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Removal of a mobile device from a local service domain

Abstract

A mobile device configurable for direct communication in a wide area wireless network may join a local service domain and receive services through a gateway of that local service domain. The mobile device may be removed from the local service domain if the mobile device has been inactive for a threshold time period, the gateway device receives data indicating that the mobile device has been added to a different service domain, or a reply for a polling message sent to the mobile device has not been received.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS (1) This application is a continuation of U.S. application Ser. No. 16/985,770, filed Aug. 5, 2020, which is a continuation of U.S. application Ser. No. 16/565,797, filed Sep. 10, 2019, now U.S. Pat. No. 10,771,841, which is a continuation of U.S. application Ser. No. 12/706,365, filed on Feb. 16, 2010, now U.S. Pat. No. 10,455,275, the entireties of which are incorporated by reference.

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 provide a notification summary to inform a specific user about pending events in any of one or more services. The notification 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.

(7) In some embodiments, a handset or other end device in a local service domain can receive video service notifications. The video service notifications can provide information to a user of the end device about a video service (e.g., a television program or a movie) available within the local network. The video service notification can include a request for a response to the notification, with the request having a corresponding URI or other type of link to cause a desired action (e.g., to commence recording or playing content associated with a particular video service). In still other embodiments, a mobile device configurable for direct communication in a wide area wireless network can join a local service domain and receive services through a gateway of that local service domain

(8) 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.
(35) FIG. **34** is similar to FIG. **1**, but shows additional elements in network **100** that facilitate video service notifications.
(36) FIG. **35** is a block diagram of a set top terminal according to some embodiments.
(37) FIGS. **36**A-**36**D are examples of video service notifications according to some embodiments.
(38) FIGS. **37**A and **37**B are communication diagrams showing information flows in connection with a user setting video notification preferences and receiving video service notifications according to some embodiments.
(39) FIG. **38** is a block diagram of a local premises according to some embodiments.
(40) FIG. **39** is a communication diagram showing information flows in connection with a user setting video notification preferences and receiving video service notifications according to the embodiment of FIG. **38**.
(41) FIG. **40** is a flow chart showing operations performed by a DECT handset, or other end device in a local service domain, in connection with video service notifications.
(42) FIGS. **41**A and **41**B are a flow charts showing operations performed by a video notification server in some embodiments.
(43) FIGS. **42**A and **42**B are a flow charts showing operations performed by a set top terminal in some embodiments.
(44) FIG. **43** is a block diagram of a local premises in an embodiment in which a separate video notification server can be omitted.
(45) FIG. **44** is a block diagram of a smart phone mobile device according to some embodiments.
(46) FIG. **45** is a communication diagram showing information flows in connection with a mobile device joining a local service domain according to some embodiments.
(47) FIG. **46** is a communication diagram showing information flows in connection with a mobile device joining a local service domain according to some additional embodiments.
(48) FIG. **47** is a communication diagram showing information flows in an embodiment where a notification of an incoming call is displayed on a television connected to an STT end device.
(49) FIG. **48** is a communication diagram showing information flows where notification of an incoming call to a mobile device TN is displayed on multiple end devices in a local service domain.
(50) FIG. **49** shows a display of active calls and available TNs similar to that of FIG. **19**, but with a mobile device TN added to numbers that can be selected to make a new call.
(51) FIG. **50** is a communication diagram showing information flows in connection with a location identification feature according to some embodiments.
(52) FIG. **51** is a flow chart showing operations performed by a mobile device according to various embodiments.
(53) FIG. **52** is a flow chart showing operations performed by a CPE gateway according to various

embodiments.

DETAILED DESCRIPTION

(54) 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.

(55) 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" or "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. A variety of services, as described below, are provided to end devices in the domain of CPE gateway **111**. Accordingly, local devices communicating (and receiving services) through CPE gateway **111** can also be considered within a local service domain of CPE gateway **111**. The portion of network **100** beyond premises **110** forms an external network relative to the local service domain of CPE gateway **111** and the local network of premises **110**.

(56) 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 (not shown) 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.

(57) 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 provide voice telephony, short message service (SMS) servers, instant messaging servers, web servers, servers providing various types of content described herein, etc. In some embodiments, cloud **113** may include NCS (Network-based Call Signaling) elements. In other embodiments, cloud **113** might also (or alternatively) include IP Multimedia System (IMS) elements (e.g., call state control function elements at the IMS service layer). Additional elements in cloud **113** may include video on demand (VOD) servers, remote DVR (rDVR) web servers, and other video head end elements.

