive, at the server, information from the switch associated with the server and in response to the switch receiving an outgoing call from the mobile device to the access telephone number via a second channel;
 the information indicating the outgoing call is being made to the access telephone number from the primary telephone number;
 the processor configured to send, to the switch, information from the server directing the switch to:
 - (a) connect the outgoing call to a contact telephone number indicated by the mobile device; and
 - (b) identify a telephone number from which the outgoing call is being made as the secondary telephone number.

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6. The apparatus of claim 5, wherein the data channel is an Internet Protocol (IP) channel.

7. The apparatus of claim 5, wherein the second channel is established in accordance with a CDMA or GSM standard.

8. The apparatus of claim 5, wherein the second channel is not an Internet Protocol (IP) channel.

9. A non-transitory processor-readable medium storing code representing instructions to be executed by a processor, the code comprising code to cause the processor to:

 automatically store electronic information that indicates an association of a secondary telephone number and a primary telephone number with a mobile device in a computer memory associated with a server;

 automatically transmit information that indicates an access telephone number to the mobile device via a data channel;

 automatically associate the telephone access number with a switch associated with the server;

 receive, at the server, information from the switch associated with the server and in response to the switch receiving an outgoing call from the mobile device to the access telephone number via a second channel,

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the information indicating the outgoing call is being made to the access telephone number from the primary telephone number; and

send, to the switch, information from the server directing the switch to:

 (a) connect the outgoing call to a contact telephone number indicated by the mobile device, and

 (b) identify a telephone number from which the outgoing call is being made as the secondary telephone number.

10. The non-transitory processor-readable medium of claim 9, wherein the data channel is an Internet Protocol (IP) channel.

11. The non-transitory processor-readable medium of claim 9, wherein the second channel is established in accordance with a CDMA or GSM standard.

12. The non-transitory processor-readable medium of claim 9, wherein the second channel is not an Internet Protocol (IP) channel.

* * * * *

Exhibit E

**IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION**

FLYPSI, INC. (D/B/A FLYP),

Plaintiff,

vs.

DIALPAD, INC.,

Defendant.

Civil Action No. 6:21-cv-642-ADA

JURY TRIAL DEMANDED

DECLARATION OF DR. SCOTT NETTLES ON CLAIM CONSTRUCTION

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I, Scott M. Nettles, hereby declare as follows:

I. INTRODUCTION

1. I have been retained as an expert on behalf of Plaintiff Flypsi, Inc. (“Flyp” or “Plaintiff”), in connection with the above-captioned lawsuit to provide my analyses and opinions in certain technical aspects of this dispute. The purpose of this Declaration is to evaluate and explain how a person of ordinary skill in the art at the time of the alleged invention would understand certain claim terms in U.S. Patent Nos. 9,667,770 (the “’770 patent”), 10,051,105 (the “’105 patent”), 10,334,094 (the “’094 patent”), and 11,012,554 (the “’554 patent”) (collectively the “the Asserted Patents” and attached hereto as Appendix A).

2. To the extent Defendant Dialpad, Inc. (“Dialpad” or “Defendant”) produces one or more expert declarations supporting its positions, I reserve the right to supplement my opinions here upon reviewing such declaration(s).

3. Attached hereto as Appendix B is a copy of my *Curriculum Vitae* describing my background and experience. It also includes a list of the publications I have authored and a list of the other cases in which I have testified during the last four years. I have personal knowledge of the facts and opinions set forth in this declaration, and, if called upon to do so, I would testify competently thereto.

4. I am being compensated for the time I have spent on this litigation at my customary rate of \$550 per hour. My compensation does not depend in any way upon the opinions I provide or the outcome of this litigation.

II. QUALIFICATIONS

5. I have attached a current copy of my curriculum vitae as Appendix B. A list of the cases during at least the last five years in which I have signed a Protective Order, have testified as an expert either at a trial, hearing, or deposition, or have submitted statements/opinions is included.

6. I attended Michigan State University from 1977 to 1981 as a Merit Scholar and an Alumni Distinguished Scholar and received a bachelor's degree in Chemistry. I later attended Carnegie Mellon University from 1988 to 1995, during which time I received both a master's degree (1992) and a Ph.D. (1996) in Computer Science. My dissertation was entitled "Safe and Efficient Persistent Heaps" and focused on high performance automatic storage management for advanced database systems.

7. Before earning my Ph.D., I worked for over four years in industry at Silicon Solutions, Inc. and Digital Equipment Corporation, developing computer aided design (CAD) software for the semiconductor and computer sectors. For example, I designed and implemented systems for VLSI mask generation and VLSI design rule checking. I also built the first graphical drawing editor for the X window system, Artemis, which included a sophisticated graphical user interface.

8. I have worked as a professor at three universities since 1995: the University of Pennsylvania, the University of Arizona, and The University of Texas at Austin. I was the recipient of a National Science Foundation CAREER award for "CAREER: Advancing Experimental Computer Science in Storage Management and Education" while I was an Assistant Professor at the University of Pennsylvania. During this time, I also was part of the DARPA funded SwitchWare project, which was one of the pioneering groups in the area of Active Networking ("AN"). My group developed PLAN, the first domain-specific programming language for programmable packets, as well as PLANet, the first purely active inter-network. Generally speaking, the goals of SwitchWare was to develop highly programable switches, hence the name. As part of this work, I built both layer 2 switches (bridges) and layer-3 switches (routers).

9. I joined the faculty of The University of Texas at Austin (“UT”), in the Department of Electrical and Computer Engineering in 1999. In 2005, I was appointed Associate Professor with tenure. At UT, my graduate teaching focused on networking, including numerous advanced seminars on mobile and wireless networking. My undergraduate teaching included networking, operating systems, and one of UT’s required programming classes, which focuses on programming with abstractions, Java, and data structures.

10. At UT, I continued to develop AN technology and in 2002, my Ph.D. student, Mike Hicks, won the ACM SIGPLAN dissertation award for our joint work on software updating. Along with my Ph.D. student, Seong-kyu Song, I focused my AN work on mobile and wireless networking. As a result, my research shifted away from AN to mobile and wireless networking in general, especially interactions between the network, the radios, and the physical world. Most of my most recent research involves the development of Hydra, which is a working prototype of an advanced software-implemented WiFi network funded primarily by NSF.

11. I retired from UT Austin in the Spring of 2013. I am currently self-employed, and my current work primarily involves consulting on various matters, including patent litigation.

III. MATERIALS CONSIDERED

12. As part of my preparation for writing this Declaration, I reviewed the Asserted Patents, their prosecution histories, Defendant’s claim construction brief and materials cited therein, the parties’ identification of extrinsic evidence, and any other documents I cite below.

IV. APPLICABLE LEGAL STANDARDS

13. In this section, I describe my understanding of certain legal standards. I have been informed of these legal standards by Flyp’s attorneys. I am not an attorney and I am relying only on instructions from Flyp’s attorneys for these legal standards.

14. Based on my discussions with counsel about the applicable legal standard, I understand that claim construction is a matter of law and will be decided by the Court. I understand that the relevant inquiry in claim construction is the question of how a person of ordinary skill in the art would have understood the claim terms at the time of the earliest priority date, in the context of the particular claim in which it appears as well as in light of the patent specification, the prosecution history, and any other relevant intrinsic and extrinsic evidence.

15. I have been informed that a single claim term should be construed consistently with its appearance in other places in the same claim or in other claims of the same patent, unless it is clear from the specification and prosecution history that the terms have different meanings at different portions of the claims.

16. I have been informed, as a general rule, that unless a patent applicant shows an intent to limit their invention, particular examples or embodiments discussed in the specification are not to be read into the claims as limitations. I have also been told that the construction that stays true to the claim language and most naturally aligns with the patent's description of the invention will be the correct construction.

17. I have been informed that 35 U.S.C. § 112 ¶ 6 (pre-AIA, now § 112(f)) states that “[a]n 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, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.” I have also been informed that when a claim uses the phrase “means for” to describe a limitation, it is presumed that § 112 ¶ 6 applies. Similarly, I understand that if a claim term does not use the word “means,” there is a rebuttable presumption that 35 U.S.C. § 112, ¶ 6 does not apply to that claim term. I understand that when a claim term lacks the word

“means,” the presumption can be overcome and § 112, ¶ 6 will apply if the challenger demonstrates that the claim term fails to recite sufficiently definite structure or else recites function without reciting sufficient structure for performing that function. When that presumption is rebutted, I have been informed that that a “means-plus-function” limitation must be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

V. PERSON OF ORDINARY SKILL IN THE ART

18. I understand that the factors considered in determining the ordinary level of skill in the art include: (i) the levels of education and experience of persons working in the field; (ii) the types of problems encountered in the field; and (iii) the sophistication of the technology. I understand that a person of ordinary skill in the art (“POSITA”) is not a specific real individual, but rather a hypothetical individual having the qualities reflected by the factors above.

19. I understand that Flyp has claimed a priority date of July 17, 2013 for all Asserted Patents, and I have assumed that date applies in my analysis. I have not, at this time, been asked to provide any opinions on the proper priority date. I was asked to consider whether my opinions would change if the June 17, 2014 filing date of the ’770 patent were used as the priority date for the Asserted Patents instead. My opinions would not change under that date, given the similarities in the field as of those two dates, the level of skill and the understanding of a POSITA regarding the relevant claim terms would have been the same.

20. In my opinion, at priority date of the Asserted Patents, a POSITA would have had a Bachelor of Science degree in electrical engineering, computer science, computer engineering, and/or a closely related-field, and at least two years of work or research in telecommunications, telephone networks, and/or the development of mobile applications related to the same. More work experience could compensate for less education, and vice versa.

21. This is consistent with the level of education and skill of persons working in the field, the types of problems in the field, and the sophistication of the technology at the priority date.

22. I myself exceeded this level of skill as of the priority date. In addition to being (at least) a POSITA at the time of the invention, as an engineering professor, I taught hundreds of students from 1995–2013 who would meet these qualifications. In particular, during this time I taught Introduction to Networking at the graduate level approximately 15 times including many classes for working engineers return for a Master’s degree part time. These students would have been POSITA’s at the relevant time.

VI. OVERVIEW OF THE TECHNOLOGY

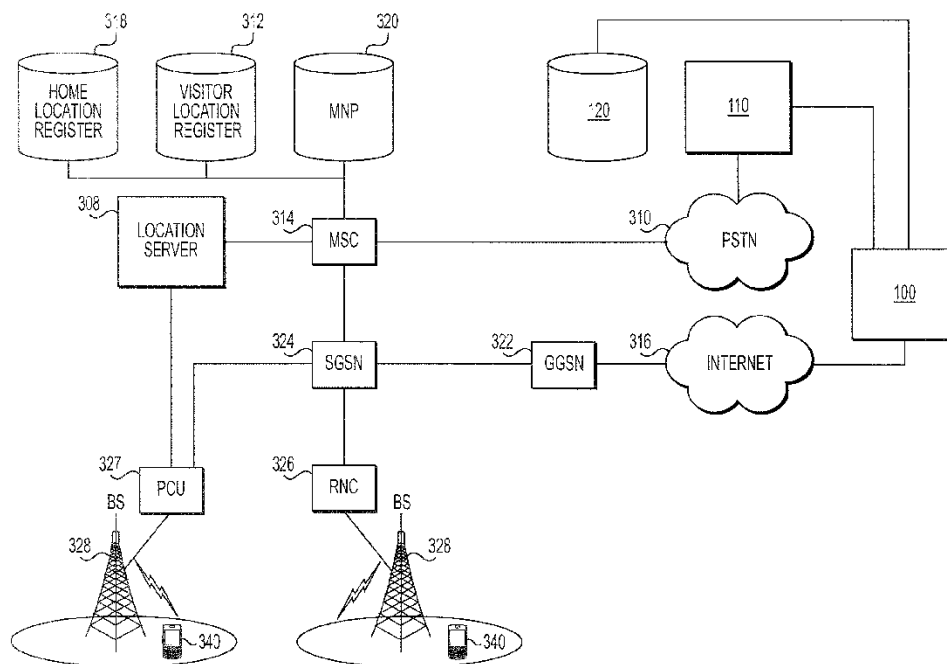
23. The four Asserted Patents share a common specification. As such, I will generally cite only to the ’770 patent and will provide parallel citations in footnotes.

24. At a high level, the Asserted Patents relate to “delivering telephone calls using the combination of a data channel and a voice channel,” which may involve providing “pre-call information,” which “may permit the same handset to be associated with multiple secondary telephone numbers from which calls appear to have been made and to which calls appear to have been placed.” *See* ’770 patent at Abstract.¹

25. In Figure 1, the patents depict an embodiment including “a system having a server 100, associated computer memory, such as a database 120, and an associated telecommunications switch 110 which communicate through a network with a telephone handset 340.” ’770 patent at 4:13–18.² I have reproduced Figure 1 below:

¹ *See also* ’105 patent at Abstract; ’094 patent at Abstract; and ’554 patent at Abstract.

² *See also* ’105 patent at 4:13–18; ’094 patent at 4:22–27; and ’554 patent at 4:24–29.

**FIG. 1**

26. The patents teach that “[t]he switch 110 may be connected through the PSTN 310 to the mobile network 313.” *Id.* at 4:23–25.³ They further describe that “communications between the server 100 and the handset 340 over the Internet may utilize IP,” which “are referred to herein as being conducted over a ‘data channel.’” *Id.* at 4:35–40.⁴ Or, communications “may be transmitted and received in accordance with CDMA, GSM or like standards,” which “when used to carry voice information, are referred to herein as being conducted over a ‘voice channel.’” *Id.* at 4:40–46.⁵

³ See also '105 patent at 4:23–25; '094 patent at 4:32–34; and '554 patent at 4:34–36.

⁴ See also '105 patent at 4:35–40; '094 patent at 4:44–49; and '554 patent at 4:46–51.

⁵ See also '105 patent at 4:40–46; '094 patent at 4:49–55; and '554 patent at 4:51–57.

VII. OPINIONS ON THE UNDERSTANDING OF ONE OF ORDINARY SKILL

A. “primary telephone number”

Dialpad Proposal	Flyp Proposal
a telephone number or identifier that is assigned to a handset or a mobile device at activation	Plain and ordinary meaning

27. A POSITA would find that Dialpad’s proposed construction is incorrect in that it requires a primary telephone number to be “**assigned** to a handset or a mobile device **at activation**.”

28. The claims do not recite any particular timing of assignment for the primary number. At most, the claims say “the primary telephone number being assigned to a handset.” ’770 patent at claim 1; *see also* ’105 patent at claims 2, 12, 22 (“a primary telephone number assigned to the telephone handset”). Thus, a POSITA would understand that the claims impose no limitation on when a primary telephone number is assigned.

29. The specification likewise includes no such limitation. The only reference to assignment is the following sentence: “The primary telephone number, preferably, may be a SIM number or ESN which is assigned to the handset 340 at the time of activation.” ’770 patent at 5:2–4.⁶ A POSITA would understand the language “preferably” and “may” to mean that this is only one example of assigning a primary telephone number. The specification includes no language that a POSITA would understand to limit the invention to this particular example.

30. Finally, I note that Dialpad’s proposed construction is inconsistent with a POSITA’s understanding of technology available in the marketplace. At the priority date (and continuing through today), a POSITA would understand that primary telephone numbers can be

⁶ *See also* ’105 patent at 5:2–4; ’094 patent at 5:11–13; and ’554 patent at 5:13–15.

assigned at activation or they can be assigned later, after a phone has already been activated. Specifically, in 2013 (and continuing through today), users had the ability to change their primary telephone number through a visit to a retail store, a call to customer service, or, in some cases today, online. A POSITA would understand that a user could make such a change and it would assign a new (primary) telephone number to their phone. A POSITA would understand this type of primary telephone number could be used in the invention of the Asserted Patents, as there is no limitation excluding the use of primary telephone numbers assigned after activation.

31. Accordingly, a POSITA would conclude that Dialpad’s construction is inconsistent with the plain meaning because it improperly restricts that term to numbers assigned at activation.

B. “voice channel”

Dialpad Proposal	Flyp Proposal
a communications path used for voice information and voice calls	Plain and ordinary meaning

32. A POSITA would find Dialpad’s construction incorrect because it suggests that voice channels are limited to carrying “voice information and voice calls.”

33. The claims recite the term “voice channel” in the context of receiving and connecting calls, e.g., “receiving an incoming call over at least one voice channel” and “accepting the incoming call by connecting with the switch over the at least one voice channel.” ’770 patent at claim 1; *see also* ’105 patent at claim 1 (“establishing a voice channel connection between the handset and the switch”).

34. Nothing in the claims limits a voice channel to one that is exclusively used “for voice information and voice calls,” and a POSITA therefore would not understand the claims to be limited in that way.

35. The specification does not limit “voice channel” either. Instead, the specification describes communications over the data and voice channels by using the word “may,” which a POSITA would understand to be describing examples:

The communications between the server 100 and the handset 340 over the Internet 316 may utilize IP as a protocol opposed to protocols used to establish communications according to CDMA, GSM, or like standards. Such IP governed communications are referred to herein as being conducted over a “data channel.” Conversely, communications between the switch 110 and the handset over the PSTN 310 may be transmitted and received in accordance with CDMA, GSM or like standards as opposed to using IP. Such CDMA, GSM or like governed communications, when used to carry voice information, are referred to herein as being conducted over a “voice channel.”

’770 patent at 4:35–46.⁷

36. A POSITA would also find Dialpad’s construction to be inconsistent with the technology at issue. For example, a POSITA would understand that CDMA or GSM, the example voice channels mentioned in the specification above, could also be used to carry data. Specifically, various data is exchanged in the control plane as part of setting up and managing communications in CDMA/GSM. Additionally, CDMA and GSM can be used to carry IP packets in addition to voice data.

37. Similarly, the IP protocol, mentioned above as an exemplary data channel, can be used to carry voice data. For example, even if using GSM for voice data, the backhaul (transmission from an individual cell site to the core network and/or to another cell site where the other end of the call is located) may use IP, mentioned above as an exemplary data channel, to transmit voice data. As another example, voice over IP (VOIP), which uses the IP protocol to

⁷ See also ’105 patent at 4:35–46; ’094 patent at 4:44–55; and ’554 patent at 4:46–57.

transmit voice data, was well-known to a POSITA and has been commercially available since at least the 1990s.

38. Accordingly, a POSITA would understand that voice channels are not limited to exclusively carrying “voice information and voice calls,” as Dialpad proposes. Rather, different transmission channels may be able to transmit both voice and data. As such, a POSITA would find Dialpad’s construction improperly limiting and inconsistent with the specification and technology at issue.

C. “switch” and “associated with”

Dialpad Proposal	Flyp Proposal
Indefinite	Plain and ordinary meaning

39. A POSITA would understand the phrases “switch” and “associated with” in the context of the claims.

40. Indeed, Figure 1 of the Asserted Patents, which I discuss above, depicts and describes a switch 110:

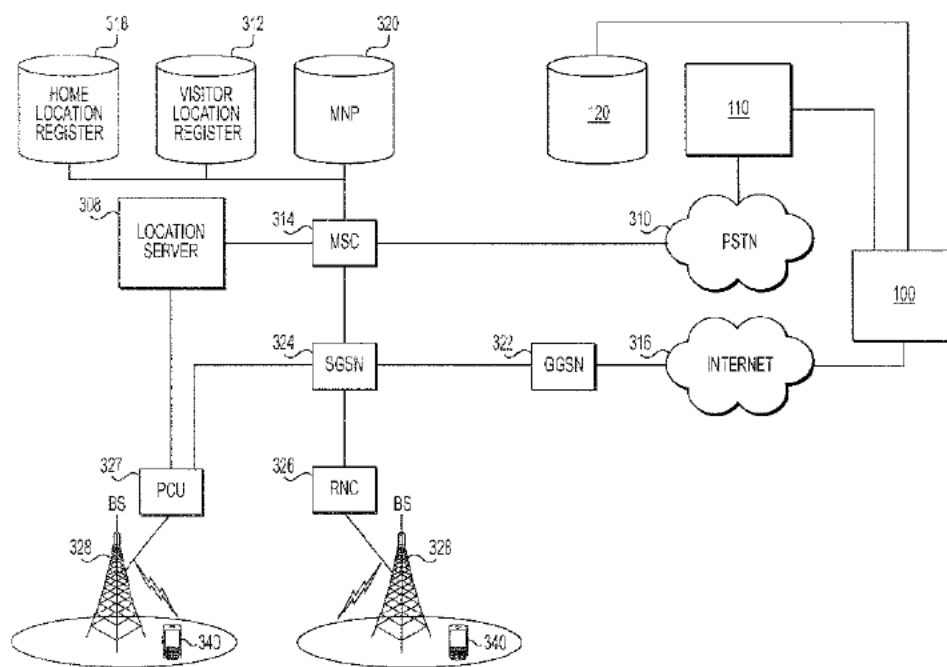


FIG. 1

41. The specification teaches that “switch 110 may be connected through the PSTN 310 to the mobile network 313 at a Mobile Switching Center (MSC) 314” and ultimately “may be connected to one or more Base Stations (BS) 328 and to one or more mobile devices referred to collectively as ‘handsets’ 340.” ’770 patent at 4:23–34.⁸ Thus, from Figure 1, a POSITA would understand the switch is connected to a public switched telephone network (PSTN) and ultimately to one or more telephones such as the phones 340 depicted in Figure 1. A POSITA would know what a switch is, based at least on their background knowledge of switches, which had been used in telephony for decades, as I explain below, and how the switch is depicted in this Figure 1 in connection with the invention.

42. The specification further teaches that the switch may be used for incoming calls to a secondary telephone number: “the incoming call may be routed over the PSTN 310 to the the [sic] switch 110. Responsive to receipt of the incoming call at the switch 110, a Call Manager 104 application ... may access the call processing rules in the database 120 which are associated with the secondary telephone number ... Subject to the accessed call processing rules, the Call Manager 104 may assign or look up a bridge telephone number to be used for completion of the call in step 406.” *Id.* at 5:58–6:2.⁹ It further explains that a “once the call to the bridge telephone number is received at the switch 110, the switch may ‘bridge’ the incoming voice channel call to the bridge telephone number with the incoming voice channel call to the secondary telephone number to thereby connect the incoming call from the calling party to the handset 340 via a voice channel.” *Id.* at 6:67–7:6.¹⁰

⁸ See also ’105 patent at 4:23–34; ’094 patent at 4:32–43; and ’554 patent at 4:34–45.

⁹ See also ’105 patent at 5:58–6:2; ’094 patent at 5:67–6:11; and ’554 patent at 6:2–13.

¹⁰ See also ’105 patent at 6:67–7:6; ’094 patent at 7:9–15; and ’554 patent at 7:11–17.

43. The specification also explains how a switch can be used to place outgoing calls from a secondary telephone number. “Call Manager 104 may instruct the switch 110 to place a voice channel call to the telephone number to be called using the secondary telephone number as the originating telephone number from the switch. Once the call to the bridge telephone number from the handset 340 is received at the switch 110, the switch may ‘bridge’ the incoming voice channel call to the bridge telephone number with the outgoing voice channel call from the secondary telephone number to the contact telephone number to thereby connect the outgoing call from the handset 340 to the party being called via a voice channel.” *Id.* at 8:12–22.¹¹ The switch may also “send signaling information to the called party telephone which causes the secondary telephone number to be displayed as the number from which the call appears to have been placed.” *Id.* at 8:22–26.¹²

44. A POSITA would understand this discussion in the specification to explain how to use switches for incoming and outgoing calls. This discussion would further confirm that a POSITA understands what a switch is and how it is used in the context of the Asserted Patents and their claims.

45. The understanding that a POSITA would have from the specification is also consistent with the background knowledge they would already have regarding switches. Switches are a well-known type of device that has been used in telephony for decades. Indeed, one of Dialpad’s own documents provides a good, high-level overview of the history of switching. A POSITA would be familiar with this history. For example, the earliest switches were human-operated switchboards, where an operator would manually connect calls. *See, e.g.,*

¹¹ *See also* ’105 patent at 8:12–22; ’094 patent at 8:21–31; and ’554 patent at 8:23–33.

¹² *See also* ’105 patent at 8:22–26; ’094 patent at 8:31–35; and ’554 patent at 8:33–37.

DAP000001339 at 5. Then, around the 1950s, mechanical switches were developed, which replaced the human operators.

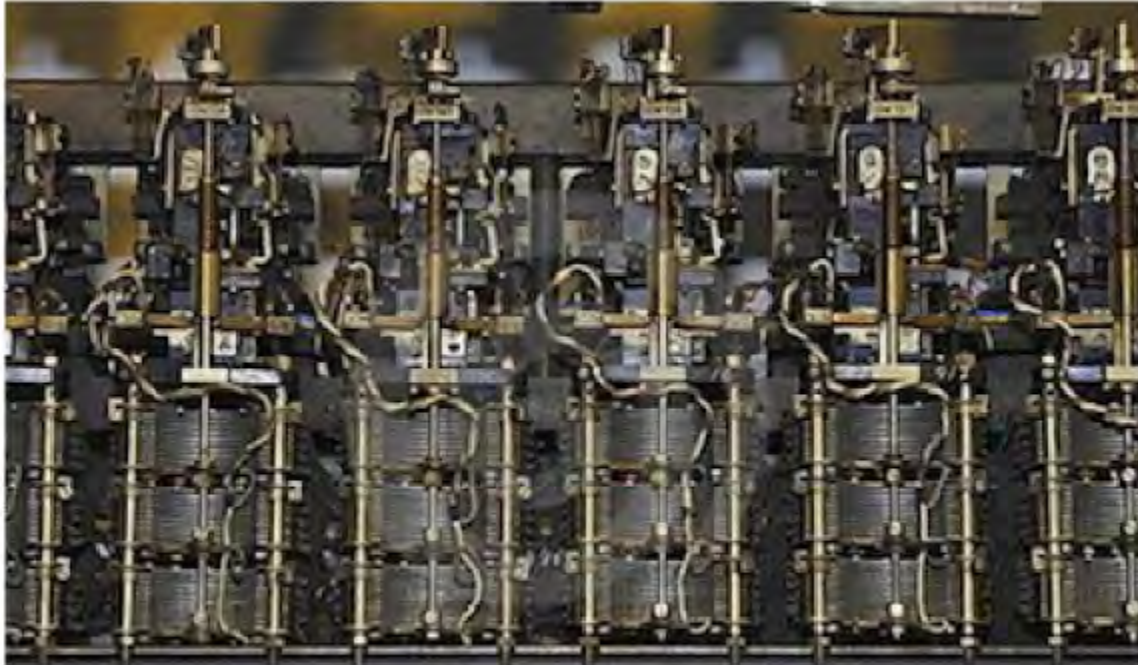


Figure 7: Mechanical Switch

Id. at 6.

46. The technology continued to develop. For example, there were circuit switched networks, which followed the traditional model of connecting one telephone to another via a single path. *Id.* at 9. There were also packet switched networks, which split the data into individual units (packets) that could be transmitted across a variety of different paths and then reconstructed at the receiving end. *Id.* at 9–10.

47. A POSITA would also understand that by the priority date of the patents, switches were no longer limited to traditional hardware devices, but could also be performed in software on standard computing equipment (sometimes called a softswitch). For example, the FreeSWITCH open source software project was released by 2008, and a POSITA would be familiar with this

and other software-based switch technology. [REDACTED]

[REDACTED]

48. A POSITA, familiar with this history, would thus understand what a switch is in the context of the claims, given that switches are a well-known type of device with a long history of use in telephony. A POSITA would also understand that switches are connected to other elements in a telephone network (e.g., bridges, servers, telephone numbers, a PSTN) and these connections enable the switches to connect calls from one telephone to another. The mere fact that the switch could be hardware (e.g., mechanical or electrical) or software would not render this term ambiguous. A POSITA would understand that any switch can satisfy the claims, so long as all the individual claim limitations are met.

49. I have also considered various dictionary definitions, including:

- “a mechanical, electrical or electronic device which opens or closes circuits, completes or breaks an electrical path, or selects paths or circuits” – Newton’s Telecom Dictionary (15th ed. 1999) (Dkt. 24-6 at 755)
- “in telecommunications and networking, a device for establishing connections between one location and another, doing the work of a telephone operator...” – Dictionary of Computer and Internet Terms (11th ed. 2013) (FLYP0004298)
- “A mechanical, electrical or electronic device which opens or closes circuits, completes or breaks an electrical path, or selects paths or circuits. Switches work at Layers 1 (Physical) and 2 (Data Link) of the OSI Reference Model, with emphasis on Layer 2. A switch looks at incoming data (voice data, or data data) to determine the destination address. Based on that address, a transmission path is set up through the switching matrix between the incoming and outgoing physical

communications ports and links...” – Newton’s Telecom Dictionary (26th ed. 2011) (FLYP0004315)

- “1. A mechanical, electromechanical, or electronic device that opens, closes, or changes the connections in an electrical circuit. 2. A device that establishes, maintains, and changes logical connections over physical circuits. Switches flexibly connect transmitters and receivers across networks of interconnected links ... In terms of switching technology, there are circuit switches and packet switches.
 - a. Circuit switches establish connections between circuits, on demand and as available. Those connections are temporary, continuous, and exclusive in nature. ...
 - b. Packet switches switch data organized into packets, discrete set of data that may take the specific form of packets, frames, or cells depending on the network technology specifics.” – Webster’s New World Telecom Dictionary (2008) (FLYP0004334)

- “3. To undergo or cause to undergo switching.

switching Any of various communication techniques that provide point to point transmission between dynamically changing data sources and sinks. ” – A Dictionary of Computing (6th ed. 2008) (FLYP0004338)

- Telco switch: “A large-scale computer system that is used to switch TDM-based, circuit-switched telephone calls. Also called a "voice switch," Lucent and Nortel Networks are the primary vendors of this equipment.”

<https://www.pcmag.com/encyclopedia/term/telco-switch>

- Telephone switch: “A large-scale computer used to route telephone calls in a central office. Such devices are made by Lucent, Nortel and others.”

<https://www.pcmag.com/encyclopedia/term/telephone-switch>

50. I have also considered various prior art references, including:

- K.E. Martensteck and A. E. Spencer, Jr., The 5ESS Switching System, 64 AT&T Tech. J. 1305, 1305–14 (Nov. 14, 1984) (FLYP0004324)
- WO 2004/049625 at [042] (“ISCP 302 may include service logic used to provide a switch, such as SSP 308 or 310, with specific call processing instructions. ... ISCP 302 may be implemented using a combination of known hardware and software. ISCP 302 is shown with a direct connection to service center 106 and a connection to ISCP SPACE 314, however, any number of network elements including routers, switches, hubs, etc., may be used to connect ISCP 302, ISCP SPACE 314, and service center 106.”)
- US 2006/0140200 at [0085] (“In operation 386, the server or switch passes the outbound call through the desired configuration parameters.”)

51. The above dictionary definitions and prior art references are consistent with my opinion that a POSITA would be familiar with the concept of a switch. The definitions provide varying levels of details, but all describe what would be understood as a “switch” by a POSITA. And the prior art reference confirms that people would understand references to “switch” as referring to common, well-understood technology.

52. The term “associated with” does not alter my conclusion. This phrase uses common English words that have no unique technical meaning to a POSITA. And in the context of the claims, the language “associated with” is used to link two elements, such as the “switch” and the

“bridge telephone number” claim 1 of the ’770 patent: “the switch being associated with a bridge telephone number such that calls directed to the bridge telephone number are automatically routed to the switch.” ’770 patent at claim 1. A POSITA would have no difficulty understanding the meaning of “associated with” in this or any of the other asserted claims. Consistent with the description in the specification and a POSITA’s background knowledge of switches and how they work with other components in a telephony system, a POSITA would understand that “associated with” thus describes a relationship between the switch and other components in the system.

VIII. CONCLUSION

53. I reserve the right to supplement or modify this Declaration based on any expert opinions that Dialpad may later present or information that may be identified during discovery.

54. If I am called to testify, in connection with my anticipated testimony in this action, I may use as exhibits various documents produced in this case that refer or relate to the matters discussed in this Declaration. I have not yet selected the exhibits that might be used. In addition, I may create or assist in the creation of certain demonstrative evidence to assist me in testifying, and I reserve the right to do so, to further support the positions in this Declaration.

I hereby declare that the foregoing is true and correct to the best of my knowledge subject to the laws of perjury of the United States.

DATED this 31st day of December 2021.

Scott M. Nettles Ph.D.

Scott M. Nettles, Ph.D.

APPENDIX A

US009667770B2

(12) **United States Patent**
Zhidov et al.

(10) **Patent No.:** **US 9,667,770 B2**
(45) **Date of Patent:** **May 30, 2017**

(54) **TELEPHONE NETWORK SYSTEM AND METHOD**

H04W 76/02; H04M 1/72547; H04M 3/42042; H04M 3/42272; H04M 3/436; H04M 3/565; H04M 2203/5054; H04L 65/1069

(71) Applicant: **Flypsi, Inc.**, Denton, TX (US)

See application file for complete search history.

(72) Inventors: **Ivan Zhidov**, Chickasa, OK (US);
Peter A. Rinfret, Nantucket, MA (US);
Sunir Kochhar, Oro Valley, AZ (US)

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(73) Assignee: **Flypsi, Inc.**, Denton, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 82 days.

(21) Appl. No.: **14/307,052**

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(65) **Prior Publication Data**

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(51) **Int. Cl.**

H04M 1/725 (2006.01)
H04M 3/42 (2006.01)
H04M 3/436 (2006.01)
H04W 76/02 (2009.01)
H04L 29/06 (2006.01)
H04M 3/56 (2006.01)

Primary Examiner — Nam Huynh

(52) **U.S. Cl.**

CPC ... **H04M 1/72547** (2013.01); **H04M 3/42042** (2013.01); **H04M 3/42272** (2013.01); **H04L 65/1069** (2013.01); **H04M 3/436** (2013.01); **H04M 3/565** (2013.01); **H04M 2203/5054** (2013.01); **H04W 76/02** (2013.01)

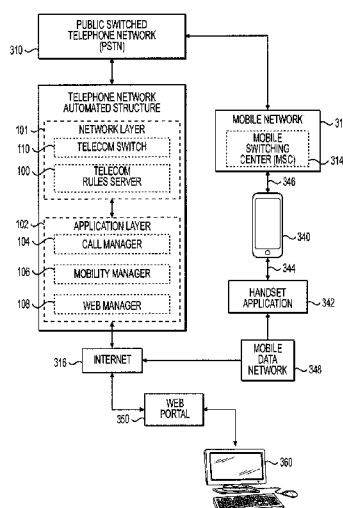
(57) **ABSTRACT**

Systems for and methods of delivering telephone calls using the combination of a data channel and a voice channel are disclosed. A data channel connection with the telephone handset may provide pre-call information used to set up incoming and outgoing calls which are ultimately connected using a voice channel. Use of the pre-call information may permit the same handset to be associated with multiple secondary telephone numbers from which calls appear to have been made and to which calls appear to have been placed.

(58) **Field of Classification Search**

CPC H04W 4/16; H04W 4/00; H04W 4/02;

6 Claims, 6 Drawing Sheets



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Page 2

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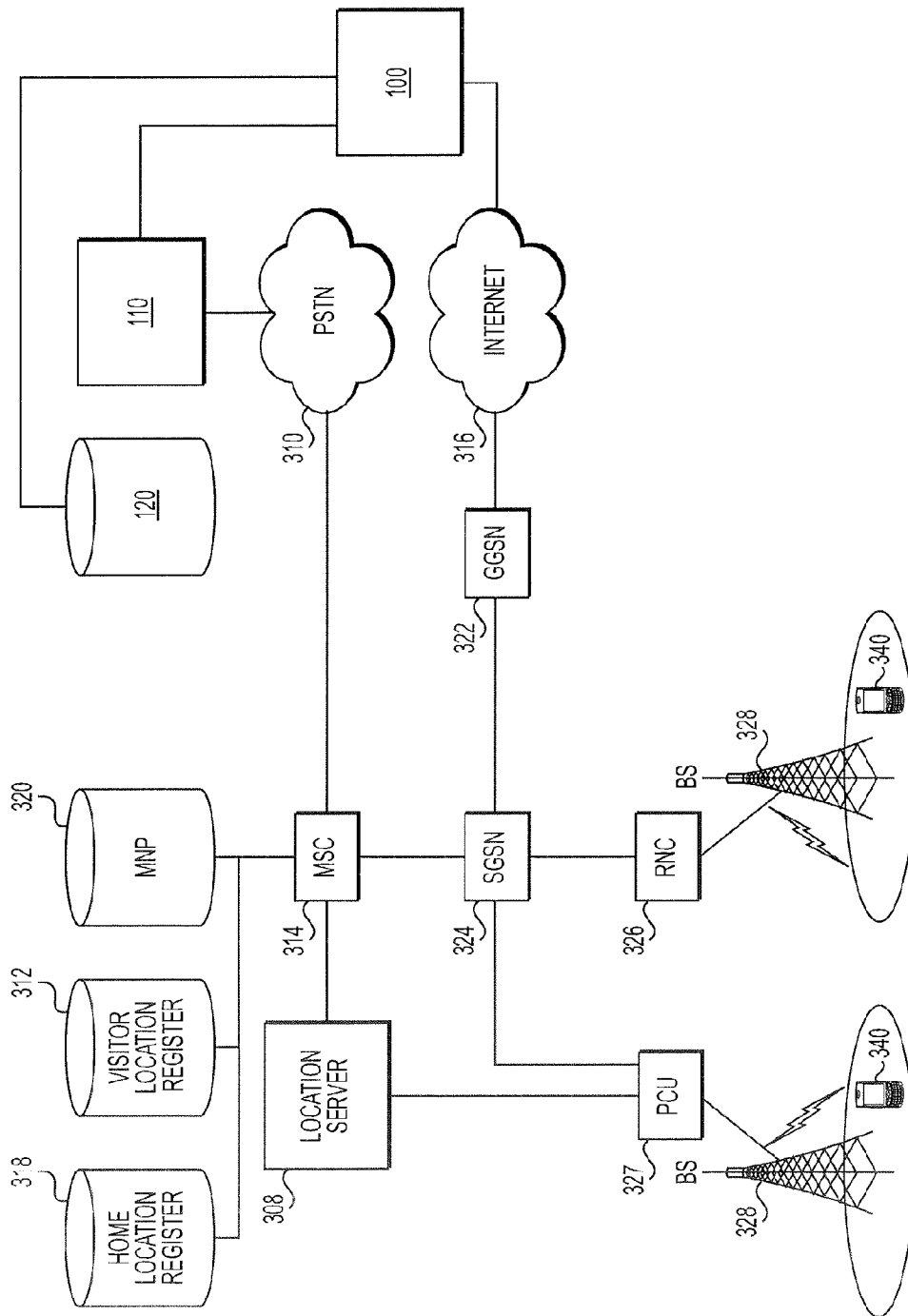
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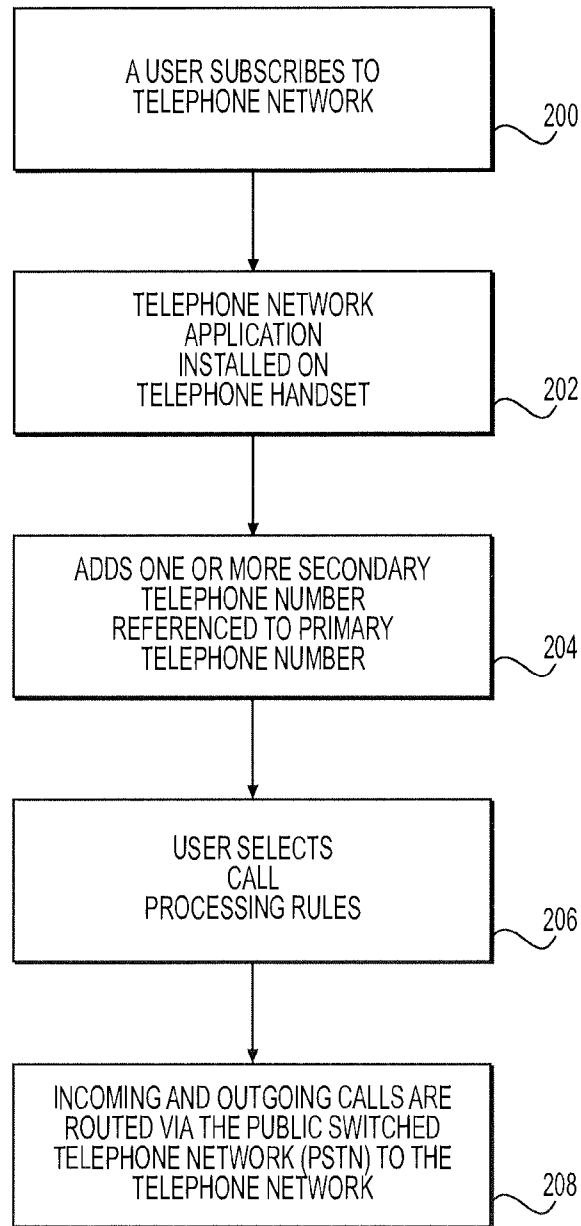
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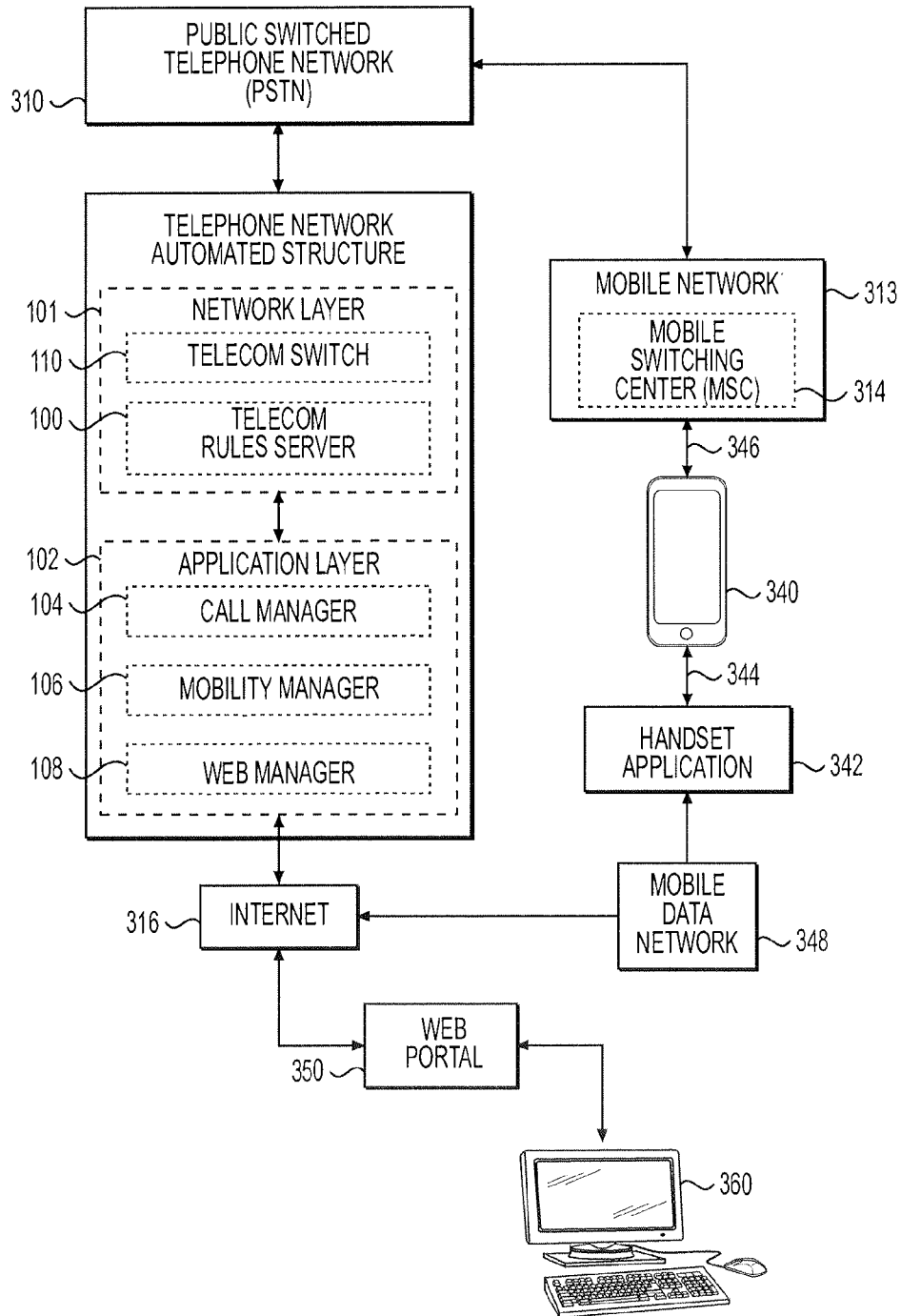
**FIG. 2**

