United States Patent	12388904
Kind Code	B2
Date of Patent	August 12, 2025
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Joining ongoing communications

Abstract

A user device may join an ongoing communication of another user device by sending a request to the other user device to join the ongoing communication. The other user device may provide an option for the user of the other device to accept the request. Alternatively, the other user device may automatically add the user device to the ongoing communication or decline to the add the user device to the ongoing communication.

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Appl. No.: 17/879375

Filed: August 02, 2022

Prior Publication Data

Document Identifier	Publication Date
US 20220377151 A1	Nov. 24, 2022

Related U.S. Application Data

continuation parent-doc US 17184114 20210224 US 11431811 child-doc US 17879375
continuation parent-doc US 16263951 20190131 US 10986193 20210420 child-doc US 17184114
continuation parent-doc US 15477570 20170403 US 10237356 20190319 child-doc US 16263951

continuation parent-doc US 14461363 20140815 US 9654572 20170516 child-doc US 15477570
continuation parent-doc US 12511604 20090729 US 8842815 20140923 child-doc US 14461363

Publication Classification

Int. Cl.: **H04L29/00** (20060101); **H04L9/40** (20220101); **H04L65/1033** (20220101); **H04L67/306** (20220101); **H04L67/51** (20220101)

U.S. Cl.:

CPC **H04L67/51** (20220501); **H04L63/102** (20130101); **H04L65/1036** (20130101); **H04L67/306** (20130101);

Field of Classification Search

CPC: H04L (67/51); H04L (63/102); H04L (65/1036); H04L (67/306)

USPC: 709/220; 709/221; 709/222

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS (1) The present application is a continuation of U.S. application Ser. No. 17/184,114, filed Feb. 24, 2021, which is a continuation of U.S. application Ser. No. 16/263,951, filed Jan. 31, 2019, now U.S. Pat. No. 10,986,193, which is a continuation of U.S. application Ser. No. 15/477,570 filed Apr. 3, 2017, now U.S. Pat. No. 10,237,356, which is a continuation of U.S. application Ser. No. 14/461,363, filed Aug. 15, 2014, now U.S. Pat. No. 9,654,572, which is a continuation of U.S. application Ser. No. 12/511,604, filed Jul. 29, 2009, now U.S. Pat. No. 8,842,815, which are each hereby incorporated by reference in its entirety for any and all non-limiting purposes.

BACKGROUND
(1) It has become increasingly common for residential and business consumers to receive multiple types of communication services. For example, users in a home may all communicate with the outside world through telephone calls, emails, instant messages, etc. In many cases, a user may employ multiple devices to take advantages of these services. As the range of available services increases, and as users seek to receive more of those services on different types of devices, management of individual user identities, preferences, contact information, and other types of data becomes increasingly complex. This complexity can be compounded when multiple users share communication devices.

SUMMARY

(2) This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the invention.

(3) In some embodiments, a profile-based system is employed to manage user identities and preferences, devices, content and/or other aspects of service delivery. The user profiles may be maintained in one or more servers or other elements located in an external network and accessed via a customer premises equipment (CPE) gateway of a local network. The profiles can be used to map users to identities, devices, services, and other features that affect the manner in which a particular user communicates with (or through) the external network.

(4) Numerous other features can be provided in one or more additional embodiments. For example, elements in an external network may be used provide a notification summary to inform a specific user about pending events in any of one or more services. The summary may, in at least some embodiments, consolidate information about pending events and synchronize notification across multiple devices. As but another example, profiles may be employed to facilitate a user selection of a particular telephone number for a voice call session. Depending on profile settings, a user may also be permitted to join a pre-existing voice call session.

(5) Profiles may also be used to control the manner in which notifications of incoming voice call sessions or of other types of events are provided. In some embodiments, for example, each user may have one or more unique audio and/or visual indicators specified in his or her profile. Those indicators can then be used with notifications to that user of incoming communications and other events directed to that user. Profiles can also be used to control the manner in which notifications of multiple simultaneous events are directed to different users.

(6) Additional embodiments include systems and techniques for providing "public address" type messages to multiple users. Yet other embodiments include a network-based address book that permits users to share selected contact data with other users. Still further embodiments combine some or all of the above-described features and/or additional features described herein.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) Some embodiments of the present invention are illustrated by way of example, and not by way of limitation, in the figures of the accompanying drawings and in which like reference numerals refer to similar elements. For convenience, the first portion of each reference numeral corresponds to the drawing figure in which the corresponding drawing element is first introduced.

(2) FIG. **1** is a block diagram showing an architecture for a network in which at least some embodiments may be implemented.

(3) FIG. **2** shows an example of a profile for a specific user according to some embodiments.

(4) FIG. **3** is a partially schematic block diagram of a server according to some embodiments.

(5) FIG. **4** is a block diagram of a CPE gateway according to some embodiments.

(6) FIG. **5** is a block diagram of an end device according to some embodiments.

(7) FIG. **6** is a communication diagram showing information flows in connection with a user creating and managing a profile according to some embodiments.

(8) FIG. **7** is a communication diagram showing information flows in connection with a user accessing a profile from a temporary device according to some embodiments.

(9) FIG. **8** is a communication diagram showing an example of notification according to some embodiments.

(10) FIG. **9** shows an example of how NCS session IDs, TNs, user IDs and other data could be mapped at a CPE gateway and at an application server according to some embodiments.

(11) FIG. **10** is a flow chart illustrating operations performed by a CPE gateway to create a notification according to some embodiments.

(12) FIG. **11** is a flow chart illustrating operations performed by a CPE gateway according to some embodiments when a user attends a notification.

(13) FIG. **12** is a communication diagram showing notifications to multiple devices and synchronization of notification status according to some embodiments.

(14) FIG. **13** is a communication diagram showing information flows, according to some embodiments, when identities, services and user profiles are overlaid so as to provide delivery of notifications and content from multiple services to multiple destinations.

(15) FIG. **14** is a communication diagram showing user configuration of notification summary attributes according to some embodiments.

(16) FIG. **15** shows architectural elements of a network implementing notifications and notification summaries according to some embodiments.

(17) FIG. **16** shows a notification summary GUI according to some embodiments.

(18) FIG. **17** is a communication diagram showing delivery and synchronization of notifications across devices according to some embodiments.

(19) FIG. **18** is a flow chart showing events and operations performed as part of telephone number selection and/or barge-in according to some embodiments.

(20) FIG. **19** is an example of a displayed list of available TNs and active calls according to some embodiments.

(21) FIG. **20** is a communication diagram showing barge-in notifications across devices according to some embodiments.

(22) FIG. **21** shows a table according to some embodiments mapping various types of information regarding TNs and users associated with a subscriber account that corresponds to a particular CPE gateway.

(23) FIG. **22** is an example of a table that could be generated and pushed to a CPE gateway in some embodiments that employ Session Initiation Protocol (SIP) signaling for call set up.

(24) FIGS. **23**A-**23**F show examples, according to some embodiments, of notifications in connection with multiple events and/or sessions.

(25) FIGS. **24**A-**24**C show call flow signaling in some embodiments.

(26) FIG. **25** is a block diagram illustrating PA message broadcast in at least some embodiments.

(27) FIG. **26** shows a network with a broadcast server according to some embodiments.

(28) FIG. **27** is a communication diagram showing transmission of a PA message according to some embodiments.

(29) FIG. **28** shows a network with an address book server according to some embodiments.

(30) FIG. **29** shows one example of how contact data may be maintained in an address book server according to some embodiments.

(31) FIG. **30** is a communication diagram showing sharing of entries in a public address book according to some embodiments.

(32) FIG. **31** is a communication diagram showing, according to some embodiments, adding contact data obtained from a search using another data service.

(33) FIG. **32** is a communication diagram showing, according to some embodiments, updating of contact data in a public address book.

(34) FIG. **33** is a communication diagram showing, according to some embodiments, addition of a new contact that is also added to a favorites list.

DETAILED DESCRIPTION

(35) Some embodiments are described in the context of a network providing television, high speed data communication, telephony and other services to subscribers over a hybrid fiber-coaxial (HFC) cable plant using one or more protocols conventionally used in such networks. However, the invention is not limited to networks using a specific type of communication medium or to a

specific set of communication protocols.

(36) FIG. **1** is a block diagram showing an architecture for a network **100** in which at least some embodiments may be implemented. A plurality of end devices **101**, **102**, **103** and **104** at a subscriber premises **110** communicate through a customer premises equipment gateway (CPE gateway) device **111** with other elements of network **100**. Devices **101-104** and CPE gateway **111** form a local network, and users sharing devices **101-104** may form a user group. The portion of network **100** beyond premises **100** forms an external network relative to the local network of premises **110**.

(37) In the example of FIG. **1**, devices **101** and **102** are digital enhanced cordless telecommunications (DECT) handsets with advanced features, device **103** is a personal computer and device **104** is a Set-Top Terminal (STT) with a television connected thereto. Additional details of devices **101-104** and examples of other types of end devices are provided below. Network **100** includes a plurality of subscriber premises each having a CPE gateway and one or more end user devices communicating with network **100** through that CPE gateway in a manner similar to that described herein for subscriber premises **110**. For convenience, however, only a single subscriber premises **110** is shown.

(38) CPE gateway **111** communicates with the external network portion of network **100** through an access sub-network **112**. Sub-network **112** includes a cable modem termination system (CMTS), downstream modulators, fiber nodes and other elements commonly found in an HFC access network. Because the existence and operation of such elements is known, further details of access sub-network **112** are not included herein. One group of network **100** elements with which CPE gateway **111** communicates through sub-network **112** is collectively represented as a cloud **113**. Included in cloud **113** are numerous servers and other network elements with which devices **101-104** at premises **110** and with which other end devices at other premises exchange information. Those servers and network elements include call management servers and other elements used to prove voice telephony, short message service (SMS) servers, instant messaging servers, web servers, servers providing various types of content described herein, etc. Cloud **113** also includes links **114** to other networks. Network **100** may communicate with a network providing mobile telephony and other types of mobile services to mobile telephones, "smart" phones, personal digital assistants (PDAs) and other types of wireless handheld devices such as smart phone **116**. CPE gateway **111** also communicates through sub-network **112** with an application server **118** and an account management server (AMS) **119**, each of which is described in more detail below. For convenience, various routers and other intermediate network elements between elements of network **100** are not shown in FIG. **1**.

(39) In at least some embodiments, and as discussed in more detail below, individual users at a subscriber premises can have unique profiles stored in a user profile database (DB) **120**. Profiles stored in DB **120** control the manner in which specific users receive information from and/or send information to network **100**. In particular, an operator of network **100** may provide (or forward) numerous different services to premises **110**. Examples of such services can include voice telephony over any of multiple telephone numbers associated with premises **110**, internet access and/or other high-speed data service, email service, SMS (short message service), instant messaging (IM) service, television, etc. Additional examples of services include, but are not limited to: a network-based address book; gaming services; services to deliver personalized news, horoscopes, financial quotes, sports reports, etc.; location-specific weather, traffic information, news, etc.; personalized greeting messages; voice mail; multimedia messaging service (MMS); audio, visual and/or text-based chat; etc. Many of those services have specific types of information used for identifying a particular user, user-specific settings and preferences, and other types of configuration data that affect how the service is provided. Each of multiple individuals sharing end devices **101-104** at premises **110** may have a separate profile stored in DB **120** that represents the identifying information, settings, preferences and other configuration data for each of those

services relative to that individual. Further details and examples of profiles and configuration data in profiles are described below.

(40) In some embodiments, user profiles are linked to a specific subscriber account. As used herein, a "subscriber" is a person, corporation or other entity that has arranged to obtain access to, and one or more services from, network **100**, and an "account" is a construct used to group various data items related to providing a subscriber with services in the network. In some embodiments, an operator of network **100** establishes an account for premises **110** that includes various sub-accounts, with each of those sub-accounts corresponding to a specific user profile. A subscriber may be, for example, a head of a family residing at premises **100**, and each of the sub-accounts may be used by individual family members. This is only one example, however, and an account need not be assigned to a particular type of entity or be associated with a single premises or gateway.