(58) Cloud **113** also includes links **114** to other networks. Network **100** may communicate with a wide area wireless 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**.

(59) 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.

(60) 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.

(61) 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.

(62) 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.

(63) 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.

(64) Field **205** contains 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.

(65) 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.

(66) 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.

(67) 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.

(68) 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 receive 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.

(69) 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.

(70) 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.

(71) 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.

(72) 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. In some embodiments, application server **118** and/or AMS **119** may be IMS application servers that communicate with CPE gateway **111** via intermediary IMS call state control function elements within cloud **113**.

(73) 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**.

(74) 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.

(75) 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 hard-wired 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**. In other embodiments, a CPE gateway may also include other types of interfaces for communicating with other types of end devices. Examples of such interfaces include but are not limited to a CAT-iq (Cordless Advanced Technology-Internet and Quality) interface for communication with CAT-iq end devices, a DLNA (Digital Living Network Alliance) interface for communicating with other devices in a premises, a femtocell interface for communicating with mobile telephones and other mobile devices, etc. 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**.
(76) 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**.
(77) 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**.
(78) 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.).
(79) 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) or smart phone **116** may interface with network **100** via a separate wide area wireless network (e.g., a third generation (3G) mobile networking and telecommunication network).
(80) 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.
(81) 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**.
(82) 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).

(83) 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**.

(84) 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**).

(85) 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).

(86) 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**).

(87) 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.

(88) 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.

(89) 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 change in profile; request to change profile; user management 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 full mail box; full voice mail box; user login/logout; management 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.

(90) 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.

(91) 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**.

(92) 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.

(93) 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.

(94) 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).

(95) 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**.

(96) 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).

(97) 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.).

(98) 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.

(99) 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.

(100) 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.
(101) 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.
(102) 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.
(103) 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.
(104) 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.
(105) 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.
(106) 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.

(107) 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 be 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.

(108) 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.

(109) 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.

(110) 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**.
(111) 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.
(112) 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**.
(113) 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.
(114) 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.
(115) 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.

(116) 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

(117) 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.

(118) 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**.

(119) 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.

(120) 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.

(121) 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).

(122) 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.

(123) 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.

(124) 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.

(125) 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**.

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

(127) 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.

(128) 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

(129) 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**.

(130) 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.

(131) 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.
(132) 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.
(133) 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).
(134) 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.
(135) 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**.
(136) 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**.
(137) 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**.
(138) 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.
(139) 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.
(140) 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**.
(141) 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.
(142) 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.
(143) 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.
(144) 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).
(145) 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.

(146) 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.

(147) 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.

(148) 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.

(149) 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.

(150) 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.

(151) 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.

(152) 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.

(153) 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.

(154) 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**.

(155) 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.

(156) 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.

(157) 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.

(158) 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.

(159) 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.
(160) 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**).
(161) 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.
(162) 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**).
(163) 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**).

(164) As indicated above, various types of notifications can be provided to end devices in a local service domain. In some embodiments, those notifications can include video service notifications. As used herein, a "video service" is a service through which video content (and any associated audio content) can be received at an end device within a local service domain. The video content can be multicast content provided at scheduled times, examples of which include television programming from over-the-air and CATV providers received through a network connection. The video content might also be unicast content (e.g., VOD movies). A "video service notification" is a notification providing a user with information about a video service (e.g., an event associated with a video service), and may include audio and/or visual indicators. A video service notification may or may not be interactive so as to facilitate a response from a user. For example, a DECT handset or some other end device may receive a textual notification that a particular movie or other type of VOD content is available. That notification may request input from the user and include a link (with an associated URI) that a user can select to cause that VOD content to be downloaded to an STT or other end device. As another example, a DECT handset or other end device may receive a notification of a previously specified television program that will soon be available via multicast. That notification may also provide the user with the ability to cause that program to be recorded on a DVR or other device. Other examples of video service notifications are provided below.