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**FIG. 3**

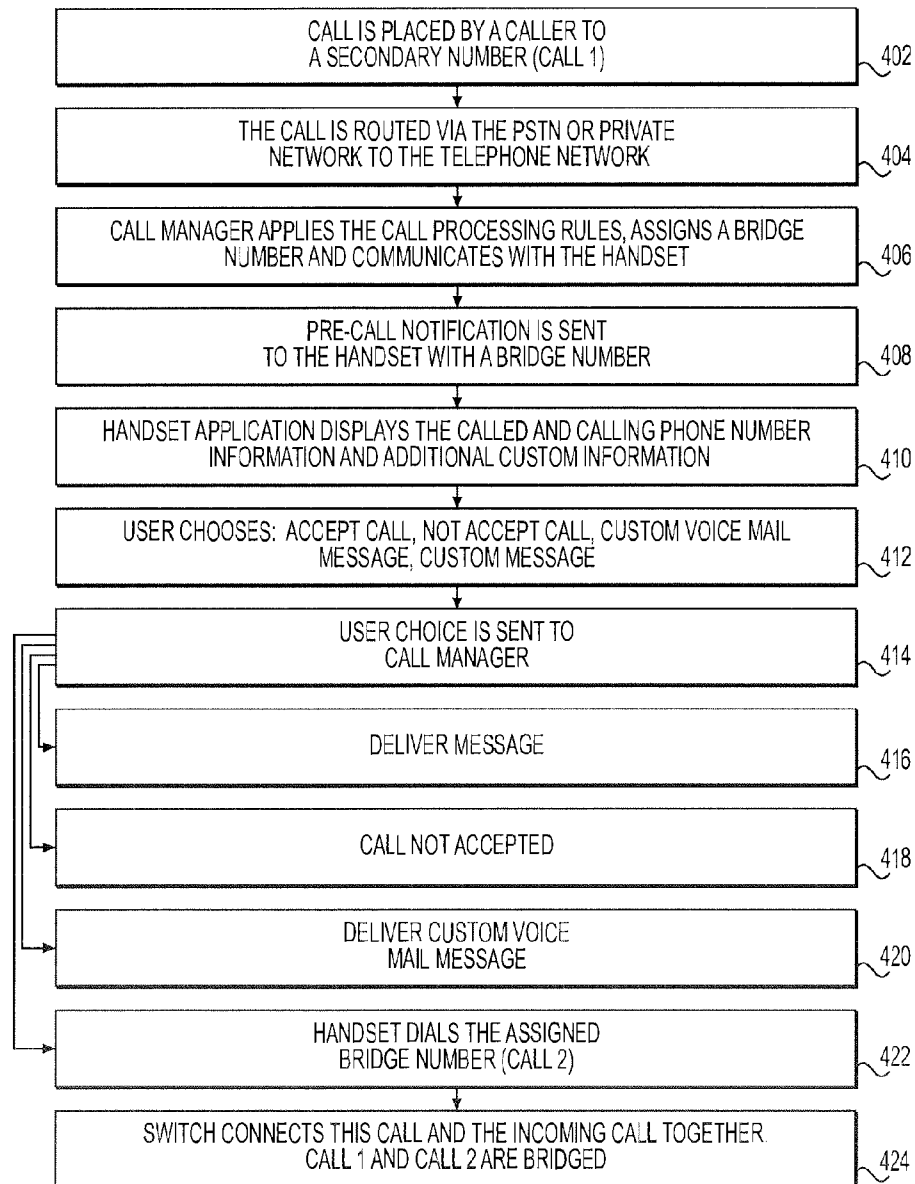
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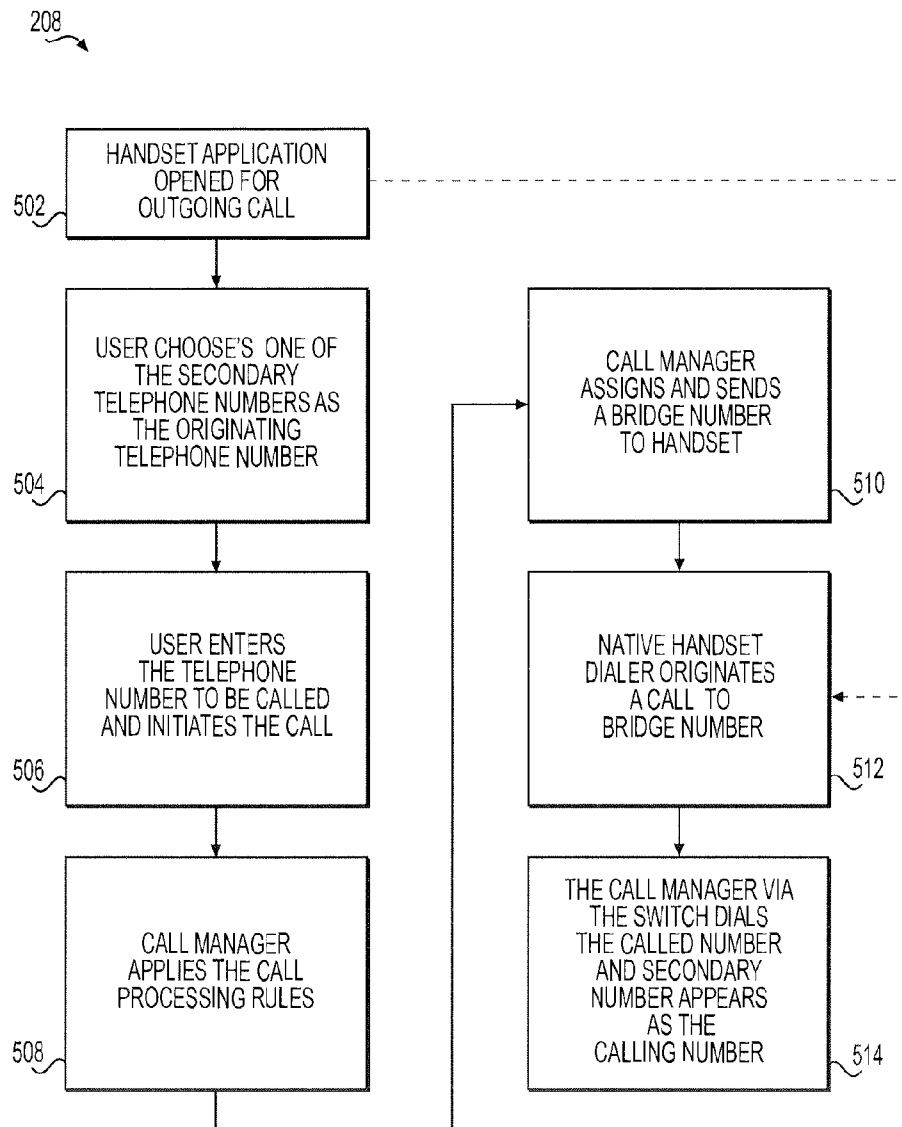
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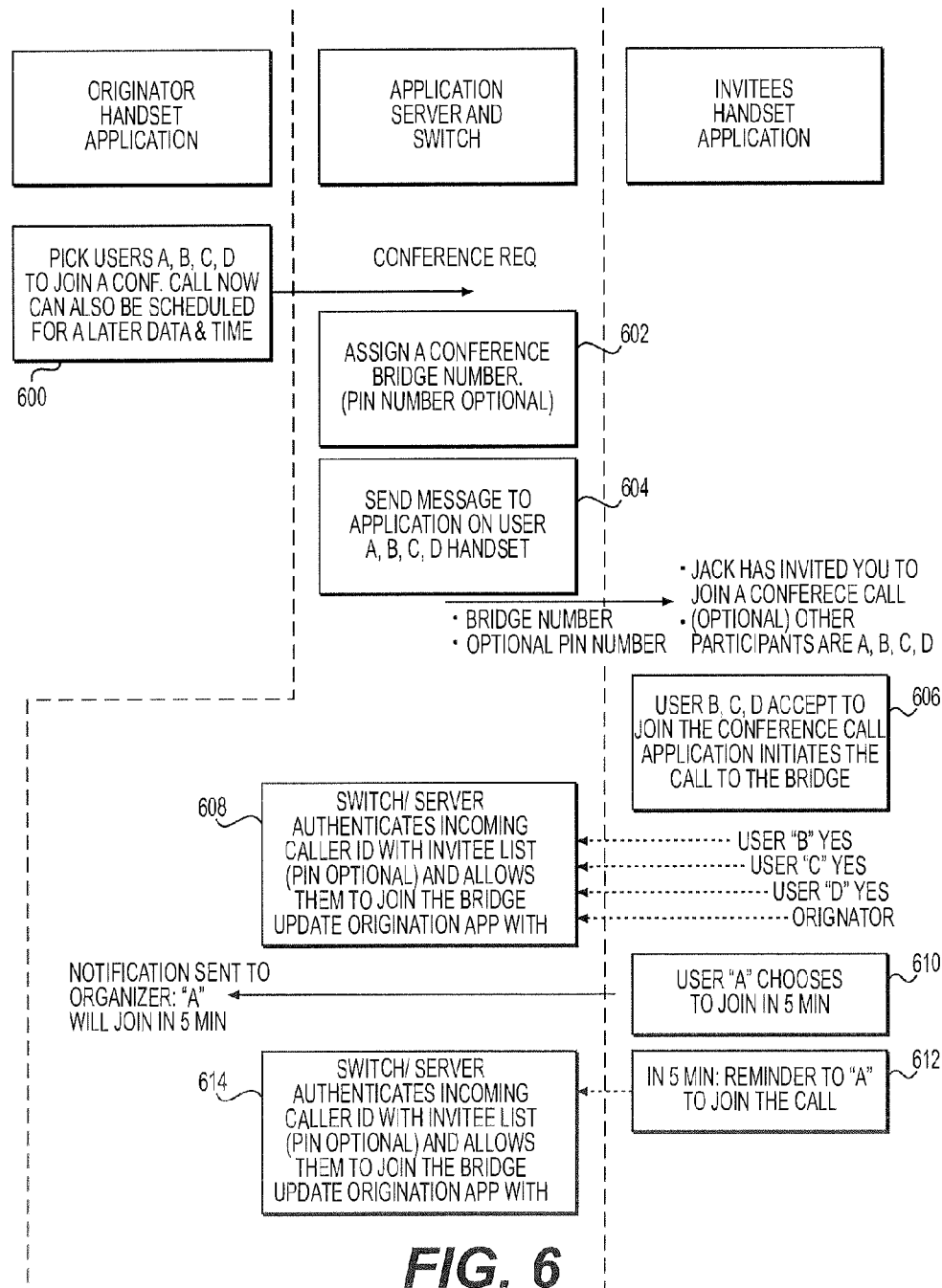
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**FIG. 4**

**FIG. 5**



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TELEPHONE NETWORK SYSTEM AND METHOD**CROSS-REFERENCE TO RELATED APPLICATIONS**

The present invention and application relates to, is a continuation-in-part of, and claims the benefit of the earlier filing date and priority of U.S. patent application Ser. No. 13/944,853, filed on Jul. 17, 2013, entitled "A Method Of A Data Channel Telephone Network System."

FIELD OF THE INVENTION

The present invention relates to systems and methods for setting up and connecting telephone calls, and delivering information related to such telephone calls using an Internet Protocol (IP) or other data channel while delivering the voice portion of the call in accordance with CDMA, GSM or like voice channel delivery standards.

BACKGROUND OF THE INVENTION

The volume of telephone calls and text messaging has increased dramatically and users are finding it more and more difficult to manage that volume of calls and messages. The current systems to aid in managing some types of calls only provide minimal assistance to the user. It is therefore an advantage of some, but not necessarily all, embodiments of the present invention to provide systems and methods for assisting callers and call recipients with the management of calls and messages.

Additional advantages of various embodiments of the invention are set forth, in part, in the description that follows and, in part, will be apparent to one of ordinary skill in the art from the description and/or from the practice of the invention.

SUMMARY OF THE INVENTION

Responsive to the foregoing challenges, Applicant has developed an innovative method of providing telephone service by transmitting call handling information between a handset and a switch using an IP channel or similar protocol channel and by transmitting a voice call associated with the call handling information between the handset and the switch using a voice channel provided in accordance with a voice channel protocol, e.g., in accordance with CDMA or GSM, 3G, 4G, LTE or like future protocol channels standards.

Applicant has further developed an innovative method of providing telephone service comprising: automatically storing electronic information that indicates an association of a secondary telephone number and a primary telephone number with a telephone handset in a computer memory associated with a server; automatically storing electronic information that indicates a selection of call processing rules for the primary telephone number in the computer memory; automatically storing electronic information that indicates a selection of call processing rules for the secondary telephone number in the computer memory; receiving an electronic indication of an incoming call to the secondary telephone number at the server, said electronic indication of an incoming call being received from a switch associated with the server; automatically accessing the call processing rules for the secondary telephone number under the control of the server responsive to the receipt of the electronic indication

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of the incoming call to the secondary telephone number; automatically handling the incoming call in accordance with the accessed call processing rules for the secondary telephone number; transmitting pre-call information via a data channel to the handset under the control of the server, said pre-call information including a bridge telephone number for connecting the handset to the incoming call at the switch; and receiving, at the server via the data channel, an electronic indication of a selection of a call processing rule for handling the incoming call to the secondary telephone number, or establishing a voice channel connection between the handset and the switch as a result of the handset calling the switch using the bridge number.

Applicant has further developed an innovative method of providing telephone service, comprising: automatically storing electronic information that indicates an association of a secondary telephone number and a primary telephone number with a telephone handset in a computer memory associated with a server; automatically associating a unique bridge telephone number with each of a plurality of contact telephone numbers in the computer memory; automatically transmitting information that indicates the association of the unique bridge telephone number with each of a plurality of contact telephone numbers to the handset via the data channel; automatically associating each primary telephone number and bridge telephone number pairing with a corresponding secondary telephone number and contact telephone number pairing in the computer memory; receiving, at a switch associated with the server, an outgoing call from the handset to the bridge telephone number via a voice channel; receiving, at the server, information from the switch indicating the outgoing call is being made to the bridge telephone number from the primary telephone number; receiving, at the switch, information from the server directing the switch to: (a) connect the outgoing call to a contact telephone number associated with the primary telephone number and bridge telephone number pairing, and (b) identify the telephone number from which the outgoing call is being made as the secondary telephone number.

Applicant has still further developed an innovative method of providing telephone service, comprising: enrolling a telephone handset in a telecommunications system having a server and a switch, wherein said telephone handset is associated with a primary telephone number in a database associated with the server and switch; electronically transmitting an application from the server to the telephone handset via a data channel responsive to telephone handset enrollment, wherein said application is: adapted to send instructions to have one or more secondary telephone numbers referenced to the primary telephone number in the database, adapted to present visually perceptible call processing rules on the telephone handset, and adapted to transmit information indicating a selection of call processing rules from the telephone handset to the server; electronically receiving instructions from the telephone handset via the data channel to reference the one or more secondary telephone numbers to the primary telephone number; storing telephone handset information, including the primary telephone number and the one or more secondary telephone numbers referenced to the primary telephone number, in the database; electronically receiving instructions from the telephone handset via the data channel to store user selected call processing rules for the telephone handset in the database, wherein the user selected call processing rules include instructions to route calls over a voice channel in a manner that will indicate that the calls are made to or from the one or more secondary telephone numbers; electronically trans-

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mitting information to the telephone handset via the data channel, said information being adapted to cause a pre-call information to be displayed on the telephone handset responsive to initiation of an outgoing call using the one or more secondary telephone numbers or an incoming call to the one or more secondary telephone numbers; electronically receiving from the telephone handset via the data channel call handling information indicating a user selected call processing rule to be used to process the outgoing or incoming call based on the call handling information.

Applicant has still further developed an innovative method of providing telephone service, comprising: associating a telephone handset with primary and secondary telephone numbers in a database; receiving, from the telephone handset via a data channel, digital information indicating primary call processing rules for handling calls to the first telephone number; storing the primary call processing rules digitally; receiving, from the telephone handset via the data channel, digital information indicating secondary call processing rules for handling calls to the secondary telephone number; storing the secondary call processing rules digitally; receiving a call request to the secondary telephone number; transmitting pre-call information to the telephone handset via the data channel responsive to receipt of the call request, wherein said pre-call information is based on the secondary call processing rules; responsive to the pre-call information, receiving information indicative of a user input to the telephone handset over the data channel; and processing the call based on the stored alternative call processing rules and user input to the telephone handset, wherein said processing includes an option of connecting the call over a voice channel.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only, and are not restrictive of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to assist the understanding of this invention, reference will now be made to the appended drawings, in which like reference characters refer to like elements.

FIG. 1 is a schematic diagram illustrating a network architecture that may be used to provide telephone service in accordance with embodiments of the present invention.

FIG. 2 is a block diagram illustrating a method of providing telephone calls in accordance with embodiments of the present invention.

FIG. 3 is a block diagram illustrating data channel and voice channel connections used to provide telephone service in accordance with embodiments of the present invention.

FIG. 4 is a block diagram illustrating a method of setting up and connecting an incoming call in accordance with one embodiment of the present invention.

FIG. 5 is a block diagram illustrating a method of setting up and connecting an outgoing call in accordance with one embodiment of the present invention.

FIG. 6 is a call sequence diagram illustrating a method of setting up and connecting a conference call in accordance with one embodiment of the present invention.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

Reference will now be made in detail to embodiments of the present invention, examples of which are illustrated in

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the accompanying drawings. It is to be understood that other embodiments may be utilized and structural changes may be made without departing from the scope of the present invention.

It should be noted that in connection with the described embodiments, reference is made to a data channel. A preferred data channel may be an Internet Protocol (IP) channel, which is not a conventional telephone voice channel. However, other data, non-conventional voice, channels over which information may be transmitted between a telephone handset and a server may be used in alternative embodiments of the invention.

With reference to FIG. 1, embodiments of the present invention may be implemented using a system having a server 100, associated computer memory, such as a database 120, and an associated telecommunications switch 110 which communicate through a network with a telephone handset 340. The server 100 may be connected to the database 120 and the switch 110. The server 100 may also be connected via the Internet 316 through one or more nodes, such as a Gateway GPRS Support Node (GGSN) 322 and a Servicing GPRS Support Node (SGSN) 324, to a mobile network 313. The switch 110 may be connected through the PSTN 310 to the mobile network 313 at a Mobile Switching Center (MSC) 314. In turn, the MSC 314 may be connected to a Home Location Register database (HLR) 318, a Visitor Location Register database (312), a Mobile Number Portability database (MNP) 320, a location server 308, and the SGSN 324. The SGSN 324 may be connected to one or more Radio Network Controllers (RNC) 326 and/or one or more Processor Control Units (PCU) 327, which in turn may be connected to one or more Base Stations (BS) 328 and to one or more mobile devices referred to collectively as "handsets" 340.

The communications between the server 100 and the handset 340 over the Internet 316 may utilize IP as a protocol opposed to protocols used to establish communications according to CDMA, GSM, or like standards. Such IP governed communications are referred to herein as being conducted over a "data channel." Conversely, communications between the switch 110 and the handset over the PSTN 310 may be transmitted and received in accordance with CDMA, GSM or like standards as opposed to using IP. Such CDMA, GSM or like governed communications, when used to carry voice information, are referred to herein as being conducted over a "voice channel."

With reference to FIGS. 1 and 2, method embodiments of the invention may be facilitated starting with step 200 in which a handset 340 may be used to subscribe to the telephone network that includes the server 100 and switch 110 used to provide telephone service in accordance with embodiments of the invention. A user may subscribe to the telephone network in step 200 by enrolling the telephone handset 340 using a data channel connection between the handset and the server 100. Responsive to a data channel request received from the handset 340, a handset application may be transmitted to the handset from the server 100, and installed and stored in memory associated with the handset in step 202. Once the handset application is installed on the handset 340, the handset may connect to the server 100 by operation of the handset application as needed over a data channel connection which may include the BS 328, RNC 326 or PCU 327, SGSN 324, GGSN 322, and Internet 316.

In connection with step 204, the server 100 may transmit information to the handset 340 via the data channel, which, through automatic operation of the handset application, permits the user to select one or more secondary telephone

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numbers to be referenced to a primary telephone number for the handset. The primary telephone number, preferably, may be a SIM number or ESN which is assigned to the handset 340 at the time of activation. Once selected, the handset 340 may automatically transmit information which to the server 100 over the data channel which requests that the secondary telephone numbers be associated with the primary telephone number. In response, the server 100 may store (i.e., reference) information indicating the association of the one or more selected secondary telephone numbers in computer memory associated with the server such as the database 120. In an alternative embodiment, the server 100 may automatically assign one or more secondary telephone numbers to the handset 340, as opposed to them being selected.

In step 206 of FIG. 2, the handset 340 may be used to access the handset application installed thereon to select call processing rules for handling incoming and outgoing voice channel calls to and from the handset 340. Information indicating call processing rules may be transmitted from the handset 340 to the server 100 via the data channel by automatic operation of the handset application. Custom call processing rules may be selected for, and associated with, each of the primary telephone number and the one or more secondary telephone numbers associated with the primary telephone number. The call processing rules information may be automatically stored in a computer memory, such as database 120, by the server 100. An indication of the association of particular call processing rules with a particular handset 340 and particular primary and/or secondary telephone numbers may also be stored in the database 120. The call processing rules may include preset responses for incoming calls, such as custom stored voice message(s) and/or custom stored text message(s) to be associated with the primary and/or one or more secondary telephone numbers. The call processing rules may further permit the handset 340 to be used to control the availability of the secondary telephone numbers as well as activation of additional secondary telephone numbers and deactivation of existing secondary telephone numbers. Information indicating the call processing rules for the primary telephone number and secondary telephone numbers may be stored automatically in memory associated with the handset 340. The call processing rules may further include stock rules used for all telephone numbers, such as an option to accept or not accept (i.e., drop) an incoming call. With reference to step 208, the application stored on the handset 340 may enable it to be used to receive incoming calls from, and place outgoing calls to, a recipient telephone (not shown) which is connected to the PSTN 310, as explained in more detail below.

With reference to FIGS. 3 and 4, the handset 340 may be used to receive incoming (terminating) calls to a secondary telephone number, using a telephone network automated structure having a network layer 101 and an application layer 102 associated therewith. An incoming call to the secondary telephone number may be placed in step 402 by a calling party. The incoming call is routed from the caller's telephone to the PSTN 310. In step 404, the incoming call may be routed over the PSTN 310 to the switch 110. Responsive to receipt of the incoming call at the switch 110, a Call Manager 104 application, which cooperates with a Mobility Manager 106 application, and a Web Manager 108 application, which are all associated with the server 100, may access the call processing rules in the database 120 which are associated with the secondary telephone number that is being called. Subject to the accessed call processing rules, the Call Manager 104 may assign or look up a bridge

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telephone number to be used for completion of the call in step 406. The bridge telephone number may be associated with the switch 110, and calls to the bridge telephone number may be automatically routed to this switch.

The call processing rules may provide for call routing via a call distribution algorithm where the call could be routed to one or many telephone numbers. The call processing rules may be user selectable and configurable, and may apply to voice, text and/or other data messaging. The call processing rules may govern how calls are handled and may provide automated call routing or call dropping based on location data of the calling and/or called party. The call processing rules may further govern handling calls based on incoming caller ID, which may identify a calling party as being on an accepted caller ID list or a non-accepted caller ID list. The call processing rules may further provide call routing based on weekday, weekend, holiday, time of day, biometrics data, and accelerometer data information. The call processing rules may still further provide call routing based on an interface with a handset 340 calendar to check availability to accept calls. Such calendars may include, for example, Outlook, Google Calendar, and other user calendars.

If the call processing rules indicate that the secondary telephone number is not available to this particular caller, or to all callers, however, the Call Manager 104 may apply such rule or rules and reject the incoming call at the conclusion of step 406. Application of the call processing rules for a call rejection may result in the call simply not being answered, being dropped, or automated return of a voice, text, or other type of message to the calling telephone number or a communication device associated therewith.

On the other hand, if the call processing rules permit completion of the call, in step 408 the Call Manager 104 may transmit pre-call notification information to the handset 340, which includes the assigned/looked up bridge telephone number, via the data channel connection, i.e., over the Internet 316 and the Mobile Data Network 348. The pre-call information may include information used by the application installed on the handset 340 to cause a display of the calling telephone number, the calling party name, calling party location, such as GPS location, and/or the called secondary telephone number, as well as other information in step 410. The incoming pre-call information may be received at the handset 340 before or during the call ringing on the handset.

In step 412, responsive to receipt of the incoming pre-call notification information, the handset application may cause the handset 340 to display call handling choices for the call. For example, the handset 340 may be directed under the control of the handset application to display receive call, drop call, custom voice mail message, and/or custom text message choices. The choices may be selected through interaction with the handset 340, all before the call is connected or dropped. In step 414, the selection of either delivering a responsive text message (416), not accepting, i.e., "dropping" the call (418), or responding to the call with a custom voice message (420) may be transmitted from the handset 340 to the server 100 via the data channel. Thereafter, the Call Manager 104 may automatically implement the drop call or respond with text or voice message instructions received over the data channel, and the call attempt may be terminated thereafter.

If the call is accepted in step 414, however, the handset application may automatically cause the handset 340 to call the bridge telephone number in step 422 over a voice channel. The return call from the handset 340 to the bridge telephone number may be routed over the PSTN 310 to the switch 110 using a voice channel connection. In step 424,

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once the call to the bridge telephone number is received at the switch **110**, the switch may “bridge” the incoming voice channel call to the bridge telephone number with the incoming voice channel call to the secondary telephone number to thereby connect the incoming call from the calling party to the handset **340** via a voice channel. Further, the switch **110** may automatically send signaling information to the calling party telephone which causes the secondary telephone number to be displayed as the number to which the call has been completed.

With continued reference to FIG. **3**, the web manager **108** may be used to process Internet **316** transactions for the server **110**. The system may also employ a web portal **350** to link a digital device **360** other than a handheld **340** to the telecommunications system for calling in accordance with embodiments of the invention. For example, embodiments of the invention may be used with digital devices **360** such as a desktop computer, laptop computer, iPad, tablet, iPod **790**, or the like.

With reference to FIGS. **3** and **5**, the handset **340** may be used to place outgoing (originating) calls from a secondary telephone number, using the telephone network automated structure shown in FIG. **3** and described above. If the party to be called has not yet been called using a secondary telephone number, an outgoing call from the handset **340** may be initiated to such party in step **502** by opening the handset application installed thereon. Once the handset application is open, the handset **340** may be used to choose a secondary telephone number as the originating telephone number in step **504**. A list of such secondary telephone numbers may be stored in memory associated with the handset.

In step **506**, the handset **340** may be used to enter, or select from an address file, a contact telephone number to be called in order to initiate a call to such telephone number. The handset application may cause the handset **340** to transmit information to the server **100** Call Manager **104** via the data channel automatically as a result of the selection of the secondary telephone number and the contact telephone number. The transmitted information may indicate the secondary telephone number from which the call is to appear to the called party to have been placed, and the contact telephone number to be called.

In step **508**, responsive to receipt of the data channel communication from the handset **340** requesting set up of a call from it to the telephone number to be called, the Call Manager **104** may access the call processing rules in the database **120** which are associated with the secondary telephone number from which the call is to appear to have been placed. In step **510**, subject to the accessed call processing rules, the Call Manager **104** may assign a bridge telephone number to be used to connect the call from the handset **340** to the switch **110** and send pre-call information including the bridge telephone number to the handset via the data channel.

The bridge telephone number may be associated with the switch **110**, and calls to the bridge telephone number may be automatically routed to this switch. Once the bridge telephone number is assigned, the server **100** under the control of the Call Manager **104**, may store information in the database **120** which associates the bridge telephone number with the primary telephone number for the handset **340**, the secondary telephone number selected for the call, and the contact telephone number to be called. More specifically, the stored information may indicate that each combination of primary telephone number and bridge telephone number are uniquely associated with each combination of secondary telephone number and contact telephone number. In other

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words, each combination of primary telephone number and bridge telephone number for the handset **340** map to a unique combination of secondary telephone number and contact telephone number in the database **120** memory.

In step **512**, responsive to receipt of the bridge telephone number information over the data channel, the handset application may cause the handset **340** to automatically call the bridge telephone number via a voice channel. The return call from the handset **340** to the bridge telephone number may be routed over the PSTN **310** to the switch **110** using a voice channel connection.

In step **514**, the Call Manager **104** may instruct the switch **110** to place a voice channel call to the telephone number to be called using the secondary telephone number as the originating telephone number from the switch. Once the call to the bridge telephone number from the handset **340** is received at the switch **110**, the switch may “bridge” the incoming voice channel call to the bridge telephone number with the outgoing voice channel call from the secondary telephone number to the contact telephone number to thereby connect the outgoing call from the handset **340** to the party being called via a voice channel. Further, the switch **110** may automatically send signaling information to the called party telephone which causes the secondary telephone number to be displayed as the number from which the call appears to have been placed. Because each pairing of a primary telephone number and a bridge telephone number maps to a unique contact telephone number and secondary telephone number pairing, the call can be completed at the switch **110** to the correct contact telephone number while showing the desired secondary telephone number as the originating number.

With continued reference to FIG. **5**, in the event that the contact telephone has been previously called using the secondary telephone number on the handset **340**, the user may directly select the bridge telephone number associated with the secondary telephone number and contact telephone number in step **506** either using the handset application in step **502**, or without opening the handset application in step **512**. Alternatively, the handset may have a stored “shortcut” which, when the user selects the contact telephone number to be called from the secondary telephone number, results in the associated bridge telephone number being dialed. In either case, the handset **340** may dial the bridge telephone number to connect with the Call Manager **104** in step **512**. In step **514**, the Call Manager **104** may look up the secondary telephone number and the contact telephone number associated with the paired bridge telephone number and primary telephone number for the handset **340**. Thereafter, the switch **110** may dial the contact telephone number and bridge the call from the handset **340** in a manner that makes the secondary telephone number appear to be the telephone number from which the call is being placed.

FIG. **6** is a call flow diagram illustrating a method of setting up and connecting a multi-party conference call in accordance with an embodiment of the present invention. With reference to FIGS. **3** and **6**, the communication sequence for a conference call is illustrated between the handset application stored on the handset **340**, the Call Manager **104** application associated with the server **100** and switch **110**, and a conference call invitee handset. In step **600**, the application on the handset **340** may be used to select invitees (users) for a conference call. The telephone numbers of the invitees may be selected from an address book or manually entered. Further, the conference call may be selected to be initiated immediately, or at some future date and time.

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Once the invitees are selected, the handset **340** may be instructed by the handset application to transmit a conference request to the server **100** via a data channel. In step **602**, the Call Manager **104** operating on the server **100** may assign a conference bridge telephone number to the conference call in response to receipt of the conference request. In step **604**, the Call Manager **104** may cause the server **100** to send conference invitation messages to each of the invitee handsets, and more specifically, applications stored on the invitee handsets, via a data channel. The invitation messages may include the assigned bridge telephone number for the conference call and an optional PIN or code number for the conference call. The invitation message may provide a notice, for example, "Jack has invited you to join a conference call," and further include identification of other invited participants.

In step **606**, each invitee handset may be used to accept to join the conference call, join at a later time, or decline to join. If the acceptance is for a future scheduled conference call, an indication of the acceptance (including acceptance to join late) may be transmitted from each invitee handset under the control of the application installed thereon, to the server **100** Call Manager **104** via the data channel. Further, if the invitation is declined altogether, an indication thereof may be transmitted from each invitee handset to the server **100**. Thereafter, the Call Manager **104** may transmit information to the originating handset **340**, and optionally the invitee handsets, via the data channel, which indicates acceptance of a future conference call, acceptance to join late (step **610**), or declination of the conference call invitation.

If the conference call invitation is accepted and it is time for the call, each accepting invitee handset may automatically or manually dial the bridge telephone number using a voice channel. The switch **110** may receive the voice channel calls to the bridge telephone number and may authenticate the invitees right to join the conference call in step **608** by comparing the invitee's telephone number with that of the invitee list, as well as comparing any PIN input by the invitee with the PIN selected for the conference call. If the authentication is successful, the invitee handset is connected to the call via the voice channel. An automatic update may be transmitted via the data channel from the server to the originating handset **340** indicating that a particular invitee handset has joined the conference call.

If an invitee chose to join late, the server **100** may automatically transmit a reminder to the affected invitee handset to join the call at the agreed time in step **612**. Thereafter, the late joining invitee handset may dial the bridge telephone number automatically or manually using a voice channel. The switch **110** may receive the voice channel call to the bridge telephone number, authenticate the late joining invitee handset, and connect the handset to the conference call in step **614**.

The foregoing has described the principles, embodiments and modes of operation of the present invention. However, the invention should not be construed as being limited to the particular embodiments discussed. The above described embodiments should be regarded as illustrative rather than restrictive, and it should be appreciated that variations may be made in those embodiments by workers skilled in the art without departing from the scope of the present invention as defined by the following claims.

What is claimed:

1. A method of providing telephone service, the method comprising:

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associating a secondary telephone number with a primary telephone number in at least one computer memory device, the primary telephone number being assigned to a handset;

acquiring first digital information from the handset over at least one data channel, the first digital information indicating primary call processing rules for handling calls directed to the primary telephone number;

storing the primary call processing rules in the at least one computer memory device;

acquiring second digital information from the handset over the at least one data channel, the second digital information indicating secondary call processing rules for handling calls directed to the secondary telephone number;

storing the secondary call processing rules in the at least one computer memory device;

receiving an incoming call over at least one voice channel at a switch, the switch being associated with a bridge telephone number such that calls directed to the bridge telephone number are automatically routed to the switch, the incoming call being directed to a handset-associated telephone number, the handset-associated telephone number being the primary telephone number or the secondary telephone number, and;

based on the primary call processing rules or the secondary call processing rules:

transmitting pre-call information to the handset over the at least one data channel the pre-call information including the bridge telephone number and the handset-associated telephone number, such that the handset is capable of displaying the handset-associated telephone number to a user and, based on user input, accepting the incoming call by connecting with the switch over the at least one voice channel using the bridge telephone number.

2. The method of claim 1, wherein the handset-associated telephone number is the secondary telephone number, and the pre-call information is transmitted based on the secondary call processing rules.

3. The method of claim 1, wherein the pre-call information includes a plurality of call handling choices for display by the handset and selection via the user input.

4. The method of claim 1, further comprising:

receiving an outgoing call request from the handset over the at least one data channel, the outgoing call request including an originating telephone number and a contact telephone number to be called, the originating telephone number being the primary telephone number or the secondary telephone number;

connecting with the handset at the switch over the at least one voice channel using the bridge telephone number; and

transmitting an outgoing call over the at least one voice channel from the switch, the outgoing call being directed to the contact telephone number and indicating the originating telephone number.

5. The method of claim 1, wherein the at least one data channel includes an Internet protocol (IP) channel.

6. The method of claim 5, wherein the at least one voice channel is established in accordance with at least one of a Code Division Multiple Access (CDMA) standard and a Global System for Mobiles (GSM) standard.

* * * * *

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See application file for complete search history.

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Primary Examiner — Nam Huynh

(63) Continuation of application No. 14/307,052, filed on Jun. 17, 2014, now Pat. No. 9,667,770, which is a
(Continued)

(57) **ABSTRACT**

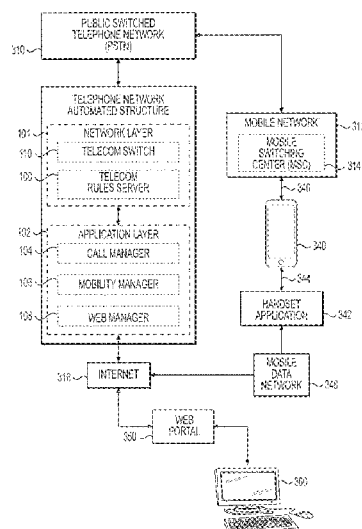
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H04M 3/42 (2006.01)

(Continued)

(52) **U.S. Cl.**
CPC ... ***H04M 1/72547*** (2013.01); ***H04M 3/42042***
(2013.01); ***H04M 3/42272*** (2013.01); ***H04L***
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H04M 3/565 (2013.01); ***H04M 2203/5054***
(2013.01); ***H04W 76/02*** (2013.01); ***H04W***
76/10 (2018.02)

Systems for and methods of delivering telephone calls using the combination of a data channel and a voice channel are disclosed. A data channel connection with the telephone handset may provide pre-call information used to set up incoming and outgoing calls which are ultimately connected using a voice channel. Use of the pre-call information may permit the same handset to be associated with multiple secondary telephone numbers from which calls appear to have been made and to which calls appear to have been placed.

36 Claims, 6 Drawing Sheets



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filed on Jul. 17, 2013, now abandoned.

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H04L 29/06 (2006.01)
H04M 3/436 (2006.01)
H04W 76/10 (2018.01)

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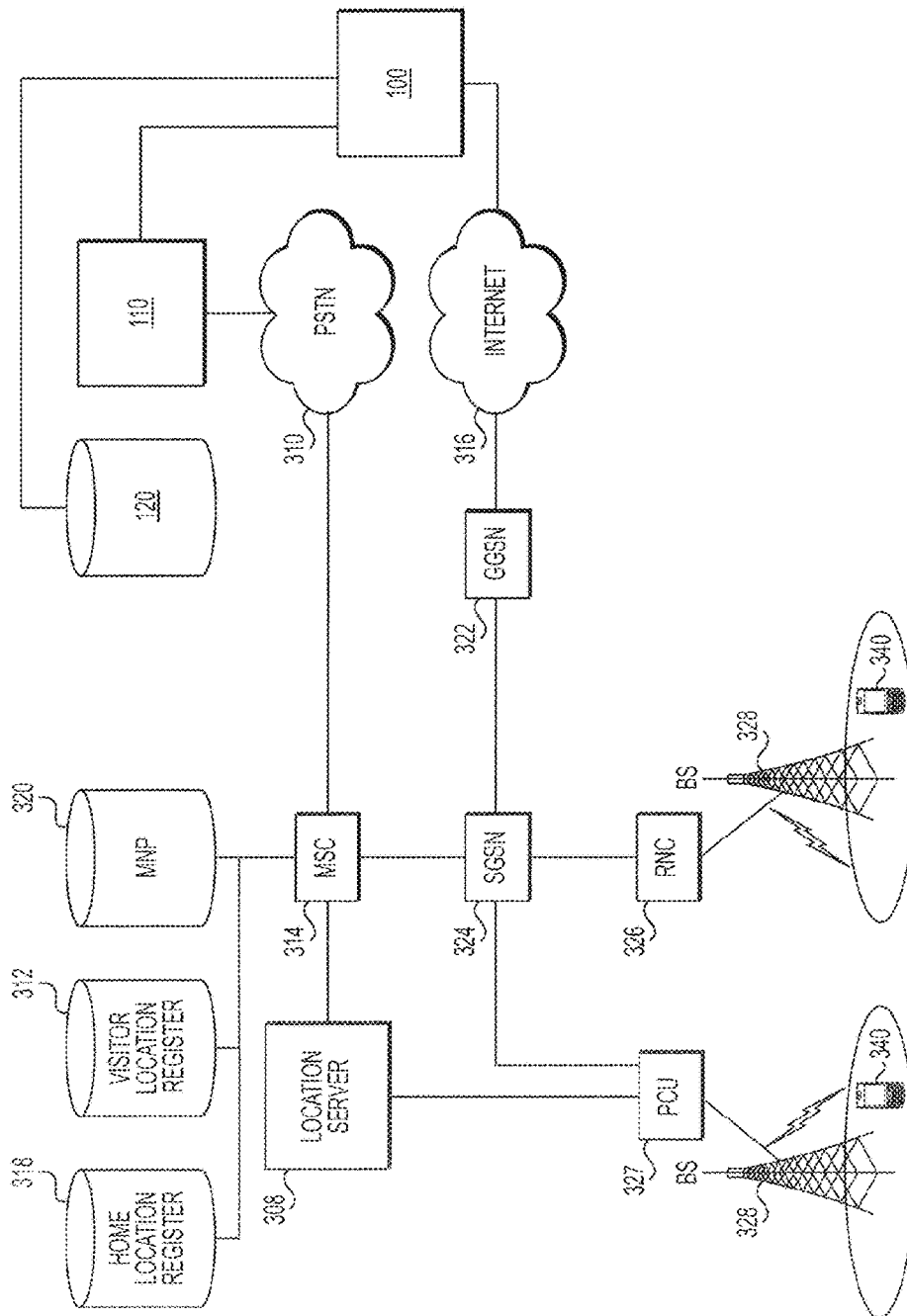
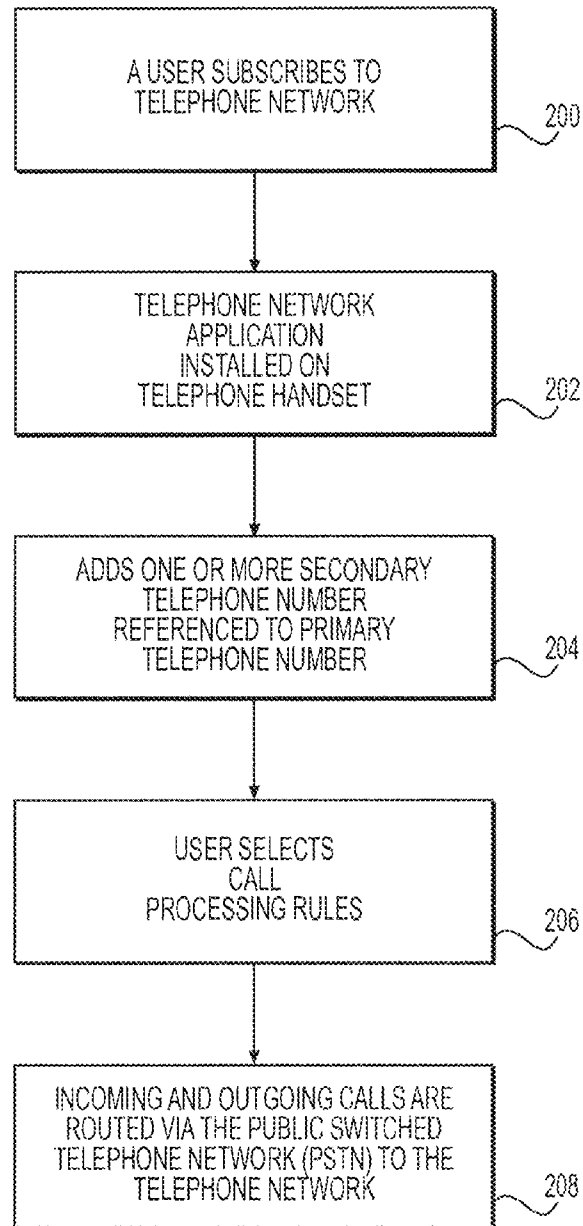