(41) Profiles stored in DB **120** can be created and managed from end devices **101-104** and/or other devices and are device-agnostic. In other words, individual users may create and manage their profiles from various types of devices and may receive content delivery, notifications and other services in a synchronized manner across multiple devices and device types.

(42) FIG. **2** shows an example of a profile **200** for a specific user stored in database **120**. A first field **201** contains a name for profile **200**. This name can be, e.g., a name of the user or some variant of that user's name. A second field **202** contains credentials for the user. The credentials can include a user identification (UID) (e.g., the user name or some other name used to identify the user) and a password. The credentials could also include other types of data (e.g., encryption keys, etc.) and could include multiple separate sets of credentials (e.g., separate passwords and/or UIDs for different services). The next set of fields **203** contain identities for the user in various services. Examples of an identity include a telephone number (TN) and/or a session identifier associated with a TN, an email address, an instant messaging (IM) identifier, a game handle, etc. In some embodiments, the service to which a particular identity applies is implicit from the format of the identity (e.g., a ten-digit TN is implicitly linked to telephony-related services), but separate fields linking identities to services could also be included. In some implementations of some embodiments, each subscriber account is provided with a set of TNs (e.g., five TNs) that can be assigned to individual users, with one of those TNs acting as a default TN. Further examples of user/TN linking are described below.

(43) Fields **204** contain identifiers for specific end devices over which the user wishes to receive notifications (described in more detail below) and other aspects of various services. The identifiers in fields **204** can be, e.g., media access control (MAC) addressed of identified devices. In the example of FIG. **2**, the profile contains the identifiers of end devices **101-104** shown at premises **110** in FIG. **1**. However, this need not be the case. For example, end devices at a premises may include devices (e.g., a game console) that a particular family member may not use, and that family member may thus decide that he or she does not want any services for him or her directed to that never-used device. As another example, one member of a family may have a smart phone that is not used by other family members (e.g., phone **116**), and thus other family members would not identify that smart phone in their profiles.

(44) Field **205** contain priorities that the user has assigned to each of the devices identified in fields **204**. In some embodiments, a user can configure a profile so that notifications of various events (e.g., incoming calls, new emails, updated news or other information, etc.) are first sent to one or more primary devices, then to one or more secondary devices if the notification is not attended at a primary device, then to one or more tertiary devices, etc. In some such embodiments, notifications are sent to all devices by default if no priorities are specified in a profile. A user could also configure a profile so that notifications for events in one service are sent to some end devices and notifications for events in a different service are sent to different devices.

(45) Fields **206** contain pointers to various audio and/or visual indicators that are to be employed

when notifying the user of an event associated with a service. An audio indicator can be a ring tone or other type of sound. A visual indicator can be a specific color to which a display screen should be set, a picture or other graphic, a video clip, etc. A visual indicator could also include a specific type of pop-up message to be provided on certain devices (e.g., a "toaster" pop-up indicator on a bottom corner of a computer window) and/or whether such an indicator is to be allowed, specific text to be flashed on a display, an indicator that a display screen is to be flashed, an indicator that an LED or other light is to be flashed, etc. Although only a single audio indicator and a single visual indicator are shown in FIG. **2**, a single profile could specify multiple audio and/or visual indicators. For example, a user may specify a first audio and/or visual indicator combination to be used for notifications for one type of service (e.g., incoming telephone calls), a second audio and/or visual indicator combination to be used for notifications for another type of service (e.g., IM messages), etc. Examples of other types of notifications are included below.

(46) Fields **207** indicates various services the user is authorized to receive. In some cases, the authorizations in fields **207** are controlled by a subscriber, while in other instances the operator of network **100** controls such authorizations. For example, the operator of network **100** may make one set of services available to subscribers who pay a basic fee, a larger set of services available to subscribers paying a slightly higher fee, etc. In some embodiments, each account has a primary user who can control the degree to which other, non-primary users can access and/or modify their profiles, and thus control the degree to which those other users can access certain services. By way of illustration, a parent/primary user may restrict a child from using certain news or other services, from making long distance telephone calls, from receiving IM messages or other incoming communications between certain hours, etc. In a similar manner, a primary user could limit the degree to which a non-primary user could modify other aspects of a profile. As but one illustration, a non-primary user may be prevented from changing end devices identified in that non-primary user's profile.

(47) Field **208** contains a sub-network **112** MAC address and/or IP address for CPE gateway **111**. Field **209** contains an identifier of the account with which profile **200** is associated. A field **210** indicates whether the profile is for a "primary" user.

(48) A profile could include numerous other types of configuration information for a particular user. A profile could indicate the extent to which a particular user has "barge-in" rights to join an ongoing telephone call or other service session (described below). A profile could specify the types of notifications a user wishes to receives and/or the devices on which the user wishes to receive certain types of notifications. By way of illustration, a user may keep a DECT end device used for business purposes in a home office, and thus not want to receive IM or personal email notifications, sports updates or other distracting non-business notifications on that DECT device. A profile could include presence information (e.g., one or more fields to indicate whether a user has logged into or is currently utilizing a specific and device, the last end device the user utilized, etc.). A profile could also be used to contain personalization data that controls the types of notifications to be provided for certain services, examples of which include: the types of news stories for which a user would like to receive notifications; specific companies about which a user would like to receive financial update service notifications; a specific zodiac sign for which the user would like to receive a daily horoscope notification; sports teams for which the user would like to receive game score notifications; location information for services providing weather, traffic, local news or other location-related notifications; etc. As but one additional example, a profile may specify how notifications of emails, voice mails, IM messages, and other types of incoming communications are to be synchronized, how often such notifications are to be delivered, the devices from which such notifications can be accessed, etc. A profile could control the manner in which personalized greeting messages from a user are formatted and/or certain content to be included in such messages (e.g., a picture of the user). A profile could be used to control a user's access to a network-based address book. A profile could identify other users in a community of users (e.g., other family

members) to be provided certain multicast messages and/or indicate users from whom multicast messages are to be relayed.

(49) Data within a profile can also be used by other network elements to determine whether a particular user and/or device is authorized for a particular service, and thus provide access control. A profile could further be used for auto detection of devices and services, for authorization of additional devices for services, for other types of configuration management, and various other purposes. Accordingly, the data items shown in FIG. **2** are merely examples of the types of data that can be contained in a user profile. Moreover, the table of FIG. **2** is merely one example of how profile data can be stored in accordance with some embodiments. The actual format of profile data and/or of the tables or other data structures used to organize and store profile data will vary among different embodiments.

(50) Users access profiles in database **120** through account management system (AMS) **119** (FIG. **1**). Specifically, AMS **119** provides configuration management and access control functions through which users create, update and otherwise manage their individual profiles. In at least some embodiments, AMS **119** provides these functions through a web page or other portal that a user can access through any of end devices **101-104** and/or through a separate web portal (e.g., accessible over device **116** or remotely from premises **110**). Upon accessing the profile management portal, a user can create a profile having data such as shown in FIG. **2** and/or modify individual elements of the profile data. In some implementations, each family or other local user group associated with subscriber account will have a primary user (e.g., a parent) with highest privileges to control the profiles of other individual users (e.g., children) within that group. Those other users will have limited privileges for creation and management of their own profiles, but will not be able to modify the profiles of other users.

(51) Application server **118** receives notifications from other application servers and network devices that are destined for particular identities associated with a particular user (e.g., emails to a specific email address, instant messages to a specific IM ID, etc.). In some embodiments, messages for setting up voice telephony sessions and messages containing coded voice data for such sessions are exchanged with CPE gateway **111** by call managements servers (CMS), CMTSs and other network elements directly, but information regarding such sessions is forwarded to application server **118** (by CPE gateway **111** and/or from other elements within network **100**). Server **118** then consults user profile DB **120** and extracts various data from the profile(s) applicable to the identities being notified. That data may include, e.g., devices to which the notifications are to be forwarded, the CPE gateway through which such devices can be reached, visual and/or audio indicators to be used for the notification, etc. Server **118** then pushes the notifications and the profile data to the appropriate CPE gateway. In some embodiments, profile data for users in a local user group associated with an account is pushed to and cached on CPE gateway **111** when gateway **111** is booted, and updates are pushed to gateway **111** as such updates are made. Other operations performed by application server **118** may include consolidating and/or reconciling notifications from multiple sources and/or services for an individual user, concurrent delivery of notifications to multiple end devices for a particular user, and synchronization of notifications across multiple devices.

(52) In some embodiments, AMS **119** and application server **118** interface with user profile DB **120** using an XML interface, a web services interface, or other appropriate interface. Network elements in cloud **113** may similarly communicate with application server **118** over an XML interface, a web services interface or other appropriate interface. AMS **119**, user profile database **120** and application server **118** may each be implemented as multiple servers for redundancy and/or to increase the amount of analysis, data storage and other services being performed simultaneously.

(53) FIG. **3** is a partially schematic block diagram of a server **300** that can act as one of AMS **119**, user profile DB **120** and/or application server **118**. Server **300** includes one or more hardware interfaces **301-303** that provide physical connections by which server **300** communicates with other

servers or elements in network **100**. In at least some embodiments, hardware interfaces **301-303** include one or more Ethernet cards. Server **300** further includes memory **304** for storing instructions and data and a processor **305** for executing instructions and controlling operation of server **300**. Although a single block is shown for memory **304** and a single block shown for processor **305**, memory and computational operations of server **300** could respectively be distributed across multiple memory devices and multiple processors located within server **300** and/or across memory and processors located on multiple platforms. Memory **304** may include volatile and non-volatile memory and can include any of various types of storage technology, including one or more of the following types of storage devices: read only memory (ROM) modules, random access memory (RAM) modules, magnetic tape, magnetic discs (e.g., a fixed hard disk drive or a removable floppy disk), optical disk (e.g., a CD-ROM disc, a CD-RW disc, a DVD disc), flash memory, and EEPROM memory. Processor **305** may be implemented with any of numerous types of devices, including but not limited to one or more general purpose microprocessors, one or more application specific integrated circuits, one or more field programmable gate arrays, and combinations thereof. In at least some embodiments, processor **305** carries out operations described herein according to machine readable instructions stored in memory **304** and/or stored as hardwired logic gates within processor **305**. Processor **305** communicates with and controls memory **304** and interfaces **302-303** over one or more buses **306**.

(54) Returning to FIG. **1**, and as previously indicated, end devices **101-104** communicate with network **100** through CPE gateway **111**. For example, CPE gateway **111** receives notifications and other service data from application server **118** and forwards same to the appropriate end devices. CPE gateway **111** similarly forwards call signaling and other data from end devices **101-104** to various elements of network **100**. CPE gateway **111** may also perform any of numerous additional functions in various embodiments. For example, CPE gateway **111** may provide the session ID of an outgoing call (e.g., a NCS ID in systems using an NCS-based protocol or a SIP session ID in systems using SIP-based protocol) to application server **118**. CPE gateway **111** also interfaces with application server **118** (e.g., using a web service interface such as SOAP/XML), interfaces with AMS **119** (e.g., using a SOAP/XML interface) for profile creation and update, maps a Session ID to a TN, determines a profile and its attributes from a TN and maps a session ID to those profile attributes by communicating with application server **118**, and pushes the personalized profile attributes along with a session ID to an end device. CPE gateway **111** may also act as a proxy to forward user credentials from an end device to AMS **119** and forward profile attributes from application server **118** to the end device.

(55) CPE gateway **111** interfaces with each end device on a physical layer (e.g., wired or wireless) using protocols specific to the end device. CPE gateway **111** may be incorporated with components performing additional operations (e.g., a Data over Cable System Interface Specification (DOCSIS) cable modem). FIG. **4** is a block diagram of CPE gateway **111** according to some embodiments. A main processor **401** is configured to execute instructions so as to perform various operations as described herein, to perform various DOCSIS MAC and PHY (physical) layer operations, and to control operation of other components of CPE gateway **111**. Instructions executed by main processor **401** may be hardwired logic gates and/or may be instructions read from memory **402** or **403**. Main processor **401** communicates with network **100** across an RF interface **404** that includes a coaxial cable connector **405**, a duplex filter **406**, a wideband tuner **407** and an upstream communication amplifier **408**. Main processor **401** communicates with end devices through various additional interfaces that include additional hardware and/or firmware. Such interfaces can include a USB interface **410**, a DECT 6.0 interface **411**, MOCA (Multimedia Over Coax) interface **412**, 2.4 GHz WiFi interface **414**, 5 GHz WiFi interface **413**, Ethernet interface **415** and RJ11 interface **420**. A power supply **416** and/or battery backup **417** provide electrical power. User input to CPE gateway **111** may be provided over one of the aforementioned interfaces or via a separate collection of buttons or other controls in a console **421**.