(165) As with other types of notifications described above, one or more aspects of video service notifications can be defined by a user profile. For example, one user may configure his profile so that video service alerts are provided to all end devices in a local service domain, while another user might configure her profile so that video service notifications are only provided to certain end devices. As another example, a primary user (e.g., a parent) may configure profiles of secondary users (e.g., minor children) so that those secondary users are unable to receive certain types of video service notifications.

(166) FIG. **34** is similar to FIG. **1**, but shows additional elements in network **100** that facilitate video service notifications. A video notification server **3401** communicates with CPE gateway **111** via access network **112**, with application server **118** and with user profile database **120**. As with application server **118**, AMS **119** and other servers previously described, video notification application server **3401** includes hardware such as was described in connection with FIG. **3**, but which is programmed or otherwise configured to carry out operations such as are described herein. In some embodiments, video notification server **3401** may be combined with application server **118**. Although FIG. **34** shows a direct connection between server **3401** and access sub-network **112**, this is only for convenience, and intermediate servers, routers and other elements are omitted. In some embodiments, server **3401** may alternatively be an IMS application server that communicates with CPE gateway **111** and with other application servers through IMS call state control function (CSCF) elements located within cloud **113**. CPE gateway **111**, end devices **101**-**104** and **116**, application server **118**, AMS **119**, profile database **120** and other elements of network **100** also include programming or are otherwise configured (e.g., with one or more application specific integrated circuits (ASICs) or other hard-wired logic) so as to carry out video service notification operations described herein.

(167) Also shown in FIG. **34**, within cloud **113**, is a video headend **3402**. Although shown as a single block for simplicity, video head end **3402** may include numerous elements distributed across multiple devices within cloud **113**. Headend **3402** includes network servers to which an STT or other end device may send commands (via access sub-network **112**) to commence delivery of VOD content, remote DVR (rDVR web servers) that can send commands to an STT to cause that STT to start or stop recording, and other servers that communicate with STTs and other end devices so as

to facilitate video content delivery. The servers of headend **3402** similarly include hardware such as was described in connection with FIG. **3**, but also include programming or are otherwise configured so as to carry out operations such as are described herein.

(168) As previously indicated in connection with FIG. **1**, end device **104** of FIG. **34** is an STT. STT **104** communicates with video headend **3402** via access sub-network **112**. In the embodiment of FIG. **34**, STT **104** is physically connected to CPE gateway **111** by way of MoCA interface **412** (see FIG. **4**) and/or Ethernet interface **415**. However, STT **104** and CPE gateway **111** share the physical coaxial cable connection to access network **112** (e.g., via a splitter connecting STT **104** and gateway **111** to a coaxial drop cable connecting premises **110** and access sub-network **112**). Although video service content data is carried to premises **110** over the same medium used to carry data for telephony and other services, video service data may be carried in separate physical channels. For example, a portion of the downstream RF frequency sub-bands (and/or certain time slots within downstream RF frequency sub-bands) may be allocated to video services content data, while other sub-bands and/or time slots are allocated for other services.

(169) FIG. **35** is a block diagram of STT **104** according to some embodiments. STT **104** includes one or more RF interfaces **3501-1** through **3501-***n* that provide physical connections to coaxial cable(s). STT **104** further includes memory **3504** for storing instructions and data and a processor **3505** for executing instructions and controlling operation of STT **104**. Although a single block is shown for memory **3504** and a single block shown for processor **3505**, memory and computational operations of STT **104** could respectively be distributed across multiple memory devices and multiple processors located within STT **104**. For example, STT **104** may include additional processors for executing video and audio CODEC routines, etc. Memory **3504** 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**. Processor **3505** may be implemented with any of numerous types of devices, including but not limited to one or more of the example devices described in connection with processor **305** of FIG. **3**. In at least some embodiments, processor **3505** of STT **104** carries out operations described herein according to machine readable instructions stored in memory **3504** and/or stored as hardwired logic gates within processor **3505**. Processor **3505** communicates with and controls memory **3504** and interfaces **3501-1** through **3501-***n* over one or more buses **3506**. STT **104** also includes one or more audio and/or video interfaces **3502-1** through **3502-***n* (e.g., left and right audio channel outputs, a video output, an HDMI output) over which audio and video data is output for presentation on the display and/or speaker(s) of a television or other device. A infrared interface **3503** receives input from a remote control. Processor **3505** also communicates with interfaces **3502-1** through **3502-***n* and **3503** over bus **3506**.