FIG. 1

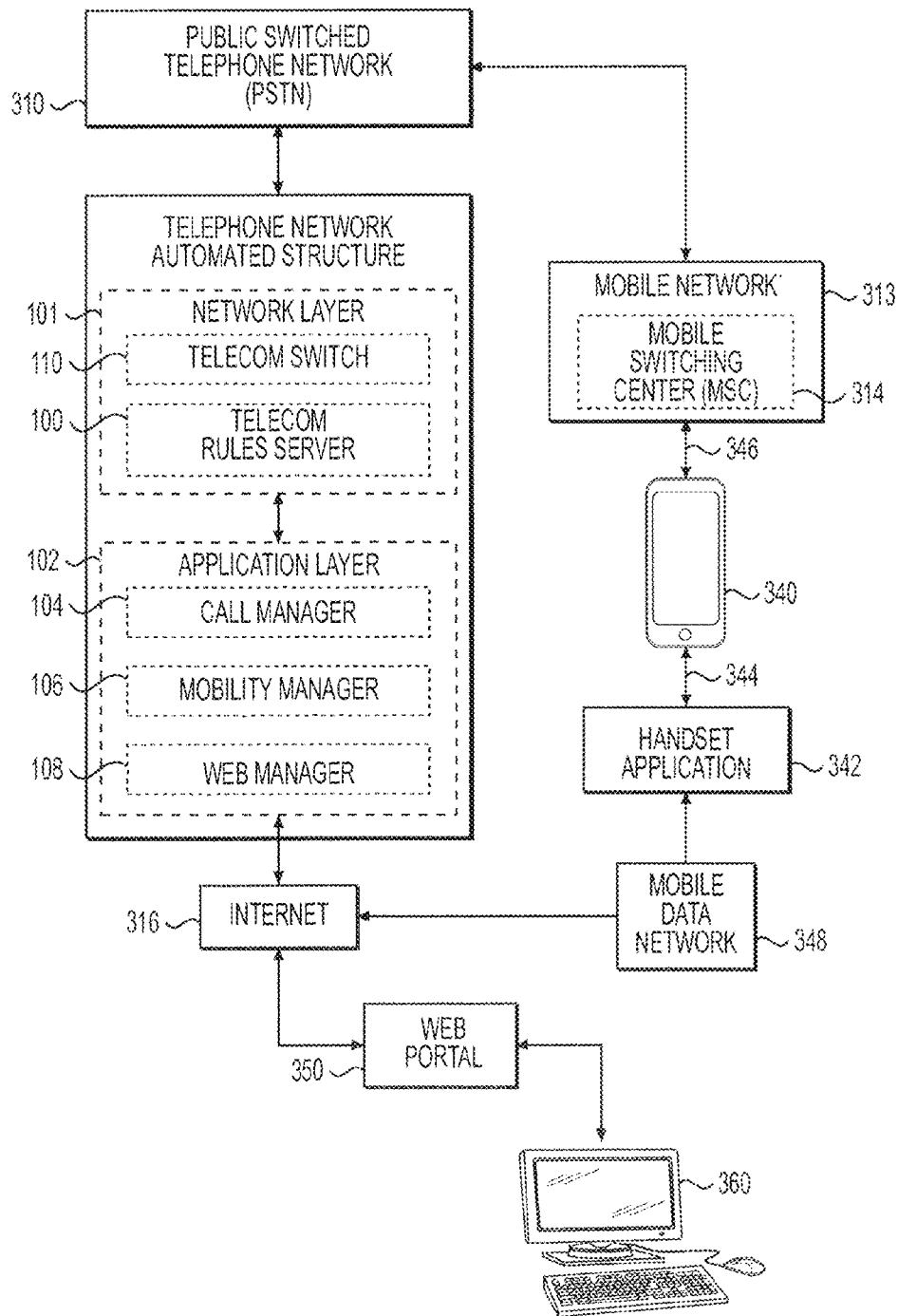
**FIG. 2**

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**FIG. 3**

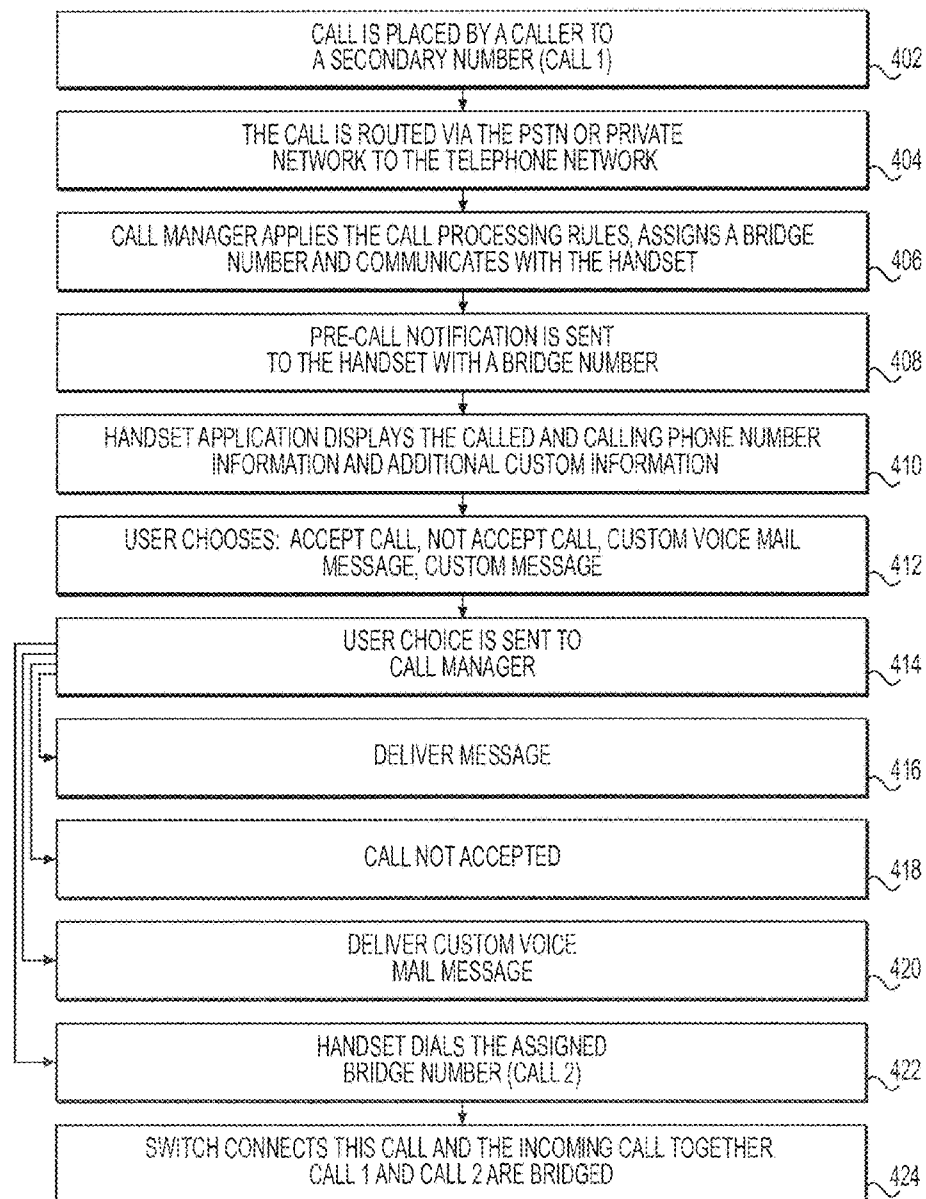
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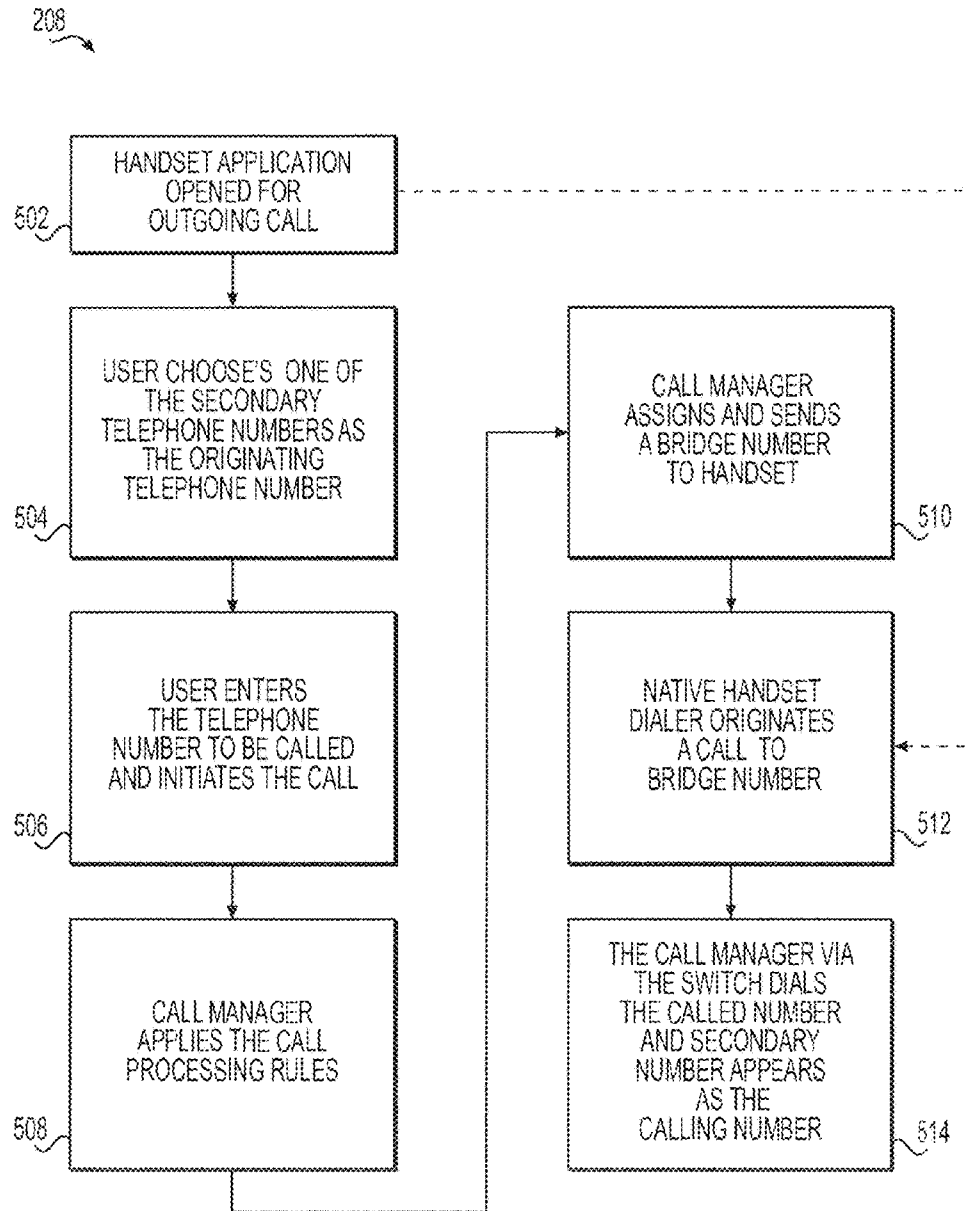
**FIG. 4**

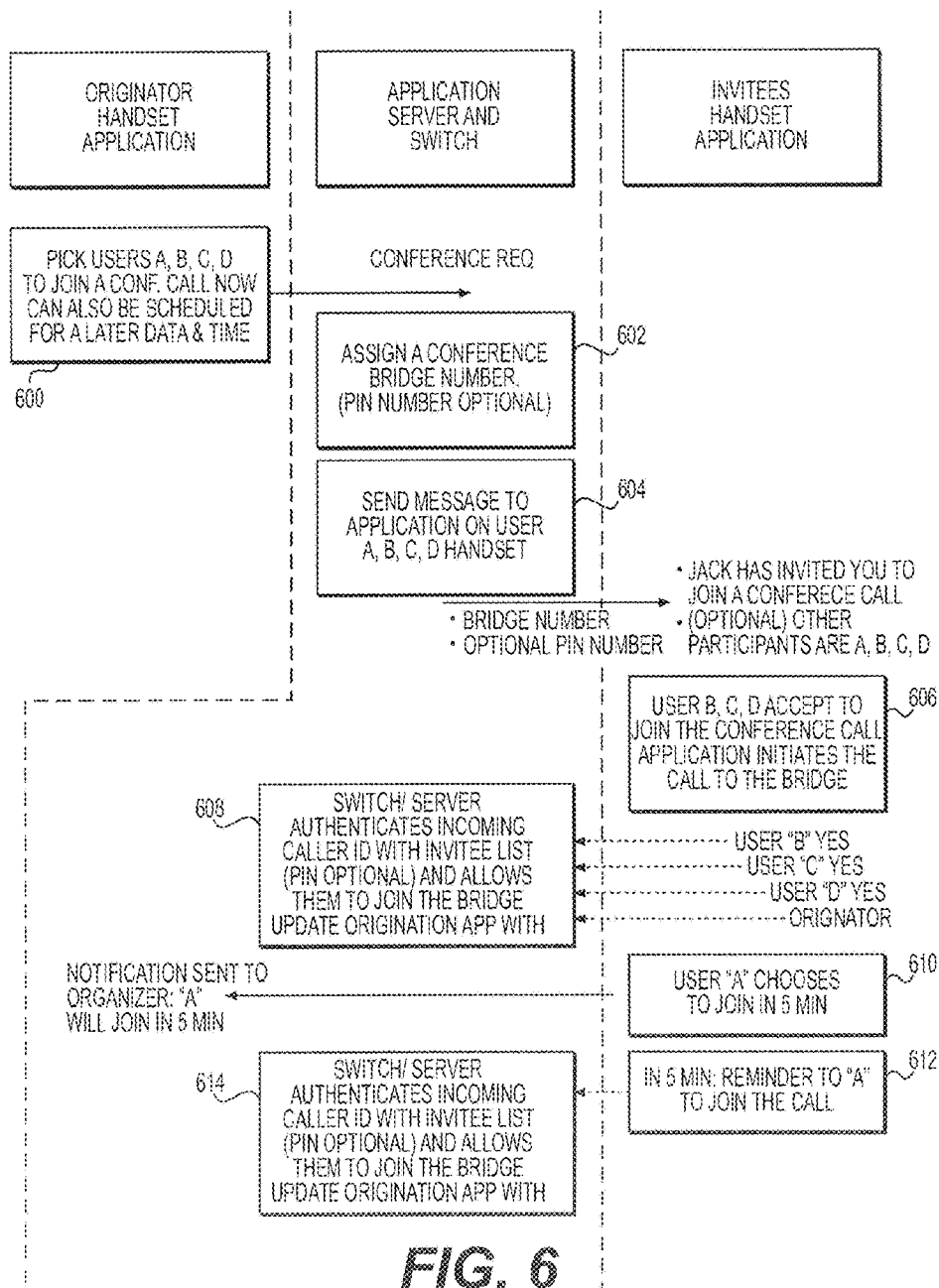
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**FIG. 5**



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TELEPHONE NETWORK SYSTEM AND METHOD**CROSS-REFERENCE TO RELATED APPLICATIONS**

This application is a continuation of U.S. application Ser. No. 14/307,052, filed Jun. 17, 2014, entitled "Telephone Network System And Method," which is a continuation-in-part of, and claims the benefit of the earlier filing date and priority of, U.S. patent application Ser. No. 13/944,853, filed on Jul. 17, 2013, entitled "A Method Of A Data Channel Telephone Network System," both of which are incorporated in their entirety.

FIELD OF THE INVENTION

The present invention relates to systems and methods for setting up and connecting telephone calls, and delivering information related to such telephone calls using an Internet Protocol (IP) or other data channel while delivering the voice portion of the call in accordance with CDMA, GSM or like voice channel delivery standards.

BACKGROUND OF THE INVENTION

The volume of telephone calls and text messaging has increased dramatically and users are finding it more and more difficult to manage that volume of calls and messages. The current systems to aid in managing some types of calls only provide minimal assistance to the user. It is therefore an advantage of some, but not necessarily all, embodiments of the present invention to provide systems and methods for assisting callers and call recipients with the management of calls and messages.

Additional advantages of various embodiments of the invention are set forth, in part, in the description that follows and, in part, will be apparent to one of ordinary skill in the art from the description and/or from the practice of the invention.

SUMMARY OF THE INVENTION

Responsive to the foregoing challenges. Applicant has developed an innovative method of providing telephone service by transmitting call handling information between a handset and a switch using an IP channel or similar protocol channel and by transmitting a voice call associated with the call handling information between the handset and the switch using a voice channel provided in accordance with a voice channel protocol, e.g., in accordance with CDMA or GSM, 3G, 4G, LTE or like future protocol channels standards.

Applicant has further developed an innovative method of providing telephone service comprising: automatically storing electronic information that indicates an association of a secondary telephone number and a primary telephone number with a telephone handset in a computer memory associated with a server; automatically storing electronic information that indicates a selection of call processing rules for the primary telephone number in the computer memory; automatically storing electronic information that indicates a selection of call processing rules for the secondary telephone number in the computer memory; receiving an electronic indication of an incoming call to the secondary telephone number at the server, said electronic indication of an incoming call being received from a switch associated with the

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server; automatically accessing the call processing rules for the secondary telephone number under the control of the server responsive to the receipt of the electronic indication of the incoming call to the secondary telephone number; automatically handling the incoming call in accordance with the accessed call processing rules for the secondary telephone number; transmitting pre-call information via a data channel to the handset under the control of the server, said pre-call information including a bridge telephone number for connecting the handset to the incoming call at the switch; and receiving, at the server via the data channel, an electronic indication of a selection of a call processing rule for handling the incoming call to the secondary telephone number, or establishing a voice channel connection between the handset and the switch as a result of the handset calling the switch using the bridge number.

Applicant has further developed an innovative method of providing telephone service, comprising: automatically storing electronic information that indicates an association of a secondary telephone number and a primary telephone number with a telephone handset in a computer memory associated with a server; automatically associating a unique bridge telephone number with each of a plurality of contact telephone numbers in the computer memory; automatically transmitting information that indicates the association of the unique bridge telephone number with each of a plurality of contact telephone numbers to the handset via the data channel; automatically associating each primary telephone number and bridge telephone number pairing with a corresponding secondary telephone number and contact telephone number pairing in the computer memory; receiving, at a switch associated with the server, an outgoing call from the handset to the bridge telephone number via a voice channel; receiving, at the server, information from the switch indicating the outgoing call is being made to the bridge telephone number from the primary telephone number; receiving, at the switch, information from the server directing the switch to; (a) connect the outgoing call to a contact telephone number associated with the primary telephone number and bridge telephone number pairing, and (b) identify the telephone number from which the outgoing call is being made as the secondary telephone number.

Applicant has still further developed an innovative method of providing telephone service, comprising: enrolling a telephone handset in a telecommunications system having a server and a switch, wherein said telephone handset is associated with a primary telephone number in a database associated with the server and switch; electronically transmitting an application from the server to the telephone handset via a data channel responsive to telephone handset enrollment, wherein said application is: adapted to send instructions to have one or more secondary telephone numbers referenced to the primary telephone number in the database, adapted to present visually perceptible call processing rules on the telephone handset, and adapted to transmit information indicating a selection of call processing rules from the telephone handset to the server; electronically receiving instructions from the telephone handset via the data channel to reference the one or more secondary telephone numbers to the primary telephone number; storing telephone handset information, including the primary telephone number and the one or more secondary telephone numbers referenced to the primary telephone number, in the database; electronically receiving instructions from the telephone handset via the data channel to store user selected call processing rules for the telephone handset in the database, wherein the user selected call processing rules include

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instructions to route calls over a voice channel in a manner that will indicate that the calls are made to or from the one or more secondary telephone numbers; electronically transmitting information to the telephone handset via the data channel, said information being adapted to cause a pre-call information to be displayed on the telephone handset responsive to initiation of an outgoing call using the one or more secondary telephone numbers or an incoming call to the one or more secondary telephone numbers; electronically receiving from the telephone handset via the data channel call handling information indicating a user selected call processing rule to be used to process the outgoing or incoming call; and automatically handling the outgoing or incoming call based on the call handling information.

Applicant has still further developed an innovative method of providing telephone service, comprising: associating a telephone handset with primary and secondary telephone numbers in a database; receiving, from the telephone handset via a data channel, digital information indicating primary call processing rules for handling calls to the first telephone number; storing the primary call processing rules digitally; receiving, from the telephone handset via the data channel, digital information indicating secondary call processing rules for handling calls to the secondary telephone number; storing the secondary call processing rules digitally; receiving a call request to the secondary telephone number; transmitting pre-call information to the telephone handset via the data channel responsive to receipt of the call request, wherein said pre-call information is based on the secondary call processing rules; responsive to the pre-call information, receiving information indicative of a user input to the telephone handset over the data channel; and processing the call based on the stored alternative call processing rules and user input to the telephone handset, wherein said processing includes an option of connecting the call over a voice channel.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only, and are not restrictive of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to assist the understanding of this invention, reference will now be made to the appended drawings, in which like reference characters refer to like elements.

FIG. 1 is a schematic diagram illustrating a network architecture that may be used to provide telephone service in accordance with embodiments of the present invention.

FIG. 2 is a block diagram illustrating a method of providing telephone calls in accordance with embodiments of the present invention.

FIG. 3 is a block diagram illustrating data channel and voice channel connections used to provide telephone service in accordance with embodiments of the present invention.

FIG. 4 is a block diagram illustrating a method of setting up and connecting an incoming call in accordance with one embodiment of the present invention.

FIG. 5 is a block diagram illustrating a method of setting up and connecting an outgoing call in accordance with one embodiment of the present invention.

FIG. 6 is a call sequence diagram illustrating a method of setting up and connecting a conference call in accordance with one embodiment of the present invention.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

Reference will now be made in detail to embodiments of the present invention, examples of which are illustrated in

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the accompanying drawings. It is to be understood that other embodiments may be utilized and structural changes may be made without departing from the scope of the present invention.

It should be noted that in connection with the described embodiments, reference is made to a data channel. A preferred data channel may be an Internet Protocol (IP) channel, which is not a conventional telephone voice channel. However, other data, non-conventional voice, channels over which information may be transmitted between a telephone handset and a server may be used in alternative embodiments of the invention.

With reference to FIG. 1, embodiments of the present invention may be implemented using a system having a server 100, associated computer memory, such as a database 120, and an associated telecommunications switch 110 which communicate through a network with a telephone handset 340. The server 100 may be connected to the database 120 and the switch 110. The server 100 may also be connected via the Internet 316 through one or more nodes, such as a Gateway GPRS Support Node (GGSN) 322 and a Servicing GPRS Support Node (SGSN) 324, to a mobile network 313. The switch 110 may be connected through the PSTN 310 to the mobile network 313 at a Mobile Switching Center (MSC) 314. In turn, the MSC 314 may be connected to a Home Location Register database (HLR) 318, a Visitor Location Register database (312), a Mobile Number Portability database (MNP) 320, a location server 308, and the SGSN 324. The SGSN 324 may be connected to one or more Radio Network Controllers (RNC) 326 and/or one or more Processor Control Units (PCU) 327, which in turn may be connected to one or more Base Stations (BS) 328 and to one or more mobile devices referred to collectively as "handsets" 340.

The communications between the server 100 and the handset 340 over the Internet 316 may utilize IP as a protocol opposed to protocols used to establish communications according to COMA, GSM, or like standards. Such IP governed communications are referred to herein as being conducted over a "data channel." Conversely, communications between the switch 110 and the handset over the PSTN 310 may be transmitted and received in accordance with CDMA, GSM or like standards as opposed to using IP. Such CDMA, GSM or like governed communications, when used to carry voice information, are referred to herein as being conducted over a "voice channel."

With reference to FIGS. 1 and 2, method embodiments of the invention may be facilitated starting with step 200 in which a handset 340 may be used to subscribe to the telephone network that includes the server 100 and switch 110 used to provide telephone service in accordance with embodiments of the invention. A user may subscribe to the telephone network in step 200 by enrolling the telephone handset 340 using a data channel connection between the handset and the server 100. Responsive to a data channel request received from the handset 340, a handset application may be transmitted to the handset from the server 100, and installed and stored in memory associated with the handset in step 202. Once the handset application is installed on the handset 340, the handset may connect to the server 100 by operation of the handset application as needed over a data channel connection which may include the BS 328, RNC 326 or PCU 327, SGSN 324, GGSN 322, and Internet 316.

In connection with step 204, the server 100 may transmit information to the handset 340 via the data channel, which, through automatic operation of the handset application, permits the user to select one or more secondary telephone

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numbers to be referenced to a primary telephone number for the handset. The primary telephone number, preferably, may be a SIM number or ESN which is assigned to the handset 340 at the time of activation. Once selected, the handset 340 may automatically transmit information which to the server 100 over the data channel which requests that the secondary telephone numbers be associated with the primary telephone number. In response, the server 100 may store (i.e., reference) information indicating the association of the one or more selected secondary telephone numbers in computer memory associated with the server such as the database 120. In an alternative embodiment, the server 100 may automatically assign one or more secondary telephone numbers to the handset 340, as opposed to them being selected.

In step 206 of FIG. 2, the handset 340 may be used to access the handset application installed thereon to select call processing rules for handling incoming and outgoing voice channel calls to and from the handset 340. Information indicating call processing rules may be transmitted from the handset 340 to the server 100 via the data channel by automatic operation of the handset application. Custom call processing rules may be selected for, and associated with, each of the primary telephone number and the one or more secondary telephone numbers associated with the primary telephone number. The call processing rules information may be automatically stored in a computer memory, such as database 120, by the server 100. An indication of the association of particular call processing rules with a particular handset 340 and particular primary and/or secondary telephone numbers may also be stored in the database 120. The call processing rules may include preset responses for incoming calls, such as custom stored voice message(s) and/or custom stored text message(s) to be associated with the primary and/or one or more secondary telephone numbers. The call processing rules may further permit the handset 340 to be used to control the availability of the secondary telephone numbers as well as activation of additional secondary telephone numbers and deactivation of existing secondary telephone numbers. Information indicating the call processing rules for the primary telephone number and secondary telephone numbers may be stored automatically in memory associated with the handset 340. The call processing rules may further include stock rules used for all telephone numbers, such as an option to accept or not accept (i.e., drop) an incoming call. With reference to step 208, the application stored on the handset 340 may enable it to be used to receive incoming calls from, and place outgoing calls to, a recipient telephone (not shown) which is connected to the PSTN 310, as explained in more detail below.

With reference to FIGS. 3 and 4, the handset 340 may be used to receive incoming (terminating) calls to a secondary telephone number, using a telephone network automated structure having a network layer 101 and an application layer 102 associated therewith. An incoming call to the secondary telephone number may be placed in step 402 by a calling party. The incoming call is routed from the caller's telephone to the PSTN 310. In step 404, the incoming call may be routed over the PSTN 310 to the switch 110. Responsive to receipt of the incoming call at the switch 110, a Call Manager 104 application, which cooperates with a Mobility Manager 106 application, and a Web Manager 108 application, which are all associated with the server 100, may access the call processing rules in the database 120 which are associated with the secondary telephone number that is being called. Subject to the accessed call processing rules, the Call Manager 104 may assign or look up a bridge

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telephone number to be used for completion of the call in step 406. The bridge telephone number may be associated with the switch 110, and calls to the bridge telephone number may be automatically routed to this switch.

The call processing rules may provide for call routing via a call distribution algorithm where the call could be routed to one or many telephone numbers. The call processing rules may be user selectable and configurable, and may apply to voice, text and/or other data messaging. The call processing rules may govern how calls are handled and may provide automated call routing or call dropping based on location data of the calling and/or called party. The call processing rules may further govern handling calls based on incoming caller ID, which may identify a calling party as being on an accepted caller ID list or a non-accepted caller ID list. The call processing rules may further provide call routing based on weekday, weekend, holiday, time of day, biometrics data, and accelerometer data information. The call processing rules may still further provide call routing based on an interface with a handset 340 calendar to check availability to accept calls. Such calendars may include, for example, Outlook, Google Calendar, and other user calendars.

If the call processing rules indicate that the secondary telephone number is not available to this particular caller, or to all callers, however, the Call Manager 104 may apply such rule or rules and reject the incoming call at the conclusion of step 406. Application of the call processing rules for a call rejection may result in the call simply not being answered, being dropped, or automated return of a voice, text, or other type of message to the calling telephone number or a communication device associated therewith.

On the Other hand, if the call processing rules permit completion of the call, in step 408 the Call Manager 104 may transmit pre-call notification information to the handset 340, which includes the assigned/looked up bridge telephone number, via the data channel connection, i.e., over the Internet 316 and the Mobile Data Network 348. The pre-call information may include information used by the application installed on the handset 340 to cause a display of the calling telephone number, the calling party name, calling party location, such as GPS location, and/or the called secondary telephone number, as well as other information in step 410. The incoming pre-call information may be received at the handset 340 before or during the call ringing on the handset.

In step 412, responsive to receipt of the incoming pre-call notification information, the handset application may cause the handset 340 to display call handling choices for the call. For example, the handset 340 may be directed under the control of the handset application to display receive call, drop call, custom voice mail message, and/or custom text message choices. The choices may be selected through interaction with the handset 340, all before the call is connected or dropped. In step 414, the selection of either delivering a responsive text message (416), not accepting, i.e., "dropping" the call (418), or responding to the call with a custom voice message (420) may be transmitted from the handset 340 to the server 100 via the data channel. Thereafter, the Call Manager 104 may automatically implement the drop call or respond with text or voice message instructions received over the data channel, and the call attempt may be terminated thereafter.

If the call is accepted in step 414, however, the handset application may automatically cause the handset 340 to call the bridge telephone number in step 422 over a voice channel. The return call from the handset 340 to the bridge telephone number may be routed over the PSTN 310 to the switch 110 using a voice channel connection. In step 424,

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once the call to the bridge telephone number is received at the switch **110**, the switch may “bridge” the incoming voice channel call to the bridge telephone number with the incoming voice channel call to the secondary telephone number to thereby connect the incoming call from the calling party to the handset **340** via a voice channel. Further, the switch **110** may automatically send signaling information to the calling party telephone which causes the secondary telephone number to be displayed as the number to which the call has been completed.

With continued reference to FIG. **3**, the web manager **108** may be used to process Internet **316** transactions for the server **110**. The system may also employ a web portal **350** to link a digital device **360** other than a handheld **340** to the telecommunications system for calling in accordance with embodiments of the invention. For example, embodiments of the invention may be used with digital devices **360** such as a desktop computer, laptop computer, iPad, tablet, iPod **790**, or the like.

With reference to FIGS. **3** and **5**, the handset **340** may be used to place outgoing (originating) calls from a secondary telephone number, using the telephone network automated structure shown in FIG. **3** and described above. If the party to be called has not yet been called using a secondary telephone number, an outgoing call from the handset **340** may be initiated to such party in step **502** by opening the handset application installed thereon. Once the handset application is open, the handset **340** may be used to choose a secondary telephone number as the originating telephone number in step **504**. A list of such secondary telephone numbers may be stored in memory associated with the handset.

In step **506**, the handset **340** may be used to enter, or select from an address file, a contact telephone number to be called in order to initiate a call to such telephone number. The handset application may cause the handset **340** to transmit information to the server **100** Call Manager **104** via the data channel automatically as a result of the selection of the secondary telephone number and the contact telephone number. The transmitted information may indicate the secondary telephone number from which the call is to appear to the called party to have been placed, and the contact telephone number to be called.

In step **508**, responsive to receipt of the data channel communication from the handset **340** requesting set up of a call from it to the telephone number to be called, the Call Manager **104** may access the call processing rules in the database **120** which are associated with the secondary telephone number from which the call is to appear to have been placed. In step **510**, subject to the accessed call processing rules, the Call Manager **104** may assign a bridge telephone number to be used to connect the call from the handset **340** to the switch **110** and send pre-call information including the bridge telephone number to the handset via the data channel.

The bridge telephone number may be associated with the switch **110**, and calls to the bridge telephone number may be automatically routed to this switch. Once the bridge telephone number is assigned, the server **100** under the control of the Call Manager **104**, may store information in the database **120** which associates the bridge telephone number with the primary telephone number for the handset **340**, the secondary telephone number selected for the call, and the contact telephone number to be called. More specifically, the stored information may indicate that each combination of primary telephone number and bridge telephone number are uniquely associated with each combination of secondary telephone number and contact telephone number. In other

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words, each combination of primary telephone number and bridge telephone number for the handset **340** map to a unique combination of secondary telephone number and contact telephone number in the database **120** memory.

In step **512**, responsive to receipt of the bridge telephone number information over the data channel, the handset application may cause the handset **340** to automatically call the bridge telephone number via a voice channel. The return call from the handset **340** to the bridge telephone number may be routed over the PSTN **310** to the switch **110** using a voice channel connection.

In step **514**, the Call Manager **104** may instruct the switch **110** to place a voice channel call to the telephone number to be called using the secondary telephone number as the originating telephone number from the switch. Once the call to the bridge telephone number from the handset **340** is received at the switch **110**, the switch may “bridge” the incoming voice channel call to the bridge telephone number with the outgoing voice channel call from the secondary telephone number to the contact telephone number to thereby connect the outgoing call from the handset **340** to the party being called via a voice channel. Further, the switch **110** may automatically send signaling information to the called party telephone which causes the secondary telephone number to be displayed as the number from which the call appears to have been placed. Because each pairing of a primary telephone number and a bridge telephone number maps to a unique contact telephone number and secondary telephone number pairing, the call can be completed at the switch **110** to the correct contact telephone number while showing the desired secondary telephone number as the originating number.

With continued reference to FIG. **5**, in the event that the contact telephone has been previously called using the secondary telephone number on the handset **340**, the user may directly select the bridge telephone number associated with the secondary telephone number and contact telephone number in step **506** either using the handset application in step **502**, or without opening the handset application in step **512**. Alternatively, the handset may have a stored “shortcut” which, when the user selects the contact telephone number to be called from the secondary telephone number, results in the associated bridge telephone number being dialed. In either case, the handset **340** may dial the bridge telephone number to connect with the Call Manager **104** in step **512**. In step **514**, the Call Manager **104** may look up the secondary telephone number and the contact telephone number associated with the paired bridge telephone number and primary telephone number for the handset **340**. Thereafter, the switch **110** may dial the contact telephone number and bridge the call from the handset **340** in a manner that makes the secondary telephone number appear to be the telephone number from which the call is being placed.

FIG. **6** is a call flow diagram illustrating a method of setting up and connecting a multi-party conference call in accordance with an embodiment of the present invention. With reference to FIGS. **3** and **6**, the communication sequence for a conference call is illustrated between the handset application stored on the handset **340**, the Call Manager **104** application associated with the server **100** and switch **110**, and a conference call invitee handset. In step **600**, the application on the handset **340** may be used to select invitees (users) for a conference call. The telephone numbers of the invitees may be selected from an address book or manually entered. Further, the conference call may be selected to be initiated immediately, or at some future date and time.

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Once the invitees are selected, the handset **340** may be instructed by the handset application to transmit a conference request to the server **100** via a data channel. In step **602**, the Call Manager **104** operating on the server **100** may assign a conference bridge telephone number to the conference call in response to receipt of the conference request. In step **604**, the Call Manager **104** may cause the server **100** to send conference invitation messages to each of the invitee handsets, and more specifically, applications stored on the invitee handsets, via a data channel. The invitation messages may include the assigned bridge telephone number for the conference call and an optional PIN or code number for the conference call. The invitation message may provide a notice, for example, "Jack has invited you to join a conference call," and further include identification of other invited participants.

In step **606**, each invitee handset may be used to accept to join the conference call, join at a later time, or decline to join. If the acceptance is for a future scheduled conference call, an indication of the acceptance (including acceptance to join late) may be transmitted from each invitee handset under the control of the application installed thereon, to the server **100** Call Manager **104** via the data channel. Further, if the invitation is declined altogether, an indication thereof may be transmitted from each invitee handset to the server **100**. Thereafter, the Call Manager **104** may transmit information to the originating handset **340**, and optionally the invitee handsets, via the data channel, which indicates acceptance of a future conference call, acceptance to join late (step **610**), or declination of the conference call invitation.

If the conference call invitation is accepted and it is time for the call, each accepting invitee handset may automatically or manually dial the bridge telephone number using a voice channel. The switch **110** may receive the voice channel calls to the bridge telephone number and may authenticate the invitees right to join the conference call in step **608** by comparing the invitee's telephone number with that of the invitee list, as well as comparing any PIN input by the invitee with the PIN selected for the conference call. If the authentication is successful, the invitee handset is connected to the call via the voice channel. An automatic update may be transmitted via the data channel from the server to the originating handset **340** indicating that a particular invitee handset has joined the conference call.

If an invitee chose to join late, the server **100** may automatically transmit a reminder to the affected invitee handset to join the call at the agreed time in step **612**. Thereafter, the late joining invitee handset may dial the bridge telephone number automatically or manually using a voice channel. The switch **110** may receive the voice channel call to the bridge telephone number, authenticate the late joining invitee handset, and connect the handset to the conference call in step **614**.

The foregoing has described the principles, embodiments and modes of operation of the present invention. However, the invention should not be construed as being limited to the particular embodiments discussed. The above described embodiments should be regarded as illustrative rather than restrictive, and it should be appreciated that variations may be made in those embodiments by workers skilled in the art without departing from the scope of the present invention as defined by the following claims.

What is claimed:

1. A method of providing telephone service, comprising: automatically storing electronic information that indicates an association of a secondary telephone number and a

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primary telephone number with a telephone handset in a computer memory associated with a server;
automatically storing electronic information that indicates a selection of call processing rules for the primary telephone number in the computer memory;
automatically storing electronic information that indicates a selection of call processing rules for the secondary telephone number in the computer memory;
receiving an electronic indication of an incoming call to the secondary telephone number at the server, said electronic indication of an incoming call being received from a switch associated with the server;
automatically accessing the call processing rules for the secondary telephone number under the control of the server responsive to the receipt of the electronic indication of the incoming call to the secondary telephone number;
automatically handing the incoming call in accordance with the accessed call processing rules for the secondary telephone number;
transmitting pre-call information via a data channel to the handset under the control of the server, said pre-call information including a bridge telephone number for connecting the handset to the incoming call at the switch; and
receiving, at the server via the data channel, an electronic indication of a selection of a call processing rule for handling the incoming call to the secondary telephone number, or
establishing a voice channel connection between the handset and the switch as a result of the handset calling the switch using the bridge telephone number.

2. A method for providing telephone service to a telephone handset having a primary telephone number assigned to the telephone handset, wherein at least a secondary telephone number is associated with the primary telephone number assigned to the telephone handset, the method comprising:

A) in response to an incoming call to the secondary telephone number received by a switch, retrieving, by a server from a database, a first bridge telephone number to be used for completion of the incoming call to the secondary telephone number, wherein the first bridge telephone number is associated with the switch such that calls to the first bridge telephone number are automatically routed to the switch; and

B) transmitting, from the server to the telephone handset via at least one data channel, pre-call information including the first bridge telephone number, whereby the pre-call information allows the telephone handset to accept the incoming call to the secondary telephone number by making a first bridge call using the first bridge telephone number to connect the incoming call to the telephone handset via the switch.

3. The method of claim 1, wherein:

the incoming call is from a calling telephone number; and the first bridge telephone number stored in the database and to be used for completion of the incoming call is associated with the switch and the calling telephone number, such that calls to the first bridge telephone number from the calling telephone number are automatically routed to the switch.

4. The method of claim 1, wherein the pre-call information transmitted in B) from the server to the telephone handset via the at least one data channel includes display information to cause a display on the telephone handset of at least one of:

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a calling telephone number of the incoming call;
 a calling party name;
 a calling party location; and
 the secondary telephone number.

5. The method of claim 1, further comprising:

C) receiving, at the server from the telephone handset via the at least one data channel, user input information indicative of a user input to the telephone handset regarding call handling choices for the incoming call; and

D) processing, by the server, the user input information, wherein D) comprises at least one of:
 delivering a responsive text message;
 dropping the incoming call; and
 responding to the incoming call with a custom voice message.

6. The method of claim 1, further comprising:

C) receiving, by the switch, the first bridge call by the telephone handset to the first bridge telephone number and;

D) in response to C), bridging, by the switch, the first bridge call to the first bridge telephone number with the incoming call to the secondary telephone number so as to connect the incoming call to the telephone handset.

7. The method of claim 6, wherein:

in D), the switch connects the incoming call to the telephone handset via a voice channel; and
 a voice channel protocol for communications between the switch and the telephone handset over the voice channel includes at least one of a CDMA standard, a GSM standard, a 3G standard, a 4G standard and an LTE standard.

8. The method of claim 6, wherein:

the incoming call to the secondary telephone number is from a first contact telephone number;
 the first bridge telephone number to be used for completion of the incoming call is associated with the switch and the first contact telephone number; and
 the method further comprises:

E) receiving, by the server from the telephone handset via the at least one data channel, an outgoing call request to a first contact telephone number to be called by the telephone handset using the secondary telephone number;

F) retrieving, by the server from the database, a second bridge telephone number to be used for completion of an outgoing call from the secondary telephone number to the second contact number, wherein the second bridge telephone number is associated with the switch such that calls to the second bridge telephone number are automatically routed to the switch;

G) transmitting, by the server to the telephone handset via the at least one data channel, outgoing pre-call information including the second bridge telephone number, whereby the outgoing pre-call information causes the telephone handset to automatically make a second bridge call to the second bridge telephone number; and
 H) bridging, by the switch, the second bridge call to the second bridge telephone number with the outgoing call from the secondary telephone number to the first contact telephone number so as to connect the outgoing call to the telephone handset.

9. The method of claim 8, wherein:

the switch connects the outgoing call to the telephone handset via a voice channel; and
 a voice channel protocol for communications between the switch and the telephone handset over the voice chan-

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nel includes at least one of a CDMA standard, a GSM standard, a 3G standard, a 4G standard and an LTE standard.

10. The method of claim 8, further comprising:

I) assigning, by the server, the second bridge telephone number associated with the switch and the first contact telephone number such that the combination of the primary telephone number and the second bridge telephone number is uniquely associated with the secondary telephone number and the first contact telephone number; and

J) storing, by the server in the database, information that associates the second bridge telephone number with the primary telephone number, the secondary telephone number, and the first contact telephone number.

11. The method of claim 10, wherein the telephone handset includes an address file comprising a plurality of contact telephone numbers including at least the first contact telephone number, and wherein:

in J), the information stored in the database maps a unique combination of the secondary telephone number and one contact telephone number of the plurality of contact telephone numbers to a corresponding combination of the primary telephone number and a unique bridge telephone number for each contact telephone number of the plurality of contact telephone numbers.

12. A system for providing telephone service to a telephone handset having a primary telephone number assigned to the telephone handset, the system comprising:

a server to implement a call manager application, wherein the server is communicatively coupled to the telephone handset via at least one data channel of a mobile data network;

a database communicatively coupled to the server, wherein the database stores at least one secondary telephone number associated with the primary telephone number assigned to the telephone handset; and
 a switch communicatively coupled to the server and a mobile switching center of a mobile network,

wherein upon implementation of the call manager application by the server:

A) in response to the switch receiving an incoming call to the secondary telephone number from a first contact telephone number:

A1) the server retrieves from the database a first bridge telephone number to be used for completion of the incoming call to the secondary telephone number, wherein the first bridge telephone number is associated with the switch and the first contact telephone number such that calls to the first bridge telephone number from the first contact number are automatically routed to the switch;

A2) the server transmits to the telephone handset, via the at least one data channel, pre-call information including the first bridge telephone number, whereby the pre-call information allows the telephone handset to accept the incoming call to the secondary telephone number by making a first bridge call using the first bridge telephone number to connect the incoming call to the telephone handset via the switch;

A3) the switch receives the first bridge call by the telephone handset to the first bridge telephone number; and

A4) in response to the first bridge call, the switch bridges the first bridge call to the first bridge telephone number with the incoming call to the

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secondary telephone number so as to connect the incoming call to the telephone handset; and

B) in response to the server receiving from the telephone handset, via the at least one data channel, an outgoing call request to a second contact telephone number to be called by the telephone handset using the secondary telephone number;

B1) the server retrieves from the database a second bridge telephone number to be used for completion of an outgoing call from the secondary telephone number to the second contact telephone number, wherein the second bridge telephone number is associated with the switch such that calls to the second bridge telephone number are automatically routed to the switch;

B2) the server transmits to the telephone handset, via the at least one data channel, outgoing pre-call information including the second bridge telephone number, whereby upon receipt by the telephone handset, the outgoing pre-call information causes the telephone handset to automatically make a second bridge call to the second bridge telephone number;

B3) the switch receives the second bridge call to the second bridge telephone number from the telephone handset;

B4) the switch places the outgoing call to the second contact telephone number using the secondary telephone number as an originating number from the switch; and

B5) the switch bridges the second bridge call to the second bridge telephone number with the outgoing call from the secondary telephone number to the second contact telephone number so as to connect the outgoing call to the telephone handset.

13. The system of claim 12, wherein upon implementation of the call manager application by the server:

C) the server assigns the first bridge telephone number associated with the switch and the first contact telephone number such that the combination of the primary telephone number and the first bridge telephone number is uniquely associated with the secondary telephone number and the first contact telephone number;

D) the server stores in the database first information that associates the first bridge telephone number with the primary telephone number, the secondary telephone number, and the first contact telephone number;

E) the server assigns the second bridge telephone number associated with the switch and the second contact telephone number such that the combination of the primary telephone number and the second bridge telephone number is uniquely associated with the secondary telephone number and the second contact telephone number; and

F) the server stores in the database second information that associates the second bridge telephone number with the primary telephone number, the secondary telephone number, and the second contact telephone number.

14. The system of claim 13, wherein the telephone handset includes an address file comprising a plurality of contact telephone numbers including at least the first contact telephone number and the second contact telephone number, and wherein upon implementation of the call manager application by the server:

G) the server stores in the database mapping information, including the first information and the second information,

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that maps a unique combination of the secondary telephone number and one contact telephone number of the plurality of contact telephone numbers to a corresponding combination of the primary telephone number and a unique bridge telephone number for each contact telephone number of the plurality of contact telephone numbers.

15. The system of claim 14, wherein:

the switch connects at least one of the incoming call and the outgoing call, when present, to the telephone handset via at least one voice channel; and

a voice channel protocol for communications between the switch and the telephone handset over the at least one voice channel includes at least one of a CDMA standard, a GSM standard, a 3G standard, a 4G standard and an LTE standard.

16. The system of claim 15, wherein:

the switch is coupled to the mobile switching center via a public switched telephone network (PSTN) or a private network; and

the switch connects at least one of the incoming call and the outgoing call, when present, to the telephone handset via the at least one voice channel over the PSTN or the private network.

17. The system of claim 12, wherein:

the switch connects at least one of the incoming call and the outgoing call, when present, to the telephone handset via at least one voice channel; and

a voice channel protocol for communications between the switch and the telephone handset over the at least one voice channel includes at least one of a CDMA standard, a GSM standard, a 3G standard, a 4G standard and an LTE standard.

18. The system of claim 12, wherein:

the switch is coupled to the mobile switching center via a public switched telephone network (PSTN) or a private network; and

the switch connects at least one of the incoming call and the outgoing call, when present, to the telephone handset over at least one voice channel of the PSTN or the private network.

19. The system of claim 18, wherein the at least one data channel is an Internet protocol (IP) channel.

20. The system of claim 18, wherein a voice channel protocol for communications between the switch and the telephone handset over the at least one voice channel includes at least one of a CDMA standard, a GSM standard, a 3G standard, a 4G standard and an LTE standard.

21. The system of claim 18, wherein:

the at least one data channel is an Internet protocol (IP) channel; and

a voice channel protocol for communications between the switch and the telephone handset over the at least one voice channel includes at least one of a CDMA standard, a GSM standard, a 3G standard, a 4G standard and an LTE standard.

22. A system for providing telephone service to a telephone handset having a primary telephone number assigned to the telephone handset, the system comprising:

a server to implement a call manager application, wherein the server is communicatively coupled to the telephone handset via at least one data channel of a mobile data network;

a database communicatively coupled to the server, wherein the database stores at least one secondary telephone number associated with the primary telephone number assigned to the telephone handset; and

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a switch communicatively coupled to the server and a mobile switching center of a mobile network; wherein:

upon implementation of the call manager application by the server, and in response to the switch receiving an incoming call to the secondary telephone number, the server:

A) retrieves from the database a first bridge telephone number to be used for completion of the incoming call to the secondary telephone number, wherein the first bridge telephone number is associated with the switch such that calls to the first bridge telephone number are automatically routed to the switch; and

B) transmits to the telephone handset, via the at least one data channel, pre-call information including the first bridge telephone number, whereby the pre-call information allows the telephone handset to accept the incoming call to the secondary telephone number by making a first bridge call using the first bridge telephone number to connect the incoming call to the telephone handset via the switch.

23. The system of claim 22, wherein:

the incoming call is from a calling telephone number; and the first bridge telephone number stored in the database and to be used for completion of the incoming call is associated with the switch and the calling telephone number, such that calls to the first bridge telephone number from the calling telephone number are automatically routed to the switch.

24. The system of claim 22, wherein the pre-call information transmitted in B) from the server to the telephone handset via the at least one data channel includes display information to cause a display on the telephone handset of at least one of:

a calling telephone number of the incoming call; a calling party name; a calling party location; and the secondary telephone number.