(56) In the example of FIG. **1**, end devices **101** and **102** are DECT handsets communicating with CPE gateway over DECT interface **411** in FIG. **4**. FIG. **5** is a block diagram of end device **101**, with end device **102** being similar. DECT handset device **101** includes a transceiver **501** that receives and demodulates wireless signals from interface **411** and that modulates and transmits signals to interface **411**. A processor **502** is configured to execute instructions so as to perform various operations as described herein and to control operation of other components of device **101**. Those instructions may be stored in memory **508** as executable instructions and/or as hard wired logic within processor **502**. Processor **502** is also configured to perform one or more types of CODEC (coder/decoder) operations to convert data to audio for output through speaker **503** and to convert sound received through microphone **504** into data. Processor **502** outputs video data to a display **505** and receives user input through a keypad **506** and/or through touch sensitive portions of display **505**. Processor **502** is configured to provide a browser or other graphical user interface (GUI) on display **505** by which a user of device **101** can receive visual indicators for notifications, access various services, configure a user profile, etc. A battery **509** provides electrical power to device **101**.

(57) End device **103** in FIG. **1** is a personal computer. Similar to the platform **300** described in connection with FIG. **3**, device **103** includes one or more hardware interfaces that provide physical connections over which device **103** communicates with CPE gateway **111**. Those hardware interfaces may be wireless interfaces communicating with one or interfaces **413** or **414** (FIG. **4**), a USB interface communicating with interface **410**, an Ethernet interface communicating with interface **415**, etc. Device **103** further includes memory for storing instructions and data and a processor for executing instructions and controlling operation of device **103**. That memory may include volatile and non-volatile memory and can include any of various types of storage technology, including one or more of the types of storage devices described in connection with FIG. **3**. The processor of device **103** may be implemented with any of numerous types of devices, including but not limited to one or more general purpose microprocessors, one or more application specific integrated circuits, one or more field programmable gate arrays, and combinations thereof. In at least some embodiments, the processor of device **103** carries out operations described herein according to machine readable instructions stored in the memory of device **103** and/or stored as hardwired logic gates within the device **103** processor. Device **103** may include (or be communicatively coupled to) a display and a speaker to provide video and audio output, respectively. A keyboard and/or mouse provide user input to device **103**.

(58) Other types of end devices can include other types of cordless or wired telephones, Set Top Terminals, game consoles, etc. Each of the devices may also include memory and processor(s) configured to execute instructions so as to carry out operations described herein. Such devices may also include and/or be communicatively coupled to output devices (e.g., speakers and/or display screens) and input devices (e.g., keyboards, keypads, game controllers, remote control units for navigating and selecting elements of onscreen menus, etc.).

(59) As previously indicated, end devices **101-104** and other end devices provide content and service data to users and allow users to create and/or manage individual profiles. The above-described end devices communicate with external network elements outside of premises **110** using CPE gateway **111** as a proxy device. Other types of end devices (not shown) may communicate with application server **118**, AMS **119** and/or other elements of network **100** without using CPE gateway **111**. For example, personal digital assistant (PDA) **116** or a smart phone may interface with network **100** via a separate wireless network.

(60) Each of the above-described end devices may be shared by multiple users in a user group associated with premises **110**. For example, handset devices **101** and **102** may be available for use by any member of a family residing at premises **110**, computer device **103** may be a computer that all members of the family use, etc. Even though devices **101-104** are not dedicated to specific users, any of the users in the group can have a unique experience when utilizing one of end devices

101-104. For example, a user receiving an incoming telephone call, email or other communication on any of various ones of those devices can receive a notification that employs a user-specific audio and/or visual indicator derived from that user's profile maintained in DB **120**. Each of end devices **101-104** also provides an interface for a user to communicate with AMS **119** and application server **118** for accessing the user's profile and to retrieve various notifications and other information. This interface may be a web service interface such as SOAP/XML, a web browser interface, or another application running on the device. In some embodiments, an end device may also implement a mechanism for temporary authorization to access a user profile if the device is not currently associated with that user's profile.

(61) FIG. **6** is a communication diagram showing information flows in connection with a user ("user A") creating and managing a profile using end device **101** at premises **100** (FIG. **1**). Although end device **101** is used in the present example, other end devices at premises **110** could also be used. On line **6-1**, AMS **119** provides a profile management presentation layer to end device **101** via CPE gateway **111**. As used herein, "presentation layer" refers to a collection of user interface components (e.g., applications or applets permitting a user to select icons or fill in data fields) and user interface process components (e.g., applications and applets controlling the user interface components and sending user-supplied data to AMS **119**). Although not shown in FIG. **6**, AMS **119** may have provided the profile management presentation layer in response to various types of stimuli. As but one example, user A may have touched a region of display screen **505** (FIG. **5**) corresponding to a "create/modify profile" command, which may have caused end device **101** to send a signal to CPE gateway **111**, which in turn caused CPE gateway **111** to forward a signal to AMS **119**.

(62) Upon receiving the profile management presentation layer, end device **101** provides a screen for user A to sign on by providing a user ID and password or by providing other credentials. If user A has not signed on in a previous session, the user ID and password could be provided to user A by the operator of network **100** or by the primary user on the account (if user A is not the primary user). In some embodiments, a default profile is initially established for each TN linked to a particular account. The default profile includes minimal information (e.g., a different color visual indicator and a different ring tone) for each TN so that calls to different TNs can be distinguished without requiring any setup by a subscriber. Users can then modify those profiles to include other types of information. In some implementations, an account may be allowed to have more profiles than TNs, thus requiring certain profiles to share a particular TN. In some cases, a subscriber may wish to create a temporary profile (e.g., for a houseguest) specifying certain types of services that can be accessed through a specific device (e.g., a DECT handset in a guest bedroom).

(63) User A signs on (line **6-2**), and end device **101** forwards user A's credentials to AMS **119** via CPE gateway **111** (line **6-3**). After verifying the received credentials, AMS **119** either creates a profile for user A or opens a pre-existing profile and permits user A to access that profile (line **6-4**). After AMS **119** informs end device **101** that user A may access the profile (not shown in FIG. **6**), user A inputs identities such as an email ID, a TN (e.g., one of multiple telephone cumbers previously associated with the account for premises **110**), an instant messaging ID, etc. (line **6-5**). End device **101** sends those identities to AMS **119** via CPE gateway **111** (line **6-6**), and AMS **119** associates those identities with the user A profile by storing appropriate data in the user A profile in DB **120** (line **6-7**). User A then inputs identifications for devices to be associated with the user A profile (line **6-8**), which information is forwarded to AMS **119** via CPE gateway **111** (line **6-9**) and associated with the user A profile in DB **120** by AMS **119** (line **6-10**). AMS **119** then authorizes the identified devices for services based on the profile by informing CPE gateway **111** and end device **101** (line **6-11**). In some embodiments, this authorization may flow through application server **118**. End device **101** is informed in line **6-11** because user A is currently logged in through end device **101**, but other authorized end devices may not receive a specific notification of authorization as part of line **6-11**.

(64) In line **6-12**, user A configures personalized audio and visual indicators by inputting the necessary information into end device **101**. User A may, e.g., provide names of files containing ring tones, images, etc. and/or cause such files to be uploaded. The personalized audio and video indicators are forwarded to AMS **119** (line **6-13**), which then associates the personalized audio and video indicators with the user A profile in DB **120** (line **6-14**). User A may provide additional user profile attributes and/or updates (line **6-15**) that are also forwarded to AMS **119** (line **6-16**) and associated with the user A profile (line **6-17**).

(65) In some embodiments, a user could login from multiple end devices and update the user's profile concurrently from those devices. The latest update on the profile would then be updated by AMS **119** and synchronized across the end devices. For updating the profile, the upstream system may auto-detect the end device based on user credentials and provide the user interface for profile update. The user profile stored in DB **120** by AMS **119** is device agnostic and maintained at the upstream network and can be derived from multiple devices to deliver multiple services (i.e., the user can use the network based profile and access the identities and content from any device for any service).

(66) FIG. **7** is a communication diagram showing information flows in connection with user A accessing a profile from a temporary device. In some embodiments, a user can login to the system for receiving services from an end device that was not previously associated with that user's profile. For example, user A may have previously configured his or her profile so that incoming telephone calls and message are directed to (handset) end device **101** and (computer) end device **103**, but not to (handset) end device **102** or (STT) end device **104**. If user A logs in using handset end device **102**, AMS **119** will provide temporary rights to device **102** and user A will receive all notifications at device **102** as long as the session is authorized with proper credentials and active. User A logs in with his or her user name and password using end device **102** at line **7-1**. Those credentials are forwarded to AMS **119** via CPE gateway **111** (line **7-2**), which then validates those credentials and provides temporary access rights to device **102** for user A (line **7-3**). Device **102** then processes that authorization (line **7-4**) and establishes a session via CPE gateway **111** with AMS **119** (line **7-5**). AMS **119** then advises application server **118** that notifications from applications and services identified in the user A profile should be forwarded to device **102** (line **7-6**). When application server **118** receives such a notification it is pushed to device **102** via CPE gateway **111** (lines **7-7** and **7-8**). User A can then attend to a notification on device **102** just as he or she would using device **102** or device **103** (line **7-9**).

(67) Although not shown in FIG. **7**, application server **118** in some embodiments sends a message to CPE gateway **111** after line **7-6** indicating that notifications of events for identities in the user A profile should be sent to device **102**. In this manner, CPE gateway **111** will know to cause device **102** to generate notifications of such events. As indicated above, external network messages relating to new voice calls may come to CPE gateway **111** directly from a CMS, CMTS or other network elements without passing through application server **118**. However, other types of services may send messages containing data for a particular user identity to CPE gateway **111** through application server **118**. In either case, CPE gateway **111** will use information previously received from AMS **119** to cause end device **102** to generate an appropriate notification.

(68) Numerous types of notifications can be provided through an end device in a manner similar to that described in connection with FIG. **7** and in connection with other drawings figures. Some notifications may inform a specific user of an incoming call to a TN mapped in that user's profile, of a missed call and/or of a voice mail message. Other types of notifications may inform a user of other telephony-related events (e.g., a call-back from a previously busy TN). Still other types of notifications may inform a user of a new IM message, SMS message, MMS message, email or other type of message. Table 1 lists a number of different types of notification events corresponding to various different service types.

(69) TABLE-US-00001 TABLE 1 Service type Notification events voice/telephony incoming call;

missed call; new voice mail; call-back; emergency call; presence indication messaging new IM; new SMS message; new MMS message; new email; network status message; presence indication profile management change in profile; request to change profile; user login/logout/presence information news update or alert sports update or alert local update or alert news/weather/traffic financial stock quote or other update or alert horoscope daily horoscope alarm/calendar wake-up alarm; calendar reminder system management full mail box; full voice mail box; user login/ logout; other system alerts; emergency notifications emergency update or alert alerts/home alarm advertisements update or alert; sale notices, etc. other personalized update or alert services

Table 1 is not intended as an exhaustive list of possible notifications. Other types of notifications can be provided in various embodiments and/or are described below.