(170) Memory **3504** of STT **104** is used to store instructions and data used by STT **104** to carry out conventional STT operations such as tuning to and decoding content data, communicating VOD commands and other information to video headend **3402**, providing an electronic program guide (EPG), etc. Memory **3504** is also used to store content for later viewing. In addition to data used for conventional STT operations, memory **3504** in at least some embodiments also stores users' video notification preference information that STT **104** uses to generate and/or act on video service notifications. As discussed in more detail below, this information can include identification of specific content (e.g., specific movies or television shows) or content types (e.g., a genre of movies or TV shows, sporting events with a team from a particular city or university), users to be notified regarding predefined content or content type, etc.

(171) FIGS. **36**A-**36**D are examples of video service notifications according to some embodiments. The following examples describe video service notifications viewed on, and attendable through, DECT handset **101**. As with other types of notifications described previously, however, video notifications can be provided to other types of end devices in a local service domain and/or can be simultaneously provided to multiple end devices. FIG. **36**A shows a notification summary GUI

3601 presented on the display of handset **101**. GUI **3601** is similar to the notification summary GUI shown in FIG. **16**, except that a new entry **3602** ("New Video Alerts") is added for video service notifications. A URI or other link is associated with entry **3602**. Upon selecting entry **3602**, the pending video service notifications for the user "Mike" are shown in a subsequent GUI **3603** (FIG. **36**B). The first entry **3604** in GUI **3603** notifies the user that a specific content ("James Bond") is available through VOD and includes a URI link ("View on Living Room TV") corresponding to requested input. If the user selects that link, a response is communicated to STT **104** (in a manner described below) that causes STT to begin presenting "James Bond" on the living room television. A second entry **3605** notifies the user that another specific content ("Batman") is available through a specific service (HBO) at 8 pm and also includes a link corresponding to requested input. Selecting the URI link associated with entry **3605** will cause a command to be transmitted to STT **104** that results in STT **104** recording "Batman."

(172) FIG. **36**C shows another example of a video service notification GUI **3606** that might alternatively be provided in response to selecting entry **3602** of GUI **3601** (FIG. **36**A). GUI **3606** has a single entry notifying the user that "James Bond" is on VOD, but which includes a request for input having multiple URI links that the user can select to achieve different actions. If the user selects link **3607**, information is communicated to STT **104** that causes STT **104** to begin presenting "James Bond" on the living room television. If the user selects link **3608**, information is communicated to STT **104** that causes "James Bond" to be presented on a different television. For example, STT **104** may be one of multiple STTs in premises **110** and may be in communication with other STTs (not shown in FIG. **34**) over a MoCA network connected to one of RF interfaces **3501** (FIG. **35**). Upon receiving a response corresponding to user selection of link **3608**, STT **104** causes a different STT to begin presenting "James Bond" on the bedroom television. If the user selects link **3609**, information is communicated to STT **104** that causes "James Bond" to be recorded. If the user selects link **3610**, information is communicated to STT **104** that causes the current video service notification to be sent to a different user. Selecting link **3610** may result in presentation of a subsequent GUI (not shown) on handset **101** that requests identification of the forwardee user.

(173) Some video service notifications may not require (or even permit) a response from the notified user. FIG. **36**D shows an example of video service notification GUI **3611** that advises the user that STT **104** has begun presenting a specific content ("Halloween") on a television attached to STT **104**. The user receiving the notification shown in FIG. **36**D may have previously configured STT **104** (or another element in network **100**, as discussed below) to generate a notification whenever movies or other content having certain ratings are accessed. A parent could use such notifications to learn if young children are watching content that the parent deems inappropriate.

(174) The video notification alerts described in connection with FIGS. **36**A-**36**D are but a few examples of video service notifications and possible response options according to at least some embodiments. Other examples of notifications include but are not limited to: availability of a specified content item based on a previously stored user preference relating to that specific content item, availability of a content item based on a previously stored user preference relating to a content type, availability of a content item based on a recommendation from a third party, availability of a content item based on previous content selections, selection of a particular content or content type by another user, an attempt by another user to override a content selection or preference, reminders regarding content start times, etc. Other examples of possible responses to video service notifications include instructions to queue content for presentation on a specified media player, instructions to download content for storage, instructions to stream content to specified end devices for immediate viewing, instructions to schedule recording of specified content or of content available from a specified service (e.g., record whatever is on HBO between 8 PM and 12 AM), a "snooze" instruction to repeat a notification, an instruction to provide video guide information (e.g., times and/or channels when the same or similar content will again be