25. The system of claim 22, wherein the server further:

C) receives user input information from the telephone handset, via the at least one data channel and responsive to B), indicative of a user input to the telephone handset regarding call handling choices for the incoming call; and

D) processes the incoming call based at least in part on the user input information, wherein D) comprises at least one of:

delivering a responsive text message; dropping the incoming call; and responding to the incoming call with a custom voice message.

26. The system of claim 22, wherein after B), the switch: receives the first bridge call by the telephone handset to the first bridge telephone number and;

in response to the first bridge call, bridges the first bridge call to the first bridge telephone number with the incoming call to the secondary telephone number so as to connect the incoming call to the telephone handset.

27. The system of claim 26, wherein:

the switch connects the incoming call to the telephone handset via a voice channel; and

a voice channel protocol for communications between the switch and the telephone handset over the voice channel includes at least one of a CDMA standard, a GSM standard, a 3G standard, a 4G standard and an LTE standard.

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28. The system of claim 26, wherein:

the switch is coupled to the mobile switching center via a public switched telephone network (PSTN) or a private network; and

the switch connects the incoming call to the telephone handset over a voice channel of the PSTN or the private network.

29. The system of claim 28, wherein the at least one data channel is an Internet protocol (IP) channel.

30. The system of claim 28, wherein a voice channel protocol for communications between the switch and the telephone handset over the voice channel includes at least one of a CDMA standard, a GSM standard, a 3G standard, a 4G standard and an LTE standard.

31. The system of claim 28, wherein:

the at least one data channel is an Internet protocol (IP) channel; and

a voice channel protocol for communications between the switch and the telephone handset over the voice channel includes at least one of a CDMA standard, a GSM standard, a 3G standard, a 4G standard and an LTE standard.

32. The system of claim 22, wherein upon the server receiving from the telephone handset, via the at least one data channel, an outgoing call request to a first contact telephone number to be called by the telephone handset using the secondary telephone number, the server further:

C) retrieves from the database a second bridge telephone number to be used for completion of an outgoing call from the secondary telephone number to the second contact number, wherein the second bridge telephone number is associated with the switch such that calls to the second bridge telephone number are automatically routed to the switch;

D) transmits to the telephone handset, via the at least one data channel, outgoing pre-call information including the second bridge telephone number, whereby the outgoing pre-call information causes the telephone handset to automatically make a second bridge call to the second bridge telephone number; and

E) instructs the switch to place the outgoing call to the first contact telephone number using the secondary telephone number as an originating number from the switch, whereby the switch bridges the second bridge call to the second bridge telephone number with the outgoing call from the secondary telephone number to the first contact telephone number so as to connect the outgoing call to the telephone handset.

33. The system of claim 32, wherein:

the switch connects the outgoing call to the telephone handset via a voice channel; and

a voice channel protocol for communications between the switch and the telephone handset over the voice channel includes at least one of a CDMA standard, a GSM standard, a 3G standard, a 4G standard and an LTE standard.

34. The system of claim 32, wherein:

the switch is coupled to the mobile switching center via a public switched telephone network (PSTN) or a private network; and

in D), the second bridge call is routed to the switch over a voice channel of the PSTN or the private network.

35. The system of claim 32, wherein the server further:

F) assigns the second bridge telephone number associated with the switch and the first contact telephone number such that the combination of the primary telephone number and the second bridge telephone number is

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uniquely associated with the secondary telephone number and the first contact telephone number; and
 G) stores in the database information that associates the second bridge telephone number with the primary telephone number, the secondary telephone number, 5
 and the first contact telephone number.

36. The system of claim 35, wherein:

the telephone handset includes an address file comprising a plurality of contact telephone numbers including at least the first contact telephone number; and 10
 the information stored in the database in G) maps a unique combination of the secondary telephone number and one contact telephone number of the plurality of contact telephone numbers to a corresponding combination of the primary telephone number and a unique bridge 15
 telephone number for each contact telephone number of the plurality of contact telephone numbers.

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(54) **TELEPHONE NETWORK SYSTEM AND METHOD**

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See application file for complete search history.

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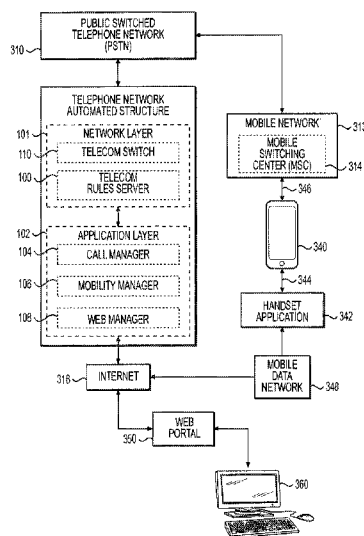
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Primary Examiner — Nam T Huynh

(57) ABSTRACT

Systems for and methods of delivering telephone calls using the combination of a data channel and a voice channel are disclosed. A data channel connection with the telephone handset may provide pre-call information used to set up incoming and outgoing calls which are ultimately connected using a voice channel. Use of the pre-call information may permit the same handset to be associated with multiple secondary telephone numbers from which calls appear to have been made and to which calls appear to have been placed.

12 Claims, 6 Drawing Sheets



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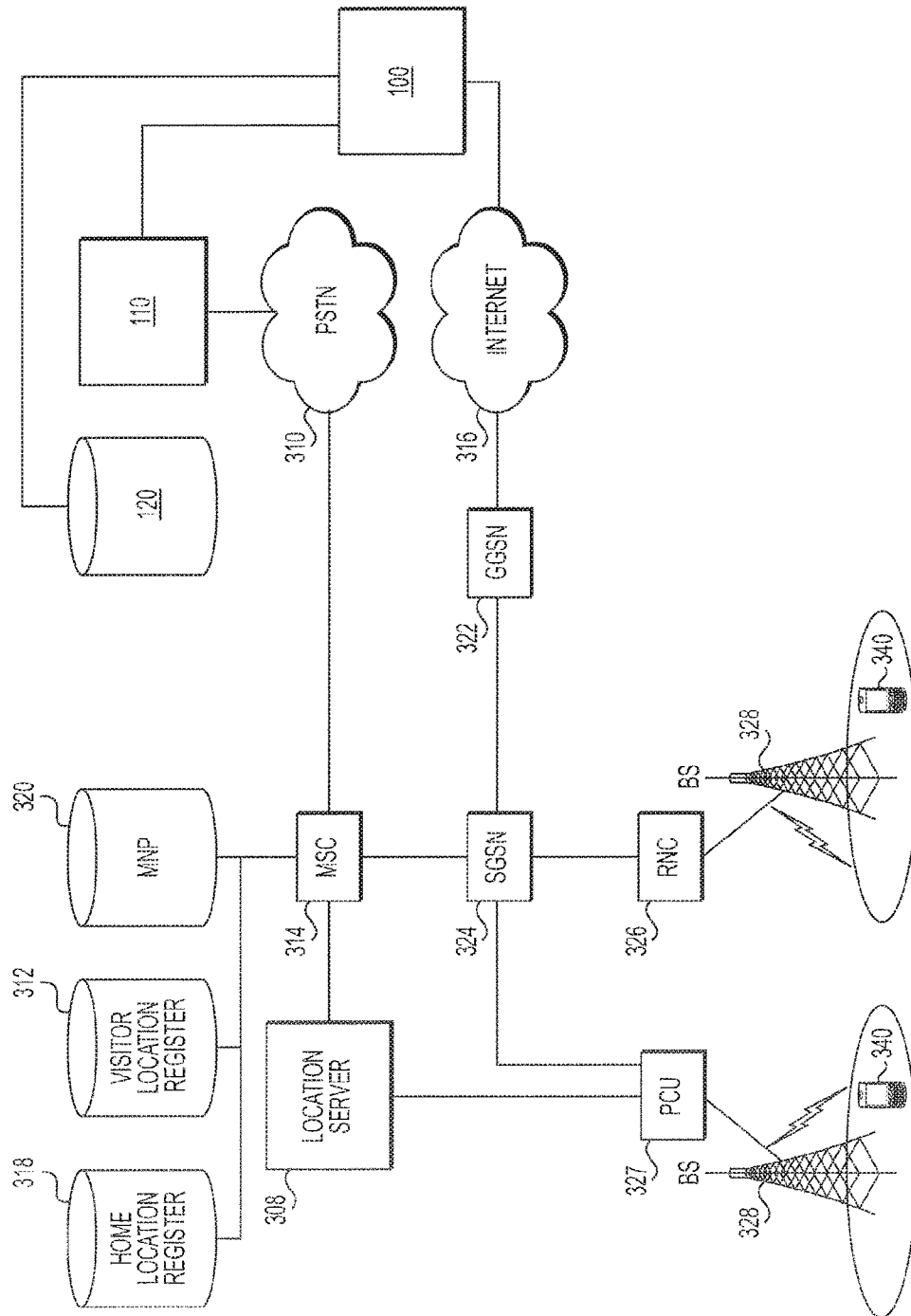
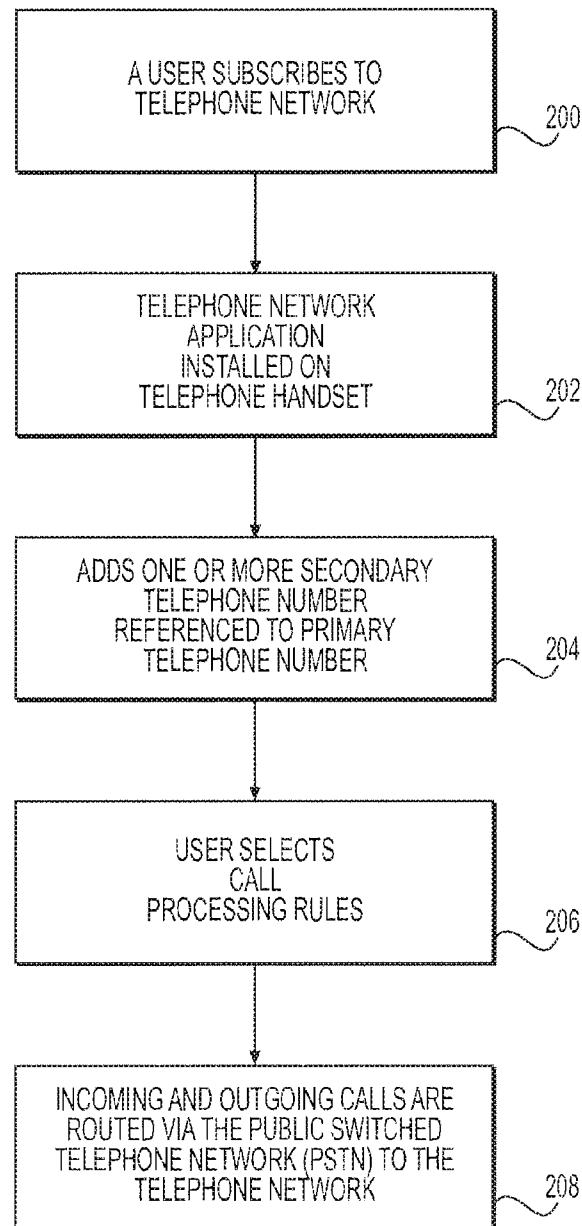
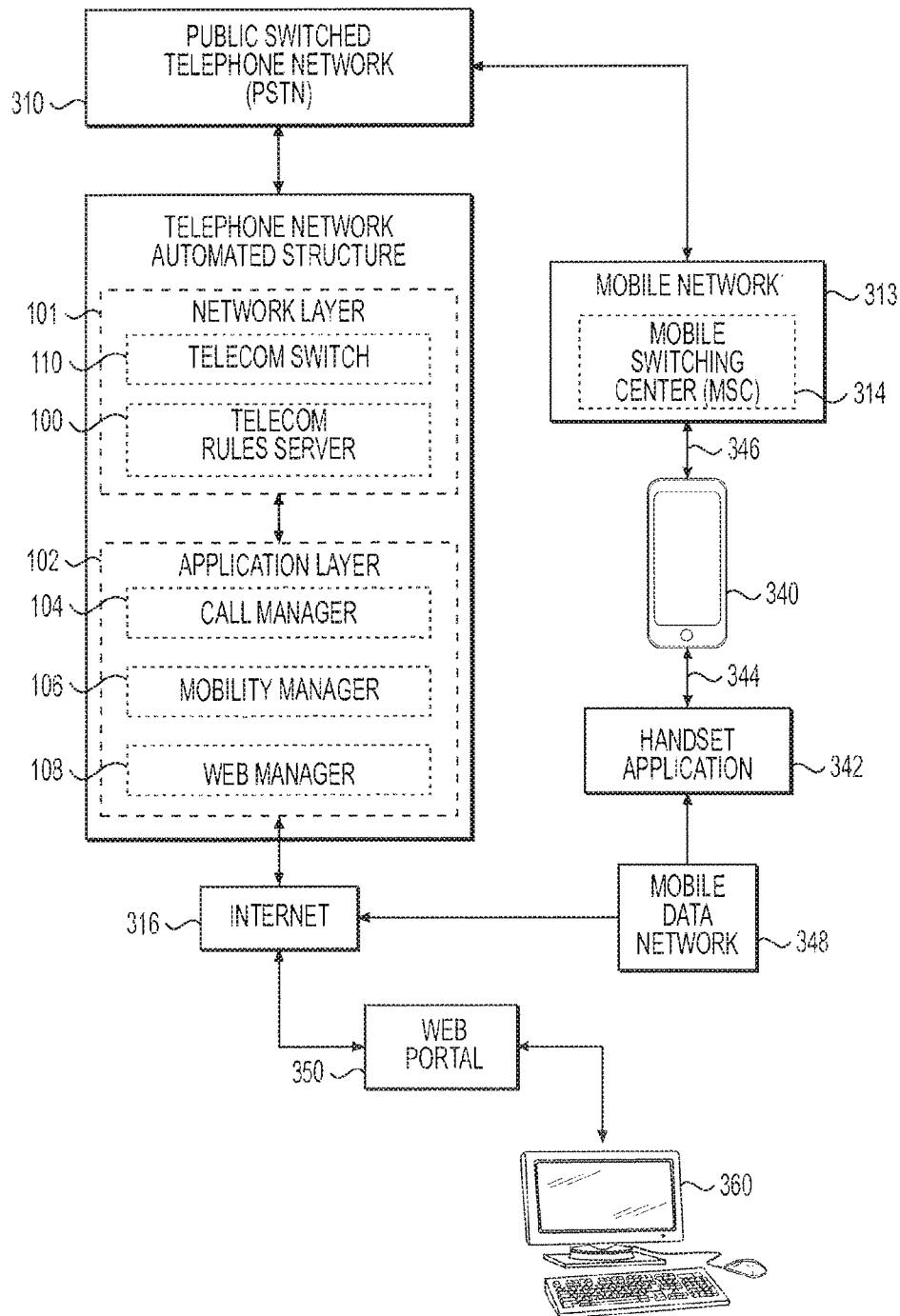


FIG. 1

**FIG. 2**

**FIG. 3**

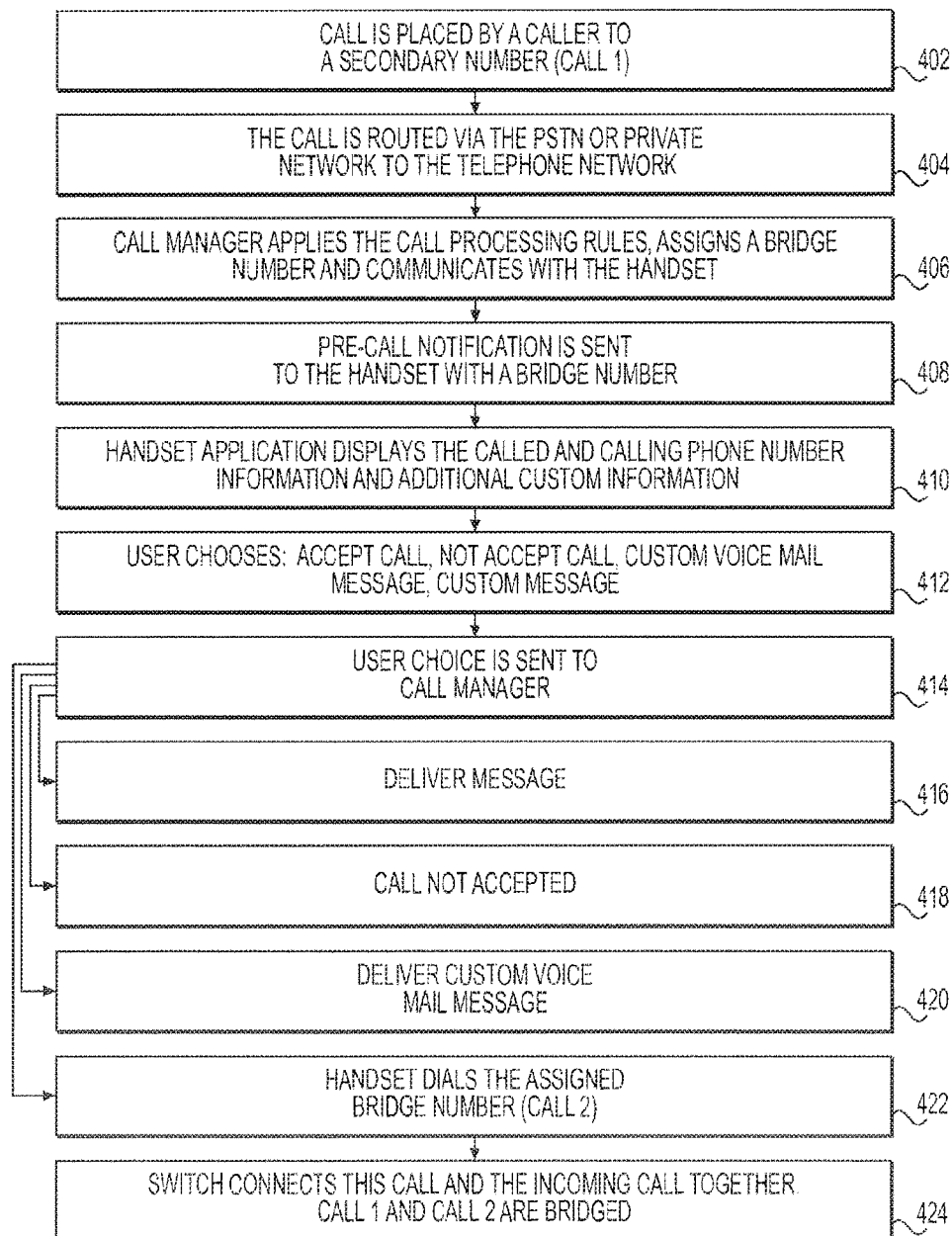
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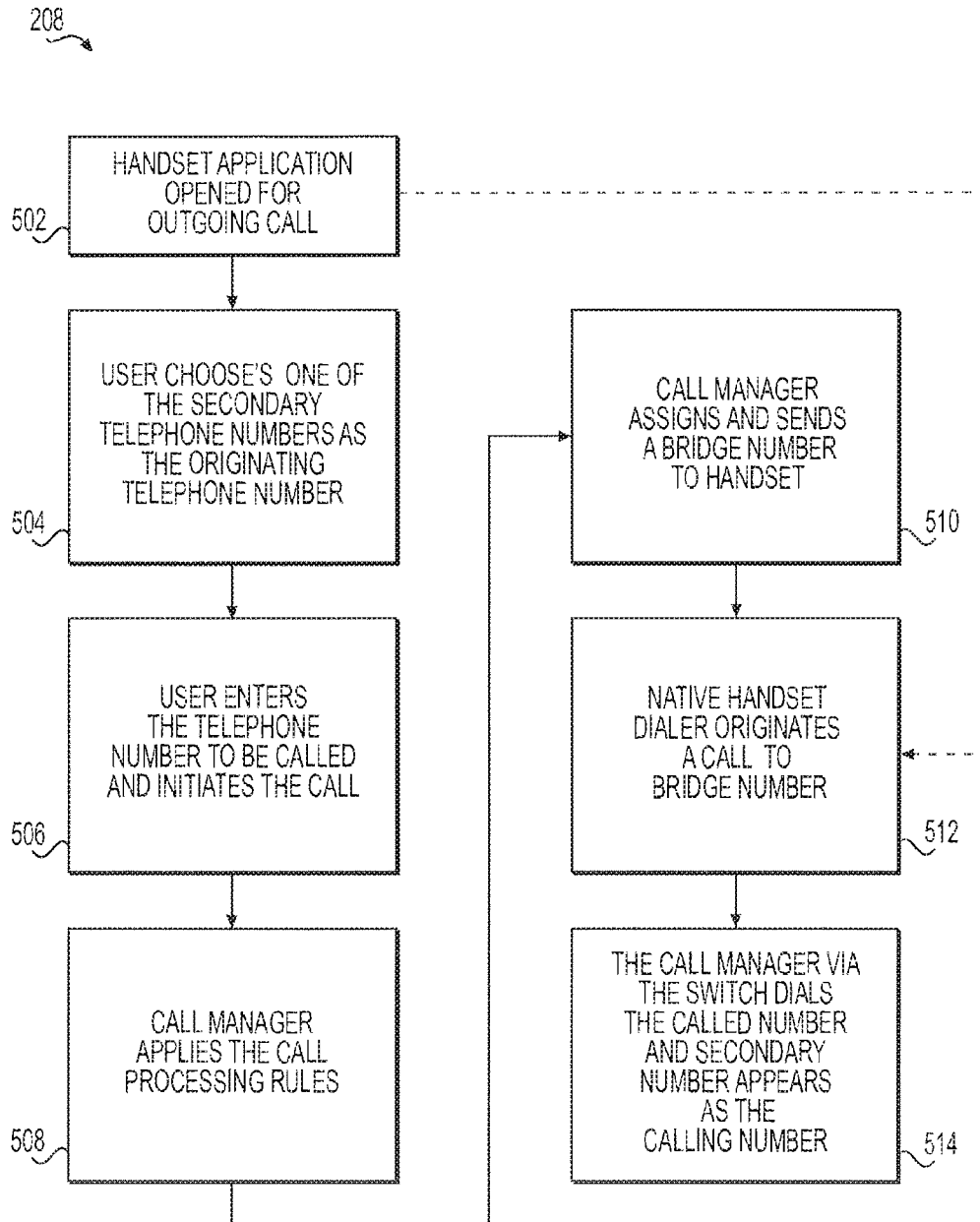
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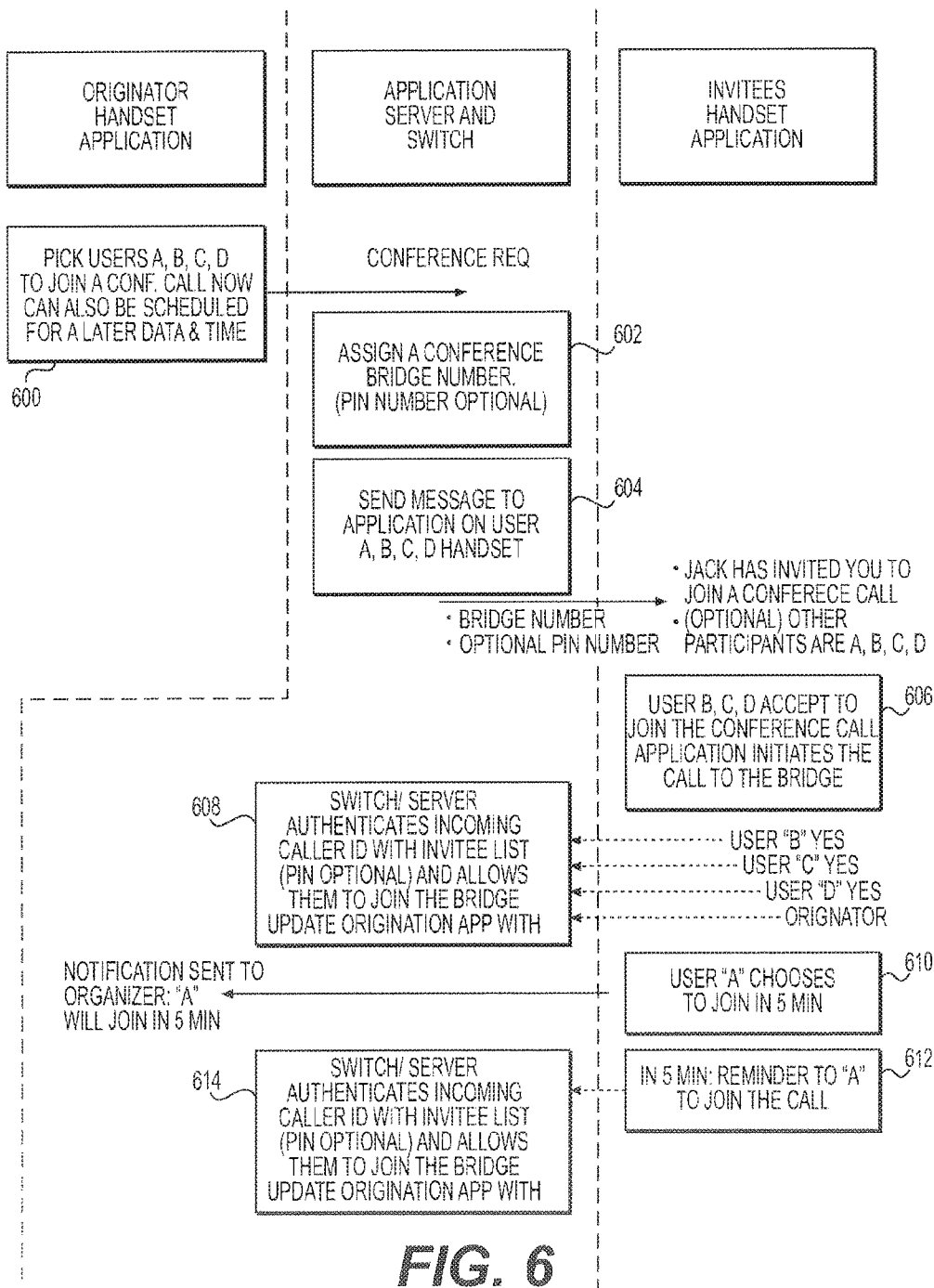
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**FIG. 4**

**FIG. 5**



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TELEPHONE NETWORK SYSTEM AND METHOD**CROSS-REFERENCE TO RELATED APPLICATIONS**

The present application claims the benefit, under 35 U.S.C. § 120, as a continuation of U.S. patent application Ser. No. 15/582,091, now U.S. Pat. No. 10,051,105, filed Apr. 28, 2017, entitled "Telephone Network System and Method," which is a continuation of and which claims priority benefit, under 35 U.S.C. § 120, to U.S. patent application Ser. No. 14/307,052, now U.S. Pat. No. 9,667,770, filed Jun. 17, 2014, entitled "Telephone Network System and Method," which is a continuation-in-part of and which claims priority benefit, under 35 U.S.C. § 120, to U.S. patent application Ser. No. 13/944,853, filed on Jul. 17, 2013, entitled "A Method Of A Data Channel Telephone Network System," the disclosure of each of which is incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

The present invention relates to systems and methods for setting up and connecting telephone calls, and delivering information related to such telephone calls using an Internet Protocol (IP) or other data channel while delivering the voice portion of the call in accordance with CDMA, GSM or like voice channel delivery standards.

BACKGROUND OF THE INVENTION

The volume of telephone calls and text messaging has increased dramatically and users are finding it more and more difficult to manage that volume of calls and messages. The current systems to aid in managing some types of calls only provide minimal assistance to the user. It is therefore an advantage of some, but not necessarily all, embodiments of the present invention to provide systems and methods for assisting callers and call recipients with the management of calls and messages.

Additional advantages of various embodiments of the invention are set forth, in part, in the description that follows and, in part, will be apparent to one of ordinary skill in the art from the description and/or from the practice of the invention.

SUMMARY OF THE INVENTION

Responsive to the foregoing challenges, Applicant has developed an innovative method of providing telephone service by transmitting call handling information between a handset and a switch using an IP channel or similar protocol channel and by transmitting a voice call associated with the call handling information between the handset and the switch using a voice channel provided in accordance with a voice channel protocol, e.g., in accordance with CDMA or GSM, 3G, 4G, LTE or like future protocol channels standards.

Applicant has further developed an innovative method of providing telephone service comprising: automatically storing electronic information that indicates an association of a secondary telephone number and a primary telephone number with a telephone handset in a computer memory associated with a server; automatically storing electronic information that indicates a selection of call processing rules for the primary telephone number in the computer memory;

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automatically storing electronic information that indicates a selection of call processing rules for the secondary telephone number in the computer memory; receiving an electronic indication of an incoming call to the secondary telephone number at the server, said electronic indication of an incoming call being received from a switch associated with the server; automatically accessing the call processing rules for the secondary telephone number under the control of the server responsive to the receipt of the electronic indication of the incoming call to the secondary telephone number; automatically handling the incoming call in accordance with the accessed call processing rules for the secondary telephone number; transmitting pre-call information via a data channel to the handset under the control of the server, said pre-call information including a bridge telephone number for connecting the handset to the incoming call at the switch; and receiving, at the server via the data channel, an electronic indication of a selection of a call processing rule for handling the incoming call to the secondary telephone number, or establishing a voice channel connection between the handset and the switch as a result of the handset calling the switch using the bridge number.

Applicant has further developed an innovative method of providing telephone service, comprising: automatically storing electronic information that indicates an association of a secondary telephone number and a primary telephone number with a telephone handset in a computer memory associated with a server; automatically associating a unique bridge telephone number with each of a plurality of contact telephone numbers in the computer memory; automatically transmitting information that indicates the association of the unique bridge telephone number with each of a plurality of contact telephone numbers to the handset via the data channel; automatically associating each primary telephone number and bridge telephone number pairing with a corresponding secondary telephone number and contact telephone number pairing in the computer memory; receiving, at a switch associated with the server, an outgoing call from the handset to the bridge telephone number via a voice channel; receiving, at the server, information from the switch indicating the outgoing call is being made to the bridge telephone number from the primary telephone number; receiving, at the switch, information from the server directing the switch to: (a) connect the outgoing call to a contact telephone number associated with the primary telephone number and bridge telephone number pairing, and (b) identify the telephone number from which the outgoing call is being made as the secondary telephone number.

Applicant has still further developed an innovative method of providing telephone service, comprising: enrolling a telephone handset in a telecommunications system having a server and a switch, wherein said telephone handset is associated with a primary telephone number in a database associated with the server and switch; electronically transmitting an application from the server to the telephone handset via a data channel responsive to telephone handset enrollment, wherein said application is: adapted to send instructions to have one or more secondary telephone numbers referenced to the primary telephone number in the database, adapted to present visually perceptible call processing rules on the telephone handset, and adapted to transmit information indicating a selection of call processing rules from the telephone handset to the server; electronically receiving instructions from the telephone handset via the data channel to reference the one or more secondary telephone numbers to the primary telephone number; storing telephone handset information, including the primary tele-

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phone number and the one or more secondary telephone numbers referenced to the primary telephone number, in the database; electronically receiving instructions from the telephone handset via the data channel to store user selected call processing rules for the telephone handset in the database, wherein the user selected call processing rules include instructions to route calls over a voice channel in a manner that will indicate that the calls are made to or from the one or more secondary telephone numbers; electronically transmitting information to the telephone handset via the data channel, said information being adapted to cause a pre-call information to be displayed on the telephone handset responsive to initiation of an outgoing call using the one or more secondary telephone numbers or an incoming call to the one or more secondary telephone numbers; electronically receiving from the telephone handset via the data channel call handling information indicating a user selected call processing rule to be used to process the outgoing or incoming call; and automatically handling the outgoing or incoming call based on the call handling information.

Applicant has still further developed an innovative method of providing telephone service, comprising: associating a telephone handset with primary and secondary telephone numbers in a database; receiving, from the telephone handset via a data channel, digital information indicating primary call processing rules for handling calls to the first telephone number; storing the primary call processing rules digitally; receiving, from the telephone handset via the data channel, digital information indicating secondary call processing rules for handling calls to the secondary telephone number; storing the secondary call processing rules digitally; receiving a call request to the secondary telephone number; transmitting pre-call information to the telephone handset via the data channel responsive to receipt of the call request, wherein said pre-call information is based on the secondary call processing rules; responsive to the pre-call information, receiving information indicative of a user input to the telephone handset over the data channel; and processing the call based on the stored alternative call processing rules and user input to the telephone handset, wherein said processing includes an option of connecting the call over a voice channel.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only, and are not restrictive of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to assist the understanding of this invention, reference will now be made to the appended drawings, in which like reference characters refer to like elements.

FIG. 1 is a schematic diagram illustrating a network architecture that may be used to provide telephone service in accordance with embodiments of the present invention.

FIG. 2 is a block diagram illustrating a method of providing telephone calls in accordance with embodiments of the present invention.

FIG. 3 is a block diagram illustrating data channel and voice channel connections used to provide telephone service in accordance with embodiments of the present invention.

FIG. 4 is a block diagram illustrating a method of setting up and connecting an incoming call in accordance with one embodiment of the present invention.

FIG. 5 is a block diagram illustrating a method of setting up and connecting an outgoing call in accordance with one embodiment of the present invention.

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FIG. 6 is a call sequence diagram illustrating a method of setting up and connecting a conference call in accordance with one embodiment of the present invention.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

Reference will now be made in detail to embodiments of the present invention, examples of which are illustrated in the accompanying drawings. It is to be understood that other embodiments may be utilized and structural changes may be made without departing from the scope of the present invention.

It should be noted that in connection with the described embodiments, reference is made to a data channel. A preferred data channel may be an Internet Protocol (IP) channel, which is not a conventional telephone voice channel. However, other data, non-conventional voice, channels over which information may be transmitted between a telephone handset and a server may be used in alternative embodiments of the invention.

With reference to FIG. 1, embodiments of the present invention may be implemented using a system having a server 100, associated computer memory, such as a database 120, and an associated telecommunications switch 110 which communicate through a network with a telephone handset 340. The server 100 may be connected to the database 120 and the switch 110. The server 100 may also be connected via the Internet 316 through one or more nodes, such as a Gateway GPRS Support Node (GGSN) 322 and a Servicing GPRS Support Node (SGSN) 324, to a mobile network 313. The switch 110 may be connected through the PSTN 310 to the mobile network 313 at a Mobile Switching Center (MSC) 314. In turn, the MSC 314 may be connected to a Home Location Register database (HLR) 318, a Visitor Location Register database (312), a Mobile Number Portability database (MNP) 320, a location server 308, and the SGSN 324. The SGSN 324 may be connected to one or more Radio Network Controllers (RNC) 326 and/or one or more Processor Control Units (PCU) 327, which in turn may be connected to one or more Base Stations (BS) 328 and to one or more mobile devices referred to collectively as "handsets" 340.

The communications between the server 100 and the handset 340 over the Internet 316 may utilize IP as a protocol opposed to protocols used to establish communications according to CDMA, GSM, or like standards. Such IP governed communications are referred to herein as being conducted over a "data channel." Conversely, communications between the switch 110 and the handset over the PSTN 310 may be transmitted and received in accordance with CDMA, GSM or like standards as opposed to using IP. Such CDMA, GSM or like governed communications, when used to carry voice information, are referred to herein as being conducted over a "voice channel."

With reference to FIGS. 1 and 2, method embodiments of the invention may be facilitated starting with step 200 in which a handset 340 may be used to subscribe to 10 the telephone network that includes the server 100 and switch 110 used to provide telephone service in accordance with embodiments of the invention. A user may subscribe to the telephone network in step 200 by enrolling the telephone handset 340 using a data channel connection between the handset and the server 100. Responsive to a data channel request received from the handset 340, a handset application may be transmitted to the handset from the server 100, and installed and stored in memory associated with the handset

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in step 202. Once the handset application is installed on the handset 340, the handset may connect to the server 100 by operation of the handset application as needed over a data channel connection which may include the BS 328, RNC 326 or PCU 327, SGSN 324, GGSN 322, and Internet 316.

In connection with step 204, the server 100 may transmit information to the handset 340 via the data channel, which, through automatic operation of the handset application, permits the user to select one or more secondary telephone numbers to be referenced to a primary telephone number for the handset. The primary telephone number, preferably, may be a SIM number or ESN which is assigned to the handset 340 at the time of activation. Once selected, the handset 340 may automatically transmit information which to the server 100 over the data channel which requests that the secondary telephone numbers be associated with the primary telephone number. In response, the server 100 may store (i.e., reference) information indicating the association of the one or more selected secondary telephone numbers in computer memory associated with the server such as the database 120. In an alternative embodiment, the server 100 may automatically assign one or more secondary telephone numbers to the handset 340, as opposed to them being selected.

In step 206 of FIG. 2, the handset 340 may be used to access the handset application installed thereon to select call processing rules for handling incoming and outgoing voice channel calls to and from the handset 340. Information indicating call processing rules may be transmitted from the handset 340 to the server 100 via the data channel by automatic operation of the handset application. Custom call processing rules may be selected for, and associated with, each of the primary telephone number and the one or more secondary telephone numbers associated with the primary telephone number. The call processing rules information may be automatically stored in a computer memory, such as database 120, by the server 100. An indication of the association of particular call processing rules with a particular 10 handset 340 and particular primary and/or secondary telephone numbers may also be stored in the database 120. The call processing rules may include preset responses for incoming calls, such as custom stored voice message(s) and/or custom stored text message(s) to be associated with the primary and/or one or more secondary telephone numbers. The call processing rules may further permit the handset 340 to be used to control the availability of the secondary telephone numbers as well as activation of additional secondary telephone numbers and deactivation of existing secondary telephone numbers. Information indicating the call processing rules for the primary telephone number and secondary telephone numbers may be stored automatically in memory associated with the handset 340. The call processing rules may further include stock rules used for all telephone numbers, such as an option to accept or not accept (i.e., drop) an incoming call. With reference to step 208, the application stored on the handset 340 may enable it to be used to receive incoming calls from, and place outgoing calls to, a recipient telephone (not shown) which is connected to the PSTN 310, as explained in more detail below.

With reference to FIGS. 3 and 4, the handset 340 may be used to receive incoming (terminating) calls to a secondary telephone number, using a telephone network automated structure having a network layer 101 and an application layer 102 associated therewith. An incoming call to the secondary telephone number may be placed in step 402 by a calling party. The incoming call is routed from the caller's telephone to the PSTN 310. In step 404, the incoming call

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may be routed over the PSTN 310 to the switch 110. Responsive to receipt of the incoming call at the switch 110, a Call Manager 104 application, which cooperates with a Mobility Manager 106 application, and a Web Manager 108 application, which are all associated with the server 100, may access the call processing rules in the database 120 which are associated with the secondary telephone number that is being called. Subject to the accessed call processing rules, the Call Manager 104 may assign or look up a bridge telephone number to be used for completion of the call in step 406. The bridge telephone number may be associated with the switch 110, and calls to the bridge telephone number may be automatically routed to this switch.

The call processing rules may provide for call routing via a call distribution algorithm where the call could be routed to one or many telephone numbers. The call processing rules may be user selectable and configurable, and may apply to voice, text and/or other data messaging. The call processing rules may govern how calls are handled and may provide automated call routing or call dropping based on location data of the calling and/or called party. The call processing rules may further govern handling calls based on incoming caller ID, which may identify a calling party as being on an accepted caller ID list or a non-accepted caller ID list. The call processing rules may further provide call routing based on weekday, weekend, holiday, time of day, biometrics data, and accelerometer data information. The call processing rules may still further provide call routing based on an interface with a handset 340 calendar to check availability to accept calls. Such calendars may include, for example, Outlook, Google Calendar, and other user calendars.

If the call processing rules indicate that the secondary telephone number is not available to this particular caller, or to all callers, however, the Call Manager 104 may apply such rule or rules and reject the incoming call at the conclusion of step 406. Application of the call processing rules for a call rejection may result in the call simply not being answered, being dropped, or automated return of a voice, text, or other type of message to the calling telephone number or a communication device associated therewith.

On the other hand, if the call processing rules permit completion of the call, in step 408 the Call Manager 104 may transmit pre-call notification information to the handset 340, which includes the assigned/looked up bridge telephone number, via the data channel connection, i.e., over the Internet 316 and the Mobile Data Network 348. The pre-call information may include information used by the application installed on the handset 340 to cause a display of the calling telephone number, the calling party name, calling party location, such as GPS location, and/or the called secondary telephone number, as well as other information in step 410. The incoming pre-call information may be received at the handset 340 before or during the call ringing on the handset.

In step 412, responsive to receipt of the incoming pre-call notification information, the handset application may cause the handset 340 to display call handling choices for the call. For example, the handset 340 may be directed under the control of the handset application to display receive call, drop call, custom voice mail message, and/or custom text message choices. The choices may be selected through interaction with the handset 340, all before the call is connected or dropped. In step 414, the selection of either delivering a responsive text message (416), not accepting, i.e., "dropping" the call (418), or responding to the call with a custom voice message (420) may be transmitted from the handset 340 to the server 100 via the data channel. Thereafter, the Call Manager 104 may automatically implement

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the drop call or respond with text or voice message instructions received over the data channel, and the call attempt may be terminated thereafter.

If the call is accepted in step 414, however, the handset application may automatically cause the handset 340 to call the bridge telephone number in step 422 over a voice channel. The return call from the handset 340 to the bridge telephone number may be routed over the PSTN 310 to the switch 110 using a voice channel connection. In step 424, once the call to the bridge telephone number is received at the switch 110, the switch may “bridge” the incoming voice channel call to the bridge telephone number with the incoming voice channel call to the secondary telephone number to thereby connect the incoming call from the calling party to the handset 340 via a voice channel. Further, the switch 110 may automatically send signaling information to the calling party telephone which causes the secondary telephone number to be displayed as the number to which the call has been completed.

With continued reference to FIG. 3, the web manager 108 may be used to process Internet 316 transactions for the server 110. The system may also employ a web portal 350 to link a digital device 360 other than a handheld 340 to the telecommunications system for calling in accordance with embodiments of the invention. For example, embodiments of the invention may be used with digital devices 360 such as a desktop computer, laptop computer, iPad, tablet, iPod 790, or the like.

With reference to FIGS. 3 and 5, the handset 340 may be used to place outgoing (originating) calls from a secondary telephone number, using the telephone network automated structure shown in FIG. 3 and described above. If the party to be called has not yet been called using a secondary telephone number, an outgoing call from the handset 340 may be initiated to such party in step 502 by opening the handset application installed thereon. Once the handset application is open, the handset 340 may be used to choose a secondary telephone number as the originating telephone number in step 504. A list of such secondary telephone numbers may be stored in memory associated with the handset.

In step 506, the handset 340 may be used to enter, or select from an address file, a contact telephone number to be called in order to initiate a call to such telephone number. The handset application may cause the handset 340 to transmit information to the server 100 Call Manager 104 via the data channel automatically as a result of the selection of the secondary telephone number and the contact telephone number. The transmitted information may indicate the secondary telephone number from which the call is to appear to the called party to have been placed, and the contact telephone number to be called.

In step 508, responsive to receipt of the data channel communication from the handset 340 requesting set up of a call from it to the telephone number to be called, the Call Manager 104 may access the call processing rules in the database 120 which are associated with the secondary telephone number from which the call is to appear to have been placed. In step 510, subject to the accessed call processing rules, the Call Manager 104 may assign a bridge telephone number to be used to connect the call from the handset 340 to the switch 110 and send pre-call information including the bridge telephone number to the handset via the data channel.

The bridge telephone number may be associated with the switch 110, and calls to the bridge telephone number may be automatically routed to this switch. Once the bridge telephone number is assigned, the server 100 under the control

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of the Call Manager 104, may store information in the database 120 which associates the bridge telephone number with the primary telephone number for the handset 340, the secondary telephone number selected for the call, and the contact telephone number to be called. More specifically, the stored information may indicate that each combination of primary telephone number and bridge telephone number are uniquely associated with each combination of secondary telephone number and contact telephone number. In other words, each combination of primary telephone number and bridge telephone number for the handset 340 map to a unique combination of secondary telephone number and contact telephone number in the database 120 memory.

In step 512, responsive to receipt of the bridge telephone number information over the data channel, the handset application may cause the handset 340 to automatically call the bridge telephone number via a voice channel. The return call from the handset 340 to the bridge telephone number may be routed over the PSTN 310 to the switch 110 using a voice channel connection.

In step 514, the Call Manager 104 may instruct the switch 110 to place a voice channel call to the telephone number to be called using the secondary telephone number as the originating telephone number from the switch. Once the call to the bridge telephone number from the handset 340 is received at the switch 110, the switch may “bridge” the incoming voice channel call to the bridge telephone number with the outgoing voice channel call from the secondary telephone number to the contact telephone number to thereby connect the outgoing call from the handset 340 to the party being called via a voice channel. Further, the switch 110 may automatically send signaling information to the called party telephone which causes the secondary telephone number to be displayed as the number from which the call appears to have been placed. Because each pairing of a primary telephone number and a bridge telephone number maps to a unique contact telephone number and secondary telephone number pairing, the call can be completed at the switch 110 to the correct contact telephone number while showing the desired secondary telephone number as the originating number.

With continued reference to FIG. 5, in the event that the contact telephone has been previously called using the secondary telephone number on the handset 340, the user may directly select the bridge telephone number associated with the secondary telephone number and contact telephone number in step 506 either using the handset application in step 502, or without opening the handset application in step 512. Alternatively, the handset may have a stored “shortcut” which, when the user selects the contact telephone number to be called from the secondary telephone number, results in the associated bridge telephone number being dialed. In either case, the handset 340 may dial the bridge telephone number to connect with the Call Manager 104 in step 512. In step 514, the Call Manager 104 may look up the secondary telephone number and the contact telephone number associated with the paired bridge telephone number and primary telephone number for the handset 340. Thereafter, the switch 110 may dial the contact telephone number and bridge the call from the handset 340 in a manner that makes the secondary telephone number appear to be the telephone number from which the call is being placed.