(70) FIG. **8** is a communication diagram showing one example of notification in a session-based network (e.g., as part of a NCS or SIP session). In particular, FIG. **8** shows the call flow to receive personalized notifications for a voice call at an end device based on a user profile. Shared end devices in a local network (e.g., the local network shown for premises **110** in FIG. **1**) will use the personalized audio and visual indicators stored in the profile of a called user to notify that user of an incoming call. At line **8-1**, CPE gateway **111** is booted and forwards its MAC address or other identifier to application server **118**. The example of FIG. **8** assumes that user profiles have already been created (e.g., as described in connection with FIG. **6**) and are mapped to the TNs of the account associated with CPE gateway **111**. Application server **118** then consults user profile DB **120** and/or AMS **119** and verifies credentials and profile settings (line **8-2**) and then obtains information from those profiles (line **8-3**). In particular, application server **118** identifies the audio and visual indicators for each of those user profiles, user-to-TN mappings from those profiles, and other user-specific attributes. Application server **118** then forwards the user attributes to CPE gateway **111** at line **8-4**. CPE gateway **111** stores those attributes for future use in generating notifications to users of incoming telephone calls and other events. If CPE gateway **111** was at this point unplugged and then plugged back in, the steps of lines **8-1** through **8-4** would be repeated.

(71) At line **8-5**, CPE gateway **111** receives an event trigger from an upstream network element indicating an incoming call directed to one of the TNs of the account associated with CPE gateway **111**. If the event trigger related to a different service, it would (in at least some embodiments) have been routed to CPE gateway **111** through application server **118**. Upon receiving the event trigger message, CPE gateway **111** determines the appropriate audio and visual indicators mapped to the called TN and uses those indicators to cause end devices to generate notifications of the incoming call in accordance with one or more of the profiles for which data was received at line **8-4** (line **8-6**). When user A notices the audio and/or visual indicators on end device **101**, user A recognizes that a call to user A is incoming (line **8-7**). User A attends to the notification at line **8-8**. As used herein, "attending" a notification refers to providing an input that acknowledges the notification and that may (in some cases) cause the notification to be canceled and/or cleared. A notification can be attended by accepting an incoming session or communication (e.g., answering a telephone call, accepting a new email or IM message, etc.), by rejecting an incoming session or communication, by indicating that the notification has been received but will be addressed later (e.g., transferring a call to voice mail, by acknowledging a new message notification without opening the new message, etc.), and/or by other means. End device **101** then sends a message to application server **118** via CPE gateway **111** clearing the notification at line **8-9**. The notification to user A for the incoming call is the then cleared (line **8-10**). CPE gateway **111** may also send a signal to application server **118** indicating that the notification can be cleared (not shown). Other elements of the call setup are not shown in FIG. **8**, but may be in accordance with known internet telephony call setup procedures. If user A attend the notification in line **8-8** by accepting the incoming call, the call would continue after the notification was cleared at lines **8-9** through **8-10**.

(72) FIG. **9** shows one example of how NCS (Network-based Call Signaling) session IDs, TNs, user IDs and other data could be mapped at CPE gateway **111** and at application server **118**. The

first NCS session ID (NCS ID **1**) is mapped a first TN (TN**1**). TN**1**, which is also the default number for CPE gateway **111** (as discussed in more detail below), is mapped to user A (i.e., is linked to user A by user A's profile). In the example of FIG. **9**, user A is also logged into the local network of CPE gateway **111** (through an end device not indicated in FIG. **9**). In a similar manner, NCS ID **2** is mapped to TN**1** (a non-default number) and user B, with user B also being logged in. NCS ID **3** is mapped to TN**3** and user C, who is not currently logged in.

(73) When there is a new telephone call, email message, instant message or other type of event associated with one of the services provided to users associated with a particular account, a visual and/or audio notification of that event will be provided for a reasonable amount of time so that the event can be noticed and differentiated by the appropriate user(s). For example, a notification of an incoming telephone call to a TN mapped to user A will have audio and/or video indicators specified by user A's profile and may be generated on multiple end devices. Once user A attends to and clears that notification on one of those end devices, the visual notification will be cleared and discontinued on all the end devices. If there are other pending notifications for other events and/or other users, audio and/or visual notifications for those notifications will continue to be provided on other end devices, and will also be provided on the device just utilized by user A to attend a notification if that device is not still in use (e.g., if user A attended the notification by directing the call to voice mail). If there are multiple pending notifications, they may be played in a predefined sequence (e.g., based on order of receipt at application server **118** or CPE gateway **111**). When all users attend their notifications, the visual alert indicators will be turned off on all the handsets.

(74) Notifications could be provided in various ways. For example, distinct visual and audio indicators could be provided for each type of event when used by a single user. By way of illustration, a user may specify one combination of audio and visual indicators for telephone call notifications and a different combination of audio and visual indicators for instant messaging notifications. Distinct audio and visual indicators could also be used to identify a user to whom a notification is directed. For example, user A's profile may indicate that user A is mapped to TN**1**, has specified song 1 as a ring tone and red as a visual indicator, and identifies handset end devices **101** and **102**. User B's profile may indicate that user B is mapped to TN**2**, has specified song 2 as a ring tone and blue as a visual indicator, and also identify handset devices **101** and **102**. An incoming call to TN**1** would result in playing of song 1 and display of red on devices **101** and **102**. An incoming call to TN**2** would result in playing of song 2 and display of blue on devices **101** and **102**. A call to TN**1** followed by a call to TN**2** before the TN**1** call is answered would result in devices **101** and **102** each playing song 1 while displaying red for a first time period, followed by playing song 2 while displaying blue for another time period, with the cycle repeating until one of the notifications is attended or times out (e.g., if a caller hangs up).

(75) FIG. **10** is a flow chart illustrating operations performed by CPE gateway **111** to create a notification of a call to TN**1** on end device **101**, which is mapped to user A in the user A profile. CPE gateway **111** would simultaneously perform similar operations with regard to additional end devices mapped in user A's profile. In block **1001**, CPE gateway **111** receives a message indicating an incoming call to TN**1**. In block **1002**, CPE gateway **111** determines if end device **101** is idle. If so, CPE gateway **111** proceeds on the yes branch to block **1004** and determines the correct audio and visual indicators. Those indicators may have been previously stored (e.g., as described in connection with FIG. **8**). CPE gateway **111** then causes device **101** to provide a notification of the incoming call with those indicators (block **1005**). If device **101** had not been idle in block **1002**, gateway **111** would have proceeded to block **1003** and waited until device **101** became idle, at which point gateway **111** would have then proceeded to block **1004**. If the caller were to hang up before CPE gateway **111** transitioned from block **1003** to block **1004**, the notification provided in block **1004** could be of a missed call. Operations similar to those of FIG. **10** could be performed for other types of notifications or to provide notifications of multiple pending events. If CPE gateway **111** received notifications in block **1001** of a call to TN**1** and to TN**2** (as described above in a

previous example), the audio and visual indicators for both calls would be determined in block **1004** (song 1/red and song 2/blue), and the notifications would be provided in sequence in block **1005**.

(76) FIG. **11** is a flow chart illustrating operations performed by CPE gateway **111** when a user attends a notification. As with the example of FIG. **10**, CPE gateway **111** may perform the operations of FIG. **11** in parallel for multiple end devices. CPE gateway **111** receives a message indicating an incoming event for user A in block **1101** and forwards a notification with the appropriate indicators. CPE gateway **111** receives an indication in block **1102** that the user has attended the notification. In block **1103**, CPE gateway **111** determines if there are any additional unattended notifications for user A. If not, CPE gateway **111** proceeds on the "no" branch to block **1105**, clears the notification (including, e.g., sending an appropriate message to application server **118**), and causes the end device to discontinue the indicators. If there are additional unattended indicators, CPE gateway **111** proceeds on the "yes" branch to block **1104**, clears the notification attended in block **1102**, and provides the next notification (or sequence of notifications).

(77) Once a notification is attended by a user, the notification may be cleared on the device utilized for attending the notification and on all other devices. Notifications as described above could also be provided in SIP-based IMS networks. Notifications with audio and/or video indicators could be provided on other types of devices. In some embodiments, notifications with only audio or visual indicators might be provided through some devices (e.g., audio only in an end device without a display screen, visual only for devices the user has specified in a profile as visual-only, etc.).

(78) FIG. **12** is a communication diagram showing notifications to multiple devices and synchronization of notification status. CPE gateway device **111** is booted and forwards identifying information to application server **118** at line **12-1**. Application server **118** verifies the identifying information for CPE gateway **111** via AMS **119** and DB **120** (not shown), receives profile information from DB **120** via AMS **119** (also not shown), and forwards profile settings to CPE gateway **111** for users associated with an account linked to CPE gateway **111** at line **12-2**. User A logs in with end device **101** at line **12-3** and with end device **102** and line **12-4**. At line **12-5** CPE gateway **111** receives a message indicating an event trigger and that references one of the user identities in the user A profile. In some embodiments, the message received by CPE at line **12-5** would come from a CMS or other element in network **100** for a voice call, but would come through application server **118** for other types of services. CPE gateway **111** consults the profile data cached at line **12-2** and determines the appropriate audio and visual indicators, and then causes device **101** to produce a notification using those indicators (line **12-6**). User A notices this notification at line **7** but does not yet attend. CPE gateway **111** causes device **102** to produce a notification (using the same indicators) at line **12-8**, which user A notices without attending at line **12-9**. User A attends the notification on device **102** at line **12-10**, resulting in device **102** signaling same to CPE gateway **111** (line **12-11**). CPE gateway **111** may also signal application server **118** that the notification has been attended (not shown). CPE gateway **111** then signals device **101** to clear the notification (line **12-12**) and synchronizes a notification summary (described below) at device **101** (line **12-13**). Device **101** then shows the notification removed (line **12-14**). As in previous drawing figures, FIG. **12** does not show other call-set up signaling messages and messages containing voice data that would be transmitted between CPE gateway **111** and a CMS or other network element.

(79) In some embodiments, identities, services and user profiles can be overlaid so as to provide delivery of notifications and content from multiple services to multiple destinations. FIG. **13** is a communication diagram showing information flows in one such scenario. The example of FIG. **13** assumes a profile such as is shown in FIG. **2** (e.g., mapping user A to TN**1** and the services shown in field **207** of FIG. **2** and specifying notifications to devices **101-104**). At line **13-1** application server **118** receives a notification from a first application service (e.g., an email). Application server **118** receives a notification from a second application service at line **13-2** (e.g., a news update for the news service specified in the user A profile). The example of FIG. **13** further assumes that

profile information for user A has previously been stored at CPE gateway **111** in a manner such as shown in FIG. **8**. In other embodiments, application server **118** could retrieve user A profile information from user profile DB **120** and/or AMS **119** upon receipt of the notifications of lines **13-1** and **13-2**. Application server **118** provides the email notification to CPE gateway **111** at line **13-3**, whereupon CPE gateway **111** causes devices **101** and **102** to provide email notifications with the appropriate audio and visual indicators for user A (lines **13-4** and **13-5**). Notifications would also be provided through devices **103** and **104** if those devices could accommodate such notifications, but devices **103** and **104** are not further discussed in connection with FIG. **13**. Application server **118** provides the news notification to CPE gateway **111** at line **13-6**, with CPE gateway **111** causing devices **101** and **102** to provide the news notifications with the appropriate audio and visual indicators for user A at lines **13-7** and **13-8**. User A attends the email notification on device **101** at line **13-9**. This is forwarded to CPE gateway **111** (lines **13-10**), which clears the email notification (lines **13-11** and **13-12**) and continues the news notification (line **13-13**). If user A discontinues use of device **101** before the news notification is attended, CPE gateway would then cause device **101** to resume the news notification.

(80) Various features in some embodiments offer multiple advantages over many pre-existing systems. In many existing systems where users might wish to receive notifications at multiple end devices from multiple sources, delivery mechanisms are specific to the service and to the device. In such systems, notifications are often not synchronized or coordinated. For example, one end device may receive a notification long after that notification has been received by and attended on a different end device. As another example, a notification may be simultaneously received at two end devices, but will continue to show on one of those devices after being attended on the other of those devices. As yet another example, a user receiving multiple notifications from multiple different sources may be forced to separately retrieve information about notifications from each of those sources and/or be forced to individually configure notification preferences using a separate interface and/or connection for each source. By consolidating notifications at the network level and forwarding those notifications according to a user profile maintained at the network level, these and other concerns can be addressed.