available), restarting content that has already begun, and trick mode operation commands (e.g., pause, rewind, fast forward, etc.).
(175) In some cases, a user may set his or her video notification preferences so that an event associated with a particular video service notification automatically receives a certain disposition specified in the user's preferences. For example, a user could set a preference so that whenever a television show or movie meeting certain criteria is broadcast, STT **104** will automatically record that content. The user might also set a preference so that the user receives notifications advising that such recording has begun. If STT **104** cannot carry out the preference for some reason (e.g., insufficient memory to store the content), a notification of that reason can also be generated automatically. In other cases, events associated with a particular video service notification may require manual disposition. Examples of notifications for alerts requiring manual disposition are shown in FIGS. **36**B and **36**C. Other aspects of video service notifications that users can control through notification preferences include content or content type for which notifications should be generated and/or action (automatically recording) taken, the number of times a particular notification should be provided, whether a notification can be "snoozed," whether notifications should be scheduled to occur at certain times or as events transpire, etc. User preferences can be configured so that notifications are generated based on a single content item (e.g., to provide an alert and/or take a specified action if show X is about to be transmitted), based on multiple content items (e.g., to provide an alert and/or take a specified action if any of shows X, Y, etc. is about to be transmitted), based on content source (e.g., record all content on HBO), based on content source and time (e.g., record all content on HBO at 10 PM every night), based on combinations of these various criteria, and based on other criteria and combinations of criteria.
(176) Video notifications can also take many forms. In addition to the textual examples shown in FIGS. **36**A-**36**D, different colors and/or images could also be added. For example, based on data in each user's profile, different colors or images could be associated with different types of notifications. Audio indicators could also be used as part of video service notifications. In some embodiments, a video service notification may include a video stream (e.g., a small window previewing content to which a notification pertains). "Toaster" alerts, pop-up windows and other types of notifications could also be used.
(177) As with other notifications and services described herein, video service notifications are in some embodiments constrained by each user's profile. Profile data may be used to control the form of video service notifications to a particular user, to control the devices on which video service notifications are provided, to control priority of video service notifications (e.g., whether a video service notification can interrupt other notifications or services), etc. Profile data may also be used to control the type of video service notifications that particular user may receive. As but one example, a parent primary user may configure the profiles of child users to prevent those children from receiving video notifications, from receiving certain types of video notifications or from otherwise using the video service notification features to bypass parental controls previously programmed into STT **104**.
(178) In addition to user profile data stored in database **120** and/or cached in CPE gateway **111**, data relating to video service notifications may also be stored in other devices. In some embodiments, the user preferences relating to notifications content are stored in STT **104** and/or in video notification server **3401**. For example, a particular user's preference to record or be informed of one or more identified content items (or content item types) may be stored as data in STT **104** (or server **3401**), but the manner in which that user receives notifications about the preferred content is controlled by the user's profile data stored in user profile database **120** and/or gateway **111**.
(179) FIG. **37**A is a communication diagram showing information flows in connection with a user setting video notification preferences and receiving video service notifications according to some embodiments. Although FIG. **37**A and subsequent drawings describe a use of a DECT handset to

receive and respond to video service notifications and to configure video service notification preferences, these operations could be performed using any of the other types of end devices described herein, as well as other types of end devices (e.g., a corded telephone, a WiFi end device, a soft client running on a device communicating over an Ethernet, USB, BLUETOOOTH or other interface, etc.). In the embodiment of FIG. **37**A, the user's video service notification preferences are stored in STT **104**.