FIG. 6 is a call flow diagram illustrating a method of setting up and connecting a multi-party conference call in accordance with an embodiment of the present invention. With reference to FIGS. 3 and 6, the communication sequence for a conference call is illustrated between the

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handset application stored on the handset **340**, the Call Manager **104** application associated with the server **100** and switch **110**, and a conference call invitee handset. In step **600**, the application on the handset **340** may be used to select invitees (users) for a conference call. The telephone numbers of the invitees may be selected from an address book or manually entered. Further, the conference call may be selected to be initiated immediately, or at some future date and time.

Once the invitees are selected, the handset **340** may be instructed by the handset application to transmit a conference request to the server **100** via a data channel. In step **602**, the Call Manager **104** operating on the server **100** may assign a conference bridge telephone number to the conference call in response to receipt of the conference request. In step **604**, the Call Manager **104** may cause the server **100** to send conference invitation messages to each of the invitee handsets, and more specifically, applications stored on the invitee handsets, via a data channel. The invitation messages may include the assigned bridge telephone number for the conference call and an optional PIN or code number for the conference call. The invitation message may provide a notice, for example, "Jack has invited you to join a conference call," and further include identification of other invited participants.

In step **606**, each invitee handset may be used to accept to join the conference call, join at a later time, or decline to join. If the acceptance is for a future scheduled conference call, an indication of the acceptance (including acceptance to join late) may be transmitted from each invitee handset under the control of the application installed thereon, to the server **100** Call Manager **104** via the data channel. Further, if the invitation is declined altogether, an indication thereof may be transmitted from each invitee handset to the server **100**. Thereafter, the Call Manager **104** may transmit information to the originating handset **340**, and optionally the invitee handsets, via the data channel, which indicates acceptance of a future conference call, acceptance to join late (step **610**), or declination of the conference call invitation.

If the conference call invitation is accepted and it is time for the call, each accepting invitee handset may automatically or manually dial the bridge telephone number using a voice channel. The switch **110** may receive the voice channel calls to the bridge telephone number and may authenticate the invitees right to join the conference call in step **608** by comparing the invitee's telephone number with that of the invitee list, as well as comparing any PIN input by the invitee with the PIN selected for the conference call. If the authentication is successful, the invitee handset is connected to the call via the voice channel. An automatic update may be transmitted via the data channel from the server to the originating handset **340** indicating that a particular invitee handset has joined the conference call.

If an invitee chose to join late, the server **100** may automatically transmit a reminder to the affected invitee handset to join the call at the agreed time in step **612**. Thereafter, the late joining invitee handset may dial the bridge telephone number automatically or manually using a voice channel. The switch **110** may receive the voice channel call to the bridge telephone number, authenticate the late joining invitee handset, and connect the handset to the conference call in step **614**.

The foregoing has described the principles, embodiments and modes of operation of the present invention. However, the invention should not be construed as being limited to the particular embodiments discussed. The above described

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embodiments should be regarded as illustrative rather than restrictive, and it should be appreciated that variations may be made in those embodiments by workers skilled in the art without departing from the scope of the present invention as defined by the following claims.

What is claimed:

1. A method of providing telephone service, comprising: automatically storing electronic information that indicates an association of a secondary telephone number and a primary telephone number with a telephone handset in a computer memory associated with a server; automatically associating a bridge or access telephone number with each of a plurality of contact telephone numbers in the computer memory; automatically transmitting information that indicates the association of the bridge or access telephone number with each of a plurality of contact telephone numbers to the handset via a data channel; automatically associating each primary telephone number and bridge or access telephone number pairing with a corresponding secondary telephone number and contact telephone number pairing in the computer memory; receiving, at a switch associated with the server, an outgoing call from the handset to the bridge or access telephone number via a second channel; receiving, at the server, information from the switch indicating the outgoing call is being made to the bridge or access telephone number from the primary telephone number; and receiving, at the switch, information from the server directing the switch to: (a) connect the outgoing call to a contact telephone number associated with the primary telephone number and bridge or access telephone number pairing, and (b) identify a telephone number from which the outgoing call is being made as the secondary telephone number.
2. The method of claim 1, wherein the data channel is an Internet protocol (IP) channel.
3. The method of claim 2, wherein the second channel is established in accordance with a CDMA or GSM standard.
4. The method of claim 1, wherein the second channel is not an Internet Protocol (IP) channel.
5. An apparatus, comprising: a memory; and a processor operatively coupled to the memory, the processor configured to automatically store electronic information that indicates an association of a secondary telephone number and a primary telephone number with a telephone handset in a computer memory associated with a server, the processor configured to automatically associate a bridge or access telephone number with each of a plurality of contact telephone numbers in the computer memory, the processor configured to automatically transmit information that indicates the association of the bridge or access telephone number with each of a plurality of contact telephone numbers to the handset via a data channel, the processor configured to automatically associate each primary telephone number and bridge or access telephone number pairing with a corresponding secondary telephone number and contact telephone number pairing in the computer memory, the processor configured to receive, at the server, information from a switch associated with the server and in response to the switch receiving an outgoing call from the handset to the bridge or access telephone number

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via a second channel, the information indicating the outgoing call is being made to the bridge or access telephone number from the primary telephone number, the processor configured to send, to the switch, information from the server directing the switch to: (a) connect the outgoing call to a contact telephone number associated with the primary telephone number and bridge or access telephone number pairing, and (b) identify a telephone number from which the outgoing call is being made as the secondary telephone number.

6. The apparatus of claim 5, wherein the data channel is an Internet Protocol (IP) channel.

7. The apparatus of claim 5, wherein the second channel is established in accordance with a CDMA or GSM standard.

8. The apparatus of claim 5, wherein the second channel is not an Internet Protocol (IP) channel.

9. A non-transitory processor-readable medium storing code representing instructions to be executed by a processor, the code comprising code to cause the processor to:

automatically store electronic information that indicates an association of a secondary telephone number and a primary telephone number with a telephone handset in a computer memory associated with a server;

automatically associate a bridge or access telephone number with each of a plurality of contact telephone numbers in the computer memory;

automatically transmit information that indicates the association of the bridge or access telephone number with each of a plurality of contact telephone numbers to the handset via a data channel;

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automatically associate each primary telephone number and bridge or access telephone number pairing with a corresponding secondary telephone number and contact telephone number pairing in the computer memory; receive, at the server, information from a switch associated with the server and in response to the switch receiving an outgoing call from the handset to the bridge or access telephone number via a second channel, the information indicating the outgoing call is being made to the bridge or access telephone number from the primary telephone number; and

send, to the switch, information from the server directing the switch to: (a) connect the outgoing call to a contact telephone number associated with the primary telephone number and bridge or access telephone number pairing, and (b) identify a telephone number from which the outgoing call is being made as the secondary telephone number.

10. The non-transitory processor-readable medium of claim 9, wherein the data channel is an Internet Protocol (IP) channel.

11. The non-transitory processor-readable medium of claim 9, wherein the second channel is established in accordance with a CDMA or GSM standard.

12. The non-transitory processor-readable medium of claim 9, wherein the second channel is not an Internet Protocol (IP) channel.

* * * * *

US011012554B2

(12) **United States Patent**
Zhidov et al.(10) **Patent No.:** **US 11,012,554 B2**(45) **Date of Patent:** ***May 18, 2021**(54) **TELEPHONE NETWORK SYSTEM AND
METHODS**(71) Applicant: **Flypsi, Inc.**, Bedford, TX (US)(72) Inventors: **Ivan Zhidov**, Chickasha, OK (US);
Peter Rinfret, Nantucket, MA (US);
Sunir Kochhar, Oro Valley, AZ (US)(73) Assignee: **Flypsi, Inc.**, Bedford, TX (US)(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.This patent is subject to a terminal dis-
claimer.(21) Appl. No.: **17/039,566**(22) Filed: **Sep. 30, 2020**(65) **Prior Publication Data**

US 2021/0021701 A1 Jan. 21, 2021

Related U.S. Application Data(60) Division of application No. 16/444,753, filed on Jun.
18, 2019, now abandoned, which is a division of
application No. 16/031,806, filed on Jul. 10, 2018,
now Pat. No. 10,334,094, which is a continuation of
application No. 15/582,091, filed on Apr. 28, 2017,
now Pat. No. 10,051,105, which is a continuation of
application No. 14/307,052, filed on Jun. 17, 2014,
now Pat. No. 9,667,770, which is a
continuation-in-part of application No. 13/944,853,
filed on Jul. 17, 2013, now abandoned.(51) **Int. Cl.****H04M 1/725** (2021.01)**H04M 3/42** (2006.01)**H04W 76/10** (2018.01)**H04M 3/56** (2006.01)*H04M 3/436* (2006.01)*H04L 29/06* (2006.01)(52) **U.S. Cl.**CPC ... **H04M 1/72547** (2013.01); **H04M 3/42042**
(2013.01); **H04M 3/42263** (2013.01); **H04M**
3/42272 (2013.01); **H04L 65/1069** (2013.01);
H04M 3/436 (2013.01); **H04M 3/565**
(2013.01); **H04M 2203/5054** (2013.01); **H04W**
76/10 (2018.02)(58) **Field of Classification Search**CPC . **H04W 76/19**; **H04W 36/0055**; **H04W 76/18**;
H04W 36/08; **H04W 76/27**; **H04W**
36/0085; **H04W 8/18**; **H04M 3/42042**;
H04M 2203/2011; **H04M 3/42059**; **H04M**
3/42102; **H04M 3/42263**; **H04M 3/42272**;
H04M 3/42229; **H04M 3/4365**

See application file for complete search history.

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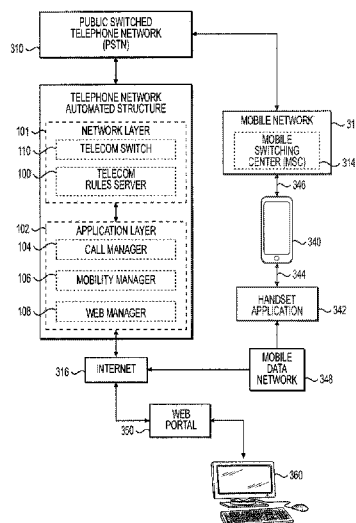
U.S. PATENT DOCUMENTS

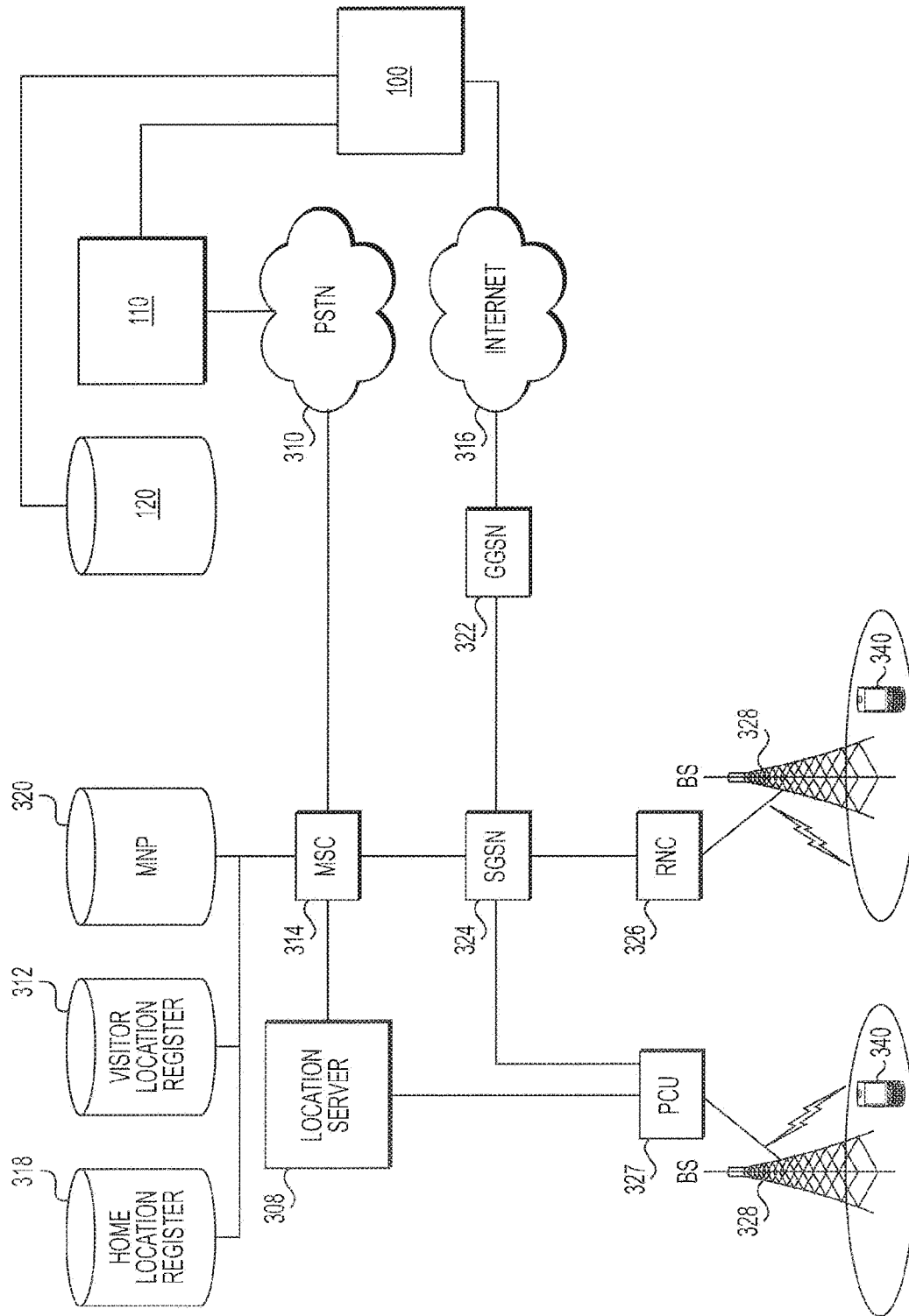
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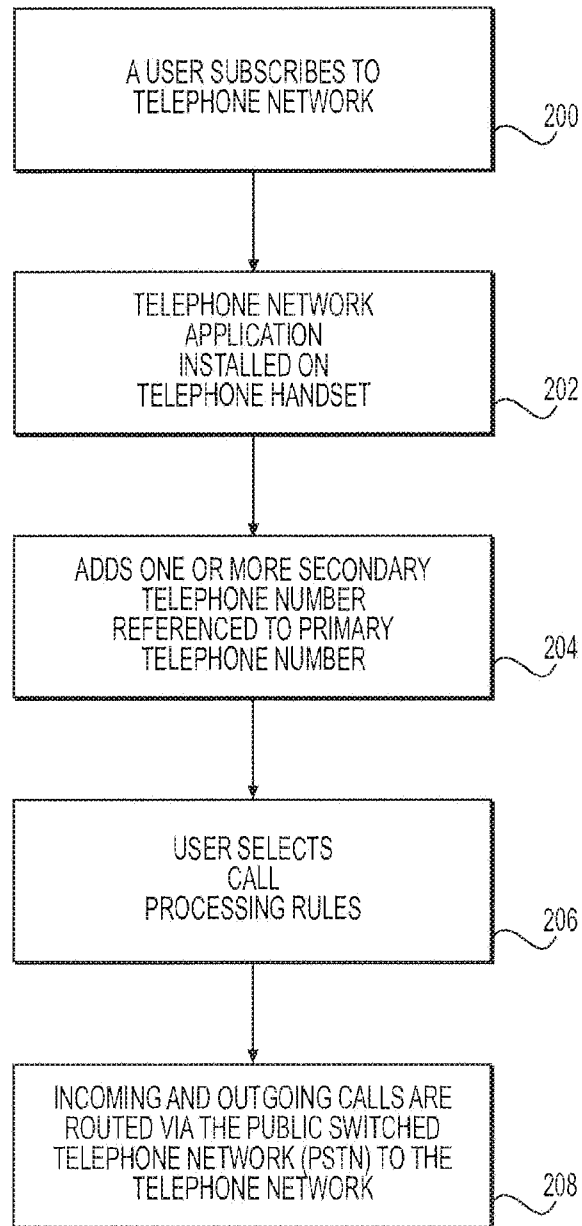
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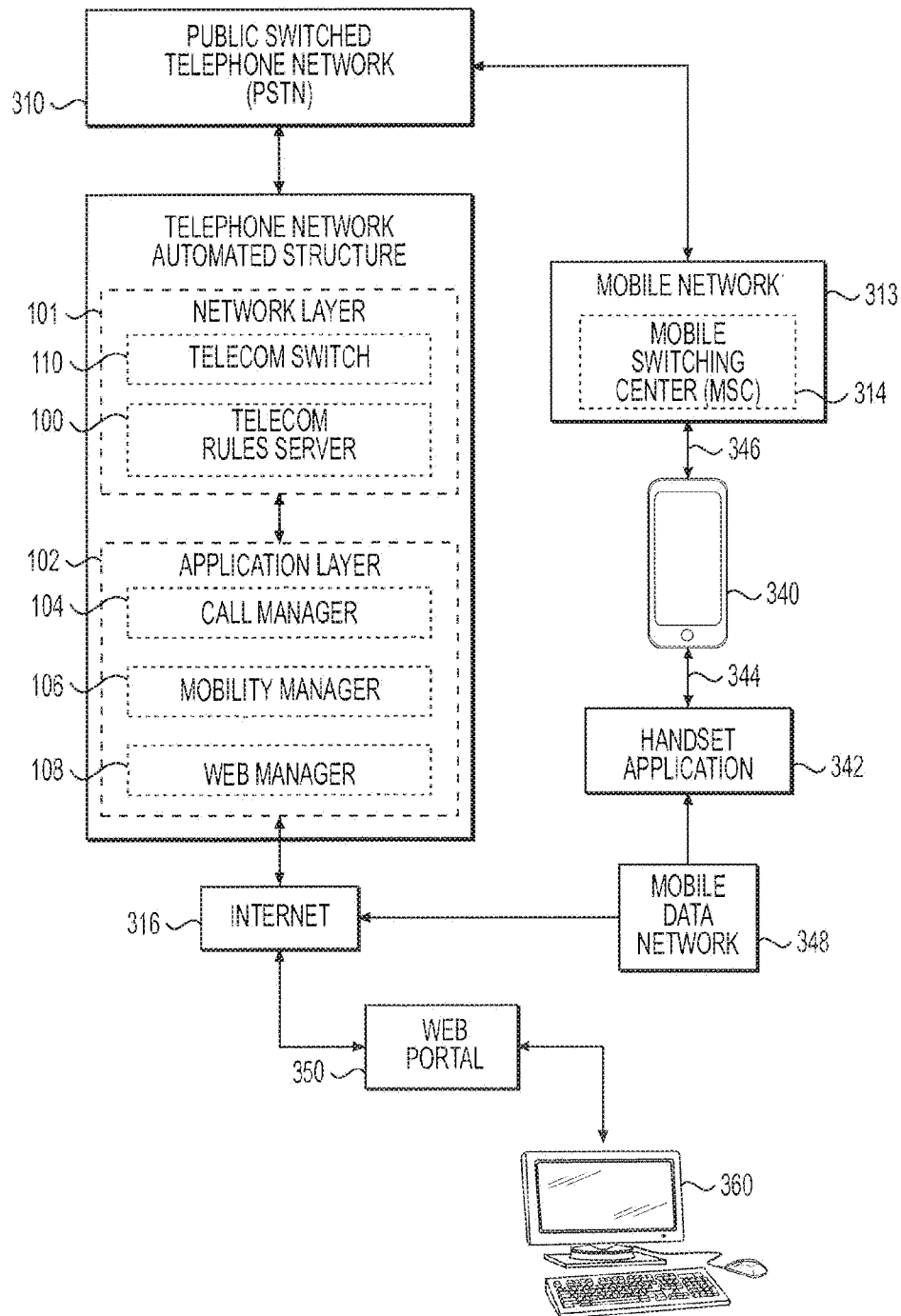
Primary Examiner — Nam T Huynh(74) *Attorney, Agent, or Firm* — West & Associates, A
PC; Stuart J. West

(57)

ABSTRACTSystems for and methods of delivering telephone calls using
the combination of a data channel and a voice channel are
disclosed. A data channel connection with the telephone
handset may provide pre-call information used to set up
incoming and outgoing calls which are ultimately connected
using a voice channel. Use of the pre-call information may
permit the same handset to be associated with multiple
secondary telephone numbers from which calls appear to
have been made and to which calls appear to have been
placed.**12 Claims, 6 Drawing Sheets**

**FIG. 1**

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**FIG. 3**

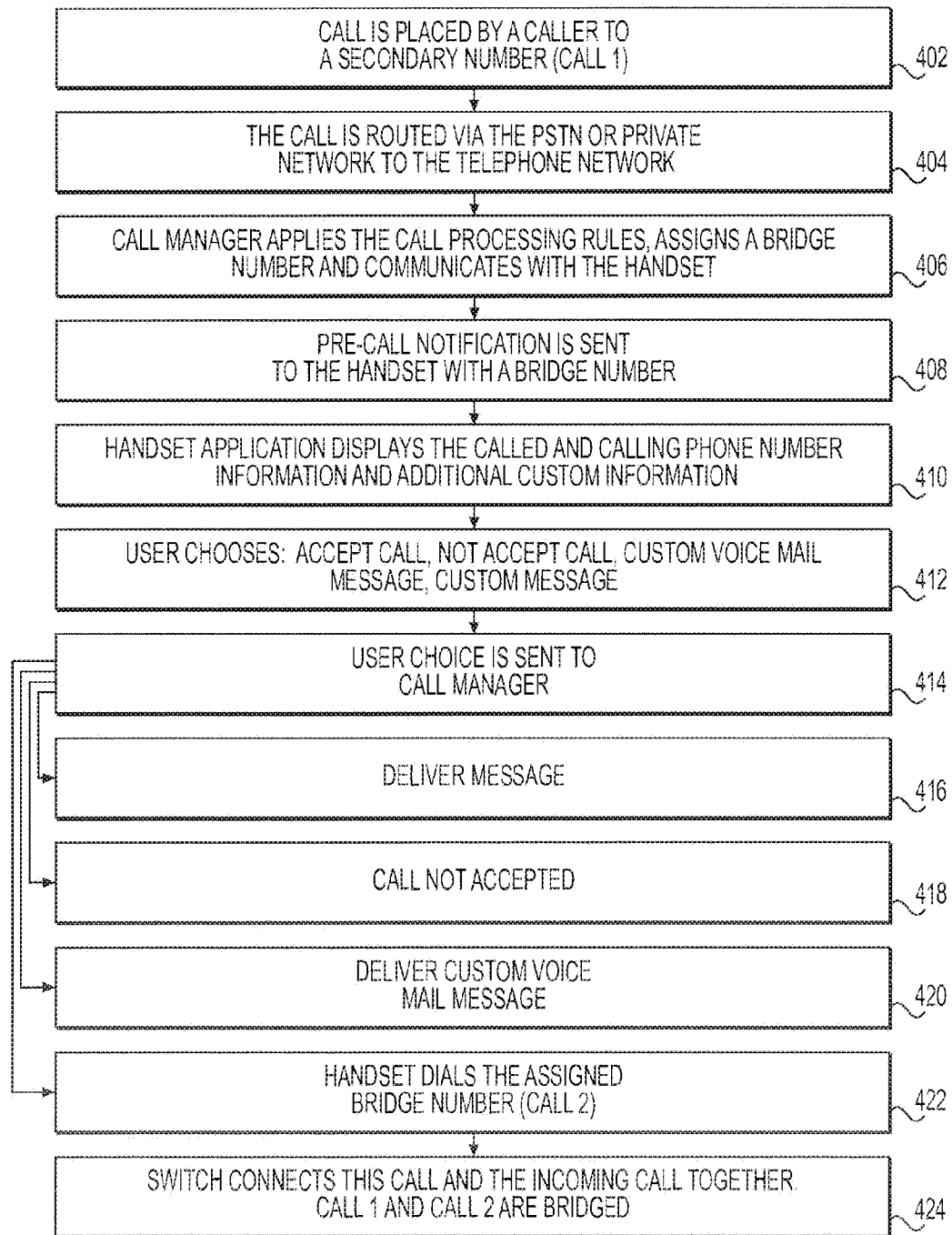
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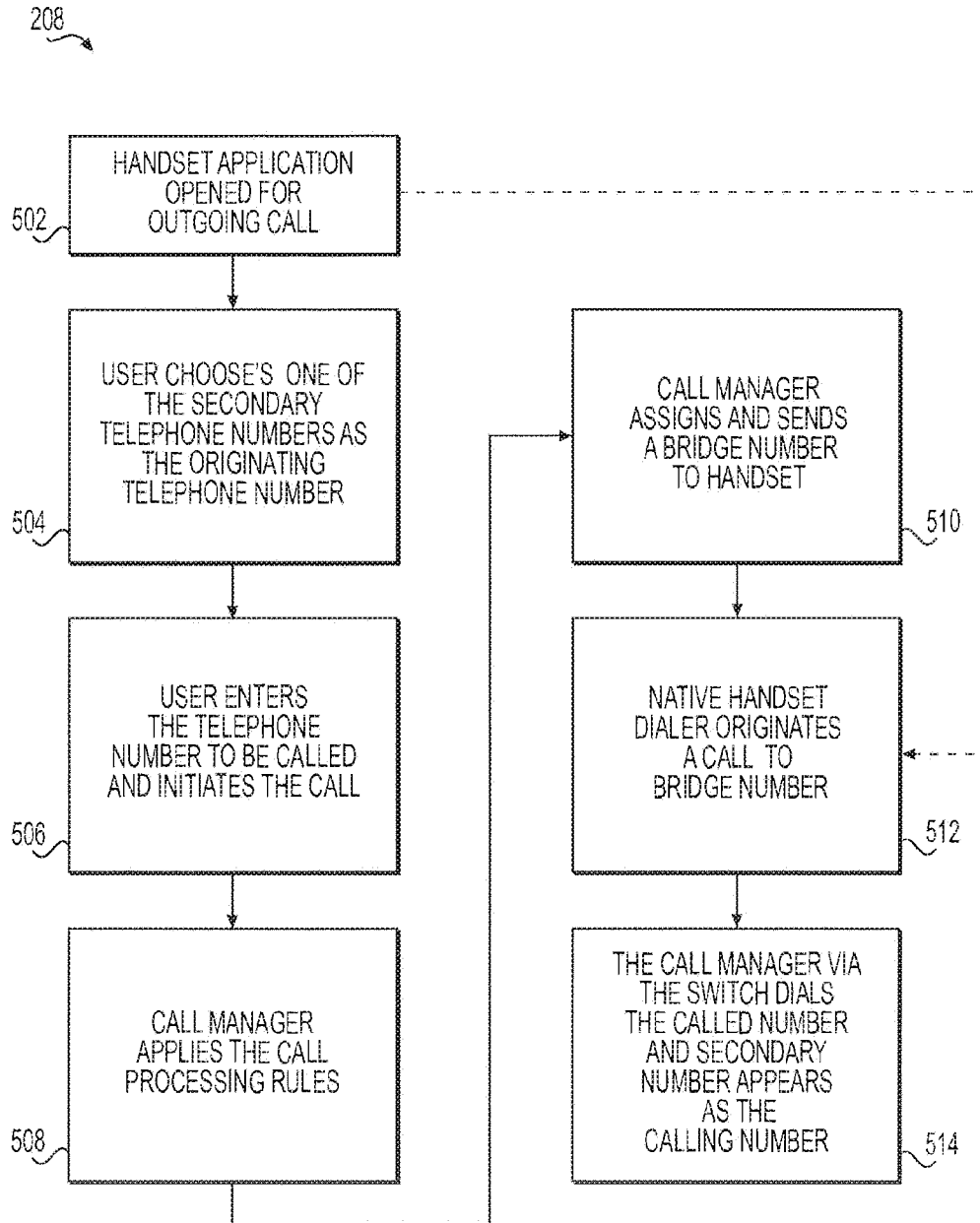
**FIG. 4**

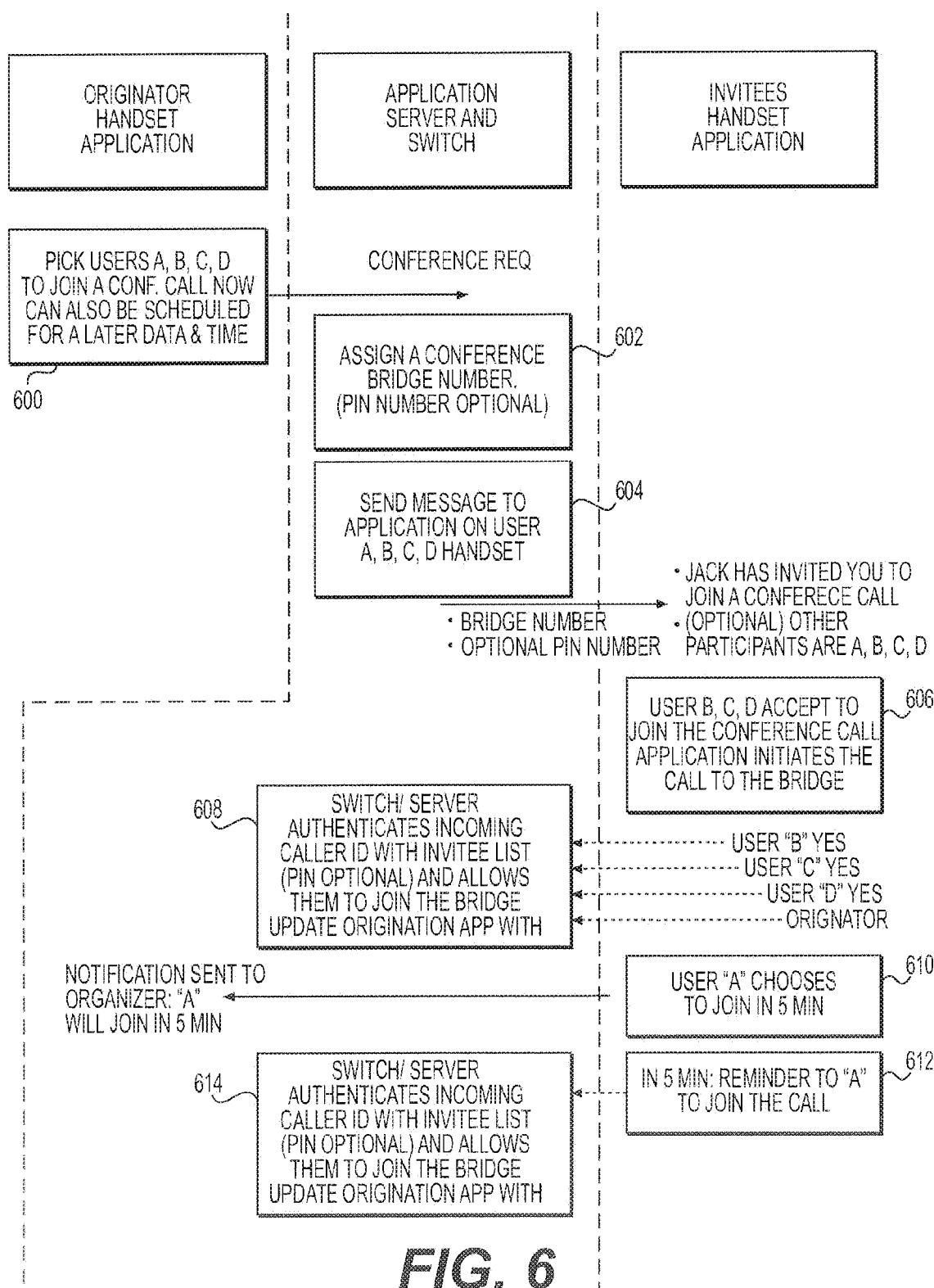
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**FIG. 5**



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**TELEPHONE NETWORK SYSTEM AND
METHODS****CROSS-REFERENCE TO RELATED
APPLICATION(S)**

This application is a divisional application and claims the benefit of priority to co-pending U.S. patent application Ser. No. 16/444,753, filed Jun. 18, 2019, by Zhidov, et al., which is a divisional application of U.S. patent application Ser. No. 16/031,806 (now U.S. Pat. No. 10,334,094), filed Jul. 10, 2018 by Zhidov, et al., which is a continuation application of U.S. patent application Ser. No. 15/582,091 (now U.S. Pat. No. 10,051,105), filed Apr. 28, 2017, by Zhidov, et al., which is a continuation application of U.S. patent application Ser. No. 14/307,052 (now U.S. Pat. No. 9,667,770), filed Jun. 17, 2014, by Zhidov, et al., which is a continuation-in-part application of US patent application Ser. No. 13/944,853, filed Jul. 17, 2013, by Zhidov, et al., the complete contents of each of which is hereby incorporated herein by reference.

BACKGROUND**Technical Field**

The present invention relates to systems and methods for setting up and connecting telephone calls, and delivering information related to such telephone calls using an Internet Protocol (IP) or other data channel while delivering the voice portion of the call in accordance with CDMA, GSM or like voice channel delivery standards.

Background

The volume of telephone calls and text messaging has increased dramatically and users are finding it more and more difficult to manage that volume of calls and messages. The current systems to aid in managing some types of calls only provide minimal assistance to the user. It is therefore an advantage of some, but not necessarily all, embodiments of the present invention to provide systems and methods for assisting callers and call recipients with the management of calls and messages.

Additional advantages of various embodiments of the invention are set forth, in part, in the description that follows and, in part, will be apparent to one of ordinary skill in the art from the description and/or from the practice of the invention.

SUMMARY

Responsive to the foregoing challenges, Applicant has developed an innovative method of providing telephone service by transmitting call handling information between a handset and a switch using an IP channel or similar protocol channel and by transmitting a voice call associated with the call handling information between the handset and the switch using a voice channel provided in accordance with a voice channel protocol, e.g., in accordance with CDMA or GSM, 3G, 4G, LTE or like future protocol channels standards.

Applicant has further developed an innovative method of providing telephone service comprising: automatically storing electronic information that indicates an association of a secondary telephone number and a primary telephone number with a telephone handset in a computer memory asso-

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ciated with a server; automatically storing electronic information that indicates a selection of call processing rules for the primary telephone number in the computer memory; automatically storing electronic information that indicates a selection of call processing rules for the secondary telephone number in the computer memory; receiving an electronic indication of an incoming call to the secondary telephone number at the server, said electronic indication of an incoming call being received from a switch associated with the server; automatically accessing the call processing rules for the secondary telephone number under the control of the server responsive to the receipt of the electronic indication of the incoming call to the secondary telephone number; automatically handling the incoming call in accordance with the accessed call processing rules for the secondary telephone number; transmitting pre-call information via a data channel to the handset under the control of the server, said pre-call information including a bridge telephone number for connecting the handset to the incoming call at the switch; and receiving, at the server via the data channel, an electronic indication of a selection of a call processing rule for handling the incoming call to the secondary telephone number, or establishing a voice channel connection between the handset and the switch as a result of the handset calling the switch using the bridge number.

Applicant has further developed an innovative method of providing telephone service, comprising: automatically storing electronic information that indicates an association of a secondary telephone number and a primary telephone number with a telephone handset in a computer memory associated with a server; automatically associating a unique bridge telephone number with each of a plurality of contact telephone numbers in the computer memory; automatically transmitting information that indicates the association of the unique bridge telephone number with each of a plurality of contact telephone numbers to the handset via the data channel; automatically associating each primary telephone number and bridge telephone number pairing with a corresponding secondary telephone number and contact telephone number pairing in the computer memory; receiving, at a switch associated with the server, an outgoing call from the handset to the bridge telephone number via a voice channel; receiving, at the server, information from the switch indicating the outgoing call is being made to the bridge telephone number from the primary telephone number; receiving, at the switch, information from the server directing the switch to: (a) connect the outgoing call to a contact telephone number associated with the primary telephone number and bridge telephone number pairing, and (b) identify the telephone number from which the outgoing call is being made as the secondary telephone number.

Applicant has still further developed an innovative method of providing telephone service, comprising: enrolling a telephone handset in a telecommunications system having a server and a switch, wherein said telephone handset is associated with a primary telephone number in a database associated with the server and switch; electronically transmitting an application from the server to the telephone handset via a data channel responsive to telephone handset enrollment, wherein said application is: adapted to send instructions to have one or more secondary telephone numbers referenced to the primary telephone number in the database, adapted to present visually perceptible call processing rules on the telephone handset, and adapted to transmit information indicating a selection of call processing rules from the telephone handset to the server; electronically receiving instructions from the telephone handset via the

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data channel to reference the one or more secondary telephone numbers to the primary telephone number; storing telephone handset information, including the primary telephone number and the one or more secondary telephone numbers referenced to the primary telephone number, in the database; electronically receiving instructions from the telephone handset via the data channel to store user selected call processing rules for the telephone handset in the database, wherein the user selected call processing rules include instructions to route calls over a voice channel in a manner that will indicate that the calls are made to or from the one or more secondary telephone numbers; electronically transmitting information to the telephone handset via the data channel, said information being adapted to cause a pre-call information to be displayed on the telephone handset responsive to initiation of an outgoing call using the one or more secondary telephone numbers or an incoming call to the one or more secondary telephone numbers; electronically receiving from the telephone handset via the data channel call handling information indicating a user selected call processing rule to be used to process the outgoing or incoming call; and automatically handling the outgoing or incoming call based on the call handling information.

Applicant has still further developed an innovative method of providing telephone service, comprising: associating a telephone handset with primary and secondary telephone numbers in a database; receiving, from the telephone handset via a data channel, digital information indicating primary call processing rules for handling calls to the first telephone number; storing the primary call processing rules digitally; receiving, from the telephone handset via the data channel, digital information indicating secondary call processing rules for handling calls to the secondary telephone number; storing the secondary call processing rules digitally; receiving a call request to the secondary telephone number; transmitting pre-call information to the telephone handset via the data channel responsive to receipt of the call request, wherein said pre-call information is based on the secondary call processing rules; responsive to the pre-call information, receiving information indicative of a user input to the telephone handset over the data channel; and processing the call based on the stored alternative call processing rules and user input to the telephone handset, wherein said processing includes an option of connecting the call over a voice channel.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only, and are not restrictive of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to assist the understanding of this invention, reference will now be made to the appended drawings, in which like reference characters refer to like elements.

FIG. 1 is a schematic diagram illustrating a network architecture that may be used to provide telephone service in accordance with embodiments of the present invention.

FIG. 2 is a block diagram illustrating a method of providing telephone calls in accordance with embodiments of the present invention.

FIG. 3 is a block diagram illustrating data channel and voice channel connections used to provide telephone service in accordance with embodiments of the present invention.

FIG. 4 is a block diagram illustrating a method of setting up and connecting an incoming call in accordance with one embodiment of the present invention.

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FIG. 5 is a block diagram illustrating a method of setting up and connecting an outgoing call in accordance with one embodiment of the present invention.

FIG. 6 is a call sequence diagram illustrating a method of setting up and connecting a conference call in accordance with one embodiment of the present invention.

DETAILED DESCRIPTION

Reference will now be made in detail to embodiments of the present invention, examples of which are illustrated in the accompanying drawings. It is to be understood that other embodiments may be utilized and structural changes may be made without departing from the scope of the present invention.

It should be noted that in connection with the described embodiments, reference is made to a data channel. A preferred data channel may be an Internet Protocol (IP) channel, which is not a conventional telephone voice channel. However, other data, non-conventional voice, channels over which information may be transmitted between a telephone handset and a server may be used in alternative embodiments of the invention.

With reference to FIG. 1, embodiments of the present invention may be implemented using a system having a server 100, associated computer memory, such as a database 120, and an associated telecommunications switch 110 which communicate through a network with a telephone handset 340. The server 100 may be connected to the database 120 and the switch 110. The server 100 may also be connected via the Internet 316 through one or more nodes, such as a Gateway GPRS Support Node (GGSN) 322 and a Servicing GPRS Support Node (SGSN) 324, to a mobile network 313. The switch 110 may be connected through the PSTN 310 to the mobile network 313 at a Mobile Switching Center (MSC) 314. In turn, the MSC 314 may be connected to a Home Location Register database (HLR) 318, a Visitor Location Register database (312), a Mobile Number Portability database (MNP) 320, a location server 308, and the SGSN 324. The SGSN 324 may be connected to one or more Radio Network Controllers (RNC) 326 and/or one or more Processor Control Units (PCU) 327, which in turn may be connected to one or more Base Stations (BS) 328 and to one or more mobile devices referred to collectively as "handsets" 340.

The communications between the server 100 and the handset 340 over the Internet 316 may utilize IP as a protocol opposed to protocols used to establish communications according to CDMA, GSM, or like standards. Such IP governed communications are referred to herein as being conducted over a "data channel." Conversely, communications between the switch 110 and the handset over the PSTN 310 may be transmitted and received in accordance with CDMA, GSM or like standards as opposed to using IP. Such CDMA, GSM or like governed communications, when used to carry voice information, are referred to herein as being conducted over a "voice channel."

With reference to FIGS. 1 and 2, method embodiments of the invention may be facilitated starting with step 200 in which a handset 340 may be used to subscribe to the telephone network that includes the server 100 and switch 110 used to provide telephone service in accordance with embodiments of the invention. A user may subscribe to the telephone network in step 200 by enrolling the telephone handset 340 using a data channel connection between the handset and the server 100. Responsive to a data channel request received from the handset 340, a handset application

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may be transmitted to the handset from the server **100**, and installed and stored in memory associated with the handset in step **202**. Once the handset application is installed on the handset **340**, the handset may connect to the server **100** by operation of the handset application as needed over a data channel connection which may include the BS **328**, RNC **326** or PCU **327**, SGSN **324**, GGSN **322**, and Internet **316**.

In connection with step **204**, the server **100** may transmit information to the handset **340** via the data channel, which, through automatic operation of the handset application, permits the user to select one or more secondary telephone numbers to be referenced to a primary telephone number for the handset. The primary telephone number, preferably, may be a SIM number or ESN which is assigned to the handset **340** at the time of activation. Once selected, the handset **340** may automatically transmit information which to the server **100** over the data channel which requests that the secondary telephone numbers be associated with the primary telephone number. In response, the server **100** may store (i.e., reference) information indicating the association of the one or more selected secondary telephone numbers in computer memory associated with the server such as the database **120**. In an alternative embodiment, the server **100** may automatically assign one or more secondary telephone numbers to the handset **340**, as opposed to them being selected.

In step **206** of FIG. **2**, the handset **340** may be used to access the handset application installed thereon to select call processing rules for handling incoming and outgoing voice channel calls to and from the handset **340**. Information indicating call processing rules may be transmitted from the handset **340** to the server **100** via the data channel by automatic operation of the handset application. Custom call processing rules may be selected for, and associated with, each of the primary telephone number and the one or more secondary telephone numbers associated with the primary telephone number. The call processing rules information may be automatically stored in a computer memory, such as database **120**, by the server **100**. An indication of the association of particular call processing rules with a particular handset **340** and particular primary and/or secondary telephone numbers may also be stored in the database **120**. The call processing rules may include preset responses for incoming calls, such as custom stored voice message(s) and/or custom stored text message(s) to be associated with the primary and/or one or more secondary telephone numbers. The call processing rules may further permit the handset **340** to be used to control the availability of the secondary telephone numbers as well as activation of additional secondary telephone numbers and deactivation of existing secondary telephone numbers. Information indicating the call processing rules for the primary telephone number and secondary telephone numbers may be stored automatically in memory associated with the handset **340**. The call processing rules may further include stock rules used for all telephone numbers, such as an option to accept or not accept (i.e., drop) an incoming call. With reference to step **208**, the application stored on the handset **340** may enable it to be used to receive incoming calls from, and place outgoing calls to, a recipient telephone (not shown) which is connected to the PSTN **310**, as explained in more detail below.

With reference to FIGS. **3** and **4**, the handset **340** may be used to receive incoming (terminating) calls to a secondary telephone number, using a telephone network automated structure having a network layer **101** and an application layer **102** associated therewith. An incoming call to the secondary telephone number may be placed in step **402** by

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a calling party. The incoming call is routed from the caller's telephone to the PSTN **310**. In step **404**, the incoming call may be routed over the PSTN **310** to the switch **110**. Responsive to receipt of the incoming call at the switch **110**, a Call Manager **104** application, which cooperates with a Mobility Manager **106** application, and a Web Manager **108** application, which are all associated with the server **100**, may access the call processing rules in the database **120** which are associated with the secondary telephone number that is being called. Subject to the accessed call processing rules, the Call Manager **104** may assign or look up a bridge telephone number to be used for completion of the call in step **406**. The bridge telephone number may be associated with the switch **110**, and calls to the bridge telephone number may be automatically routed to this switch.

The call processing rules may provide for call routing via a call distribution algorithm where the call could be routed to one or many telephone numbers. The call processing rules may be user selectable and configurable, and may apply to voice, text and/or other data messaging. The call processing rules may govern how calls are handled and may provide automated call routing or call dropping based on location data of the calling and/or called party. The call processing rules may further govern handling calls based on incoming caller ID, which may identify a calling party as being on an accepted caller ID list or a non-accepted caller ID list. The call processing rules may further provide call routing based on weekday, weekend, holiday, time of day, biometrics data, and accelerometer data information. The call processing rules may still further provide call routing based on an interface with a handset **340** calendar to check availability to accept calls. Such calendars may include, for example, Outlook, Google Calendar, and other user calendars.

If the call processing rules indicate that the secondary telephone number is not available to this particular caller, or to all callers, however, the Call Manager **104** may apply such rule or rules and reject the incoming call at the conclusion of step **406**. Application of the call processing rules for a call rejection may result in the call simply not being answered, being dropped, or automated return of a voice, text, or other type of message to the calling telephone number or a communication device associated therewith.