(81) In some embodiments, each user can access a user-specific notification summary GUI to obtain information about all pending notifications. In some embodiments, and as discussed below, that summary GUI will provide a consolidated and scrollable summary of pending alerts with links to obtain additional information about each notification. Because the alert summary is generated at each end device from information maintained in a consolidated form at the network level, attending a notification on one end device will cause the notification summary to be appropriately updated if accessed from any other end device. As with other aspects of the manner in which network services are provided, a user can configure his or her notification summary, with such configuration information being maintained in the user's profile.

(82) As indicated above, a user can configure a profile to specify the types of notifications that the user wishes to receive and/or the devices to which certain types of notifications should be provided. A user could similarly configure a notification summary to include information about certain types of notifications but not include information about others.

(83) In some embodiments, a user can also configure a profile to control numerous other aspects of the manner in which notifications are provided and the manner in which such notifications are reflected in a notification summary. For example, a user can configure a profile so that notifications and/or notification summaries are prioritized based on class or type of notification (e.g., the service instantiating the notification, whether the notification is of a new call or message), based on state of the notification (e.g., the number of unread emails referenced in an email notification), the level of notification intensity, the staleness of the notification (e.g., the time since the notification was initially provided), the current activities of the user, etc. A profile could also be configured to provide a cursory level view of notifications and/or indications of whether notifications have been

attended.

(84) In some embodiments, the severity of a notification will be set by the provider or initiator of the event causing the notification, but a user may be able to override such severity settings for some or all notifications (e.g., all non-emergency notifications). In some embodiments, emergency notifications may be accompanied by a specific audio and/or visual indicator even if a user has configured his or her profile to not provide any audio or visual notifications.

(85) FIG. **14** is a communication diagram showing user configuration of notification summary attributes. The user logs in using end device **101** at line **15-1**. This is forwarded to AMS **119** via CPE gateway **111** (not shown) at line **14-2**. The user credentials are validated by AMS **119** and a profile configuration session established (line **14-3**). The user then accesses the notification summary settings in the profile configuration session (line **14-4**), which access request is forwarded to AMS **119** (line **14-5**) and to an application server with policy control **1401** (line **14-6**). Application server with policy control **1401**, which could be the same as application server **118** (FIG. **1**) or could be a separate server, implements policies specified by the user profile. At line **14-7**, notification summary attributes for the user are forwarded to AMS **119**, which then provides those attributes through the profile configuration session GUI to device **101** at line **14-8**. The user makes changes to the notification summary attributes at line **14-9**, which are forwarded to AMS **119** at line **14-10**, and to application server with policy control **1401** at line **14-11**. At line **14-12**, the attributes are stored. In some embodiments, modification of notification summary aspects of a user profile is completely conducted by AMS **119**, with AMS storing any modifications in DB **120**, and with application server **118** or application server **1401** then accessing the modifications.

(86) FIG. **15** shows architectural elements of network **100** implementing notifications and notification summaries according to some embodiments. Application server with policy control **1401**, which may be part of application server **118** of FIG. **1** or a separate server, controls the notification system of network **100** so as to deliver notifications to end devices in accordance with appropriate profile data. Server **1401** also provides the notification summary GUI to end devices via, e.g., WML. Additional aspects of the notification summary GUI are provided below. Notification server **1502**, which may also be a part of application server **118** from FIG. **1** (e.g., a separate set of programming routines in server **118**) or a separate server, consolidates notifications from multiple servers and provides them to application server **1401**. Notification server **1502** also receives status updates for notifications from end devices and forwards messages to upstream network elements to modify the status of notifications so as to synchronize notifications. Such synchronization can be performed by a push or pull model. In a pull model, a notification summary is updated from the network whenever an end device initiates the notification summary GUI. In a pull model, notification server **1502** pushes changes to end devices whenever any notification state is changed. Application servers **1503**, **1504** and **1505** are in the network cloud **113** of FIG. **1**, and represent servers that initiate various types of notifications. Server **1503** is an email server, server **1504** is a voice mail server, and server **1505** is an SMS/MMS server. Provider alert feed **1406** pushes notifications to end devices from the operator of network **100**. Notifications from alert feed **1506** could include emergency messages, advertisements, etc.

(87) End devices can be configured to display notifications and the notification summary GUI. In some embodiments, data caching at the end devices or a CPE gateway can be employed to reduce bandwidth consumption. In some embodiments, notification data will not be stored on an end device, but some end devices can be configured (either directly or through a profile) to store notification information. Notification information stored on an end device might not synchronized, however. End devices in some embodiments may implement a client application to receive and display notifications from application server **1401** and to send the actions/commands related to those notifications so that such notifications can be updated in network **100** and synchronized across devices.

(88) In some embodiments, each of application server **1401**, AMS **119**, notification server **1502** and

end device clients can be implemented as software services in a component based model for easy portability across platforms and devices.

(89) End device client applications may connect to application server **1401** using any of various messaging protocols, and can be implemented as a browser-based application. Other types of display applications could be used, however. Indeed, notifications could be conveyed through end devices in a variety of different manners. As but one example, various available operating systems provide functions and APIs to deliver messages to multiple clients. In some embodiments, application server **1401** can support the server functionality to deliver notifications to multiple clients by using OS-specific messaging methods. As another example, notifications can be delivered to multiple clients by implementing a standard set of protocols between application server **1401** and end devices using application level protocols. Each end device provides a unique interface and a protocol suite for receiving notifications and sending commands via a reverse path to an application server in the upstream network. For example, a notification summary screen can be delivered to an end device using protocols such as WML to DECT hand sets or mobile phones, an OCAP based transaction model to deliver to a STT and a client-server model to deliver to PC soft phones, etc. As yet another example, component based models (e.g., JAVA DCOM or MICROSOFT .NET) could also be used. Distributed components could expose interfaces as web services (e.g., SOAP/XML) and notifications could be delivered via such interfaces.

(90) Simple Network Management Protocol (SNMP) provides options for delivering alerts and traps to a Network Management Server via a standard interface between the SNMP agent and the server. In some embodiments, notification server **1502** can be configured as an SNMP management server and application servers configured as SNMP agents. Notification server **1502** would receive notifications from each application server and deliver those notifications to application server **1401** for policy update before delivery to end devices. Application server **1401** applies policies and acts as a proxy to forward notifications to end devices. Application server **1401** could be configured as a management server and use SNMP PUT methods to deliver the notifications to each end device. Notifications could be implemented as SNMP OID trees for management by notification server **1502** and application server **1401**.

(91) FIG. **16** shows a notification summary GUI **1601** that could be presented on, e.g., end device **101** according to some embodiments. In the example of FIG. **16**, the user has three new emails, four missed calls, two new IM messages, and a new voicemail. By selecting a hyperlink on the line entry for new emails, the user is provided with a subsequent GUI for retrieving and viewing those emails. If there are more unread emails than can be displayed on a single screen, the subsequent GUI may be scrollable so that the user can choose which email(s) to open. In a similar manner, selecting a hyperlink on the line entry for missed calls may provide a list of calls (which list could also ne scrollable if necessary). Selecting a hyperlink on the line entry for new messages leads to a scrollable GUI with those new messages. Selecting a new voicemail hyperlink could cause any pending voicemails to be played in sequence and/or could provide a list of such voicemails (e.g., identified by calling number and time). If there were additional types notifications (e.g., notifications of available news updates, a notification that there is a new daily horoscope available, etc.), GUI **1601** could itself be scrollable.

(92) FIG. **17** is a communication diagram showing delivery and synchronization of notifications across devices. User A logs in using end device **101** at line **17-1**. Application server **1504** triggers a new notification at line **17-2** and forwards the notification to alert notification server **1502** at line **17-3**. Alert notification server **1502** consolidates the notification with other notifications (if any) at line **17-4** and then forwards the consolidated notifications to application server **1401** at line **17-5**. Application server **1401** then applies user A policies to configure a notification summary for delivery to end devices **101** and **102**. A notification summary (that includes the notification from line **17-3**) is then delivered to end devices **101** and **102** via CPE gateway **111** (not shown) at lines **17-7** and **17-8**. User A attends the notification in the notification summary at line **17-9**, which

results in device **102** transmitting a notification status update that is forwarded to application server **1401** (line **17-10**). Application server **1401** then updates server **1504** as to the status of that notification (line **17-11**). Server **1504** updates the notification status at line **17-12**. At about the same time, application server **1401** deletes the just attended notification from the notification summary. At line **17-14**, user A refreshes the notification summary on end device **101**, which then forwards a request for an updated summary to application server **1401** at line **17-15**. Application server **1401** forwards the updated notification summary (which does not include the notification just deleted at line **17-13**) at line **17-16**.

(93) Notifications can take many forms. In addition to the notification formats described above (e.g., audio and visual indicator, pop-up messages, etc.), notifications could be in the form of a hyperlink added to a web page, text added to a region of a television screen (e.g., if the television is connected to a STT), audio and/or visual indicators presented through a portable media player or during a game played on a game console or on a computer, etc.

(94) In some embodiments, after a user attends a notification by taking appropriate action (e.g., listening to a voice mail, retrieving a new message, acknowledging a new call or message without responding, etc.), the notification is removed from the notification summary and the next highest priority notification is displayed.

(95) As previously indicated above, an operator of network **100** may assign multiple TNs to a particular account. For example, the network **100** operator might assign 5 separate TNs to the account associated with premises **110**. Each of those TNs can be linked to a particular user in that user's profile, and one of the TNs can be designated as a default TN. In some implementations of the embodiment of FIG. **1** and of other embodiments described herein, telephony service is VoIP and is provided to a premises over an HFC plant. In theory, the number of simultaneous calls that can be conducted by end devices at a particular premises using separate TNs is only limited by network bandwidth. In some cases, however, a particular premises may be limited to a number of simultaneous voice calls that is less than the total number of TNs assigned to the account for that premises.

(96) In some embodiments, the default TN is assigned to the primary user, and the remaining TNs for an account are individually assigned to other users. As previously discussed, such TN assignment can be performed by making appropriate entries in each user's profile. In the absence of other profile restrictions (e.g., in the absence of a primary user preventing some users from making calls on some TNs), any user can make a call using any TN. If a user logs in to a device, calls by the user will by default employ that user's TN. If that user's TN is already in use, the user can select another TN not in use. If a person makes a call on a device without having logged in (and assuming no other users have logged in on that device), the default TN will be used if the default TN is available. The following are examples of potential use cases according to some such embodiments: Use Case 1: A user has not logged into the system and the default TN is available for use. The user makes the call using the default TN. Use Case 2: A user logs into an end device with his or her credentials. The user's TN is available for making a call and will be used for making calls. Use Case 3: A user logs into an end device with his or her credentials. The user's TN is in use. There are fewer calls in progress than the maximum number of simultaneous calls allowed from CPE gateway **111**. The user selects any one of the available TNs for making the call. Even though the available TN and line is used for making a call, the logged-in user's profile name and attributes are used for making the call for recording and notification. Use Case 4: A user logs into an end device with his or her credentials. The user's TN is in use; if all lines are in use, the user will not be able to make any call from his profile name.

(97) A user may also be permitted to join ("barge-in") an ongoing call. In particular, a logged in user can join other ongoing and active call sessions routed from a common CPE gateway by selecting a session. The session can be displayed for a group based on a user profile or a TN for a group of users. A user can select an ongoing call from a displayed list of active sessions and will be

allowed to join if any necessary approvals are obtained and any applicable control rules (e.g., restrictions in a user profile regarding barge-in to certain TNs) are satisfied. The number of users participating in a single session is in some embodiments only limited by the number of physical channels connecting a CPE gateway with end devices, and is not dependent in the number of user profiles associated with that CPE gateway. A user can select an ongoing call from a variety of groups, such as a list of user profiles in a family or other community of users associated with an account, a list of user profiles in a buddy list, and a list of user profiles in a social network.