(180) In addition to video service notifications, as indicated in connection with previous drawing figures, and as shown generally by lines **37-0**, handset **101** is used to send and receive data (and to output audio and video based on the received data) for numerous services within the local network and service domain of gateway **111**. Those services could include, e.g., voice telephony, other types of notifications, etc. At line **37-1**, the user provides input to handset **101** indicating that the user wishes to access his or her video service notification preferences. The present example assumes the user has no pre-existing video service notification preferences. If the user had previously created one or more video service notification preferences, the user might alternatively be accessing those preferences to cancel or modify a notification or to create a new notification. In response to the input from the user, handset **101** signals CPE gateway **111** that the user wishes to access his or her video preferences (line **37-2**). In response to this signal, CPE gateway **111** sends a message to video notification server **3401** at line **37-3**. In this message, gateway **111** identifies the user and indicates that the user wishes to access his or her video notification preferences. Server **3401** then contacts AMS **119** and requests authentication data for the user (line **37-4**). AMS **119** then accesses user profile database **120** (not shown) and retrieves profile data for the user. At line **37-5**, AMS **119** forwards to video notification server **3401** data authenticating the user and indicating the user is authorized to create or edit video notification preferences, as well as any user profile data that is relevant video notifications (e.g., profile data regarding form of notifications, profile data regarding types of notifications the user is entitled to receive, etc.).

(181) Upon receiving the user authentication and profile data, server **3401** provides a video notification preferences presentation layer to handset **101** via CPE gateway **111** (lines **37-6** and **37-7**). As used herein and as previously indicated, “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 server **3401**). Upon receipt of the presentation layer, handset **101** generates a user interface for creation and/or editing video notification preferences (line **37-8**). The user provides input to this UI (line **37-9**), which input is forwarded to server **3401** via gateway **111** (lines **37-10** and **37-11**). Server **3401** then forwards these preferences to one or more servers of video headend **3402** (line **37-12**) with an identification of STT **104** (e.g., an IP and/or MAC address). In some embodiments, for example, server **3401** uses information from the user profile to determine the IP and/or MAC address of STT **104** or other network addressing information. In other embodiments, server **3401** may consult a separate subscriber database that cross-references subscriber premises location (or other subscriber account information) and network addressing information for STT **104**.

(182) After receiving the preferences from video notification server **3401**, the server(s) within video headend **3402** forward the preferences directly to STT **104** (line **37-13**), which preferences STT **104** then stores (line **37-14**). Although FIG. **37**A shows the creation of video notification preferences by the user (after authentication of the user) as a single series of operations represented by lines **37-6** through **37-14**, creation and/or editing of video notification preferences could in some embodiments comprise multiple series of similar steps. For example, after one or more preferences are stored at line **37-14**, the user might provide further input to create or modify other preferences.

(183) Subsequently at line **37-15**, STT **104** detects an event trigger corresponding to one or more of the preferences stored at line **37-14**. This trigger detection could occur in various manners. As one example, the user may have set a preference requiring notification of an identified content item at

least 1 hour before that content is scheduled to be transmitted. Based on content schedule information within EPG data (also stored in STT **104**), STT **104** determines when the relevant notification time occurs. As another example, the user may have set a preference requiring a video service notification whenever content having a particular rating is output by STT **104**. If another user (e.g., one of the user's children) attempts to watch a movie having an “R” or other rating indicating the content is unsuitable, STT **104** detects this attempt.

(184) After detecting the event trigger, STT **104** sends an event trigger message to one or more servers at video headend **3402** (line **37-16**). This message includes data regarding the event trigger (e.g., text data describing what has occurred) and may also include data indicating that a response is required. If a response is required, the message may further include one or more URIs corresponding to the response(s) or data from which video head end **3402**, server **3401** or another element might generate a URI. The server within video headend **3402** then forwards the event trigger message to video notification server **3401** (line **34-17**) with the identity (e.g., IP address and/or MAC address) of STT **104**. Server **3401** uses the identifier of STT **104** to identify the CPE gateway associated with STT **104** (gateway **111** in the present example) and forwards the event trigger data to CPE gateway **111** (line **37-18**). Using the text data, URI(s) and other information from the event trigger data, as well as user profile data previously cached by gateway **111**, a video service notification is generated and sent to handset **101** (and perhaps other end devices) at line **37-19**. As previously explained in connection with FIG. **8**, user profile data can be cached by CPE gateway **111** when gateway **111** is booted.