On the other hand, if the call processing rules permit completion of the call, in step **408** the Call Manager **104** may transmit pre-call notification information to the handset **340**, which includes the assigned/looked up bridge telephone number, via the data channel connection, i.e., over the Internet **316** and the Mobile Data Network **348**. The pre-call information may include information used by the application installed on the handset **340** to cause a display of the calling telephone number, the calling party name, calling party location, such as GPS location, and/or the called secondary telephone number, as well as other information in step **410**. The incoming pre-call information may be received at the handset **340** before or during the call ringing on the handset.

In step **412**, responsive to receipt of the incoming pre-call notification information, the handset application may cause the handset **340** to display call handling choices for the call. For example, the handset **340** may be directed under the control of the handset application to display receive call, drop call, custom voice mail message, and/or custom text message choices. The choices may be selected through interaction with the handset **340**, all before the call is connected or dropped. In step **414**, the selection of either delivering a responsive text message (**416**), not accepting, i.e., "dropping" the call (**418**), or responding to the call with a custom voice message (**420**) may be transmitted from the

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handset **340** to the server **100** via the data channel. Thereafter, the Call Manager **104** may automatically implement the drop call or respond with text or voice message instructions received over the data channel, and the call attempt may be terminated thereafter.

If the call is accepted in step **414**, however, the handset application may automatically cause the handset **340** to call the bridge telephone number in step **422** over a voice channel. The return call from the handset **340** to the bridge telephone number may be routed over the PSTN **310** to the switch **110** using a voice channel connection. In step **424**, once the call to the bridge telephone number is received at the switch **110**, the switch may “bridge” the incoming voice channel call to the bridge telephone number with the incoming voice channel call to the secondary telephone number to thereby connect the incoming call from the calling party to the handset **340** via a voice channel. Further, the switch **110** may automatically send signaling information to the calling party telephone which causes the secondary telephone number to be displayed as the number to which the call has been completed.

With continued reference to FIG. **3**, the web manager **108** may be used to process Internet **316** transactions for the server **110**. The system may also employ a web portal **350** to link a digital device **360** other than a handheld **340** to the telecommunications system for calling in accordance with embodiments of the invention. For example, embodiments of the invention may be used with digital devices **360** such as a desktop computer, laptop computer, iPad, tablet, iPod **790**, or the like.

With reference to FIGS. **3** and **5**, the handset **340** may be used to place outgoing (originating) calls from a secondary telephone number, using the telephone network automated structure shown in FIG. **3** and described above. If the party to be called has not yet been called using a secondary telephone number, an outgoing call from the handset **340** may be initiated to such party in step **502** by opening the handset application installed thereon. Once the handset application is open, the handset **340** may be used to choose a secondary telephone number as the originating telephone number in step **504**. A list of such secondary telephone numbers may be stored in memory associated with the handset.

In step **506**, the handset **340** may be used to enter, or select from an address file, a contact telephone number to be called in order to initiate a call to such telephone number. The handset application may cause the handset **340** to transmit information to the server **100** Call Manager **104** via the data channel automatically as a result of the selection of the secondary telephone number and the contact telephone number. The transmitted information may indicate the secondary telephone number from which the call is to appear to the called party to have been placed, and the contact telephone number to be called.

In step **508**, responsive to receipt of the data channel communication from the handset **340** requesting set up of a call from it to the telephone number to be called, the Call Manager **104** may access the call processing rules in the database **120** which are associated with the secondary telephone number from which the call is to appear to have been placed. In step **510**, subject to the accessed call processing rules, the Call Manager **104** may assign a bridge telephone number to be used to connect the call from the handset **340** to the switch **110** and send pre-call information including the bridge telephone number to the handset via the data channel.

The bridge telephone number may be associated with the switch **110**, and calls to the bridge telephone number may be

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automatically routed to this switch. Once the bridge telephone number is assigned, the server **100** under the control of the Call Manager **104**, may store information in the database **120** which associates the bridge telephone number with the primary telephone number for the handset **340**, the secondary telephone number selected for the call, and the contact telephone number to be called. More specifically, the stored information may indicate that each combination of primary telephone number and bridge telephone number are uniquely associated with each combination of secondary telephone number and contact telephone number. In other words, each combination of primary telephone number and bridge telephone number for the handset **340** map to a unique combination of secondary telephone number and contact telephone number in the database **120** memory.

In step **512**, responsive to receipt of the bridge telephone number information over the data channel, the handset application may cause the handset **340** to automatically call the bridge telephone number via a voice channel. The return call from the handset **340** to the bridge telephone number may be routed over the PSTN **310** to the switch **110** using a voice channel connection.

In step **514**, the Call Manager **104** may instruct the switch **110** to place a voice channel call to the telephone number to be called using the secondary telephone number as the originating telephone number from the switch. Once the call to the bridge telephone number from the handset **340** is received at the switch **110**, the switch may “bridge” the incoming voice channel call to the bridge telephone number with the outgoing voice channel call from the secondary telephone number to the contact telephone number to thereby connect the outgoing call from the handset **340** to the party being called via a voice channel. Further, the switch **110** may automatically send signaling information to the called party telephone which causes the secondary telephone number to be displayed as the number from which the call appears to have been placed. Because each pairing of a primary telephone number and a bridge telephone number maps to a unique contact telephone number and secondary telephone number pairing, the call can be completed at the switch **110** to the correct contact telephone number while showing the desired secondary telephone number as the originating number.

With continued reference to FIG. **5**, in the event that the contact telephone has been previously called using the secondary telephone number on the handset **340**, the user may directly select the bridge telephone number associated with the secondary telephone number and contact telephone number in step **506** either using the handset application in step **502**, or without opening the handset application in step **512**. Alternatively, the handset may have a stored “shortcut” which, when the user selects the contact telephone number to be called from the secondary telephone number, results in the associated bridge telephone number being dialed. In either case, the handset **340** may dial the bridge telephone number to connect with the Call Manager **104** in step **512**. In step **514**, the Call Manager **104** may look up the secondary telephone number and the contact telephone number associated with the paired bridge telephone number and primary telephone number for the handset **340**. Thereafter, the switch **110** may dial the contact telephone number and bridge the call from the handset **340** in a manner that makes the secondary telephone number appear to be the telephone number from which the call is being placed.

FIG. **6** is a call flow diagram illustrating a method of setting up and connecting a multi-party conference call in accordance with an embodiment of the present invention.

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With reference to FIGS. 3 and 6, the communication sequence for a conference call is illustrated between the handset application stored on the handset 340, the Call Manager 104 application associated with the server 100 and switch 110, and a conference call invitee handset. In step 600, the application on the handset 340 may be used to select invitees (users) for a conference call. The telephone numbers of the invitees may be selected from an address book or manually entered. Further, the conference call may be selected to be initiated immediately, or at some future date and time.

Once the invitees are selected, the handset 340 may be instructed by the handset application to transmit a conference request to the server 100 via a data channel. In step 602, the Call Manager 104 operating on the server 100 may assign a conference bridge telephone number to the conference call in response to receipt of the conference request. In step 604, the Call Manager 104 may cause the server 100 to send conference invitation messages to each of the invitee handsets, and more specifically, applications stored on the invitee handsets, via a data channel. The invitation messages may include the assigned bridge telephone number for the conference call and an optional PIN or code number for the conference call. The invitation message may provide a notice, for example, "Jack has invited you to join a conference call," and further include identification of other invited participants.

In step 606, each invitee handset may be used to accept to join the conference call, join at a later time, or decline to join. If the acceptance is for a future scheduled conference call, an indication of the acceptance (including acceptance to join late) may be transmitted from each invitee handset under the control of the application installed thereon, to the server 100 Call Manager 104 via the data channel. Further, if the invitation is declined altogether, an indication thereof may be transmitted from each invitee handset to the server 100. Thereafter, the Call Manager 104 may transmit information to the originating handset 340, and optionally the invitee handsets, via the data channel, which indicates acceptance of a future conference call, acceptance to join late (step 610), or declination of the conference call invitation.

If the conference call invitation is accepted and it is time for the call, each accepting invitee handset may automatically or manually dial the bridge telephone number using a voice channel. The switch 110 may receive the voice channel calls to the bridge telephone number and may authenticate the invitees right to join the conference call in step 608 by comparing the invitee's telephone number with that of the invitee list, as well as comparing any PIN input by the invitee with the PIN selected for the conference call. If the authentication is successful, the invitee handset is connected to the call via the voice channel. An automatic update may be transmitted via the data channel from the server to the originating handset 340 indicating that a particular invitee handset has joined the conference call.

If an invitee chose to join late, the server 100 may automatically transmit a reminder to the affected invitee handset to join the call at the agreed time in step 612. Thereafter, the late joining invitee handset may dial the bridge telephone number automatically or manually using a voice channel. The switch 110 may receive the voice channel call to the bridge telephone number, authenticate the late joining invitee handset, and connect the handset to the conference call in step 614.

The foregoing has described the principles, embodiments and modes of operation of the present invention. However,

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the invention should not be construed as being limited to the particular embodiments discussed. The above described embodiments should be regarded as illustrative rather than restrictive, and it should be appreciated that variations may be made in those embodiments by workers skilled in the art without departing from the scope of the present invention as defined by the following claims.

What is claimed:

1. A method of providing telephone service, comprising:
 - automatically storing electronic information that indicates an association of a secondary telephone number and a primary telephone number with a mobile device in a computer memory associated with a server;
 - automatically transmitting information that indicates an access telephone number to the mobile device via a data channel;
 - automatically associating the telephone access number with a switch associated with the server;
 - receiving, at the switch associated with the server, an outgoing call from the mobile device to the access telephone number via a second channel;
 - receiving, at the server, information from the switch indicating the outgoing call is being made to the access telephone number from the primary telephone number; and
 - receiving, at the switch, information from the server directing the switch to:
 - (a) connect the outgoing call to a contact telephone number indicated by the mobile device, and
 - (b) identify a telephone number from which the outgoing call is being made as the secondary telephone number.
2. The method of claim 1, wherein the data channel is an Internet protocol (IP) channel.
3. The method of claim 2, wherein the second channel is established in accordance with a CDMA or GSM standard.
4. The method of claim 1, wherein the second channel is not an Internet Protocol (IP) channel.
5. An apparatus, comprising:
 - a memory; and
 - a processor operatively coupled to the memory;
 the processor configured to automatically store electronic information that indicates an association of a secondary telephone number and a primary telephone number with a mobile device in a computer memory associated with a server;
 the processor configured to automatically transmit information that indicates an access telephone number to the mobile device via a data channel;
 the processor configured to automatically associate the telephone access number with a switch associated with the server;
 the processor configured to receive, at the server, information from the switch associated with the server and in response to the switch receiving an outgoing call from the mobile device to the access telephone number via a second channel;
 the information indicating the outgoing call is being made to the access telephone number from the primary telephone number;
 the processor configured to send, to the switch, information from the server directing the switch to:
 - (a) connect the outgoing call to a contact telephone number indicated by the mobile device; and
 - (b) identify a telephone number from which the outgoing call is being made as the secondary telephone number.

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6. The apparatus of claim 5, wherein the data channel is an Internet Protocol (IP) channel.

7. The apparatus of claim 5, wherein the second channel is established in accordance with a CDMA or GSM standard.

8. The apparatus of claim 5, wherein the second channel is not an Internet Protocol (IP) channel.

9. A non-transitory processor-readable medium storing code representing instructions to be executed by a processor, the code comprising code to cause the processor to:

automatically store electronic information that indicates an association of a secondary telephone number and a primary telephone number with a mobile device in a computer memory associated with a server;

automatically transmit information that indicates an access telephone number to the mobile device via a data channel;

automatically associate the telephone access number with a switch associated with the server;

receive, at the server, information from the switch associated with the server and in response to the switch receiving an outgoing call from the mobile device to the access telephone number via a second channel,

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the information indicating the outgoing call is being made to the access telephone number from the primary telephone number; and

send, to the switch, information from the server directing the switch to:

(a) connect the outgoing call to a contact telephone number indicated by the mobile device, and

(b) identify a telephone number from which the outgoing call is being made as the secondary telephone number.

10. The non-transitory processor-readable medium of claim 9, wherein the data channel is an Internet Protocol (IP) channel.

11. The non-transitory processor-readable medium of claim 9, wherein the second channel is established in accordance with a CDMA or GSM standard.

12. The non-transitory processor-readable medium of claim 9, wherein the second channel is not an Internet Protocol (IP) channel.

* * * * *

APPENDIX B

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Research Interests

Experimental computer science and engineering. Networking, operating, database, and transaction systems. Programming languages. Wireless and mobile networking. Design and implementation of router, switch, firewall, and wireless node prototypes. Cross-layer network design and implementation. Active networking and mobile code. Memory management and high-performance garbage collection. Persistent storage management and flash memory.

Education

1988 – 1995, Carnegie Mellon University **Pittsburgh, PA**

Ph.D. in Computer Science, 1996.

Thesis: *Safe and Efficient Persistent Heaps*

Advisor: Jeannette Wing

M.S. in Computer Science, 1992.

1981 – 1984, Department of Chemistry, Stanford University **Palo Alto, CA**

Ph.D. candidate. Research focus - statistical mechanics and computational chemistry.

1977 – 1981, Michigan State University **East Lansing, MI**

B.S. in Chemistry (Honors College), 1981.

Awards

2008 Grand Prize Award for WinCool Wireless Networking Demo Contest WiNTECH Workshop at ACM MobiCom 2008, San Francisco, CA for Hydra demonstration.

2005 Outstanding Faculty Software Engineering Masters Program.

2002 First PhD student, Michael Hicks, winner of the 2002 ACM SIGPLAN Doctoral Dissertation award.

1997 – 2001, NSF CAREER award for “CAREER: Advancing Experimental Computer Science in Storage Management and Education.”

1977 – 1981, Merit Scholar, Alumni Distinguished Scholar, Michigan State University.

Work Experience

May 2013 – Present **Austin, TX/San Francisco, CA**
Consultant.

June 2013 – May 2015, The University of Texas at Austin **Austin, TX**
Adjunct Associate Professor, Department of Electrical and Computer Engineering.

September 2005 – May 2013, The University of Texas at Austin **Austin, TX**
Associate Professor (with tenure), Department of Electrical and Computer Engineering.

September 1999 – August 2005, The University of Texas at Austin **Austin, TX**
Assistant Professor, Department of Electrical and Computer Engineering.

March 2001 – December 2004 University of Pennsylvania **Philadelphia, PA**
Adjunct Assistant Professor, Department of Computer and Information Science.

Scott M. Nettles

August 1998 – August 1999, The University of Arizona **Tucson, AZ**
 Visiting Assistant Professor, Department of Computer Science.

January 1995 – August 1999, University of Pennsylvania **Philadelphia, PA**
 Assistant Professor, Department of Computer and Information Science.

Summer 1990, DEC Systems Research Center **Palo Alto, CA**
 Wrote formal specification of copying garbage collection in Larch specification language.

September 1988 – December 1994, Carnegie Mellon University **Pittsburgh, PA**
 Research Assistant, School of Computer Science.

May 1985 – August 1988, DEC Western Research Laboratory **Palo Alto, CA**
 Designed and implemented CAD software, including Artemis, a graphics editor, and WCHCK, a well checker for the Magic VLSI layout system.

June 1984 – April 1985, Silicon Solutions, Inc. **Menlo Park, CA**
 Designed and implemented novel algorithms for VLSI mask generation.

Summers 1978, 1979, 1980, 1981, Michigan State University **East Lansing, MI**
 Research Assistant, Department of Chemistry.

Teaching Experience

September 1999 – 2011 **The University of Texas at Austin**

Spring 2011:

EE422C, Data Structures.

EE382N-5, Communication Networks: Technology/Architecture/Protocols.

EE372N, Telecommunication Networks.

Fall 2010:

EE422C, Data Structures.

Spring 2010:

EE322C, Data Structures.

EE382V, Wireless and Mobile Networking.

Fall 2009:

EE322C, Data Structures.

EE382N-5, Communication Networks: Technology/Architecture/Protocols.

Spring 2009:

EE382N-5, Communication Networks: Technology/Architecture/Protocols (ESE).

Fall 2008:

EE322C, Data Structures.

EE382N-5, Communication Networks: Technology/Architecture/Protocols.

Summer 2008:

Group Independent Study - Reading in Wireless and Mobile Networking.

Spring 2008:

EE382N-5, Communication Networks: Technology/Architecture/Protocols (ESE).

EE382V, Wireless and Mobile Networking.

Fall 2007:

EE322C, Data Structures.

EE382N-5, Communication Networks: Technology/Architecture/Protocols.

Summer 2007:

Group Independent Study - Reading in Wireless and Mobile Networking.

Scott M. Nettles

Spring 2007:

EE382N-5, Communication Networks: Technology/Architecture/Protocols (ESE).

EE382V, Wireless and Mobile Networking.

Fall 2006:

EE322C, Data Structures.

EE382N-5, Communication Networks: Technology/Architecture/Protocols.

Summer 2006:

Group Independent Study - Reading in Wireless and Mobile Networking.

Spring 2006:

EE382N-5, Communication Networks: Technology/Architecture/Protocols (ESE).

Fall 2005:

EE322C, Data Structures.

EE382N-5, Communication Networks: Technology/Architecture/Protocols.

Summer 2005:

Group Independent Study - Reading in Wireless and Mobile Networking.

Spring 2005:

EE372N, Telecommunication Networks.

EE382N-5, Communication Networks: Technology/Architecture/Protocols (ESE).

Fall 2004:

EE382N-5, Communication Networks: Technology/Architecture/Protocols.

Summer 2004:

Group Independent Study - Reading in Wireless and Mobile Networking.

Spring 2004:

EE372N, Telecommunication Networks.

EE382N-5, Communication Networks: Technology/Architecture/Protocols (ESE).

EE382V, Advanced Topics in Mobile Networking.

Previously:

9 terms (4 ESE), EE382N-5, Communication Networks: Technology/Architecture/Protocols.

3 terms, EE360P, Operating Systems.

2 terms, EE397K, Advanced Topics in Mobile Networking.

1 term, EE382N, Active and Mobile Networking.

1 term, EE397K, Advanced Topics in Active Networking.

August 1998 – August 1999**The University of Arizona**

Spring 1999, CS 425/525, Principles of Computer Networking.

Fall 1998, CS 576, Graduate Introduction to Computer Architecture.

January 1995 – May 1998**University of Pennsylvania**

4 terms, CIS 501, Graduate Introduction to Computer Architecture.

1 term, CIS 570, Advanced Programming Language Implementation.

1 term, CSE 385 (Honors), Experimental Computer Science Laboratory.

Fall 1988 – Fall 1994, School of Computer Science**Carnegie Mellon University**

Teaching assistant for Analysis of Algorithms and Introduction to Programming Languages.

Fall 1981 – Spring 1984, Department of Chemistry**Stanford University**

Teaching assistant for Freshman Chemistry, Physical Chemistry and Advanced

Physical Chemistry Laboratory. Head teaching assistant Freshman Chemistry.

Scott M. Nettles

Fall 1980 – Spring 1981, Department of Chemistry **Michigan State University**
Teaching assistant for Honors Freshman Chemistry.

Fall 1979 – Spring 1980, Lyman Briggs College **Michigan State University**
Head teaching assistant for Introductory APL and Introductory Fortran.

Funding

Past

“NeTS-ProWiN: Practical Use of Channel Information in Multihop Wireless Networks,” 9/06-8/10, NSF, \$725,802, PI: Scott Nettles, Co-PI: Robert Heath

“Cooperative Communication and Architectures for Cross-Layer Coordination,” 6/06-12/06, The Department of Defense (Air Force), \$118,401, PI: Scott Nettles Co-PI: Christine Julien

“NeTS - ProWiN: Collaborative Research: Exploiting Flexible PHYs in Networks: Prototype and Algorithms,” 9/04-8/06, NSF, \$500,000, PI: Scott Nettles, Co-PIs: Jeffrey Andrews, Sanjay Shakkottai, Robert Heath, Gustavo de Veciana, Co-Collaborator: Kapil Dandekar, Drexel University.

“MIMO Ad Hoc Battlefield Networks in Dense Urban Environments,” 6/04-5/05, National Instruments, \$52,500, PI: Robert Heath, Co-PIs: Scott Nettles, Jeff Andrews, Kapil Dandekar (Drexel University).

“ITR: Collaborative Research: Resource Allocation and Denial of Service Prevention in Active Networks,” 9/00-8/04, NSF (CSE-0081360), \$417,746, PI: Scott M. Nettles, Co-PI: Gustavo de Veciana, Co-Collaborator: Jonathan Smith, The University of Pennsylvania.

“CISE Research Instrumentation,” 3/00-2/03, NSF, \$139,481, with Doug Burger, Steve Keckler, Harrick Vin, Inderjit Dhillon, and Tandy Warnow.

“SCOUT: Scientific Computing Cluster of UT,” 8/00-7/01, IBM Shared University Research Grant, \$430,000, with Doug Burger, Steve Keckler, Harrick Vin, Inderjit Dhillon, and Tandy Warnow.

“Accelerating Network Evolution with a Software Switch for Active Networks,” 8/96-7/00, DARPA, \$3,175,688, PI: J. M. Smith, Co-PIs: D. J. Farber, C. A. Gunter, S. M Nettles, D. C. Feldmeier, and W. D. Sincoskie.

“Undergraduate Education in High Performance Computing,” 7/96-6/98, NSF, \$98,955, PI: V. Tannen, Co-PIs: I. Lee, S. Nettles, E. Simoncelli, I. Winston.

“A Storage Management Test-Bed,” 6/97-5/98, Penn Research Foundation, \$8,000, PI: S. Nettles.

“CAREER: Advancing Experimental Computer Science in Storage Management and Education,” 6/97-5/00, NSF, \$205,000, PI: S. Nettles.

“Intel Technology for Education 2000: ENIAC 2000,” 12/97-12/00, Intel, \$1,900.00, PI: David Farber. Note: Although we choose not to have Co-PIs on this grant, I was one of the primary authors.

Scott M. Nettles**Completed PhD Students**

Michael Hicks (“Dynamic Software Updating”, May 2001, University of Pennsylvania. Winner of the 2002 ACM SIGPLAN Doctoral Dissertation Award.) (Currently, Associate Professor, University of Maryland CS, CAREER Award 2004).

Jon Moore (“Practical Programmable Packets”, July 2002, University of Pennsylvania)).

Seong-kyu Song (“Applying Active Network Adaptability to Wireless Networks,” December 2004, The University of Texas at Austin).

Alex Garthwaite (“Making the Trains Run on Time”, December 2004, University of Pennsylvania)).

Minyoung Park (“Designing Medium Access Control Protocols for Multiple-Input Multiple-Output Wireless Networks,” July 2005, The University of Texas at Austin)

Yihong Zhou (“Spatial Usage and Power Control in Multihop Wireless Networks,” December 2006, The University of Texas at Austin)

Soon Hyeok Choi (“A Software Architecture for Cross-Layer Wireless Networks,” May 2008, The University of Texas at Austin)

Wonsoo Kim (“Improving the Performance of Wireless Networks using Frame Aggregation and Rate Adaptation,” December 2010, The University of Texas at Austin)

Ketan Mandke (“Validating Wireless Network Simulations Using Direct Execution,” February 2012, The University of Texas at Austin)

Karen Watkins (“Beam-Enabled Acoustic Link Establishment (BEALE) for Underwater Acoustic Networks,” April 2013, The University of Texas at Austin)

UT Master’s Students

MS Thesis Completed - Stephen Shannon, Sangyoo Ha, Vijaylaxmi Chakravarty, Anish Jacob, Hari Sankar.

MS Report Completed -

Vivek Kumar, Jay Shah, Manoj Agarwal, Harold Zhu, Divya Madhusudhan, Jaewoo Kim, Chatchawan Dejitthirat, Vijay Hampapur, Tatiana Garban, Diane Flemming, Anant Badrayani, Nikolaus Brauer, Omar Cardona, Edward Doan, Elton Faggett, Jermel Kyon Holman, Vijaya Jas, Adriana Lopez Prieto, Sanjay Mishra, Louis Orenstein, Nicholas Orlick, S. V. N. Vavilikolanu, Madeline Vega.

Former Post Doctoral Fellows

University of Pennsylvania - Luke Hornoff.

Completed Plan II Honors Thesis

Matthew Augustine (Also Senior Project).

Scott M. Nettles

Professional Activities

Technical Program Committee Member-International Working Conference on Active Networks, 2002, 2003, 2004.

Technical Program Committee Member-IEEE Computer and Communication Society (INFOCOM) Conference, 2003.

Member International Federation for Information Processing Working Group 6.7 on Active and Programmable Networks, 2000-Present.

Presentation to, Chief of Naval Operations Strategic Study Group, 2004.

NSF Wireless Networking PI meeting, 2004.

DARPA Application Private Networks workshop, 2003.

DARPA Active Networks Next Generation Workshop, 2001.

Co-Program Chair and Committee Member-International Working Conference on Active Networks, 2001.

DARPA Information Science and Technology Study Group (ISAT) on "Mobility and Security", 2000.

Technical Program Committee Member - International Symposium on Memory Management, 1998, 2000.

Co-organizer of the Seventh International Workshop on Persistent Object Systems. Cape May, New Jersey, June 1996.

NSF grant review panels CISE-CCR (compiler area) (1997), CISE-AINR (Network Area) (2000, 2001, 2003), CISE-NeTS (Network Area) (2004), CISE-SOD (2004)

Reviewer for a variety of conferences and journals, including: ACM Transactions on Programming Languages and Systems, the ACM SIGPLAN Conference on Programming Language Design and Implementation, IEEE Computer and Communication Society (INFOCOM) Conference, ACM SIGPLAN International Conference on Functional Programming, the ACM Symposium on Operating Systems Principles, and others.

Departmental Service

Graduate Admissions Committee, Communications, Networking, and Systems area, 2000-2011.

Computer Engineering Curriculum Committee, 1999-2004.

Communications, Networking, and Systems Curriculum Committee, 1999-2011.

Graduate Admissions Committee, Computer Engineering area, 2000-2002.

Undergraduate Appeals Committee, 2000-2004.

Department Metric Review Committee, 2002.

Scott M. Nettles

Publications and Talks

Books

1. "Proceedings of the Third International Working Conference on Active Networks," Ian W. Marshall, Scott Nettles, and Naoki Wakamiya editors, volume 2207 of Lecture Notes in Computer Science, 164 pages. Springer-Verlag, October 2001.
2. "Proceedings of the Seventh International Workshop on Persistent Object Systems," Richard Connor and Scott Nettles, Ed., 267 pages. *Morgan Kaufmann*, 1997.

Book Chapters

1. "Execution Environments," Scott M. Nettles and Michael Hicks, To appear in Active Networks, Bobby Bhattacharjee and James Sterbenz editors, John Wiley and Sons, U.K., 2004, Book in progress, our chapter is complete.
2. "Realizing SwitchWare," Jonathan M. Smith and Scott M. Nettles, Appears in Programmable IP Networks: Management and Rapid Service Deployment, A. Galis, S. Denazis, C. Klein, and C. Brou editors, Artech House (March 2004), pages 65-86.

Refereed Journal Publications

1. "Using Active Networking's Adaptability in Ad Hoc Routing." Nettles, S.M. and Song, S.K. , In IFIP Lecture Notes in Computer Science (LNCS). Vol. 3912, No. 3912, 138-155, 2011.
2. "Evolution in Action: Using Active Networking to Evolve Network Support for Mobility," Hicks, M. and Nettles, S., Seong-Kyu, S., and Shannon, S. , In IFIP Lecture Notes in Computer Science (LNCS). Vol. 2546, No. 2546, 146-161, 2011.
3. "Active Networking for TCP over Wireless," Nettles, S.M. and Song, S.K., In IFIP Lecture Notes in Computer Science (LNCS). Vol. 3912, No. 3912, 156-168, 2011.
4. "On the architecture of Authentication, Authorisation, and Accounting for real-time secondary market services," Yihong Zhou, Dapeng Wu, and Scott M. Nettles, In International Journal of Wireless and Mobile Computing (IJWMC), Vol. 4, No. 3, 2010
5. "On MAC-Layer Denial of Service Attacks in IEEE 802.11 networks: Analysis and Countermeasures," Yihong Zhou, Dapeng Wu, and Scott M. Nettles, Int. J. Wire. Mob. Comput. 1, 3/4 (Feb. 2006), 268-275.
6. "Dynamic Software Updating," Michael Hicks and Scott Nettles, In *ACM Transactions on Programming Languages and Systems*. 27, 6, (2005) 1049–1096
7. "Active Networking: One View of the Past, Present, and Future," Jonathan M. Smith and Scott Nettles, *IEEE Transactions on Systems, Man, and Cybernetics*, Part C 34(1): 4-18 (2004).
8. "Disk-Covering, a fast converging method for phylogenetic tree reconstruction," D. Huson, S. Nettles, and T. Warnow, *The Journal of Computational Biology*, Special issue for selected papers from RECOMB 1999, Vol. 6, No. 3, 1999, pp. 369-386. (This appeared in a preliminary form in the Proceedings of RECOMB 1999, as Obtaining highly accurate topology estimates of evolutionary trees from very short sequences. Lyon, France.)
9. "The Hybrid tree reconstruction method," D. Huson, S. Nettles, K. Rice, T. Warnow, and S. Yooshef *The Journal of Experimental Algorithmics*, Volume 4, Article 5, 1999. Special issue for selected papers from The Workshop on Algorithms Engineering, Saarbrücken, Germany, 1998. <http://www.jea.acm.org/1999/HusonHybrid/>.

10. "The SwitchWare Active Network Architecture," D. Scott Alexander, William A. Arbaugh, Michael W. Hicks, Pankaj Kakkar, Angelos D. Keromytis, Jonathan T. Moore, Carl A. Gunter, Scott M. Nettles, and Jonathan M. Smith, *IEEE Networking*, Special issue on Active and Controllable Networking, 1998.
11. "Composing First-Class Transactions," Nicholas Haines, Darrell Kindred, J. Gregory Morrisett, Scott M. Nettles, and Jeannette M. Wing, *ACM Transactions on Programming Languages and Systems*, Vol. 16, No. 6, November 1994, Pages 1719-1736.
12. "Solvent Isotope Effects Upon the Kinetics of Some Simple Electrode Reactions," Michael J. Weaver, Paul D. Tyma and Scott M. Nettles, *J. Electroanal. Chem.*, 140(1980).
13. "Solvent Isotope Effects Upon the Thermodynamics of Some Transition-Metal Redox Couples in Aqueous Media," Michael J. Weaver and Scott M. Nettles, *Inorg. Chem.*, 19(1980).

Invited Publications

1. "Chunks in PLAN: Language Support for Programs as Packets," Jonathan T. Moore, Michael Hicks, and Scott M. Nettles, *Proceedings of the 37th Annual Allerton Conference on Communication, Control, and Computing*, September 1999.

Refereed Conference Publications

1. "An Experimental Evaluation of Rate Adaptation for Multi-Antenna Systems," Wonsoo Kim, M. O. Khan, K. T. Truong, Soon-Hyeok Choi, R. Grant, H. K. Wright, K. Mandke, R. Daniels, R. W. Heath, Jr., and S. Nettles Appears in Proc. of the IEEE INFOCOM 2009, April 19-25, 2009, Rio de Janeiro, Brazil, pp. 2313 - 232 (2009).
2. "Improving the performance of multi-hop wireless networks using frame aggregation and broadcast for TCP ACKs," Wonsoo Kim, Hyrum K. Wright, and Scott M. Nettles Appears in CoNEXT '08: Proceedings of the 2008 ACM CoNEXT Conference (2008).
3. "Throughput/Delay Measurements of Limited Feedback Beamforming in Indoor Wireless Networks," R. Daniels, K. Mandke, S. Nettles and R. W. Heath, Jr. Appears in Proc. of IEEE Global Telecommunications Conf., pp. 1-6, New Orleans, LA, USA, Nov. 30 - Dec. 4, 2008 (2008)
4. "Machine learning for physical layer link adaptation in multiple-antenna wireless networks," R. Daniels, K. Mandke, Steven W. Peters, S. Nettles and R. W. Heath, Jr. Appears in WiNTECH '08: Proceedings of the third ACM international workshop on Wireless network testbeds, experimental evaluation and characterization, (2008)
5. "A Software Architecture for Cross-Layer Wireless Network Adaptations," Soon-Hyeok Choi, Dewayne E. Perry, and Scott M. Nettles Appears in WICSA '08: Proceedings of the Seventh Working IEEE/IFIP Conference on Software Architecture (2008)
6. "Physical Concerns for Cross-Layer Prototyping and Wireless Network Experimentation," K. Mandke, R. Daniels, Soon-Hyeok Choi, S. Nettles and R. W. Heath, Jr., Appears in Proc. of the Second ACM International Workshop on Wireless Network Testbeds, Experimental Evaluation and Characterization, pp. 11-18, Montreal, Canada, September 10, (2007).
7. "A MIMO Demonstration of Hydra," K. Mandke, R. Daniels, Soon-Hyeok Choi, S. Nettles and R. W. Heath, Jr. Appears in Proc. of the Second ACM International Workshop on Wireless Network Testbeds, Experimental Evaluation and Characterization, pp. 101-102, Montreal, Canada, September 10, (2007).

8. "Early Results on Hydra: A Flexible MAC/PHY Multihop Testbed," K. Mandke, Soon-Hyeok Choi, Gibeom Kim, R. Grant, R. Daniels, Wonsoo Kim, R. W. Heath, Jr., and S. Nettles Appears in Proc. of IEEE Vehicular Tech. Conf. , pp. 1896-1900, Dublin, Ireland, April 23 - 25, (2007).
9. "Multichannel Feedback in OFDM Ad Hoc Networks," T. Tang, K.Mandke, C. B. Chae, R. W. Heath, Jr., and S. Nettles Appears in IEEE Sensor and Ad Hoc Communications and Networks (SECON), vol. 2, pp. 701-706, (2006).
10. "Authentication, Authorization, and Accounting for Real-Time Secondary Market Services," Yihong Zhou, Dapeng Wu, and Scott M. Nettles, Appears in the IEEE International Conference on Communications (ICC) May 2005.
11. "Balancing the Hidden and Exposed Node Problems With Power Control In CSMA/CA-Based Wireless Networks," Yihong Zhou and Scott M. Nettles, Appears in the IEEE Wireless Communications and Networking Conference 2005.
12. "Improving TCP throughput for multi-hop wireless networks using multiple antennas," Minyoung Park and Scott M. Nettles, Appears in the Vehicular Technology Conference, 2005.
13. "An overhead controlled MAC protocol for high data-rate wireless networks," Soon-Hyeok Choi and Scott M. Nettles, Appears in the Vehicular Technology Conference, 2005.
14. "A max-min strategy for QoS improvement in MIMO ad-hoc networks," Seung Jun Baek, Gibeom Kim, and Scott M. Nettles, Appears in the Vehicular Technology Conference, 2005.
15. "Analyzing and Preventing MAC-Layer Denial of Service Attacks for Stock 802.11 Systems," Yihong Zhou, Dapeng Wu, and Scott M. Nettles, Appears in Proc. of IEEE/ACM First International Workshop on Broadband Wireless Services and Applications.
16. "Improving Throughput and Fairness for MIMO Ad Hoc Networks Using Antenna Selection Diversity," Minyoung Park, Robert W. Heath, Jr. and Scott Nettles, Appears in in Proc. of IEEE Global Telecommunications Conf., Dallas, TX, USA on Nov. 29 - Dec. 3, 2004.
17. "A MIMO-OFDM Transceiver for Ad Hoc Networking," Taiwen Tang, Minyoung Park, Robert W. Heath, Jr., and Scott M. Nettles, Appears in Proc. of International Workshop on Wireless Ad-hoc Networks, Oulu, Finland on May 31 - Jun. 3, 2004.
18. "Wireless Channel-aware Ad Hoc Cross-Layer Protocol with Multi-route Path Selection Diversity," Minyoung Park, Jeffery G. Andrews and Scott Nettles, Appears in Proceedings of the IEEE Vehicular Technology Conference, October, 2003.
19. "Scalable Distributed Management with Lightweight Active Packets," Jonathan T. Moore, Jessica Kornblum Moore, and Scott Nettles, Appears in the Fourth International Working Conference on Active Networks (IWAN 2002).
20. "Experiences with Capsule-based Active Networking," Jonathan T. Moore, Michael Hicks, David Wetherall, and Scott Nettles. In *Proceedings of DARPA Active Networks Conference and Exposition, 2002*, San Francisco, June 2002.
21. "Dynamic Software Updating," Michael Hicks, Jonathan T. Moore, and Scott Nettles, *Proceedings of the ACM SIGPLAN Conference on Programming Language Design and Implementation*, pages 13-23. ACM, June 2001. (~20% acceptance rate)
22. "Practical Programmable Packets," Jonathan T. Moore, Michael Hicks, and Scott Nettles, *Proceedings of the Twentieth IEEE Computer and Communication Society (INFOCOM) Conference*, pages 41-50. IEEE, April 2001. (23% acceptance rate)

23. "Compiling PLAN to SNAP," Michael Hicks, Jonathan T. Moore, and Scott Nettles. *Proceedings of the Third International Working Conference on Active Networks*, Ian W. Marshall, Scott Nettles, and Naoki Wakamiya editors, volume 2207 of Lecture Notes in Computer Science, pages 134-151. Springer-Verlag, October 2001.
24. "Active Networking Means Evolution (or enhanced extensibility required)," Michael Hicks and Scott Nettles. *Proceedings of the Second International Working Conference on Active Networks*, Hiroshi Yashuda editor, volume 1942 of Lecture Notes in Computer Science, pages 16-32. Springer-Verlag, October 2000.
25. "PLANet: An Active Internetwork," Michael Hicks, Jonathan T. Moore, D. Scott Alexander, Carl A. Gunter, and Scott Nettles, *Proceedings of the Eighteenth IEEE Computer and Communication Society (INFOCOM) Conference*, pages 1124-1133. IEEE, March 1999. (32% acceptance rate)
26. "Sidney and RDS: An Evaluation of Two Persistent Storage Systems," Scott M. Nettles, *Proceedings of the IEEE International Performance, Computing, and Communications Conference*, Phoenix, February 1999.
27. "PLAN: A Packet Language for Active Networks," Michael Hicks, Pankaj Kakkar, Jonathan T. Moore, Carl A. Gunter, and Scott Nettles, *The ACM SIGPLAN International Conference on Functional Programming (ICFP)*, pages 86-93. Baltimore, September 1998. (~20% acceptance rate)
28. "Transactions for Java," Alex Garthwaite and Scott Nettles, *IEEE International Conference on Computer Languages*, pages 16-27, Chicago, May 1998. (30% acceptance rate)
29. "A Study of Large Object Spaces," Michael Hicks, Luke Hornoff, Jonathan T. Moore, and Scott Nettles, *Proceedings of the International Symposium on Memory Management (ISMM)*, pages 138-145, Vancouver, October 1998.
30. "The SwitchWare Active Network Implementation," D. Scott Alexander, Michael W. Hicks, Pankaj Kakkar, Angelos D. Keromytis, Marianne Shaw, Jonathan T. Moore, Carl A. Gunter, Trevor Jim, Scott M. Nettles, and Jonathan M. Smith, *Proceedings of the ACM SIGPLAN Workshop on ML*, Baltimore, September 1998.
31. "Transactions in a Flash," Morgan Price and Scott Nettles. In *Proceedings of the Eighth Workshop on Persistent Object Systems*, pages 2-16, September 1998.
32. "Network Programming with PLAN," Michael Hicks, Pankaj Kakkar, Jonathan T. Moore, Carl A. Gunter and Scott Nettles, in *Internet Programming Languages, ICCL'98 Workshop*, Henri E. Bal and Boumediene Belkhouche and Luca Cardelli editors, volume 1686 of Lecture Notes in Computer Science, pages 127-143. Springer-Verlag, May 1998.
33. "The Disk-Covering Method for Tree Reconstruction," D. Huson, S. Nettles, L. Parida, T. Warnow, and S. Yooseph, *Algorithms and Experiments (ALEX)*, 1998.
34. "Active Bridging," Scott Alexander, Marianne Shaw, Scott M. Nettles, and Jonathan M. Smith, In *Proceedings of SIGCOMM '97*, pages 101-111, September 1997. (11% acceptance rate)
35. "Infrastructure for proof-referencing code," C. Gunter, P. Homeier and S. Nettles, in *Proceedings, Workshop on Foundations of Secure Mobile Code*, March 1997.
36. "The Measured Cost of Copying Garbage Collection Mechanisms," Michael Hicks, Jonathan T. Moore, and Scott Nettles, In *Proceedings of the International Conference on Functional Programming (ICFP)*, pages 292-305, June 1997. (32% acceptance rate)

37. "Transactions for Java," Alex Garthwaite and Scott Nettles, in *Proceedings of the First Workshop on Java and Persistence*, September 1996.
38. "A Rollback Technique for Implementing Persistence by Reachability," Scott Nettles and James O'Toole, in *Proceedings of the Seventh Workshop on Persistent Object Systems*, pages 120-127, June 1996.
39. "Concurrent Replicating Garbage Collection," James W. O'Toole and Scott M. Nettles, In *Proceedings of the ACM Conference on Lisp and Functional Programming*, pages 34-42, June 1994. Also MIT-LCS-TR-570 and CMU-CS-93-138. (~20% acceptance rate)
40. "Concurrent Compacting Garbage Collection of a Persistent Heap," James W. O'Toole, Scott M. Nettles, and David K. Gifford, In *Proceedings of the 14th ACM Symposium on Operating Systems Principles*, pages 161-174, ACM, December 1993. (27% acceptance rate) Also CMU-CS-93-137 and MIT-LCS-TR-569.
41. "Real-Time Replication Garbage Collection," Scott M. Nettles and James W. O'Toole, In *Proceedings of the SIGPLAN Symposium on Programming Language Design and Implementation*, pages 217-226, ACM, June 1993. (17% acceptance rate)
42. "Improving the Performance of SML Garbage Collection using Application-Specific Virtual Memory Management," Eric Cooper, Scott Nettles, and Indira Subramanian, In *Proceedings of the ACM Conference on Lisp and Functional Programming*, pages 43-52, June 1992. (~20% acceptance rate)
43. "Replication-Based Incremental Copying Collection," Scott M. Nettles, James W. O'Toole, David Pierce, and Nicholas Haines, in *Proceedings of the SIGPLAN International Workshop on Memory Management*, Springer-Verlag, pages 357-364, September 1992. Also CMU-CS-93-135.
44. "Extensions to Standard ML to Support Transactions," Jeannette M. Wing, Manuel Faehnrich, J. Gregory Morrisett, and Scott M. Nettles, in *ACM SIGPLAN Workshop on ML and its Applications*, pages 104-118, June 1992. Also CMU-CS-92-132, April 1992.
45. "Persistence + Undoability = Transactions," Scott M. Nettles and Jeannette M. Wing, in *Proceedings of Hawaii International Conference on Systems Science 25*, January 1992. Also CMU-CS-91-173, August 1991.
46. "Reliable Distributed Computing with Avalon/Common Lisp," Stewart M. Clamen, Linda D. Leibengood, Scott M. Nettles, and Jeannette M. Wing, In *Proceedings of the 1990 International Conference on Computer Languages*, pages 169-179, New Orleans, March 1990. Also CMU-CS-89-186.

Technical Reports

1. "General-Purpose Persistence Using Flash Memory," Jonathan T. Moore, Michael Hicks, and Scott Nettles. Technical Report MS-CIS-97-3, CIS Department, University of Pennsylvania, 1997.
2. "Switchware: Accelerating Network Evolution," J. M. Smith, D. J. Farber, C. A. Gunter, S. M. Nettles, D. C. Feldmeier, and W. D. Sincoskie. Technical Report MS-CIS-96-38, CIS Department, University of Pennsylvania, 1996.
3. "Safe and Efficient Persistent Heaps," Scott Nettles. Technical Report CMU-CS-TR-95-225, Carnegie Mellon School of Computer Science, December 1995.
4. "Tinkertoy Transactions," Nicholas Haines, Darrell Kindred, J. Gregory Morrisett, Scott M. Nettles, and Jeannette M. Wing, Technical Report CMU-CS-93-202, Carnegie Mellon Computer Science Department, December 1993.

5. "Venari/ML Interfaces and Examples," Jeannette M. Wing, Manuel Faehndrich, Nicholas Haines, Karen Kietzke, Darrell Kindred, J. Gregory Morrisett and Scott M. Nettles, Technical Report CMU-CS-93-123, Carnegie Mellon Computer Science Department, March 1993.
6. "A Larch Specification of Copying Garbage Collection," Scott Nettles, Technical Report CMU-CS-92-219, Carnegie Mellon Computer Science Department, December 1992.

Invited Talks

1. "PLAN and PLANet," Brown University, Department of Computer Science, Spring 1999.
2. "Safe and Efficient Persistent Heaps," The University of Arizona, Department of Computer Science, December 1998.
3. "PLAN and PLANet," The University of Arizona, Department of Computer Science, Spring 1998.
4. "PLAN and PLANet," Indiana University, Department of Computer Science, Spring 1998.
5. "PLAN and PLANet," The University of Texas at Austin, Department of Computer Sciences, Spring 1998.
6. "PLAN and PLANet," Rutgers University, Department of Computer Science, Spring 1998.
7. "Replicating Collection and the Oscar Performance Evaluation Tool," Sun Microsystems Java Research Group, August 1997.
8. "Replicating Collection and the Oscar Performance Evaluation Tool," Intel Java Research Group, August 1997.
9. "Transactions For Java," Carnegie Mellon, August 1996.
10. "Safe and Efficient Persistent Heaps," INRIA, June 1996.
11. "Real-Time Replication Garbage Collection," Xerox Palo Alto Research Center, Palo Alto, California, June 1993.
12. "Real-Time Replication Garbage Collection," DEC Systems Research Center, Palo Alto, California, June 1993.
13. "Real-Time Replication Garbage Collection," Massachusetts Institute of Technology, Cambridge, Massachusetts, November 1992.
14. "Persistence + Undoability = Transactions," European Computer Research Center, Munich, Germany, September 1992.
15. "Distributed First-Class Values for Functional Languages," European Computer Research Center, Munich, Germany, September 1992.