(98) FIG. **18** is a flow chart showing events and operations performed as part of call selection and/or barge-in according to some embodiments. At block **1801**, user A attempts to initiate an outgoing call with end device **101** by, e.g., touching the display screen **505** or pressing an appropriate button. At block **1802**, a determination is made whether all TNs for the premises **110** account are in use. This determination can be made in CPE gateway **111**. If all TNs are in use, user A is unable to make an outgoing call ("yes" branch to block **1803**). If all TNs are not in use, flow proceeds on the "no" branch to block **1804**, and it is determined whether a user is logged in to end device **101**. The determination of block **1804** can similarly be made in CPE gateway **111**. If a user is logged in, flow proceeds on the "yes" branch to block **1806**. Note that the logged in user could be user A or could be another user. In block **1806**, CPE gateway **111** determines if the TN of the logged in user is available. If not, flow proceeds to block **1809**, which block is described below. Otherwise, flow proceeds to block **1807**, where CPE gateway **111** causes end device **101** to indicate that the login user's TN is available, and user A dials the number to be called. The call is connected via CPE gateway **111** and upstream network elements at block **1808**.

(99) Returning to block **1804**, if a user is not logged in, flow proceeds to block **1805** on the "no" branch. CPE gateway **111** then determines in block **1805** if the default TN is available. If so, CPE gateway **111** causes said availability to be indicated on end device **101**, and user A dials the called TN at block **1817**. The call is then connected in block **1818**. If at block **1805** CPE gateway **111** determines that the default TN is not available, flow proceeds on the "no" branch to block **1809**. At block **1809** CPE gateway **111** causes end device **101** to display a list of available TNs and active calls. An example of such a display is shown in FIG. **19**. Flow then proceeds to block **1810**. If user A wants to make a new call, flow proceeds on the "yes" branch to block **1816**, where user A selects one of the available TNs by providing appropriate user input to end device **101**. Flow then proceeds to block **1817**, where the number is dialed. If at block **1810** user A does not want to make a new call, flow proceeds to block **1811**. If user A does not want to join one of the active calls, flow proceeds to block **1820** and user A presses "exit." If user A does want to join an active call, an appropriate input to select an active call is provided at block **1812**. In block **1813**, CPE gateway **111** notifies other users on the call of user A's request to barge-in. If the barge-in is accepted (block **1814**), flow proceeds to block **1819**, where user A is added to the active call session. Otherwise, flow proceeds to block **1815**, where CPE gateway **111** causes end device **101** to indicate that user A's barge-in request is denied.

(100) In some embodiments, participants in an ongoing call are not provided with an opportunity to accept or reject a barge in request. In some such embodiments, a user is allowed to barge-in an ongoing call on a given TN unless there is data in that user's profile that restricts the user from barging into a call on that TN. When a user does barge-in, however, other participants in the call may be provided a with a beep or other indication that a user has joined.

(101) In the operations described above in connection with FIG. **18**, determinations and other operations performed by CPE gateway **111** in blocks **1802**, **1804**, **1805**, **1806**, **1810**, **1811** and **1814** could alternately be made in another network element (e.g., application server **118** or some other network element).

(102) When a call is made by a logged in user, the name and attributes from the logged in user's profile may be used for calling records. As indicated above, profiles can also be used to control which users may use which lines. For example, a primary user may wish to configure profiles of

some secondary users to prevent those secondary user from initiating calls on certain TNs. Similarly, the profiles of some users could be configured to prevent those users from barge-in on calls on certain TNs.

(103) In some embodiments, the TN selection and barge-in features described above are also available for other types of services. For example, a first user may allow other users to send messages or emails using the first user's email or IM identity, may allow other users to join a multi-user IM session, etc.

(104) FIG. **20** is a communication diagram showing barge-in notifications across devices. Users A and B login using devices **101** and **102**, respectively, at lines **20-1** and **20-2**. User A then initiates an outbound call using the TN of user A at line **20-3**, which call initiation is forwarded via CPE gateway **111** at line **21-4** to a call management server (within network cloud **113** of FIG. **1**) at line **20-5**. CPE gateway **111** also tracks the session ID (e.g., a NCS ID) for the call (line **20-6**). The call management server routes the call (line **20-7**). The remaining steps of the call set up are not shown.

(105) User B attempts at line **20-8** to initiate an outgoing call on device **102**. Device **102** forwards a message to CPE gateway **111** indicating that user B wishes to make a call (line **20-9**). At line **20-10**, CPE gateway **111** determines that user B's TN (i.e., the TN mapped to user B in the user B profile) is already in use. CPE gateway **111** then causes device **102** to generate a display on device **102**, similar to that of FIG. **19**, indicating the TNs for which a call is in progress and the TNs which are available (line **20-11**). At line **20-12** user B provides input to device **102** indicating a selection of the ongoing call on user B's TN (i.e., the call initiated by user A at line **20-3**). After receiving an indication from device **102** of this selection by user B (not shown in FIG. **20**), CPE gateway **111** forwards a request to device **102** requesting authentication to join the call (line **20-13**). User A may, for example have restricted certain users from barge-in to calls on user A's TN. User B provides his or her username and password at line **20-14**. This could be required, for example, as a precaution in case another user picks up device **102** after user B logged in. After user B's credentials are forwarded to CPE gateway **111** (not shown in FIG. **20**), CPE gateway **111** forwards same to AMS **119** at line **20-15**. After determining user B is authorized to barge in, AMS **119** returns an authorization to CPE gateway **111** at line **20-16**, which then permits the barge-in at line **20-17**. In some embodiments, the verification and authorization performed by AMS **119** in FIG. **20** could instead be performed by application server **118**.

(106) The call flow of FIG. **20** is extensible to other services, including but not limited to data services, messaging services, video services, etc.

(107) FIG. **21** shows a table that maps various types of information regarding TNs and users associated with a subscriber account that corresponds to a particular CPE gateway. The table of FIG. **21** is generated by application server **118** (or another network element) from profile data in DB **120**, and pushed to CPE gateway **111** when CPE gateway **111** is provisioned or reboots, in embodiments that employ NCS signaling. NCS signaling is known in the art and described, e.g., in various PACKETCABLE specifications available from Cable Television Laboratories, Inc. of Louisville, Colorado. Accordingly, details of NCS signaling are not included herein. A first column **2101** has fields that hold an identifier for a subscriber account. The second column **2102** has fields that each holds a NCS ID (a NCS identifier for a call session) to be mapped to a TN. The third column **2103** has fields holding TNs. Each field in column **2104** indicates whether a TN is a default TN. Each field in column **2105** holds a nickname or other alternate name that a user mapped to a TN may wish to see when information about that TN is shown on an end device. Each field in column **2106** holds the user name of a user mapped to a particular TN. The user name may be the same as or different than the nickname in column **2104**. For example, a user may have a user name such as "Bob12345678" and a nickname of "Bob." Each field in column **2107** holds a globally unique identifier assigned by the operator of network **100** to a particular TN. The fields in column **2108** indicate whether a user is logged in.

(108) CPE gateway **111** uses data in the table of FIG. **21** to determine which TNs are available.

Once a TN is selected from an end device, any outgoing call from that end device will use the selected TN until the user terminates the session. Once the session is terminated, the TN again becomes free for reselection according to any profile-defined rules. CPE gateway **111** registers its MAC address and FQDN with application server **118** at provisioning or reboot. Application server **118** also receives the IP address of CPE gateway **111** through the registration process. Application server **111** uses that IP address to communicate with CPE gateway **111**. Application server **118** sends the NCS table to CPE gateway **111** and updates the table as required based on profile changes. In some embodiments, for example, application server **118** may provide APIs for updating the NCS ID table with the attributes TN, profile display name and NCS ID. Application server **118** may also provide a web service interface with the provisioning system to determine the mapping of NCS ID to TN and map TN to profile name.

(109) FIG. **22** is a table that is generated and pushed to CPE gateway **111** in embodiments that employ Session Initiation Protocol (SIP) signaling for call set up. The table of FIG. **22** may similarly be created by application server **118** or other element of network **100** from profile data in DB **120**. In SIP-based communication, end devices may be addressed by a Uniform Resource Identifier (URI) to establish communication. The end device may have IP connectivity and be able to negotiate all capabilities to set up a session using SIP messages. In such embodiments, a user is allocated one or more Public User Identities by the network **100** operator. A Public User Identity may be either a SIP URI or a TEL URI. The Public User Identities can be used for routing the SIP signaling messages. Each user may also be assigned a Private User Identity, which is not a SIP URI and is not used for routing SIP requests, but is used for profile, login and authentication, and other purposes within network **100**.

(110) As can be FIG. **22**, the table maps private user identities to public user identities, TNs and call preferences (e.g., call forwarding and other IMS preferences). Each user can be provisioned with a profile mapping the Private User Identity, the Public User Identity, a TN and personal preferences. In a specific case, the Public User Identity can be mapped to a TN itself and may be a sub use case of mapping between identities and TNs.

(111) The profile mapping can be carried out during a service provisioning stage and can be pushed to CPE gateway **111**. When end devices and TNs are shared across a group of users, the Private User Identities can be used for profile login and authentication. Public User Identities can be used to select an outgoing line/TN or URI for SIP signaling. In this way, any user can use any of the available Public User Identities to make an outgoing call.

(112) If a particular user is permitted to use a particular Public User Identity, SIP headers can be appropriately modified to include this address as the "From" address to initiate a session.

(113) A profile-based system according to various embodiments allows simultaneous sessions when multiple calls are received for the same or for different users. For example, FIG. **23**A shows an incoming call to TN**1** received at CPE gateway **111**. Devices **101** and **102** are idle, as are additional DECT handset devices **2301**, **2302** and **2303**. It is assumed for purposes of FIGS. **23**A through **24**F that devices **101**, **102**, **2301**, **2302** and **2303** are mapped to users A, B and C in their respective profiles and that each user can thus receive notifications and calls (as well as other services) through any of devices **101**, **102**, **2301**, **2302** and **2303**. It is further assumed the TN**1** is the number for user A (i.e., is mapped to user A in the user A profile). Because all of end devices **101**, **102**, **2301**, **2302** and **2303** are idle in the example of FIG. **23**A, CPE gateway **111** causes notifications (e.g., ring tone and visual indicator mapped to user A in the user A profile) of the incoming call to TN**1** to be provided on each of those end devices. When user A attends the notification by answering the call on device **101**, and as shown in FIG. **23**B, all of the end devices stop ringing (i.e., CPE gateway **111** stops the notifications on all of the end devices).

(114) FIG. **23**C shows an incoming call to TN**2** while user A is still engaged in the call on device **101**. The example of FIGS. **23**A-**23**F further assume that TN**2** is mapped to user B in the user B profile. Because user A is engaged in an active call, CPE gateway **111** does not cause device **101** to

ring or otherwise provide a notification of the incoming call to TN**2**, but does cause a remaining devices **102**, **2301**, **2302** and **2303** to provide a notification using the audio and/or visual indicators from the user B profile.

(115) FIG. **23**D shows CPE gateway **111** receiving another call for user B while the calls described in FIGS. **24**A-**24**C are still ongoing. The second call for user B could be to another TN that is also mapped to user B in the user B profile, or could be another call to TN**2**. Because CPE gateway **111** knows that user B is already engaged in a call on device **102**, it does not cause notifications of the second call to be provided on devices **102**, **2301**, **2302** or **2303**. However, a call waiting tone is played for user B in device **102**.

(116) FIG. **23**E shows simultaneous incoming calls to TN**1** (mapped to user A in the user A profile) and to TN**2** (mapped to user B in the user B profile). As indicated above, notifications for simultaneous events can be provided by sequencing indicator combinations for each of the events. For example, CPE gateway **111** could cause end devices to provide a notification of a first call using a first audio/visual indicator combination for a first period of time (e.g., 10 seconds), followed by a notification of a second call using a second audio/visual indicator combination for a succeeding time period (e.g., the following ten seconds), with the sequence then repeating until one of the notifications is attended or times out. In the example of FIG. **23**E, however, user B has configured the user B profile so that device **102** is a prioritized device. Accordingly, CPE causes devices **101**, **2301**, **2302** and **2303** to only provide a notification of the call to TN**1** with the user A audio and visual indicators. CPE gateway **111** further causes device **102** to provide alternating notifications of the call to TN**1** (with the user A indicators) and of the call to TN**2** (with the user B indicators). Note that a similar result would occur if the user B profile only identifies device **102**.