(185) Handset **101** displays the notification at line **37-20**. If the notification requests a response, handset **101** waits for that response, for the notification to be canceled, or for other appropriate input. If the notification does not require a response, handset **101** may cease presentation of the notification after a predetermined amount of time (e.g., 1 minute) or in response to an appropriate user input clearing the notification (e.g., selecting “Ok” on a GUI). In the current example, the notification requests a response. The user provides that response at line **37-21** by selecting a link in the notification having a corresponding URI. That response is then forwarded to server **3401** via gateway **111** (lines **37-22** and **37-23**). Server **3401** then extracts the response URI(s) and forwards them to the appropriate servers in video headend **3402** (line **37-24**). The server(s) in headend **3402** then forward the response URI(s) to STT **104** (line **37-25**), which takes appropriate action (e.g., commence recording, output content to a television, etc.) at line **37-26**.

(186) FIG. **37**B is a communication diagram showing information flows in connection with a user setting video notification preferences and receiving video service notifications according to another embodiment. The embodiment of FIG. **37**B is similar to that of FIG. **37**A, except that the user's video service notification preferences are stored in video notification server **3401**. Lines **37-50** through **37-61** represent actions similar to those described in connection with lines **37-0** through **37-11**, respectively, of FIG. **37**A. At line **37-62**, server **3401** stores preferences received at line **37-61**. As with operations represented by lines **37-6** through **37-14** of FIG. **37**A, operations of lines **37-56** through **37-62** in FIG. **37**B could be repeated multiple times as part of a single preference editing session.

(187) At line **37-63**, server **3401** detects an event trigger corresponding to one or more of the preferences stored at line **37-62**. This event trigger detection could occur in various manners similar to those described in connection with FIG. **37**A. Because the detection occurs in server **3401** instead of STT **104**, however, server **3401** may also store some or all of the same EPG data stored by STTs. After detecting the event trigger, server **3401** sends an event trigger message to CPE gateway **111** (line **37-64**). This message includes data regarding the event trigger (e.g., the text data describing what has occurred) and may also include data indicating that a response is requested. If a response is requested, the message may further include one or more URIs corresponding to the possible response(s). Using the text data, URI(s) and other information from the event trigger data, as well as the user profile data previously received and cached by gateway

111, a video service notification is generated and sent to handset **101** (and perhaps other end devices) at line **37-65**. The operations represented by remaining lines **37-66** through **37-72** in FIG. **37**B are similar to the operations represented by lines **37-20** through **37-26**, respectively, of FIG. **37**A.

(188) In some embodiments according to FIG. **37**A or FIG. **37**B, STT **104** and video notification server **3401** may, depending on the type of notification or response at issue, communicate with different servers associated with video head end **3402**. For example, STT notifications and notification responses related to VOD service may be routed through a dedicated VOD server. However, notifications and responses related to DVR programming may be routed through a separate rDVR web server. In some embodiments, a single event trigger might result in multiple different notifications and/or responses (and/or multiple notification and response messages) routed through different video head end servers.

(189) As previously indicated in connection with FIG. **34**, various network architectures can be employed to provide video service notifications to end devices within network **100**. In some embodiments, for example, network **100** is IMS-based. In some such embodiments, video service notifications are sent to (and notification responses are sent from) end devices using SIP. Handsets and other end devices that send (or receive) video service notifications could include SIP listener client software to listen for video service notifications. A CPE gateway could then act as a SIP proxy through which the handsets would communicate with IMS applications servers. In some such embodiments, for example, video notification server **3401** could be an IMS application server (in the IMS service layer) that communicates with CSCF elements (in the IMS control layer) that control communications with CPE gateways and end devices. One or more of the servers associated with video headend **3402** could similarly be IMS application servers and communicate with server **3401** through the CSCF elements. The IMS servers of the video headend could send SIP-based instructions to STTs and/or other end devices, but could communicate content in separate non-IMS channels.

(190) In some embodiments, a separate video notification server is omitted. FIG. **38** is a block diagram of a local premises **3800** according to some such embodiments. In certain of such embodiments, a CPE gateway **3811** forwards communications between handsets **3801** and **3802** (and/or PC end device **3803** and/or smart phone end device **3816**) and an STT **3804** using a MoCA, DLNA or similar local network interface between gateway **3811** and STT **3804**. CPE gateway **3811**, DECT handset end devices **3801** and **3802**, PC end device **3803**, STT end device **3804** and smart phone end device **3816** are similar to CPE gateway **111**, DECT handset end devices **101** and **102**, PC end device **103**, STT end device **104** and smart phone end device **116**, respectively, described in connection with FIG. **34** and earlier figures. Specifically, the devices in FIG. **38** have hardware similar to that described in connection with similar earlier-described devices, but are programmed or otherwise configured to carry out operations as described below. STT **3804** stores video notification preference data, detects event triggers, communicates event trigger data to CPE gateway **3811**, and receives notification responses from gateway **3811**. Gateway **3811** creates video service notifications based on event trigger data received from STT **3804** and sends those notifications to handsets **101** and **102** (and/or other end devices), receives notification responses from handsets **3801** and **3802**, and forwards those responses to STT **3804**.