Invited Participant

1. NSF Wireless Networking PI meeting, January 2004.
2. NSF Networking PI meeting, November 2000, January 2003.
3. DARPA Active Networks Next Generation Workshop, December 2001.
4. DARPA Active Networks PI Meeting, December 2001.
5. DARPA Focus 2000, June 2000.
6. DARPA Active Networks Demonstration, December 2000.

7. OOPSLA '97 Workshop on Memory Management and Garbage Collection, Atlanta GA, October 1997.
8. Third DARPA Workshop on Active Networks, June 1997.
9. DARPA Workshop on Foundations for Secure Mobile Code, March 1997.
10. Second DARPA Workshop on Active Networks, March 1997.
11. First DARPA Workshop on Active Networks, September 1996.
12. OOPSLA '93 Workshop on Memory Management and Garbage Collection, Washington, D.C., September 1993.

Software Distributions

1. The Active Bridge. <http://www.cis.upenn.edu/~switchware/activebridge/>
2. PLAN and PLANet. <http://www.cis.upenn.edu/~switchware/PLAN/software.html>
3. Oscar. <http://www.cis.upenn.edu/~oscar/oscar.tar.gz>
4. SNAP. <http://www.cis.upenn.edu/~switchware/SNAP/snap1.0.tar.gz>.
5. Hydra. <http://hydra.ece.utexas.edu/download/>

Consulting

October 2020 - Present

Type of Matter: Patent Infringement

Law Firm: Brown Rudnick LLP representing WSOU Investments, LLC d/b/a Brazos Licensing and Development

Case: WSOU Investments, LLC D/B/A Brazos Licensing And Development, V. Hewlett Packard Enterprise Company. (Cases 6:20-cv-00725-ADA, 6:20-cv-00726-ADA, 6:20-cv-00727-ADA, 6:20-cv-00728-ADA)

Services Provided: Retained as a testifying expert witness for plaintiff. Produced declaration on claim construction.

Disposition: Awaiting hearing.

October 2020 - Present

Type of Matter: Patent Infringement

Law Firm: Brown Rudnick LLP representing WSOU Investments, LLC d/b/a Brazos Licensing and Development

Case: WSOU Investments, LLC D/B/A Brazos Licensing And Development, V. Juniper Networks, INC. (Cases 6:20-cv-00812-ADA, 6:20-cv-00813-ADA, 6:20-cv-00814-ADA, 6:20-cv-00815-ADA, 6:20-cv-00902-ADA, 6:20-cv-00903-ADA)

Services Provided: Retained as a testifying expert witness for plaintiff. Produced declaration on claim construction.

Disposition: Awaiting hearing.

September 2020 - Present

Type of Matter: Patent Infringement

Law Firm: Erise IP, P.A. representing Gogo LLC.

Case: Linksmart Wireless Technology, LLC, Vs. Gogo LLC, (Case No.: 8:18-Cv-00662-Rgk (Jdex) Consolidated)

Services Provided: Retained as testifying expert witness for defendant on non-infringement. Produced a report and was deposed.

Disposition: Awaiting trial.

July 2020 - March 2021

Type of Matter: Patent Infringement

Law Firm: Covington & Burling LLP representing Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc.

Case: Ancora Technologies, Inc., V. Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc.. (Civil Action No. 1:20-Cv-034-Ada)

Services Provided: Retained as testifying expert witness for the defendant. Produced a report on validity and non-infringement.

Disposition: Case settled.

May 2020 - Present

Type of Matter: Patent Infringement

Law Firms: Connor Kudlac Lee PLLC and Whitaker Chalk Swindle & Schwartz representing Pinn, Inc.

Case: Pinn, Inc., v Apple, Inc. (Case No. 8:19-cv-1805-DOC-JDE)

Services Provided: Retained as a testifying expert witness for plaintiff. Produced and was deposed on report concerning validity.

Disposition: Awaiting trial.

December 2019 - Present

Type of Matter: Patent Infringement

Law Firm: The Elliott Law Firm, PLLC and Smyser Kaplan & Veselka, LLP representing Return Mail, Inc.

Case: Return Mail, Inc. v United States, Case No. 1:11-cv-00130, Judge Lettow, The United States Court of Federal Claims.

Services Provided: Retained as a testifying expert witness. Produced and was deposed on report concerning validity.

Disposition: Awaiting trial.

December 2018 - February 2020

Type of Matter: Patent Infringement

Firm: J. C. Penney Company, Inc.

Case: CXT Systems, Inc. v. J. C. Penney Company, Inc., No. 2:18-cv-00233 (E. D. Tex.) (Lead CXT Systems, Inc. v. Academy, Ltd., et al., No. 2:18-cv-171 (E.D. Tex.))

Services Provided: Retained as testifying expert witness on non-infringement. Produced a report and was deposed.

Disposition: Case settled.

July 2018 - January 2020

Type of Matter: Patent Infringement

Law Firm: Erise IP, P.A. representing Digital Ally, Inc.

Case: Digital Ally, Inc., v Enforcement Video, LLC d/b/a Watchguard Video (Case No. 2:16-cv-2349, D. Kan)

Services Provided: Retained as a testifying expert witness for plaintiff.

Disposition: Case settled.

July 2018 - Present

Type of Matter: Patent Infringement

Law Firm: Erise IP, P.A. representing Digital Ally, Inc.

Case: Digital Ally, Inc., v TASER International, Inc. (Case No. 2:16-cv-2032, D. Kan)

Services Provided: Retained as a testifying expert witness for plaintiff. Produced and was deposed on reports concerning infringement and validity.

Disposition: Ongoing.

May 2018 - Present

Type of Matter: Class Action

Law Firm: Pomerantz LLP representing Williams, et al.

Case: Williams, et al. v. Apple, Inc., United States District Court for the Eastern District of New York, Civil Action No. 15-cv-07381 (SJ) (LB).

Services Provided: Retained as a testifying expert witness for the plaintiffs. Produced and was deposed on reports concerning technical issues in the class certification phase. Class was certified. Currently working on report.

Disposition: Ongoing.

January 2018 - February 2018

Type of Matter: Patent Infringement

Law Firm: Tensegrity Law Group LLP representing Arista Networks, Inc.

Case: Arista Networks, Inc. v. Cisco Systems, Inc. No. 5:16-CV-00923-BLF (N.D. Cal.)

Services Provided: Provided a declaration concerning the validity of my opinions from the Cisco/Arista ITC case listed below.

May 2017 - May 2021

Type of Matter: Patent Infringement

Law Firm: Mishcon de Reya New York LLP followed by King & Wood Mallesons LLP representing ChanBond, LLC Cases: ChanBond, LLC v. Atlantic Broadband Group, LLC (15-CV- 842); ChanBond, LLC v. Bright House Networks, LLC (15-CV- 843); ChanBond, LLC v. Cable One, Inc. (15-CV- 844); ChanBond, LLC v. Cablevision Systems Corp. et al. (15-CV- 845); ChanBond, LLC v. Cequel Communications LLC et al. (15-CV- 846); ChanBond, LLC v. Charter Communications, Inc. (15-CV- 847); ChanBond, LLC v. Comcast Corp. et al. (15-CV- 848); ChanBond, LLC v. Cox Communications, Inc. (15-CV- 849); ChanBond, LLC v. Mediacom Communications Corp. (15-CV- 850); ChanBond, LLC v. RCN Telecom Services, LLC (15-CV- 851); ChanBond, LLC v. Time Warner, Inc. et al. (15-CV- 852); ChanBond, LLC v. WaveDivision Holdings, LLC (15-CV- 853); ChanBond, LLC v. WideOpenWest Finance, LLC (15-CV- 854); All in the United States District Court for Delaware

Services Provided: Retained as a testifying expert witness for plaintiff. Produced and was deposed on reports concerning infringement. Testified in jury trial of ChanBond, LLC v. Cox Communications, Inc. (15-CV- 849).

Disposition: ChanBond, LLC v. Cox Communications, Inc. (15-CV- 849) went to trial on May 20, 2021. I testified remotely by zoom starting the second day of trial, May 24, 2020. I testified the entire day of May 24, 2020, completing my direct, cross, and redirect. All parties settled before the next day of trial.

February 2017 - November 2017

Type of Matter: Patent Infringement

Law Firm: Erise IP, P.A. representing Sandvine Corporation and Sandvine Incorporated ULC

Case: Packet Intelligence LLC v. Sandvine Corporation and Sandvine Incorporated ULC United States District Court for the Eastern District of Texas, Marshall Division. Civil Action No. 16-cv-147

Services Provided: Retained as a testifying expert witness for defendant. Produced and was deposed on reports concerning invalidity and non-infringement. Testified at trial on non-infringement.

Disposition: Jury found in favor of the defendant.

February 2017 - July 2017

Type of Matter: Inter Partes Review

Law Firm: Mishcon de Reya New York LLP representing Chanbond LLC

Case: Cisco Systems, Inc. v. Chanbond LLC, Patent Trial and Appeal Board - Cases IPR2016-01744

Services Provided: Retained as a testifying expert witness. Produced declarations in support of the patent owner in the above-mentioned matters. Deposed on declarations.

Disposition: The PTAB found for the petitioner, under appeal.

August 2016 - January 2017

Type of Matter: Inter Partes Review

Law Firm: Ascenda Law Group representing Chanbond LLC

Case: RPX Corp v. Chanbond LLC - Patent Trial and Appeal Board - Cases IPR2016-00234

Services Provided: Retained as a testifying expert witness. Produced declarations in support of the patent owner in the above-mentioned matters. Deposed on declarations.

Disposition: The PTAB found for the patent holder.

February 2016 - May 2016

Type of Matter: Inter Partes Review

Law Firm: Handal & Associates

Case: Google Inc., Nest Labs, Inc., and Dropcam, Inc., v. e.Digital Corporation Cases IPR2015-01470-01475

Services Provided: Retained as a testifying expert witness. Produced declarations in support of the patent owner in the above-mentioned matters. Case settled.

December 2015 - December 2017

Type of Matter: Patent Infringement

Law Firm: Cohen & Grace, LLC representing Innovative Memory Systems, Inc.,

Case: Innovative Memory Systems, Inc., v. Micron Technology, Inc., Case No. 1:14-Cv-01480-Rga

Services provided: Retained as a testifying expert witness. Produced declaration in support of related IPR (IPR: 2016-00330) and was deposed on declaration.

October 2015 - January 2016

Type of Matter: Inter Partes Review

Law Firm: Ascenda Law Group representing Certified Measurement, Inc.

Case: Itron, Inc, v. Certified Measurement, Inc. Case IPR2015-00570

Services Provided: Retained as a testifying expert witness. Produced a declaration in support of the patent owner in the above-mentioned matter. Deposed on declaration. Case settled.

September 2015 - 2020

Type of Matter: Patent Infringement

Law Firm: Mishcon de Reya New York LLP representing Sycamore IP Holdings LLC

Case: Sycamore IP Holdings LLC v. AT&T Corp. et al., United States District Court for the Eastern District of Texas, Marshall Division. Civil Action No.2:16-cv-588-WCB

Services Provided: Retained as a testifying expert witness for plaintiff. Produced and was deposed on reports concerning infringement and validity.

Disposition: Trial pending claim construction appeal

March 2015 - 2019

Type of Matter: Patent Infringement

Law Firm: Mishcon de Reya New York LLP followed by DiNovo Price LLP representing KlausTech, Inc.

Case: KlausTech, Inc., v. Google LLC United States District Court for the Northern District of California Case No. 4:10-cv- 05899-JSW

Services Provided: Retained as a testifying expert witness for plaintiff. Produced and was deposed on reports concerning infringement and validity.

Disposition: Ended

March 2015 - 2016

Type of Matter: Inter Partes Review

Law Firm: Ascenda Law Group representing Clouding Corp

Case: EMC Corp v. Clouding Corp - Patent Trial and Appeal Board - Cases CBM2014-00116-0118

Services Provided: Retained as a testifying expert witness. Produced declarations in support of the patent owner in the above-mentioned matters. Deposed on declarations.

February 2015 - September 2015

Type of Matter: Patent Infringement

Law Firm: Fish & Richardson representing Arista Networks, Inc.

Case: Cisco Systems v. Arista Networks, Inc. U.S. International Trade Commission, Investigation 337-TA-944

Services Provided: Retained as a testifying expert witness for respondent. Produced expert reports on Invalidity and Noninfringement for two of the patents-in-suit. Was deposed on these reports and prepared witness statements for trial. One patent dropped prehearing. Testified for ALJ Shaw on non-infringement and invalidity of the second. Finding of non-infringement.

February 2015 - June 2015

Type of Matter: Patent Infringement

Law Firm: Verrill Dana LLP representing Verisilicon, Inc.

Case: Uniloc USA, et al. v. Verisilicon, Inc. United States District Court for the Eastern District of Texas, Tyler Division. Civil Action No. 6:14-cv-486

Services Provided: Retained as a testifying expert witness for defendant Produced declaration on claim construction. Deposed on declaration. Testified at Markman hearing. Case settled before Markman ruling.

February 2015 - May 2015

Type of Matter: Injunction enforcement

Law Firm: Greenberg Traurig LLP representing Global Ground Automation, Inc.

Case: Global Ground Automation, Inc. v. ORISSA HOLDINGS, LLC, GROUND MANAGEMENT HOLDINGS, LLC, individually and dba GROUNDSPAN, and GROUNDWIDGETS-C.A. No. 6:15-cv-002-RWS-JDL

Services Provided: Retained as a testifying expert witness. Produced declaration in support of the patent owner in the above-mentioned matters. Deposed on declaration. Testified at hearing.

October 2014 - March 2015

Type of Matter: Covered Business Method Patent Review

Law Firm: The Elliott Law Firm, PLLC representing Return Mail, Inc.

Case: United States Postal Service v. Return Mail, Inc. - Patent Trial and Appeal Board - Case CBM2014-00116

Services Provided: Retained as a testifying expert witness. Produced a declaration in support of the patent owner in the above-mentioned matter.

April 2014 - July 2014

Type of Matter: Covered Business Method Patent Review

Law Firm: Rothwell, Figg, Ernst & Manbeck, P.C. representing Versata Development Group, Inc.

Case:

SAP America, Inc. and SAP AG v. Versata Development Group, Inc. US PTO - Patent Trial and Appeal Board - Case CBM2013-00042

Services Provided: Retained as a testifying expert witness. Produced a declaration in support of the patent owner in the above-mentioned matter.

January 2014 - July 2014

Type of Matter: Patent Infringement

Law Firm: Fisch Hoffman Sigler, LLP representing J.C. Penney Corporation, Inc.

Case: EMG Technology, LLC v. J.C. Penney Corporation, Inc. United States District Court for the Eastern District of Texas, Tyler Division. Civil Action No. 6:12-cv-00905

Services Provided: Retained as a testifying expert witness for defendant, J.C. Penney Corporation, Inc.. Produced an expert report on non-infringement.

Disposition: Case dismissed at EMG's request.

January 2014 - July 2014

Type of Matter: Patent Infringement

Law Firm: McAndrews Held & Malloy, Ltd. representing Walgreen Company

Cases: Walgreen Co. v. CVS Caremark Corp., United States District Court for the District of Delaware Civil Action No. 1:14-cv-00123-GMS and Walgreen Co. v. Rite Aid Corp., United States District Court for the District of Delaware Civil Action No. 1:14-cv-00124-GMS and Walgreen Co. v. Shopko Stores Operating Co. LLC, United States District Court for the District of Delaware Civil Action No. 1:14-cv-00125-GMS

Services Provided: Retained as a testifying expert witness in three closely related cases. Produced a declaration concerning infringement by each of the defendants.

Disposition: Case currently stayed.

December 2013 - April 2014

Type of Matter: Covered Business Method Patent Review

Law Firm: Haynes and Boone, LLP representing Versata Development Group, Inc.

Case: Volusion, Inc., v. Versata Development Group, Inc. US PTO - Patent Trial and Appeal Board - Cases CBM2013-00017 and CBM2013-00018

Services Provided: Retained as a testifying expert witness. Produced declarations in support of the patent owner in the above-mentioned matters. Deposed on declarations.

September 2013 - March 2014

Type of Matter: Patent Infringement

Law Firm: Taylor & Dunham, LLP representing Altium, Inc.

Case: Uniloc Luxembourg S.A., et al. v. Altair Engineering, Inc., et al. United States District Court for the Eastern District of Texas, Tyler Division. Civil Action No. 6:12-cv-806

Services Provided: Retained as a testifying expert witness for defendant, Altium. Produced declaration concerning claim construction issues.

Disposition: Client settled.

November 2012 - June 2016

Type of Matter: Patent Infringement

Law Firm: Taylor & Dunham, LLP representing Helios Software, LLC and Pearl Software, Inc.

Case: Helios Software, LLC and Pearl Software, Inc., v. Awareness Technologies, Inc., et al. United States District Court for the District of Delaware Civil Action No. 11-1259-LPS

Services Provided: Retained as a testifying expert witness. Produced expert reports on infringement, validity, and rebuttal of defendants expert report on non-infringement. Deposed on reports. Summary judgement finding for defendant.

November 2012 - June 2016

Type of Matter: Patent Infringement

Law Firm: Taylor & Dunham, LLP representing Helios Software, LLC and Pearl Software, Inc.

Case: Helios Software, LLC and Pearl Software, Inc., v. Spectorsoft Corporation, United States District Court for the District of Delaware Civil Action No. 12-081-LPS

Services Provided: Retained as a testifying expert witness. Produced expert reports on infringement, validity, and rebuttal of defendants expert report on non-infringement. Deposed on infringement and reply to defendant's expert report on non-infringement and on rebuttal of defendant's expert report on invalidity. Served as testifying expert at trial. Jury verdict for the defendant. Case settled prior to final judgement being entered.

October 2012 - December 2013

Type of Matter: Patent Infringement

Law Firm: Hosie Rice LLP representing Masterobjects, Inc.

Case: Masterobjects, Inc., v. eBay Inc., United States District Court for the Northern District of California Civil Action No. C 12-0680 (JSC)

Services Provided: Retained as a testifying expert witness. Produced expert report on infringement.

May 2012 - March 2013

Type of Matter: Patent Infringement

Law Firm: Hosie Rice LLP representing Implicit Networks, Inc.

Case: Implicit Networks, Inc., v. F5 Networks, Inc., United States District Court for the Northern District of California Civil Action No. C 10-3365 SI

Services Provided: Retained as a testifying expert witness. Produced report on infringement and validity. Was deposed on reports.

Disposition: Judge granted summary judgment of invalidity. Currently being appealed.

May 2012 - March 2013

Type of Matter: Patent Infringement

Law Firm: Hosie Rice LLP representing Implicit Networks, Inc.

Case: Implicit Networks, Inc., v. Juniper Networks, Inc. United States District Court for the Northern District of California Civil Action No. C 10-4234 SI

Services Provided: Retained as a testifying expert witness. Produced report on infringement and validity. Was deposed on reports.

Disposition: Judge granted summary judgment of invalidity. Currently being appealed.

November 2011 - August 2013

Type of Matter: Patent Infringement

Law Firm: McKool Smith representing MOSAID Technologies Inc.

Case: MOSAID Technologies Inc. v. Dell, et al. United States District Court for the Eastern District of Texas, Marshall Division Civil Action No. 2:11-CV-179

Services Provided: Retained as a testifying expert witness.

Disposition: Case settled.

October 2011 - June 2013

Type of Matter: Patent Infringement

Law Firm: McKool Smith representing Ericsson Inc.

Case: Ericsson Inc. et al., v. D-Link Corporation, et al. United States District Court for the Eastern District of Texas, Tyler Division Civil Action No. 6:10-cv-00473-LED

Services Provided: Retained as a testifying expert witness. Produced report on infringement and validity. Was deposed on reports. Testified on infringement and validity at trial.

Disposition: Jury found infringement of three patents and that patents were valid.

October 2011 - March 2013

Type of Matter: Patent Infringement

Law Firm: McKool Smith representing VirnetX Inc.

Case: VirnetX Inc., v. Apple Inc. et al. United States District Court for the Eastern District of Texas, Tyler Division Civil Action No. 6:10-cv-417

Services Provided: Retained as a testifying expert witness. Produced report on infringement. Deposed on report. Testified on infringement at trial.

Disposition: Jury found non-infringement but that patents-in-suit were valid. Currently being appealed.

October 2011 - August 2013

Type of Matter: Patent Infringement

Law Firm: McKool Smith representing VirnetX Inc.

Case: VirnetX Inc., v. Mitel Networks Corporation, et al. United States District Court for the Eastern District of Texas, Tyler Division Civil Action No. 6:11-cv-00018-LED

Services Provided: Retained as a testifying expert witness. Produced report on infringement. Deposed on report.

Disposition: Case settled.

August 2011 - March 2014

Type of Matter: Trade secret misappropriation

Law Firm: McGinnis, Lochridge & Kilgore, L.L.P. representing Versata.

Case: Versata Software, Inc., et al. v. Infosys Technologies Ltd., United States District Court for the Western District of Texas, Austin Division, Civil Action No. 1:10-cv-00792 SS

Services Provided: Retained as a testifying expert witness on trade secrets. Produced report, supplemental report, and second supplemental on trade secret misappropriation. Deposed on reports.

Disposition: Case settled.

May 2011 - February 2012

Type of Matter: Patent Infringement

Law Firm: Buether Joe & Carpenter, LLC representing J.C. Penney Company, Inc. Marshall, Gerstein & Borun LLP representing CDW, LLC.

Case: Eolas Technologies Incorporated, v. Adobe Systems Inc. et al., United States District Court for the Eastern District of Texas, Tyler Division, Civil Action No. 6:09-cv-446-LD. (Judge Davis)

Services Provided: Retained as a testifying expert witness on non-infringement. Produced report on non-infringement. Was deposed on report. Jury found patents invalid. Under appeal.

April 2011 - June 2012

Type of Matter: Patent Infringement

Law Firm: Jones Day representing Hypercom Corp. Kolisch Hartwell, P.C. representing Verifone. Morris, Manning & Martin LLP representing Ingenico.

Case: CardSoft, Inc., et al. v. Verifone Systems, Inc., et al. United States District Court for the Eastern District of Texas, Marshall Division, Civil Action No. 2:08-CV-00098-CE. (Judge Payne)

Services Provided: Retained as a testifying expert witness on non-infringement. Produced report on non-infringement. Deposed on report. Testified on non-infringement at trial.

Disposition: Jury found Hypercom and Verifone infringed and that Ingenico did not infringe. Currently being appealed.

December 2010 - March 2012

Type of Matter: Patent Infringement

Law Firm: McKool Smith representing LML Patent Corp.

Case: LML Patent Corp. v. JP Morgan Chase & Co. et al. United States District Court for the Eastern District of Texas, Marshall Division Civil Action No. 2:08CV448(DF). (Judge Folsom)

Services Provided: Retained as a testifying expert witness on infringement. Produced two expert reports on infringement. Deposed on the first report February 2011. Deposed on both reports July 2011. Settled before trial.

August 2010 – June 2012

Type of Matter: Patent Infringement

Law Firm: McKool Smith representing Versata Software, Inc., Versata Development Group, Inc., and Versata Industry Solutions, Inc. (Versata F/K/A Trilogy)

Case: Versata Software, Inc. et al. v. Internet Brands, Inc. f/k/a CarsDirect.com, Inc. et al. No. 2:08-CV-313 in the United States District Court for the Eastern District of Texas. (Judge Bryson)

Services Provided: Retained as a testifying expert witness. Produced report on infringement and validity as well as reverse engineering and trade secret issues. Was deposed on reports. Testified on infringement, validity, and trade secrets at trial.

Disposition: Jury found for the defendant on both patent and trade secret issues. Currently being appealed.

June 2010 - February 2011

Type of Matter: Patent Infringement

Law Firm: McKool Smith representing i2 Technologies, Inc.

Case: i2 Technologies, Inc. et al. v. Oracle Corporation, et al. No. 6:09-CV-194-LED in the U.S. District Court – Eastern District of Texas – Tyler Division. (Judge Davis)

Services Provided: Retained as a testifying expert witness on invalidity and non-infringement. Produced report on the invalidity of the patent in suit and a rebuttal report to Oracles's experts report on infringement. Deposed February 2011. Settled before trial.

December 2009 – October 2010

Type of Matter: Patent Infringement

Law Firm: Akin Gump Strauss Hauer & Feld LLP representing Hyundai Motor America, Inc., Hyundai Motor Manufacturing Alabama LLC, and Kia Motors America, Inc.

Case: Affinity Labs of Texas, LLC v. BMW North America, LLC et al. C.A. No. 9:08-cv-00164-RC in the United States District Court for the Eastern District of Texas (Lufkin.) (Judge Clark)

Services Provided: Retained as a testifying expert witness on non-infringement of the Hyundai entities products. Advised client concerning claim construction and testified informally at claim construction hearing. Produced a report on non-infringement and was deposed on said report. Testified on non-infringement at trial.

Disposition: Jury found the patents valid and infringed. Jury awarded Affinity Labs \$2.8 Million in damages. Currently being appealed.

October 2007 – March 2010

Type of Matter: Patent Infringement

Law Firm: McKool Smith representing Versata Software, Inc., Versata Development Group, Inc., and Versata Industry Solutions, Inc. (Versata F/K/A Trilogy)

Case: Versata Software, Inc., Versata Development Group, Inc., Versata Industry Solutions, Inc., v. SAP America, Inc., SAP, AG, C.A. No. 2:07-CV-153-CE in the United States District Court for the Eastern District of Texas. (Judge Everingham)

Services Provided: Retained as a testifying expert witness. Did extensive source code and other analysis. Produced reports on infringement and validity as well as several supplemental reports, produced various declarations, was deposed concerning claim construction, both expert reports, and late discovery. Testified as sole technical expert during trial. Testified at inequitable conduct hearing.

Disposition: Jury found the patents valid and infringed. Jury awarded Versata \$138.6 Million in damages. A subsequent trial resulted in a new damages award of \$391 Million. SAP's appeal was not granted.

October 2007 – April 2009

Type of Matter: Patent Infringement

Law Firm: McKool Smith representing Versata Software, Inc. and Versata Development Group, Inc.

Case: Versata Software, Inc., Versata Development Group, Inc., v. Sun Microsystems Inc. , C.A. No. 2:06-CV-358-TJW in the United States District Court for the Eastern District of Texas. (Judge Ward)

Services Provided: Retained as a testifying expert witness. Did extensive source code and other analysis. Produced reports on infringement and validity as well as several supplemental reports, produced various declarations, was deposed concerning claim construction and both expert reports. Testified as sole technical expert during trial.

Disposition: Jury found there was no infringement and invalidated the patents. Settled during appeal.

March 2007 – July 2007

Type of Matter: Patent Infringement

Law Firm: Slusser Wilson & Partridge, LLP representing Hybrid Patents Incorporated

Case: Hybrid Patents Incorporated v. Charter Communications, Inc., C.A. No. 2:05-CV-436-TJW in the United States District Court for the Eastern District of Texas. (Judge Ward)

Services Provided: Retained as an expert witness. Produced reports on infringement and validity as well as a supplemental report, produced various declarations, was deposed concerning both reports, and testified during the trial as the sole technical expert.

Disposition: Jury found there was no infringement but did not invalidate the patents. Settled during appeal.

Exhibit F

REDACTED

Exhibit G

Dialpad acquires Koopid
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Switch.co Renames as Dialpad, Transforms Workplace Communications

Dialpad Expands Executive Team, Adding Vice Presidents of Sales and Marketing and a Head of Design

SAN FRANCISCO & ORLANDO - March 7, 2016 - Dialpad, communications for the modern workplace, today announced at Enterprise Connect it has changed its name from Switch.co. The new name reflects a user-centric design strategy that has led to revolutionary communication products, including Dialpad and Dialpad UberConference, that fit the real-world needs of today's workers and the modern enterprise.

Dialpad simplifies communications for businesses, presenting an easy-to-use, unified "dialpad" access to voice, video, messaging and meetings across any device. This reconceptualization of how communication services are presented to users represents a major shift for the industry that will eliminate a major drag on productivity, especially for today's highly distributed organizations. Dialpad's products are currently used by 60 percent of Fortune 500 companies.

Dialpad also announced three experienced, high-profile additions to the team, including Morgan Norman as Vice President of Marketing, Steve Milner as Vice President of Sales and Omar Lee as Head of Design.

Dialpad allows workers to have more productive business conversations across every channel and medium – chat, voice, conference, documents, and even video – inside and outside of the company network. Dialpad is integrated with Microsoft Office 365, Google Apps for Work and core social

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"The largest open social network is the phone – it's how we connect across our personal and professional lives," said Dialpad CEO Craig Walker.

"Dialpad's approach to voice allows companies and coworkers to take greater advantage of it and always reach people on their own terms. But fully 'socializing' voice this way required a complete rethinking of how we present communication services to workers from any device or application. The result of this effort is our simple Dialpad."

The voice communications industry has been driven by hardware and struggled for decades to remove limitations and bring down costs driven by hardware. Previous efforts to shift to a software model have yielded some feature improvements but haven't significantly reduced costs, improved scalability and agility, or simplified use. Dialpad's 100 percent cloud-based solution is extremely easy to use, while slashing deployment costs, eliminating call charges, and offering rapid, unlimited and affordable scalability.

"Legacy on-premises business phone systems simply can't compete on functionality or cost with a well-designed cloud-based system," said Mark Winther, Group Vice President and Consulting Partner of Worldwide Telecommunications at IDC. "Dialpad has taken a very exciting approach and is already well-positioned in the enterprise market with a number of large enterprise customers and adopters of Google Apps for Work."

"Our user-centric design strategy addresses the needs of the new generation of mobile and tech-savvy workers, such as those at Uber and Motorola, who want a more consumer-like communications experience at work," said Dialpad's VP of Product Vincent Paquet. "Equally important, we've made Dialpad a completely pain-free deployment and administration experience that will make on-premises business phone systems obsolete."

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has added three key executive hires.

Morgan Norman, Dialpad's new Vice President of Marketing, leads all global marketing initiatives, including demand generation, content, product marketing, customer marketing, brand strategies, and storytelling. Prior to Dialpad, he was Chief Creative Officer and Senior Vice President of Marketing at NetSuite, and before that he was Senior Vice President of Marketing and Chief Creative Officer at Zuora. Norman will focus on expanding the marketing team, communicating Dialpad's enterprise story to the channel and the press, and developing new go-to-market initiatives on global demand-generation programs.

Steve Milner, Dialpad's new Vice President of Sales, leads all U.S. and international sales efforts. Prior to Dialpad, he served as Vice President Enterprise Sales for the U.S. at Rackspace. Before that, he served as Vice President of Global Enterprise Sales for TATA Communications Limited and Vice President of Sales for New Global Telecom. At Dialpad, Milner will lead channel and partner growth.

Omar Lee, Dialpad's new Head of Design, specializes in product-focused UX design. Prior to Dialpad, he served as User Experience Designer for YouTube/Google and Interaction Designer for Google. Before that, he held product design positions for a number of companies, including Endorse.com, Zynga, and Apple. Lee will continue to employ and refine Dialpad's people-first design strategy to ensure the development of Dialpad stays ahead of the rapidly evolving needs of the market.

Dialpad CEO Craig Walker, Motorola CIO Greg Meyers and Google Technology Evangelist for Google for Work Adam Swidler will keynote at Enterprise Connect on Tuesday, March 8 in Orlando, Florida. Follow along with @DialpadHQ from 11:00-11:30 am EST to learn more about Motorola

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ABOUT DIALPAD

Dialpad is communications for the modern workplace. Available on any device, anywhere, Dialpad includes voice, video, group messaging, SMS, MMS, conferencing, screen sharing, and document sharing, and is integrated with Microsoft Office 365 and Google Apps for Work. Dialpad customers include 60 percent of the Fortune 500, high-growth enterprises and forward thinking organizations including Motorola Solutions, ClassPass, Warby Parker, Vivint and Hillary Clinton. Formerly known as Switch.co, Dialpad is funded by Amasia, Andreessen Horowitz, Felicis Ventures, GV (formerly Google Ventures), Softbank and Work-Bench. For more information, visit dialpad.com and follow @DialpadHQ on Twitter.

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Exhibit H

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Exhibit I



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Introduction

Created by Duid Rottenberg, last modified by Christopher Rienzo on 2020.10.02

► Table of Contents (click to expand)

► Subpages (click to expand)

0. About

In this Introduction we provide a brief overview of FreeSWITCH in laymen's terms. We will then introduce all the key concepts in FreeSWITCH, and guide you on how to navigate the documentation. By following this introduction, you should be able to setup a basic deployment of FreeSWITCH in no time. Should you decide to dig deeper, and get familiar with more advanced features, we provide the links where you can find that too. At the end we will also provide a walk-through of the default configuration, so that you can get a hands-on tutorial, and most commonly used features.

1. What is FreeSWITCH?

FreeSWITCH is a Software Defined Telecom Stack enabling the digital transformation from proprietary telecom switches to a versatile software implementation that runs on any commodity hardware. From a Raspberry PI to a multi-core server, FreeSWITCH can unlock the telecommunications potential of any device. Combined with our hosted cloud platform, SignalWire, FreeSWITCH can interconnect with the outside world and scale to any size. (Visit <https://signalwire.com> for more info)

FreeSWITCH can handle voice, video and text communications from an IP Network (VoIP) and the PSTN (i.e., regular landlines). FreeSWITCH supports all popular VoIP protocols as well as interfacing with PRIs. For a full listing of supported protocols, see the [Endpoints page](#).

Some common capacities, that FreeSWITCH is used for, include

- PBX (Office phone system)
- Class 5 Softswitch (Telephone carrier)
- Application server such as Voicemail, conferencing, IVR
- Softphone

This list is by no means comprehensive, FreeSWITCH is extremely flexible, and can be used in any way you can imagine.

The default configuration showcases a full-featured PBX with many applications.

2. Where can I run FreeSWITCH?

At its core, FreeSWITCH is a library which can be embedded in your application on any device. However, more commonly, it is built to run as a background process (daemon in UNIX or Linux systems, service on Windows platforms). When you run FreeSWITCH as a daemon, you can use the CLI to interact with FreeSWITCH.

FreeSWITCH can run on many Platforms, including Linux, Mac OS X, BSD, Solaris and even Windows.

- ☑ If you don't want to operate your own server, the corporate sponsor of FreeSWITCH, SignalWire, provides cloud-hosted FreeSWITCH services from dedicated FreeSWITCH servers to auto-scaling cloud-hosted services.

Although FreeSWITCH can run on many Linux distributions, such Debian, Ubuntu, CentOS, Fedora and RHEL, our preferred distribution is Debian, because we have worked out all dependencies on Debian so you can have a smooth installation and startup. Debian is also what the FreeSWITCH developers use, therefore have the most experience with. If you run on other distributions, you might have a hard time getting all dependencies right.

- ℹ See Release Notes and Installation instructions for the latest supported platforms.

Hardware requirements depend on how you will use FreeSWITCH. FreeSWITCH can run on hardware as small as a Raspberry Pi, and can scale up to powerful data center servers with dozens of CPU cores. FreeSWITCH is capable of handling thousands of concurrent phone calls, depending on what hardware you have and which applications you are using.

- ℹ For more information about hardware requirements see Release Notes and Performance Testing and Configurations.

3. Architecture

When designing FreeSWITCH the goal was to have the following properties:

- **Extensibility** - Allowing new features to be added easily.
- **Flexibility** - Users should be able to pick and choose which functionalities are enabled, while also allowing them to replace parts of the system with different implementations
- **Scalability** - FreeSWITCH can be run on systems as small as an embedded softphone or as big as a cluster of full-blown carrier switches.
- **Stability** - Problems with one feature should not bring down the whole system.

To accomplish these goals FreeSWITCH is built using a **modular system**:

- There is a small **core** that provides the base system used by all modules, however most of the functionalities are not implemented in the core itself,
- but rather in **standalone modules** that are not dependent on each other.

When you install FreeSWITCH with the default configuration, the modules that are required for most common scenarios are enabled. We will see later in the configuration section how to enable/disable modules.

The modules are grouped by the type of functionality they provide. We will now explore the types of modules, and what functionality is provided by each.

3.1 Module Types

Type	Description
Endpoint	Endpoint modules support types of communications devices such as VoIP, PSTN (i.e., regular landline), Skype, Google Talk etc. Endpoint modules are one of the most important modules in FreeSWITCH.
Application	This is where all the action is happening! There are hundreds of application modules included in the default setup a few examples are playing a file, joining a conference, send a call to voicemail, play an IVR menu. Many of the common applications are provided by the <code>dptools</code> module.
Dialplan	A Dialplan module is responsible for routing calls, based on information such as Caller ID, Destination Number and more. The default dialplan module is the XML Dialplan. We will cover this in detail in the Dialplan section.
Directory	Provides authentication and configurations for users that can register with FreeSWITCH. The most common directory module is the XML Directory.
Codecs	Codecs are used to encode and compress audio for streaming.
File Formats	Most of the common audio formats are supported by the <code>mod_dptools:playback</code> . See the list of supported formats there. TODO From 3. Supported file types section in <code>mod_dptools:playback</code> : " <i>FreeSWITCH has an abstraction layer for file formats.</i> " (See TODO there also.)
Loggers	Record log messages. Some of the included loggers are console and log file. <code>xml_cdr</code> is another commonly used logger to output call detail records.
Languages	Support scripting languages which can be run as part of the dialplan. The most popular language is Lua. Javascript and a few others are also supported.

There are a few more types of modules, but these are the common ones. For a listing of common modules see the Modules page. If you require some functionality that's not provided by one of the existing modules, you can write your own module. Modules can be written in many popular programming languages. See the developer documentation for more information.

API

Many modules also have API commands that can be issued from the command line, script or sent from a remote computer via the event socket. What the API commands can do are up to each individual module, but some common functionalities include returning status information (such as how many listeners are in a conference) or control the currently running application (such as pausing a file being played). There are hundreds of APIs available from the different modules. In the command line you can type `show api` to see all APIs based on the modules that are loaded.

There are also API commands provided by the core, these are in the `Commands` module.

Navigating the documentation

This table provides a roadmap you can use to go through the documentation in a structured fashion.

Page	Description
Installation	How to download and install FreeSWITCH
Configuration	Overview of the structure of FreeSWITCH Configuration files.
Running FreeSWITCH	How to run FreeSWITCH in the console or as a daemon
Call Legs	Explains an important concept required to better understand Endpoints and Dialplans
Endpoints	Explains the endpoint concept in general, as well as a more detailed overview of the common endpoints
Introduction to Dialplan	Dialplan is one of the most complex parts of FreeSWITCH, this page distills it
Directory	How to setup users and devices
Logging & CDR	Setup Logging and Call Records
Databases	How to configure FreeSWITCH to store channel state in a database

Page	Description
Default Configuration	Walkthrough of the default configuration
Session Scripts	How to create custom functionality by writing scripts that run in the dialplan, mod_lua, mod_python, mod_perl, mod_v8 (for Google V8 JavaScript), mod_java
Event Socket	Allows an outside program to interact with FreeSWITCH over a network connection. The CLI uses the Event Socket to allow you to run commands and view the output of FreeSWITCH.

Support

- There is an active community on our mailing lists which can be found at <http://lists.freeswitch.org/mailman/listinfo/freeswitch-users>. (Learn how to ask smart questions before posting!)
- The FreeSWITCH developers also hang out in our Slack room.
- For larger implementations and for complex support issues we offer commercial support plans for more information please email us or call 877.422.2583.
- If you need a new feature, you can try putting up a bounty on the bounty page.
- There are community sites in several languages.
 - Russian - [freeswitch-ru google group](#) & Jabber conference freeswitch@conference.jabber.ru (обсуждение на русском)
 - Chinese - [FreeSWITCH-CN & wiki](#)

Licensing

FreeSWITCH itself is licensed under the MPL 1.1 (Mozilla Public License), however some individual modules might be using other licenses.

Additional Resources

- Join the weekly conference to keep up-to-date with the latest developments in the FreeSWITCH world.
- The annual ClueCon takes place in Chicago, Register today!
- FAQ
- Buy our books



Contributing

- Donate, click on the donate link on our website
- Join the documentation team.
- Report bugs
- Develop Software - Are you a developer? Help us develop FreeSWITCH!

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Exhibit J

Dictionary of Computer and Internet Terms

Eleventh Edition

Douglas A. Downing, Ph.D.
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Douglas Downing teaches economics and quantitative methods at the School of Business and Economics at Seattle Pacific University. He is the author of several books in both Barron's B-Z and Business Review series. He is also the author of *Java Programming the Easy Way* and *Dictionary of Mathematics Terms*, published by Barron's Educational Series, Inc. He holds the Ph.D. degree in economics from Yale University.

Michael Covington is Associate Director of the Artificial Intelligence Institute at the University of Georgia. He is the author of several books and over 250 magazine articles. He holds the Ph.D. degree in linguistics from Yale University.

Melody Mauldin Covington is a graphic designer living in Athens, Georgia. She is the author of *Dictionary of Desktop Publishing* (published by Barron's).

Catherine Anne Barren is a graduate of the Lamar Dodd School of Art (University of Georgia) and a student at University of Kentucky Law School.

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suspend to stop the CPU and input-output devices of a computer while leaving the contents of memory in place, so that it can resume where it left off without rebooting. Unlike a hibernating computer, a suspended computer continues to consume a small amount of battery power. *Contrast* HIBERNATE.

SVG (scalable vector graphics) a markup language for two-dimensional graphics (see www.w3.org/Graphics/SVG).

SVGA (Super VGA) a video resolution of 800 × 600 pixels. *Contrast* XGA.

swap file a file used for swap space. In Windows, the swap file is hidden and does not normally appear in directory listings (see HIDDEN FILE). It can be either permanent, and fixed in size, or temporary, and varying in size. Permanent swap files give faster program execution.

Besides the swap file used by the operating system, there are also swap files used by particular applications, such as Adobe PhotoShop. *See* SWAP SPACE.

swap space disk space that an operating system or program uses as a substitute for additional memory. *See* VIRTUAL MEMORY; SWAP FILE.

swash a capital letter with a decorative flourish. Swashes are best used sparingly.



FIGURE 257. Swash capital letters

.swf (Shockwave file) filename extension used by Macromedia Shockwave. *See* SHOCKWAVE.

swipe sliding your finger across a touchscreen. *See* TRANSITION EFFECT.

switch

1. in electronics, a device for interrupting or rerouting the flow of electric current.

2. in telecommunications and networking, a device for establishing connections between one location and another, doing the work of a telephone operator. For instance, on a computer network, a switch is a device that temporarily creates high-speed paths between different segments as they are needed. It works like a hub but does not add congestion to cables on which the traffic is not actually needed. *See* BRIDGE. *Compare* HUB; ROUTER.

3. in C and its derivatives, a statement for choosing different actions corresponding to different values of a variable. Each section must end with `break` unless you want execution to continue in the next section. Here is an example in Java:

```

switch (p)
{
case 1:
    System.out.println("First place\n"); break;
case 2:
    System.out.println("Second place\n"); break;
case 3:
    System.out.println("Third place\n"); break;
default:
    System.out.println("Something else\n");
}

```

switched line an ordinary (POTS) telephone line on which you establish connections by dialing; the path actually taken by the signals need not be the same when you call the same number twice on different occasions. *Contrast* DSL; T1 LINE; T3 LINE.

switching power supply a power supply that regulates the voltage of direct current by switching it off and on very rapidly and then smoothing out the variations. Most computer power supplies are of this type. The advantages of a switching power supply are that it does not waste energy and does not require a heavy transformer, since the incoming AC is chopped to give a high frequency that can be handled by a smaller, lighter transformer. The disadvantage is that it produces radio-frequency interference. *See* POWER SUPPLY; RFI PROTECTION.

SXGA (Super XGA) a monitor resolution of 1280 × 1024 pixels.

symbol font a font containing symbols or ornaments rather than a regular alphabet. Also called a pi font or DINGBARS.

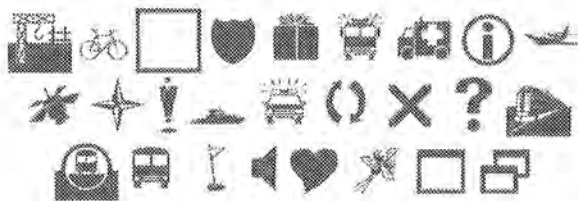


FIGURE 255. Symbol font (Minion Ornaments)

symbolic algebra the manipulation of mathematical symbols (not just their numerical values). For example, we can calculate that $(a + b) \times (c + d) = ac + ad + bc + bd$ without knowing the values of a , b , c , or d .

Symbolic algebra on computers began with the MACSYMA project at MIT in the 1960s. Today, popular symbolic algebra programs for personal computers include MathCad, Maple, Mathematica, and MATLAB. They greatly simplify the formerly tedious process of deriving and manipulating mathematical formulas.