(117) In some embodiments, a non-voice data service (e.g., email, voice mail, news service, weather services, horoscope, etc.) being provided to a device will be interrupted if a user receives an incoming voice call. This would permit, e.g., presumptively higher priority services to be preempt lower priority services. FIG. **23**F illustrates one example of this feature. In FIG. **23**F, user C is logged into and receiving a data service on device **2301**. Devices **101**, **102**, **2302** and **2303** are also in use. When an incoming call for TN**3** (mapped to user C in the user C profile) is received, CPE gateway **111** interrupts the data service and causes device **2301** to provide a notification of the incoming call to TN**3**.

(118) As with other features, users may in some embodiments configure their individual profiles so as to define priorities for one or more services. For example, some users may decide that voice calls should not preempt certain data services.

(119) CPE gateway **111** can allow multiple users to share a session (e.g., after successful barge-in) in various manners. If the session is being shared by end devices that communicate on the same physical layer (e.g., two DECT handsets), CPE gateway **111** may use the same physical channel for communication to both devices. Alternately, when end devices sharing a session communicate on different physical layers (e.g., a DECT handset and a computer communicating over a USB interface), CPE gateway **111** may stream media for the session to the end devices on separate channels.

(120) Although the examples of FIGS. **23**A-**23**F are in the context of incoming voice calls, the features shown in FIGS. **23**A-**23**F could be extended to other services provided by network **100**.

(121) FIG. **24**A shows call flow signaling, in at least embodiments using NCS signaling, to cause simultaneous ringing in response to calls originating from a Public Switched Telephone Network (PSTN). FIGS. **24**B and **24**C show another example of call flow, and in particular, show NCS signaling to cause ringing of multiple end devices in response to a call from within network **100**. FIG. **24**C is a continuation of FIG. **24**B as indicated in the lower right portion of FIG. **24**B.

(122) In some embodiments, user profiles and other aspects of the systems described herein can be employed to implement a public address (PA) system to provide messages to users through one or more end devices. In some embodiments, for example, a user wishing to address other users with

the PA system feature can login to an end device using his or her credentials. After providing input to the end device to select the PA system feature, the user can then select recipients of the PA message by selecting users from a contact list, from one or more predefined groups, or from a default group (e.g., all users associated with an account). Alternatively, a user could specify end devices to which the message is to be sent. The user then speaks the message into a microphone of the end device (e.g., microphone **504** in FIG. **5**). The message is then sent to other recipients in accordance with their respective profiles. In some embodiments, a user can further configure additional options when sending a PA message. For example, the sending user may be able to set a priority for the message, etc.

(123) Similarly, various aspects of the PA system can be controlled by profiles of individual users. For example, each user profile can indicate whether PA messages are accepted, the devices on which messages are accepted, priorities for various message type, and whether sessions for other services can be interrupted or superseded by a PA message. As with other types of profile data, a primary user such as a parent may have the power to set various PA system aspects of non-primary users' profiles. Thus, a parent could set children's' profiles so that a PA message originating from the parent will be delivered to the child regardless of how the child might be using an end device. Profiles could also be used to store various predefined messages (or pointers to such messages) that a user might wish to send on multiple occasions. As but one example, a parent might record a message such as "come to dinner" that can be played nightly to inform children that dinner is ready.

(124) In some embodiments, additional hardware and/or software can be added to end devices so that an audible message can be broadcast from the device if it is not currently held next to a user's ear. As but one example, DECT handset device **101** of FIG. **5** could configured so that a PA message received when device **101** is on hook (or otherwise not currently in use for a call) will cause a volume control for speaker **503** to be increased. The PA system could also operate so as to cause visual indicators to be provided by end devices in combination with an audio PA message (e.g., causing a display to flash a particular color).

(125) In one embodiment, a PA message is broadcast in a local network by a CPE gateway such as gateway **111** of FIG. **1**. For example, FIG. **25** shows CPE gateway **111** and end devices **101**, **102**, **2301**, **2302** and **2303**. As in the example of FIGS. **23**A-**23**F, each of devices **101**, **102**, **2301**, **2302** and **2303** is a DECT handset. User A sends a PA message by selecting the PA feature in device **101**, selecting the recipients, and recording a message (or choosing a pre-existing message). In this example, user A has selected users at devices **102**, **2301**, **2302** and **2303**. User A then provides input to device **101** causing device **101** to signal CPE gateway **111** that the message should be sent. Upon receiving the signal from device **101**, CPE gateway **111** causes devices **102**, **2301**, **2302** and **2303** to provide the PA message. In the present example, CPE gateway **111** knows the message recipients are at devices **102**, **2301**, **2302** and **2303** because each of the recipients is logged in to one of those devices or is involved in a voice or other session on one of those devices.

(126) In some embodiments, CPE gateway **111** can be configured to push a PA message to all end devices for which there is an open and active physical channel with CPE gateway **111**. As indicated above, handset end devices or other end devices with telephone functionality can be configured so that PA messages can played if the device is on hook. Alternatively, such a device could be configured so that a PA message will cause the device to go off hook.

(127) If a particular CPE gateway can only broadcast PA messages over less than all open physical channels to end devices, a FIFO, round-robin or other scheduling algorithm can be used to push the PA message over each physical channel Because a PA message is often used for one way communication and does not require a response, sequential PA message delivery may appear near real time. Message delivery could also be scheduled to incorporate intelligent routing so as to avoid message echo between end devices that are known to be near one another.

(128) In additional embodiments, a broadcast message server can be used interface with additional network elements and/or with additional networks so as to push PA messages to end devices

associated with different CPE gateways and/or communicating through different networks. FIG. **26** shows a broadcast server **2601** in network **100** according to one such embodiment. Broadcast server **2601** may include hardware components such as are described in connection with FIG. **3** and store instructions causing server **2601** to carry out operations such as are described herein. An additional premises **2602** having a CPE gateway **2603** and end device **2604** are also shown in FIG. **26**. The remaining elements in FIG. **26** are similar to those described previously. When user A at premises **110** wishes to send a PA message, user A logs into broadcast server **260** by providing his or her credentials. User A then selects the recipients of the message. In this example, user A selects users A, B and C currently using devices **102**, **2301** and **2302**, user F currently using device **116**, and user G at premises **2602** currently using STT device **2604**. After recording or selecting a message, user A causes device **101** to send a message to broadcast server **2601** indicating the PA message should be sent. Broadcast server then routes the PA message to the recipient devices in accordance with the recipient profiles. In the case of user A (device **102**), user B (device **2301**), user C (device **2302**) and user G (device **2604**), broadcast server **2601** sends the message to application server **118**, which then sends the message to CPE gateways **111** and **2603**, which in turn forward the PA message to the end devices. In the case of end device **116**, broadcast server sends the PA message to the wireless network of which device **116** is a part, which network then forwards the message to device **116**. In some embodiments, broadcast server **2601** could store the PA message and forward that message according to a FIFO, round-robin or other scheduling algorithm.

(129) In some embodiments, broadcast server **2601** could be implemented as a separate process on application server **118**, AMS **119**, a CPE gateway, or some other network element.

(130) FIG. **27** is a communication diagram showing transmission of a PA message according to the embodiment described above for FIG. **26**. User A logs in to AMS **119** at line **27-1**. User A then configures preferences related to the PA messaging feature. Subsequently, user A accesses the PA messaging service through application server **118**, which provides a GUI and other presentation layer elements of the PA messaging service (line **27-3**). User A selects a recipients of the PA message (line **27-4**) and records or selects a message (line **27-5**). After user A provides input indicating the PA message should be sent and a corresponding signal is sent to application server **118** (which input and signal are not shown in FIG. **27**), application server **118** forwards the PA message to broadcast server **2601**. Broadcast server **2601** then forwards the message (via application server **118** and/or other network elements) to the appropriate end devices.

(131) A PA message broadcast service can include numerous additional features. In some embodiments, a set of default broadcast messages can be programmed into an end device, with each of those default messages accessible by the press of a single key to enable fast messaging. A primary user could have extra privileges, e.g., the ability to "force" other users/devices to receive a broadcast message. In some embodiments, a broadcast message may be configurable to prompt a recipient for a reply (e.g., by playing a tone after the message and/or forcing the recipient to respond). In yet some additional embodiments, a recipient of a broadcast message may be permitted to "snooze" the message by causing the message to be replayed at fixed intervals. A user could configure a profile so as to establish a PA message contacts list of user to receive broadcast messages. A user may also be able to configure a profile so as to control devices over which PA messages to the user may be broadcast and/or establish priorities for such devices (e.g., cause PA messages to first be sent to a first device, then to a second device, etc.). A parent or other primary user may have the ability to supersede other users preferences and cause PA messages to be delivered a particular device and/or to interrupt a session of a non-primary user to cause the PA message to be delivered. For example, a primary user may have the ability to set a particular priority on a message that will case that message to be broadcast to other non-primary users regardless of those user's profile configurations or current session activity.

(132) In some embodiments, a network-based address book service is provided. The addresses and other data for the address-book service may be stored in a centralized server, thereby enabling

concurrent multi-party access and allowing a synchronized update of the same contact from multiple users. In some such embodiments, each user may have a private and a public address book, the latter being optionally shared with a group of users. A user may add contacts to the private or public address book from local search results (e.g., a "yellow pages" type of service) or from other types of services and from multiple end devices. Contact data can be stored in a centralized network server by exposing interfaces between multiple data services and the centralized network server. A synchronization engine can be used to maintain a reference to an item of contact data within the network and to permit multiple users to access the contact according to profile settings. Network-based storage permits synchronizing of any update to contact information across users and devices with minimal processing overhead. In addition to a public and private address book, a user may also create subsets of contacts within the public and/or private address books. In this manner, "favorites" lists and the like can be created.

(133) Various data services (e.g., a yellow pages type of service, a telephony service, an email or messaging service) may interface to the contact database via an application server.

(134) In some embodiments, and as shown in FIG. **28**, an address book server **2801** is included in network **100**. Address book server **2801** includes hardware components such as are described in connection with FIG. **3**. In addition to address book contact data, server **2801** stores instructions executable by one or more processors in server **2801** to carry out operations such as are described herein. Remaining elements of FIG. **28** are similar to those described in connection with FIG. **1**. Different interfaces on various end devices are used to synchronize and retrieve contact data address book server **2801**. Contact data in address book server **2801** can be maintained per user profiles and mapped to profiles of primary users. In some embodiments, data in address book server **2801** is accessed via application server **118**.

(135) FIG. **29** shows one example of how contact data may be maintained in address book server **2801** according to some embodiments. As used herein, a "contact" refers to a specific person, business or other entity with which a user in network **100** or some service in network **100** entity might wish to communicate. Contact data includes information identifying the contact such as a name (e.g., a person's or business's name), a street or other physical address, etc. Contact data also includes information needed to establish communication with the contact. Examples of this information include one or more TNs, an email address, an IM address, a gaming handle, etc. In at least some embodiments, a single instance of contact data is maintained in server **2801** for each contact. One example of such an instance is shown as contact record **2902**. In addition to one or more fields **2901** used to hold the contact data, record **2902** includes a field **2903** used to hold an identifier of a subscriber account. Record **2902** further include a set of fields **2905** that include a field **2906** to hold an identifier of a user, associated with that account, that is the owner of record **2902**. A field **2915** holds a flag indicating whether the user identified in field **2906** has classified the contact data as public or private, and one or more fields **2907-1** through **2907-***n* to hold pointers or other data indicating the contact data should be included in a particular "buddy list" or other sub-collection of contacts that might be established by the user identified in field **2906**. In some embodiments, pointers in fields **2907-1** through **2907-***n* may refer to lists stored or referenced in the user's profile. Record **2902** may also include one or more additional sets of fields such as set **2909** that is similar to set **2905**, but that contains data reflecting inclusion of the contact data in a different user's (identified in field **2921**) contact lists (identified in one or more fields **2922-1** through **2922-***n*). For example, user A may establish an address book entry for a particular contact and make that contact a public contact (thus part of user A's public address book). User B might then wish to include that contact information into user B's own address book.