Exhibit K

NEWTON's TELECOM DICTIONARY

26th Expanded and Updated Edition

Harry Newton

Steve Schoen, Contributing Editor





NEWTON'S TELECOM DICTIONARY

26th Expanded and Updated Edition

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the sweep test, to bring performance to design specification and/or to ensure compliance with FCC requirements. See sweep test.

sweep test Manufacturers use a sweep test to test the frequency response of a metallic cable as a quality control mechanism. The sweep test involves the checking of frequency response through generating an RF (Radio Frequency) voltage that is varied back and forth in a frequency range at a constant rate.

swell An increase from nominal voltage lasting one or more line cycles.

SWHK Abbreviation for SWITCH HOOK. Originally referred to an actual hook on older phones that held the receiver, and sprung upward to close a switch and activate the phone when the receiver was picked up. Today the term refers to any of various buttons and plungers that are pressed down and released when the handset is put down (physically "hung up" in the old days) and picked up.

swicki A swicki is a combination of search and wiki software. Swicki enables web searching that produces only the targeted search results wanted by that specialist community. The swicki search engine learns from the popularity of the links clicked by the software developers, multimedia designers, digital photographers and graphic artists who use them. Swickis are among a clutch of technologies described under the collective tag of web 2.0. The term has many definitions, but is generally applied to web pages or applications that can be easily altered by users, rather than just being passively read. The technology has also come to represent a spirit of free and open communication between or among companies and the users of their products and services. Hence, some web 2.0 technologies are also called social media technologies. Blogs and wikis are the most common examples of web 2.0 terminology.

SWIFT Society for Worldwide Interbank Financial Telecommunication. It is a member-owned cooperative and network through which its over 8,000 member financial institutions and corporate customers in over 200 countries exchange financial messages in standardized file formats. SWIFT is solely a carrier of messages. It does not hold funds, nor does it manage customer accounts on behalf of members, nor does it store financial information on an ongoing basis. SWIFT was founded in 1973 and went live in 1977. Its headquarters are in Belgium and it has offices around the world. Its web site is www.swift.com.

SWIGS Special Working Interest Groups. see www.fiberchannel.com.

swim Slow, graceful, undesired movements of display elements, groups, or images about their mean position on a display surface, such as that of a monitor. Swim can be followed by the human eye, whereas jitters usually appears as a blur.

swing upgrade A method of performing a server operating system or mail server software upgrade, without suffering the consequences if the upgrade fails or is batched. A swing upgrade involves performing the upgrade on an extra server, called a swing server, and copying onto it the production server's data files, and/or mailboxes, access control lists, and other files that need to be transferred over. After the swing server is configured, tested, and confirmed to be working properly, the existing production server is de-commissioned and the swing server becomes the production server. The former production server now is an extra server that can be used as the next swing server. The advantage of a swing upgrade is if the upgrade on the swing server fails or is batched, there are no consequences for the production server. It continues to operate without interruption. Also called a swing migration.

SWIP SWIP Shared Whois Project. When ARIN allocates a block of IP addresses to an ISP, they create a record of who has been assigned those addresses. If the ISP reassigns some of the IP addresses to a customer, then ARIN's records must be updated to show the new assignee. The e-mail based interface to ARIN that allows an ISP to make these changes is called SWIP. The act of making these changes is called "SWIPPING." SWIP rhymes with hip not hype.

swiped out An ATM or credit card that has been rendered useless because the magnetic strip is worn away from extensive (and expensive) use.

SWIS services See What I See (SWIS). The sending of live video from a cell phone to another phone or a PC. SWIS Services can be used for video messaging, social networking, commercial and free news and entertainment, etc.

Swiss army knife The one tool to have when you can't have more

than one. Be sure it has a normal screwdriver, a Phillips head screwdriver and a pair of scissors. A corkscrew also is useful.

switch A mechanical, electrical or electronic device which opens or closes circuits, completes or breaks an electrical path, or selects paths or circuits. Switches work at Layers 1 (Physical) and 2 (Data Link) of the OSI Reference Model, with emphasis on Layer 2. A switch looks at incoming data (voice data, or data data) to determine the destination address. Based on that address, a transmission path is set up through the switching matrix between the incoming and outgoing physical communications ports and links. Data switches (e.g., LAN switches and packet switches) also typically contain buffers, which can hold data packets in temporary memory until the necessary resources are available to allow the data packets to be forwarded. Voice switches, of course, don't, because you can't delay voice. Switches work link-by-link, with multiple switches typically being involved in complex networks; each switch forwards the data on a link-by-link (hop-by-hop) basis. Routers are highly intelligent data switches which are capable of setting up paths from end-to-end, perhaps in consideration of the level of privilege of the user and application. Routers commonly are used at the edges of complex data networks, where intelligence is required to set up appropriate network paths. Although such intelligent decisions impose some delay on the packet traffic, they are made only at the ingress and egress edges of the network. The routers often instruct switches in the core of the network, where speed is of the essence—switches aren't as intelligent as routers, but they are faster and less expensive. See also Ethernet Switch, OSI Reference Model, Router and Switching Fabric.

switch based resellers Switch-based resellers lease facilities from national carriers or large private line networks. They resell services provided over those facilities under their own name and provide sales, customer service, billing and technical support. Switch-based resellers own or lease their own switching equipment and, in some cases, own their transmission facilities; they typically provide originating service on a regional basis. See also Switchless Resellers.

switch busy hour The busy hour for a single switch.

switch company A hotel industry term for a telecommunications service provider that provides data links between a hotel's central reservations system (CRS) and a global distribution system (GDS), the latter being a system that provides information about availability, prices, and terms of service for airlines, ground transportation companies, and hotels, and through which reservations can be made and tickets issued.

switch control The technique by which a switching system responds to signals and directs the switching network.

switch domain An SCSA definition. A single instance of a particular technology-specific connection type. See S.100.

switch driver Protocol Mapper Code running on a Telephony Server that translates between a particular switches proprietary switch-server protocol and one of the specified computer telephony integration (CTI) protocols. See Protocol Mapper.

switch fabric An SCSA definition. The facility for connecting any two (or more) transmitting or receiving Service Providers.

switch fabric controller An SCSA definition. A technology-specific, replaceable ASP within the SCSA server. The SFC is designed to support both the internal connectivity within the group and the complex, multiparty call processing applications not directly addressed by the functionality of the Group.

switch feature A service provided by the switch that can be invoked by a computing domain or by manual telephone activity. "Do not disturb" is an example of a switch feature.

switch hook It is also called the Hook Switch. A switch hook or hook switch was originally an electrical "switch" connected to the "hook" on which the handset (or receiver) was placed when the telephone was not in use. The switch hook is now the little plunger at the top of most telephones which is pushed down when the handset is resting in its cradle (on-hook). When the handset is raised, the plunger pops up (the phone goes off-hook). Momentarily depressing the switch hook (under 0.8 of a second) can signal various services such as calling the attendant, conferencing or transferring calls. See also Switchhook Flash.

Exhibit L

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*discrete component) where connections between the device and the mounting substrate are made purely on the surface. No drilled holes are needed to mount these components, the physical connection being achieved by re-flow soldering, normally by means of an infrared heat source. Extremely high packing densities are achievable. This, combined with automatic placement and soldering, yield very cost-effective products. See also SMD.

surface patch See PATCH.

surface reconstruction The combining of multiple views of an object to give a better definition of the object than provided by any one view.

surface reflection The reflection of an environment by an object.

surface subdivision Division of patched surfaces into smaller *patches usually in order to make enough shape freedom available to meet given fairness constraints.

surfing *Informal* Dipping into the information available from the services on a large network, especially the Internet, with no definite objective in mind. Surfing is closely allied to *browsing.

surjection (onto function) A *function whose *range and codomain coincide. If

$f: X \rightarrow Y$
is a surjection then for each y in the codomain Y there is some x in X with the property that
 $y = f(x)$

A function that is not surjective is sometimes said to be *into*.

suspended process See PROCESS DESCRIPTION.

Sutherland-Hodgman clipping algorithm A *polygon-clipping algorithm in which the fundamental idea is to clip the original polygon and each resulting intermediate polygon against each edge of the clipping region in succession. The algorithm allows any planar or nonplanar polygon to be clipped to a convex clipping volume.

SVC *Abbrev.* for supervisor call. See INTERRUPT.

SVG *Abbrev.* for scalable vector graphics. A form of *XML used to describe an image. The

image is specified by lines of XML code defining paths, shapes, fills, colors, etc. Text can be included with instructions as to font, size, weight, style, and other effects. SVG were promoted by W3C as a format for images on the Web. The format has a number of advantages. The files are small (compared with a bitmap image) and the images are scalable (i.e. they can be expanded without loss of resolution). Moreover, scripts (e.g. JavaScript) can be embedded in the XML to create special effects (e.g. animation or color change in response to the cursor). In addition, the files are searchable (e.g. it is possible to search for place names on a map). Support for SVG in current (2008) web browsers is variable and generally incomplete.



- The W3C SVG specification (version 1.1)

SVGA (SuperVGA) A color *graphics adapter that was originally the upgrade of the original pixel *VGA (video graphics array) standard. It generated 800 x 600 pixels with 16 colors. However, the term quickly lost this precise meaning, and many subsequent graphics adapters with far higher resolutions and color depths have been described as "SVGA."

swapping A method of handling main memory by writing information to backing store during periods when it is not in use, and reading it back when required. See also PAGING, ROLL-IN ROLL-OUT, MEMORY HIERARCHY.

sweeping Moving a geometric element along a given path so as to form a new element as its locus: for example, a circle sweeping along a straight line creates a cylinder. The dimensionality of the resulting sweep surface is often higher than that of the generator, even though they are both embedded in the same space.

sweep surface A surface defined by *sweeping.

SWIFT See ELECTRONIC FUNDS TRANSFER SYSTEM.

swipe reader *Informal* term for slot reader. See CARD READER.

switch 1. Usually an electronic or electromechanical device that is used to connect or disconnect an electric current to an electric

circuit (see also OPTICAL SWITCH). An electronic switch can present either an effective open circuit or closed circuit depending on the status of an applied "select" signal. These switches are often used to provide isolation between low- and high-voltage switching circuits or to allow remote control of electric systems.

The word is also used as a verb, followed by a suitable preposition.

2. A type of branch with a choice of many places to which control may be passed. The destination of the branch is determined by the value of some variable or expression. Most high-level languages have a means of doing this: Algol 60 has switch variables; Fortran has computed GOTOs; and several other languages, such as C, C++, Java, Pascal, and Ada, have case statements.

3. To undergo or cause to undergo *switching.

switching Any of various communication techniques that provide point to point transmission between dynamically changing data sources and sinks. See also PACKET SWITCHING, MESSAGE SWITCHING, CIRCUIT SWITCHING.

switching algebra A term that is virtually synonymous with *Boolean algebra when applied to the analysis and synthesis of *logic (switching) circuits.

switching circuit Another (largely obsolete) name for logic circuit. Before the availability of low-cost electronic components, logic circuits were commonly implemented using relays and other switching devices. An AND function was implemented using a series connection of two switches; an OR function used a parallel combination of two switches.

switching speed (toggling speed) A measure of the rate at which a given electronic logic device is capable of changing the logic state of its output in response to changes at its input. It is a function of the delay encountered within the device, which in turn is a function of the device technology.

switching theory The theory of and manipulative methods for *switching algebra. It includes *Boolean-algebra and *state-table or *state-diagram methods of description, as well as *minimization methods.

switching waveform A waveform or signal that is capable of exhibiting one of two

possible distinct states, often corresponding to logic 1 and logic 0, and that may be used to change the status of an active switching element between two distinct conditions such as on and off or open and closed.

Sybase Trademark; see DATABASE MANAGEMENT SYSTEM, SQL SERVER.

Sylvester matrices See HADAMARD MATRICES.

symbol 1. One of a set of distinct elements in the alphabet of a *formal language. See SIGNATURE, WORD. 2. An *identifier in a program.

symbolic addressing An addressing scheme whereby reference to an address is made by some convenient symbol that (preferably) has some relationship to the meaning of the data expected to be located at that address. It serves as an aid to the programmer. The symbolic address is replaced by some form of computable/computed address during the operation of an assembler or compiler.

symbolic execution A form of semantic analysis/proof of a program in which symbols are used as input variables. The program is viewed as having an input state determined by the input data and the initial state of the program. For each line of the program a test is made to see if the state has changed. Each state change is recorded. A logical path through the program is converted into an ordered set of state changes. The final state for each path should be an output state or program termination. The program is proved correct if each sequence of inputs generates only the required output states.

The technique has been automated, but the size of program that can be handled is limited and manual assistance may be needed to handle loops correctly and efficiently. See also STATIC ANALYSIS, PROGRAM CORRECTNESS PROOF.

symbolic logic The treatment of *formal logic involving the setting up of a formalized language. The *propositional calculus and *predicate calculus are two of the more common areas of interest.

symbol manipulation The manipulation of characters rather than numbers, as occurs in symbolic mathematics, text preparation, and finite-state automata simulation.

Exhibit M

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A large-scale computer system that is used to switch TDM-based, circuit-switched telephone calls. Also called a "voice switch," Lucent and Nortel Networks are the primary vendors of this equipment. See [end office switch](#) and [tandem switch](#).

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A large-scale computer used to route telephone calls in a central office. Such devices are made by Lucent, Nortel and others. See [ESS](#), [SS7](#), [Class 4 switch](#), [Class 5 switch](#) and [digital cross-connect](#).

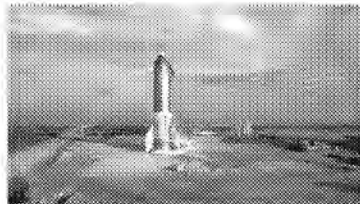
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supervision A basic signaling function that indicates the status of a component, such as trunk idle or busy, telephone on-hook or off-hook. In early switchboard operation, a human operator put a receiver across a line to monitor the status of a call, to determine if the call was in progress or had been terminated. See also *call, signaling and control, switchboard, and trunk*.

suppression Forceful constraint, prevention, or subduing. In electronics, the elimination or intentional attenuation of an unwanted oscillation, such as a sideband, a carrier, or an echo. In some voice encoding mechanisms, silence suppression senses periods of inactivity in a voice conversation and simply ceases sending data associated with that conversation. See also *attenuation, carrier, echo, encode, oscillate, sideband, and silence suppression*.

surge An elevated voltage level lasting longer than a spike. See also *ground loop, spike, and voltage*.

sustainable cell rate (SCR) See *SCR*.

SVC (Switched Virtual Circuit) A shared path established between two hosts through a packet network on command, i.e., via signaling as the call is placed. Once the path is selected, all packets in a given session travel the same path, which is selected in consideration of both the condition of the network and the load on it at the instant the connection is required. Thereby, an SVC bypasses failed and congested switches and circuits and improves overall performance through automatic load balancing. Although SVCs are defined in frame relay specifications, they are unusual in public networks due to the carrier's fear that frame relay SVCs would cannibalize more expensive services like ISDN and long distance voice. Rather, frame relay networks employ permanent virtual circuits (PVC), which are predetermined, preprogrammed paths. Globally, X.25 networks largely are based on SVCs. See also *channel, circuit, frame, frame relay, load balancing, packet, path, PVC, virtual circuit, and X.25*.

SW (Short Wavelength) Referring to fiber optic systems operating in the 850 nm range, with the IEEE 802.3ae specification for 10GBase-SR, SW being one example. See also *10GBase-SR, SW, and LW*.

SWG (Standard Wire Gauge) Synonymous with British Standard Gauge (BSG). See also *BSG and gauge*.

switch 1. A mechanical, electromechanical, or electronic device that opens, closes, or changes the connections in an electrical circuit. 2. A device that establishes, maintains, and changes logical connections over physical circuits. Switches flexibly connect transmitters and receivers across networks of interconnected links, thereby allowing network resources to be shared by large numbers of end users. Without switches, each transmitter/receiver pair would require a dedicated circuit in order to transfer data. There are a number of types of switches. In terms of switching technology, there are circuit switches and packet switches. **a.** Circuit switches establish connections between circuits, on demand and as available. Those connections are temporary, continuous, and exclusive in nature. Circuit switches were developed for voice communications, but will support any type of information transfer. Common examples of circuit switches include private branch exchanges (PBXs) and central office exchanges (COs or COEs). **b.** Packet switches switch data organized into packets, discrete sets of data that may take the specific form of packets, frames, or cells depending on the network technology specifics. For example, packet switches switch packets in networks based on the Internet Protocol (IP), frames in networks based on the frame relay or Ethernet protocols, and cells in those based on the asynchronous transfer mode (ATM) protocol. Packet switches were initially developed for data networking, but can support other forms of data, as well, although with varying degrees of success.

With respect to physical placement, there are edge switches and core switches. **c.** Edge switches are positioned at the physical edge of a public network. The user organization gains access to an edge switch via an access link, or local loop. A central office (CO) is an example of an edge switch in the context of the circuit-switched public switched telephone network (PSTN). In a Local Area Network (LAN), a workgroup switch is the equivalent of an edge switch in a public network. **d.** Core switches, also known as *tandem switches* and *backbone switches*, are high-capacity switches positioned in the physical core, or backbone, of a network and serving to interconnect edge switches.

Although switches can be very intelligent in many respects, they operate only at the Layer 2, the Data Link Layer of the OSI Reference Model. That is to say that they operate link-by-link, or hop-by-hop, generally under the control of a centralized set of logic that can coordinate their activities in order to establish end-to-end connectivity across a multi-link circuit. A switch has no concept of the network as a whole, from end-to-end. See also *ATM, backbone switch, cell, CO, core switch, Data Link Layer, edge switch, Ethernet, frame, frame relay, IP, LAN switch, OSI Reference Model, PSTN, router, and tandem switch.*

switchboard The first switching device, the switchboard literally was a series of small, mechanical switches mounted on a board. The operator manually switched the wires from one contact to another to establish a unique physical and electrical path or circuit to connect two parties in order that they might engage in a voice conversation. As all of the links, contacts, and switches are physically separated, a switchboard is a type of space division switch. Although the switchboard was superseded by the cordboard, the term remains widely used to refer to an operator console. See also *cordboard* and *switch*.

Switched 56 (Switched 56 kbps Service) More formally known as *Digital Switched Access (DSA)*. A switched digital data service that operates much like the public switched telephone network (PSTN) operates for voice calls. Switched 56 service operates over a public data network (PDN) that actually is a physical and logical partition of the PSTN. Where the PDN supports out-of-band signaling and control, the service sometimes is known as *Switched 64*, as the full 64 kbps bandwidth of a DS-0 channel is available to support end user data transmission. Switched-1536 service supports a full ISDN PRI of 24 channels, each of which provides the full 64 kbps of DS-0 bandwidth, with all signaling and control taking place out-of-band on another PRI circuit through a technique known as *non-facility associated signaling (NFAS)*. See also *DS-0, ISDN, NFAS, out-of-band signaling and control, PDN, PRI, and PSTN.*

Switched 64 See *Switched 56*.

switched circuit A circuit established through one or more intermediate switching devices, such as circuit switches or packet switches. A typical switched circuit can comprise a dedicated circuit from an originating device to an ingress switch port, or point of interface, a switch matrix through which a path is established to an egress port, and a dedicated circuit to a destination device. There may be many intermediate switches in a more complex scenario. Switched networks are highly shared, as a number of users contend for access to limited network resources through switches, which serve as points of contention, with connectivity between transmitters and receivers provided through the network on demand and as available. This sharing of limited network resources clearly allows the network providers to realize significant operational efficiencies, which are reflected in lower overall network costs. The end users realize the additional advantages of flexibility and resiliency, as the network generally can provide connectivity between any two physical locations through multiple alternate transmission paths. A switched circuit is in marked contrast to a dedicated circuit, which is dedicated to connecting two or more physical locations. Such a dedicated circuit is highly available, offers reliable levels of performance, and provides guaranteed bandwidth, but is inflexible and susceptible to catastrophic failure. See also *circuit, circuit switch, dedicated circuit, packet switch, and switch.*

switched circuit network (SCN) See *SCN*.

Switched Multimegabit Data Service (SMDS) See *SMDS*.

switched virtual circuit (SVC) See *SVC*.

switch hook An early telephone handset hung from a hook that activated a switch. When the telephone was not in use, the handset hung on the hook, or was on-hook. When the telephone was in use, the handset was off of the hook, or off-hook. When the user lifted the handset off the hook, a spring lifted the hook, which closed a switch and closed a circuit, drawing current from the central office (CO). The term now refers to the mechanical buttons or plungers that are mounted in the cradle of a telephone set, but the process remains essentially the same. Synonymous with hook switch. See also *off-hook* and *on-hook*.

Exhibit P

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The 5ESS Switching System:

Introduction

By K. E. MARTERSTECK and A. E. SPENCER, JR.*

(Manuscript received November 14, 1984)

This special issue of the *AT&T Technical Journal* is devoted to the 5ESS™ switch. In this introductory paper the authors provide some historical background; outline the characteristics of this new, advanced system; and summarize its architecture, features, and status.

I. BACKGROUND

In March 1982, the first 5ESS switch was cut over in Seneca, Illinois. This new, multifunctional, time-division digital switching system is the product of development efforts at AT&T Bell Laboratories that can be traced back to the 1950s. Development of the 5ESS electronic switch was, and continues to be, driven by the worldwide evolution of both switching technologies and expanding telecommunications needs.

To introduce the more detailed articles that follow, this paper offers a brief history of AT&T Technologies electronic switches, discusses the characteristics of the new 5ESS switch, and introduces some of its technologically innovative features.¹

1.1 Local switching systems

The first general-purpose electronic switch, the 1ESS™ switch² (which was cut over in Succasunna, New Jersey, in May 1965), contained a *space-division* switching network and a digital electronic data processor under Stored Program Control (SPC).[†] It was primarily intended to serve urban areas with large numbers of lines (between

* Authors are employees of AT&T Bell Laboratories.

† Acronyms and abbreviations used in the text are defined at the back of the *Journal*.

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10,000 and 65,000) and heavy traffic, including many business customers. The 2ESS switch, introduced in 1970, was designed to serve fewer lines (2000 to 10,000) and to meet the lighter traffic needs of suburban residential areas. In 1976 the smallest of AT&T Technologies space-division electronic switching systems, the 3ESS switch, began meeting the needs of rural Community Dial Offices (CDOs) with fewer than 4500 lines.

Also in 1976, new processors became available to modernize the 1ESS and 2ESS switches, doubling their call-carrying capacities. The 1A ESS switch incorporates the 1A processor, which has a readable and writable memory. The 2B ESS switch is equipped with the 3A central control, which combines integrated circuit design with semiconductor memory stores.

The first local electronic switches replaced earlier, wired-logic electromechanical systems such as the No. 1 and No. 5 crossbar and the still earlier step-by-step and panel progressive control systems. Stored program control led to greater flexibility in system design and reduced operations expenses in the telephone network. In early 1985, more than 3700 local electronic switching offices served more than 60 million lines worldwide.

Because of the high cost of processors and their associated memories, by the mid-1970s electronic switches still could not economically replace the smallest electromechanical switching systems. Yet these offices, serving 2000 or fewer lines, accounted for approximately 60 percent of the switching systems in the U.S. network. One response to this situation was remote switching. In 1979, the No. 10A Remote Switching System (RSS) (see Ref. 3) became available to connect these small offices to nearby host electronic switches by means of T- and N-carrier systems.

1.2 Toll switching systems

With the deployment in January 1976 of the first 4ESS switch⁴ in Chicago, fully digital electronic switching was introduced into the long distance network in the U.S.

The 4ESS switch, a high-capacity, toll and tandem switching system, brought many major technical advances to the switching art. The most important change was the use of a *time-division* digital network in place of the space-division network. Because of the rapid growth in the number of digital transmission systems, the switching network of the 4ESS switch was specifically designed to pass Pulse Code Modulation (PCM) signals without conversion. Transmission and switching functions were more closely integrated than in any previous switching system. Economic considerations, such as significant reductions in installation, operating, and maintenance costs, played an important

part in the introduction of the 4ESS switch. By the end of 1984, more than 100 systems were serving both North American and international applications. These systems have a total of 3.3 million trunk terminations and carry more than 5 billion calls per month.

1.3 Distributed systems

Following the successful introduction of time-division digital switching into the toll network, planning began for its application, with digital stored program control, in the local environment. Among the alternatives considered were adaptations of the 1A ESS switch and the 4ESS switch for local digital switching. Technology, however, was advancing rapidly in such areas as lower cost, more powerful microprocessors, and high-speed, fiber-optic communications systems. Such advances set the stage for a new generation of electronic switching with heavy emphasis on distributed network and distributed control. Thus, evolving technology and a strong market interest in digital systems led to the development of the 5ESS switch.

II. SYSTEM CHARACTERISTICS

The 5ESS switch complements the earlier systems, which so successfully replace the larger electromechanical local and toll offices. For example, it can bring electronic switching to even the smallest local office. In addition, the 5ESS switch provides digital services and capabilities for an extensive range of applications. To these ends, the new switch was designed with seven major characteristics in mind:⁵

1. The 5ESS switch is a *single system with multiple applications* (local, toll, operator services) that can cover the entire range of office sizes needed in telephone networks throughout the world. Table I shows a matrix of switching systems applied (as of 1983) across the metropolitan, suburban, and rural markets in the local, toll, and operator-services applications. The distributed control, modularity, and extensibility of the 5ESS switch allow it to serve all of these markets and applications. One consequence of this approach is the development of unified software to introduce new features throughout the family of 5ESS switches without regard to application or size. Well-defined internal interfaces allow a flexible, modular approach for both hardware and software so the system can be economically configured to meet the special needs of each market segment. For example, in the area of PCM transmission, two different international standards (North American and European) exist. From the start, the basic architectural and timing parameters of the 5ESS switch were designed to be compatible with both standards.

2. The 5ESS switch provides *integrated interfaces* between digital switching and transmission systems for both subscriber carrier systems

Table I—Switching systems used in metropolitan, suburban, and rural markets in local, toll, and operator-services applications

Application	Market					
	Metropolitan		Suburban		Rural	
Local	Crossbar tandem No. 1 crossbar No. 5 crossbar 1ESS 1A ESS	} 5ESS	No. 1 step-by-step No. 5 crossbar 2B ESS	} 5ESS	CDO No. 1 step-by-step 3ESS 10A RSS	} 5ESS
Toll	No. 4 crossbar 1A ESS 4ESS	} 5ESS	No. 5 crossbar local/toll 1A ESS	} 5ESS	No. 1 step-by-step local/toll	} 5ESS
Operator services	No. 5 crossbar Automatic Call Distributor Traffic Service Position System	} 5ESS	No. 5 crossbar Automatic Call Distributor Traffic Service Position System 5ESS	} 5ESS	Manual Traffic Service Position System/remote trunk arrangement	} 5ESS

and interexchange circuits (24- and 30-channel systems). The 5ESS switch also has an efficient, easily maintained interface to analog interexchange circuits to simplify introducing the system into existing networks. Overall, the integration of functions will lead to a more rapid movement toward the integrated digital network and to the Integrated Services Digital Network (ISDN).

3. The 5ESS switch permits the *graceful incorporation of new technology* as it becomes available. This objective is not new, of course. For example, just as the 1ESS and 2ESS switch processors were upgraded in the mid-1970s with new technology, the ferreed network was also replaced by the smaller and more economical remreed at about the same time. Similarly, since the system's introduction in 1976, virtually all the major units of the 4ESS electronic switch have been redesigned to take advantage of technological innovations.⁶ These upgrades have pointed to the advantage of well-defined intermodule interfaces. Such interfaces become even more crucial as technology reduces the physical size of equipment and the replacement of units becomes important at the equipment bay level. The distributed nature and well-defined interfaces of the 5ESS switch also allow easy replacement and evolution of selected components as market trends warrant. For example, the switching module processor has already been upgraded to raise call-handling capability above initial capacity.

4. The *modular design* of the 5ESS switch allows increases in both network and processor capacity in reasonable, cost-effective increments. Earlier SPC switches had large growth modules. The resulting breakage penalty was as much as 5 to 10 percent of the switch price. To enable the system to be responsive to changes in forecasts and demographics, the design of the 5ESS switch allows for the addition or removal of equipment in operating exchanges and for conversion from one switching application to another (e.g., from remote switch to stand-alone exchange).

5. The 5ESS switch is *highly reliable*. Automatic fault detection, fault location, and reconfiguration capabilities ensure that faults can be identified, isolated, and repaired in a timely manner, thereby providing better service at lower maintenance cost.

6. The 5ESS switch is designed for both *local and centralized maintenance*. The provision of centralized maintenance has been one major factor in the economic attractiveness of stored program control for growth and replacement of electromechanical systems. When both approaches are provided, local maintenance can be used when the first systems are introduced. Then, as the number of systems increases, telephone administrations can introduce compatible centralized maintenance systems to obtain additional economic benefits.

7. The 5ESS switch allows *new features to be introduced by means*

of software. Techniques used in the 5ESS switch, such as a sophisticated operating system, a high-level language, and a modular design, make possible the rapid addition of features.⁷ In fact, the software environment is essentially the same among modules, enabling software to be ported among the various modules as architecture and feature needs evolve. Since maintenance routines constitute more than 50 percent of the system's software, these routines are also designed to facilitate changes.⁸ In addition, considerable effort has been expended on powerful off-line development systems and rigorous design methodologies⁹ that have already proven effective during the initial applications of the 5ESS switch's software. They are expected to be increasingly valuable as the demand for services and features continues to grow, particularly in light of important new concepts, such as the evolving ISDN.

III. 5ESS SWITCH TECHNOLOGY, ARCHITECTURE, AND FEATURES

3.1 Technology

The technological sophistication of the 5ESS switch is apparent at every level of its design, from devices to architecture. Examples of state-of-the-art technology in the 5ESS switch include:

1. Gated-Diode-Crosspoint (GDX) switch—a completely electronic (solid-state) line interface that reduces the space used by 60 percent over comparable interfaces and greatly improves reliability.
2. Digital signal processor¹⁰—a high-performance, high-density Very-Large-Scale Integration (VLSI) component that on one chip combines generation and detection of multiple tones with signal filtering, thereby reducing cost, space, and power requirements. This chip performs over 1 million operations per second.
3. Fiber optics—low-cost, high-capacity, internal communication links between modules that are resistant to electromagnetic interference.
4. Distributed control—microprocessor-controlled switch modules that provide call-processing intelligence, and allow for system growth in modular increments and full feature capabilities at remote locations. These modules are coupled by a packetized control network that ensures reliable and efficient communication among all the elements of the system.

3.2 Architecture

The 5ESS switch has a modular, distributed architecture consisting of an administrative module, a communications module, and a number of switching modules (see Fig. 1). The communications module contains a message switch, which handles the packetized system control messages, and a time-multiplexed switch, which interconnects switching modules with one another, as well as with the administrative module. Fiber-optic Network Control and Timing (NCT) links connect modules.

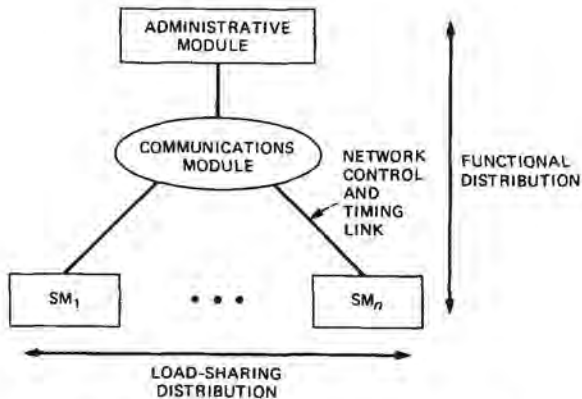


Fig. 1—Distributed architecture of the 5ESS switch.

In the architecture of the 5ESS switch, those functions that are best done globally—such as administration, resource allocation, and maintenance access—are provided in the administrative module. Those needs that are best handled close to the external interfaces—such as most of the individual call handling, provision of network capacity, and terminations for lines and trunks—are distributed in the switching modules. Thus, the switching modules provide the major processing power in the system, performing over 95 percent of the per-call work. In addition, they form the basic growth unit and, as such, can be physically located either locally or at geographically remote sites.

The design of the 5ESS switch will enable it to evolve to support Universal Information Services, a telecommunications industry goal that will enable network providers to offer their customers integrated transport, dynamic allocation of network resources, and adaptive, logically provided services.

3.3 Features

The flexible architecture of the 5ESS switch allows it to fulfill the needs of a spectrum of markets. For example, it provides basic and advanced subscriber services; toll and operator services; and extensive operations, administration, and maintenance features. Feature sets are being planned to take full advantage of the information-age capabilities of the ISDN. Table II shows the planned capacity levels through 1985 in terms of rated busy-hour calls, number of distributed switching modules, and line capacity.

IV. STATUS

The first multimodule 5ESS switch was put into service in August 1983 at Sugar Grove, Illinois. The first local/toll 5ESS switch was cut

Table II—5ESS switch capacities through 1985

Year	Rated Calls/Hour*	Maximum Number of Switching Modules	Nominal Line Capacity†
1983	130,000	30	50,000
1984	200,000	48‡	50,000
1985	300,000	192	100,000

* Sustained operation, including customer features, all effective attempts, all messages billed, with no degradation of maintenance and administrative responsiveness.

† Allows for typical mixture of lines and trunks.

‡ Includes remote switching modules.

over at Bradford, Pennsylvania, in October 1983. The remote switching module and integrated *SLC*® 96 carrier were cut over at Spotsylvania, Virginia, in April 1984. The first 5ESS switch with the international feature set was ready for service in Seoul, Republic of Korea, in February 1985.

The early thrust of the 5ESS switch has been small- to medium-size local and local/toll applications. In 1985, with the advent of the high-capacity enhancements and new features such as business and residence custom services, the application of the 5ESS switch will be expanded in both the North American and international markets. The early buildup of shipments of the 5ESS switch has been substantial. From just 183,000 lines shipped at the end of 1983, 5ESS switch line shipments grew by an additional 2.5 million in 1984, and more than 6 million lines will be shipped in 1985.

V. SUMMARY

This paper has presented a general introduction to the 5ESS switch. Its distributed architecture, use of sophisticated digital technologies, and modular hardware and software design put the 5ESS switch at the leading edge of SPC switching systems. The papers that follow discuss the system in more detail. The first discusses applications planning¹¹ for the 5ESS switch. This is followed by papers on the overall architecture,¹² the operational software,⁷ the maintenance software,⁸ the circuit-level hardware,¹³ the physical design of the hardware,¹⁴ and the software development system.⁹ The last set of papers addresses the first application and field experience,¹⁵ the operations plan,¹⁶ and factory testing.¹⁷

VI. ACKNOWLEDGMENTS

The authors wish to acknowledge the efforts of all those people in the development and systems engineering organizations of AT&T Bell Laboratories and AT&T Technologies who have worked so diligently to bring about the 5ESS switch.

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Albert E. Spencer, Jr., B.S. (Electrical Engineering), 1951, Drexel University; AT&T Bell Laboratories, 1951—. Mr. Spencer began his work at AT&T Bell Laboratories on design and development of telephone transmission systems. In 1965, after several assignments related to planning and development of

military communications systems, time-division switching systems, and data communications systems, he was appointed Director of the Local Switching Engineering Center. In 1970 he became Director of Customer Switching Systems Engineering, where he concentrated his efforts on Planning for PBXs and key telephone systems, and in 1971 transferred to Denver as Director of the Customer Switching Laboratory to assume responsibility for design and development of these systems. This work led to the development of the *Dimension** PBX. In 1975 Mr. Spencer transferred to Indian Hill to become Executive Director, Toll Electronic Switching Division, and in 1978 he transferred to the corporate planning organization with responsibility for coordinating projects related to the business segment of AT&T. In 1981 he assumed responsibility for planning the transfer of engineering and development functions to AT&T Information Systems, and in January 1983 he assumed responsibility for R&D process planning. In May 1983 Mr. Spencer was appointed Executive Director of the Switching Systems Engineering Division, where he is responsible for planning new and improved telecommunications switching systems and services for both domestic and foreign application. Member, Tau Beta Pi, Eta Kappa Nu.

Exhibit Q

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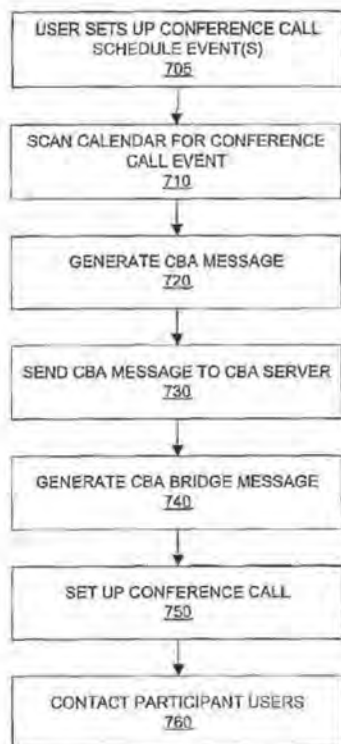
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[Continued on next page]

(54) **Title:** METHODS AND SYSTEMS FOR CONFIGURING AND PROVIDING CONFERENCE CALLS



(57) **Abstract:** Methods and systems for automatically providing conference calls are disclosed. In one aspect of the invention, methods and systems detect a conference call event (705) that was previously configured by a subscriber user and identify participant users associated with the conference call event. Once identified, each participant user is contacted and a response is received from each of the users. Based on the received responses, a conference call is established between the participant users and the subscriber user (750). In one aspect of the invention, at least one of the detecting and identifying steps are performed without user intervention.

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METHODS AND SYSTEMS FOR CONFIGURING AND PROVIDING CONFERENCE CALLS

[001] This application claims priority as a continuation-in-part of U.S. Patent Application No. 10/083,793, entitled "METHOD AND APPARATUS FOR CALENDARED COMMUNICATIONS FLOW CONTROL," filed February 27, 2002, Attorney Docket No. 01-1007; U.S. Patent Application No. 10/083,792, entitled "VOICE MAIL INTEGRATION WITH INSTANT MESSENGER," filed February 27, 2002, Attorney Docket No. 01-1001; U.S. Patent Application No. 10/083,884, entitled "DEVICE INDEPENDENT CALLER ID," filed February 27, 2002, Attorney Docket No. 01-1002; U.S. Patent Application No. 10/083,822, entitled "METHOD AND APPARATUS FOR A UNIFIED COMMUNICATION MANAGEMENT VIA INSTANT MESSAGING," filed February 27, 2002, Attorney Docket No. 01-1004; and U.S. Patent Application No. 10/084,121, entitled "CALENDAR-BASED CALLING AGENTS," filed February 27, 2002, Attorney Docket No. 01-1008, all of which claim priority to U.S. Provisional Patent Application Nos. 60/272,122, 60/272,167, 60/275,667, 60/275,719, 60/275,020, 60/275,031, and 60/276,505.

[002] Applicants also claim the right to priority under 35 U.S.C. § 119(e) based on Provisional Patent Application No. 60/428,704, entitled "DIGITAL COMPANION," filed November 25, 2002; and Provisional Patent Application No. 60/436,018, entitled "DIGITAL COMPANION," filed December 26, 2002.

[003] The present application also relates to U.S. Patent Application No. (_____), entitled "METHODS AND SYSTEMS FOR CONFERENCE CALL BUFFERING," Attorney Docket No. 03-1013; U.S. Patent Application No. (_____), entitled "METHODS AND SYSTEMS FOR COMPUTER ENHANCED CONFERENCE CALLING," Attorney Docket No. 03-1014; U.S. Patent Application No. (_____), entitled "METHODS AND SYSTEMS FOR REMOTE CALL ESTABLISHMENT," Attorney Docket No. 03-1015; U.S. Patent Application No. (_____), entitled "METHODS AND SYSTEMS FOR CALL MANAGEMENT WITH USER INTERVENTION,"

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Attorney Docket No. 03-1016; U.S. Patent Application No. (_____),
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No. 03-1028.

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TECHNICAL FIELD

[004] The present invention relates generally to data processing systems and, more particularly, to a method and system for providing conference call services.

BACKGROUND

[005] A wide variety of means exist for communication between users. For example, a user may conduct phone calls via a home phone, work phone, and mobile phone. Users may also communicate using devices such as Personal Computers ("PC's"), Personal Digital Assistants ("PDA's"), pagers, etc. using different types of messaging services, such as e-mail and instant messaging.

[006] The types of communications between users also vary. Users may communicate between each other individually or a group of users (e.g., three or more users) may communicate simultaneously through a conference call. There are different mechanisms for configuring a conference call between a group of users. Some conventional telecommunication systems configure a conference call by adding users to an established call one at a time. Alternatively, conventional systems configure a conference call by allowing members of a conference call group to call in to a common location (e.g., a bridge). Other conventional systems, on the other hand, allow a user to instruct a network to contact users included on a predetermined list to establish a conference call between the users.

[007] Although current mechanisms enable users to configure and establish conference calls, they each require at least one user to initiate the configuration of the call at the time the conference call is to take place. Accordingly, there is a need for a system and method for automatically establishing a conference call between participant users.

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SUMMARY OF THE INVENTION

[008] Methods and systems consistent with certain aspects related to the invention automatically establish a conference call between a group of users. In one aspect of the invention, methods and systems detect a conference call event that was previously configured by a subscriber user and identify participant users associated with the conference call event. Once identified, participant users are contacted and responses are received from the users. Based on the received responses, a conference call is established between the participant users and the subscriber user. In one aspect of the invention, at least one of the detecting and identifying steps are performed without user intervention.

[009] Other methods and systems consistent with certain aspect of the invention detect a conference call event previously configured by the subscriber user that indicates that a conference call should be established between a subscriber user and participant users. These methods and system also collect contact information for the participant users and provide a message including the contact information to a conference server that is configured to instruct a bridge to establish a conference call between the users by calling the participant users using the contact information included in the message. Further, these methods and systems receive a response message from the conference server including information associated with the conference call and at least one participant user.

[010] In another aspect related to the invention, methods and systems consistent with certain principles of the invention facilitate the scheduling of a conference call for a predetermined date using a calendar application, whereby the scheduling includes identifying participant users that are to participate in the conference call. Further, these methods and systems, on the predetermined date, receive an indication that a conference call has been configured in accordance with the scheduled conference call. Also, these methods and systems receive an indication that at least one participant user has either joined or declined to join the conference call and, during the

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conference call, receive an indication that another participant user has ended communications with the conference call when that participant user terminates a connection with a bridge that established the conference call in accordance with instructions provided by a server that executes the calendar application.

[011] Also, methods and systems consistent with certain aspects of the invention provide a first server for detecting a conference call event previously configured by a subscriber user and generating a first message based on the event, wherein the first message includes telephone numbers for a plurality of participant users identified by the subscriber user. These methods and systems also provide a second server for receiving the first message from the first server and generating a second message based on the first message, wherein the second message includes instructions for configuring a conference call and the telephone numbers. Additionally, the methods and systems provide a conference bridge for receiving the second message, extracting the telephone numbers from the second message, and calling the participant users using the telephone numbers, and establishing a conference call between the participant users and the subscriber user.

BRIEF DESCRIPTION OF THE DRAWINGS

[012] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate one embodiment of the invention and, together with the description, serve to explain the principles of the invention.

[013] Figure 1 is a diagram of an exemplary data processing and telecommunications environment in which features and aspects consistent with the principals of the present invention may be implemented;

[014] Figure 2 is a diagram of an exemplary user terminal, consistent with the principals of the present invention;

[015] Figure 3 is a diagram of a voice network, consistent with the principles of the present invention;

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[016] Figure 4 is a block diagram of a service center, consistent with the principles of the present invention;

[017] Figure 5 illustrates a logical architecture of an exemplary system, consistent with the principles of the present invention;

[018] Figure 6 is a diagram of an exemplary conference call environment consistent with the principles of the present invention;

[019] Figure 7 is a diagram of an exemplary flowchart of a conference call configuration process consistent with the principles of the present invention;

[020] Figure 8 is a diagram of an exemplary flowchart of a conference call process consistent with the present invention; and

[021] Figure 9 is a flowchart of an exemplary ad-hoc conference call process consistent with the present invention.

DETAILED DESCRIPTION

[022] Reference will now be made in detail to exemplary embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts. While the description includes exemplary embodiments, other embodiments are possible, and changes may be made to the embodiments described without departing from the spirit and scope of the invention. The following detailed description does not limit the invention. Instead, the scope of the invention is defined by the appended claims and their equivalents.

Overview

[023] Methods and systems consistent with certain aspects of the present invention automatically set up and maintain conference calls between an initiating user and participant users. The initiating user may schedule a conference call event with a service center by identifying a time and date of a future conference call and any participant users that are to be included in the

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call. The service center scans a data structure associated with a calendar of events for the conference call event, and when the event is detected, the service center provides instructions to a conference bridge that initiates a call to each participant user identified by the initiating user. Each participant user may accept or reject the call through one or more feedback options made available by the conference bridge. Once a call is accepted by a participant user, the conference bridge facilitates the conference call between the initiating user and any participant users that have accepted the call. The conference bridge may also leverage a speech recognition server to create a transcript of any communications during the conference call that is provided to the initiating user following termination of the conference call.

Network Environment

[024] Fig. 1 is a block diagram of a data processing and telecommunications environment 100, in which features and aspects consistent with the present invention may be implemented. The number of components in environment 100 is not limited to what is shown and other variations in the number of arrangements of components are possible, consistent with embodiments of the invention. The components of Fig. 1 may be implemented through hardware, software, and/or firmware. Data processing and telecommunications environment 100 may include a data network 102, a voice network 104, and a service center 106. A user 110 may use a user terminal 112 to interface with data network 102 and may use phones 114, 116, and 118 to interface with voice network 104. Calling party 120 may use phone 122 to call a user, such as user 110, at any one of phones 114, 116, and 118.

[025] Data network 102 provides communications between the various entities depicted in environment 100 of Fig. 1, such as user terminal 112 and service center 106. Data network 102 may be a shared, public, or private network and encompass a wide area or local area. Data network 102 may be implemented through any suitable combination of wired and/or