(136) The record **2902** of FIG. **29** is merely one example of how contact data can be stored in accordance with some embodiments. The actual format of contact data and/or of the tables or other data structures used to organize and store that contact data will vary among different embodiments. In some embodiments, and as also shown in FIG. **29**, data in address book server **2801** could also

be accessible by other applications servers and/or users associated with other accounts (or even with other networks) over LDAP (lightweight directory access protocol) interfaces.

(137) As can be appreciated from FIG. **29**, an update to contact data by one user will thus update that contact data for other users. Should a particular user wish to protect a particular contact data entry from update by other users, an additional field could be added to record **2902** to mark the contact data as read-only. In some embodiments, only the owner of a record can mark a particular contact data instance as read-only. In some such embodiments, a non-owner wishing to protect a particular contact data instance from modification by other users could create a second record for the same contact data in address book server **2801** and mark that second record as private.

(138) When a user accesses his or her contact data via an end device, the user may specify the set of contacts for which data are to be displayed. For example, user A may provide input to an end device indicating that user A wishes to see information for contacts in his or her public address book. In response, user A will be provided (e.g., on a display of the end device) with a scrollable list containing all of the contact data in server **2801** that is included in a record showing user A as the "owner" of the contact. If user A were to provide input indicating a desire to see information in user B's public address book, user A might first be provided with a GUI asking user A to select another user. Once user B is selected, user A is provided a scrollable list containing the contact data in server **2801** that are contained in records showing user B as the owner and having the public/private flag set to "public." If user A were to provide input indicating a desire to see information for contacts in a first sub-grouping of contacts, user A would provide input identifying that sub-grouping. In response, user A would be provided with a scrollable list containing each of the contacts for which server **2801** has a record showing user A in field **2906** or field **2921** and an entry (e.g., in one of fields **2907-1** through **2907-**n or **2922-1** through **2922-**n) showing the contact as in the requested sub-grouping.

(139) In some embodiments, an end device may interface with server **2801**, with application server **118** and/or with another application server so as to limit the type of contact data provided. For example, a user requesting contact data from an email application might only be provided with the name and email address for each contact.

(140) FIG. **30** is a communication diagram showing sharing of entries in a public address book. User A logs in using end device **101** at line **30-1**. Device attributes and login data are forwarded to AMS **119** (line **30-2**), which validates user A's credentials and establishes a session (line **30-3**). Subsequently, user A provides input indicating a desire to store data for an additional contact in user A's public address book (line **30-4**). This is forwarded to address book server **2801** (lines **30-5**, **30-6** and **30-7**), which stores the new contact. Subsequently, user B logs in using device **102** (line **30-8**). After user B's credentials are forwarded (line **30-9**) and validated, and a session established (line **30-10**), user B provides input indicating a desire to view contacts in user A's public address book (line **30-11**). This is forwarded to address book server **2801** (lines **30-12** and **30-13**), which retrieves user A's public address book data and makes same available to user B (lines **30-14**, **30-15** and **30-16**).

(141) FIG. **31** is a communication diagram showing adding contact data obtained from a search using another data service (e.g., a yellow pages type service, a search of call logs from a voice telephony service). User A logs in using end device **101** at line **31-1**. Device attributes and login data are forwarded to AMS **119** (line **31-2**), which validates user A's credentials and establishes a session (line **31-3**). Subsequently, user A provides input indicating a search request in the data service (line **31-4**). The request is forwarded via CPE gateway **111** (line **31-5**) and application server **118** (line **31-6**) to an application server for the accessed data service located within network cloud **113** (line **31-7**). A search result is then returned and displayed to user A (lines **31-8**, **31-9**, **31-10**). User A views the results (line **31-11**) and provides input to device **101** indicating a desire to store a contact from the search in user A's public address book (line **31-12**). In response a signal is sent via CPE gateway **111** (line **31-13**) and application server **118** (line **31-14**) to address book

server **2801** (line **31-15**). The added contact can now be accessed by other users.

(142) FIG. **32** is a communication diagram showing updating of contact data in a public address book. User A logs in using end device **101** at line **32-1**. Device attributes and login data are forwarded to AMS **119** (line **32-2**), which validates user A's credentials and establishes a session (line **32-3**). Subsequently, user A provides input indicating a desire to access his or her address book (line **32-4**). A request is then forwarded from device **101** via CPE gateway **111** (line **32-5**) and application server **118** (line **32-6**) to address server **2801** (line **32-7**). In response, address book server **2801** forwards contact data from user A's public address book (line **32-8**) via application server **118** (line **32-9**) and CPE gateway **111** (line **32-10**) to end device **101**. User A then provides input to device **101** indicating a modification to data for one or more contacts (line **32-11**). A signal representing this modification is forwarded via CPE gateway **111** (line **32-12**) and application server **118** (line **32-13**) to address book server **2801** (line **32-14**), which updates the appropriate record(s) (not shown in FIG. **32**). Subsequently, user B accesses user A's public address book from device **102** (line **32-15**), which access request is forwarded from device **102** via CPE gateway **111** (line **32-16**) and application server **118** (line **32-17**) to address server **2801** (line **32-18**). Server **2801** retrieves the requested contact data, which includes the modifications submitted by user A at line **32-11**, and sends same (line **32-19**) via application server **118** (line **32-20**) and CPE gateway **111** (line **32-20**) to device **102** (line **32-21**).

(143) FIG. **33** is a communication diagram showing addition of a new contact that is also added to a favorites list. User A logs in using end device **101** at line **33-1**. Device attributes and login data are forwarded to AMS **119** (line **33-2**), which validates user A's credentials and establishes a session (line **33-3**). Subsequently, user A provides input indicating a desire to add a new contact to the user A address book and to also include that new contact in a "favorites" list (line **33-4**). A signal representing this input is forwarded via CPE gateway **111** (line **33-5**) and application server **118** (line **33-6**) to address book server **2801** (line **33-7**). Address book server **2801** then creates a record having the contact data provided by user A, having a field indicating user A as the owner of the contact data and including an entry in an appropriate one of fields **2907-1** through **2907-**n (FIG. **29**) indicating that the new contact is also in user A's favorites list (line **34-8**). User A subsequently accesses the favorites list (lines **33-9** through **33-12**), causing address server **2801** to return the favorites list contacts (including the new contact submitted at line **33-4**) (lines **33-13** through **33-15**).

(144) Embodiments of the invention include a machine readable storage medium (e.g., a CD-ROM, CD-RW, DVD, floppy disc, FLASH memory, RAM, ROM, magnetic platters of a hard drive, etc.) storing machine readable instructions that, when executed by one or more processors, cause a server, gateway, end device or other network device to carry out operations such as are described herein. As used herein (including the claims), a machine-readable storage medium is a physical structure that can be touched by a human. A modulated signal would not by itself constitute a machine-readable storage medium.

(145) The foregoing description of embodiments has been presented for purposes of illustration and description. The foregoing description is not intended to be exhaustive or to limit embodiments of the present invention to the precise form disclosed, and modifications and variations are possible in light of the above teachings or may be acquired from practice of various embodiments. Additional embodiments may not perform all operations, have all features, or possess all advantages described above. The embodiments discussed herein were chosen and described in order to explain the principles and the nature of various embodiments and their practical application to enable one skilled in the art to utilize the present invention in various embodiments and with various modifications as are suited to the particular use contemplated. The features of the embodiments described herein may be combined in all possible combinations of methods, apparatuses, modules, systems, and machine-readable storage media. Any and all permutations of features from above-described embodiments are the within the scope of the invention.

Claims

1. A method comprising: causing, by a first device and based on the first device and a second device being connected to a same network, output of an option to join an ongoing communication between the second device and a third device; receiving, by the first device, user input indicative of a selection of the option; sending, by the first device to the second device and based on the user input, a request to join the ongoing communication; and joining, by the first device and based on the second device accepting the request, the ongoing communication.

2. The method of claim 1, wherein the joining is further based on the second device belonging to a first group of devices for which approval is needed before joining ongoing communications of the second device, the method further comprising: receiving, by the first device, user input indicative of a second selection to join a second ongoing communication of a fourth device; and based on the fourth device belonging to a second group of user devices for which approval is not needed before joining the ongoing communications of the second device, joining the second ongoing communication without causing, at the fourth device, output of an option to allow the first device to join the second ongoing communication.

3. The method of claim 1, wherein the joining is further based on the second device belonging to a first group of devices for which approval is needed before joining ongoing communications of the second device, the method further comprising: receiving, by the first device, user input indicative of a second selection to join a second ongoing communication of a fourth device; and receiving, based on the fourth device belonging to a second group of user devices restricted from joining the ongoing communications of the second device, a message declining the second selection.

4. The method of claim 1, wherein the joining is further based on a profile, associated with the first device, indicating that the first device has authorization to join ongoing communications of the second device.

5. The method of claim 1, wherein the joining is further based on a quantity of devices, participating in the ongoing communication, satisfying a threshold.

6. The method of claim 1, wherein the first device and the second device are connected to a local area network via a gateway device, wherein the ongoing communication is being facilitated by the gateway device, and wherein the causing output of the option further comprises causing output of data indicating one or more other ongoing communications being facilitated by the gateway device for other devices connected to the local area network.

7. The method of claim 1, wherein the first device or the second device comprises: a telecommunications handset; a user computing device; or a smart television.

8. The method of claim 1, wherein the ongoing communication comprises: a telephonic communication; or a messaging session.

9. A method comprising: receiving, by a first device, from a second device, and based on the first device and a second device being connected to a same network, a request for the second device to join an ongoing communication between the first device and a third device; causing, by the first device and based on the request, output of an option to accept the request; receiving, by the first device, user input indicative of a selection of the option; and conducting, by the first device and based on the selection, the ongoing communication with both the second device and the third device.

10. The method of claim 9, wherein the causing output of the option is further based on the second device belonging to a first group of devices for which approval is needed before joining ongoing communications of the first device, the method further comprising: receiving, from a fourth device, a second request for the fourth device to join the ongoing communication; and sending, based on the fourth device belonging to a second group of devices restricted from joining the ongoing communications of the first device, a message to decline the second request.

11. The method of claim 9, wherein the causing output of the option is further based on the second device belonging to a first group of devices for which approval is needed before joining ongoing communications of the first device, the method further comprising: receiving, from a fourth device, a second request for the fourth device to join the ongoing communication; and joining, based on the fourth device belonging to a second group of devices for which approval is not needed before joining the ongoing communications of the first device and without causing, at the first device, output of an option to accept the second request, the fourth device to the ongoing communication.

12. The method of claim 9, wherein the causing output of the option is further based on a profile, associated with the second device, indicating that the second device has authorization to join ongoing communications of the first device.

13. The method of claim 9, wherein the causing output of the option is further based on a quantity of devices, participating in the ongoing communication, satisfying a threshold.

14. The method of claim 9, wherein the receiving the request is based on the first device and the second device being connected to a local area network via a gateway device.

15. A method comprising: receiving, by a first device, from a second device, and based on the first device and a second device being connected to a same network, a first request for the second device to join an ongoing communication of the first device; conducting, by the first device, the ongoing communication with the second device; receiving, by the first device and from a third device, a second request for the third device to join the ongoing communication; and sending, by the first device and based on the third device belonging to a different group than the first device, a message to decline the second request.

16. The method of claim 15, wherein the conducting is performed without asking the first device to accept the first request.

17. The method of claim 15, further comprising: receiving, by the first device and from a fourth device, a third request for the fourth device to join the ongoing communication; causing, by the first device and based on the fourth device belonging to another different group than the first device and the second device, output of an option to accept the third request; receiving, by the first device, user input indicative of a selection of the option; and conducting, by the first device and based on the selection, the ongoing communication with both the second device and the fourth device.

18. The method of claim 15, wherein the conducting is further based on a profile, associated with the second device, indicating that the second device has authorization to join ongoing communications of the first device.

19. The method of claim 15, wherein the sending the message is further based on a profile, associated with the third device, indicating that the third device does not have authorization to join ongoing communications of the first device.

20. The method of claim 15, wherein the receiving the first request is based on the first device and the second device being connected to a local area network via a gateway device, and wherein the receiving the second request is based on the third device being connected to the local area network via the gateway device.