(191) FIG. **39** is a communication diagram showing information flows in connection with a user setting video notification preferences and receiving video service notifications according to the embodiment of FIG. **38**. As previously indicated in connection with other embodiments and as shown generally by line **39-0**, handset **101** is used to receive telephony, other types of notifications and other services within the local network and service domain of gateway **111**. On line **39-1**, the user provides input to handset **3801** indicating that the user wishes to access his or her video service notification preferences. The present example assumes the user has no pre-existing video service notification preferences. If the user had previously created one or more video service

notification preferences, the user might alternatively be accessing those preferences to cancel or modify a notification or to create a new notification. In response to the input from the user, handset **3801** communicates to CPE gateway **3811** that the user wishes to access his or her video preferences (line **39-2**). In response to this communication, CPE gateway **3811** sends a message to STT **3804** at line **39-3**. In this message, gateway **3811** identifies the user and indicates that the user wishes to access his or her video notification preferences.

(192) In response to the message of line **39-3**, STT **3804** provides a video notification preferences presentation layer (line **39-4**), which CPE gateway **3811** forwards to handset **3801** (line **39-5**). Upon receipt of the presentation layer, handset **3801** generates a user interface for creation and/or editing video notification preferences (line **39-6**). The user provides input to this UI (line **39-7**), which input is forwarded to gateway **3811** (lines **39-8**). Gateway **3811** then forwards those preferences to STT **3804** (line **39-9**), which STT **104** then stores at line **39-10**. Similar to previous embodiments, operations represented by lines **39-4** through **39-10** could be repeated multiple times as part of a single preference editing session.

(193) Subsequently at line **39-11**, STT **4104** detects an event trigger corresponding to one or more of the preferences stored at line **39-10**. After detecting the event trigger, STT **3804** sends an event trigger message to CPE gateway **3811** (line **39-12**), which message includes event trigger data and may also include data indicating that a response is requested. Using the text data and other information from the event trigger data, gateway **3811** generates a video service notification and sends the same to handset **3801** (and perhaps other end devices) at line **39-13**. Handset **3801** displays the notification at line **39-14**. If the notification requests a response, handset **3801** waits for that response, for the notification to be canceled, or for other appropriate input. If the notification does not request a response, handset **3801** may cease presentation of the notification after a predetermined amount of time (e.g., 1 minute) or in response to an appropriate user input clearing the notification. In the current example, the notification requests a response. The user provides that response at line **39-15** by selecting a link in the notification having a corresponding URI. That response is then forwarded to gateway **111** (line **39-16**). Gateway **3811** then extracts the response forwards it to STT **3803** (line **39-17**) for action (line **39-18**).

(194) FIG. **40** is a flow chart showing operations performed by a DECT handset, or other end device in a local service domain, in connection with video service notifications. In block **4001**, the handset communicates with other devices so as to set or modify a user's video notification preferences. Block **4001** corresponds to actions performed by handset **101** in connection with lines **37-1**, **37-2** and **37-7** through **37-10** of FIG. **37**A, to actions performed by handset **101** in connection with lines **37-51**, **37-52** and **37-57** through **37-60** of FIG. **37**B, and to actions performed by handset **3801** in connection with lines **39-1**, **39-2** and **39-5** through **39-8** of FIG. **39**. The handset then waits for a video service notification at block **4002**. If no notification is received, flow loops back to block **4002** on the “no” branch. If a notification is received, flow proceeds on the “yes” branch to block **4003**. In block **4003**, the handset presents the notification to the user (line **37-20** of FIG. **37**A, line **37-66** of FIG. **37**B, line **39-14** of FIG. **39**). If the handset processor determines in block **4004** that no response to the notification is requested, flow loops back to block **4002** on the “no” branch. Although not shown in FIG. **40**, the handset could cease displaying the notification after a predetermined period or in response to an input from the user (e.g., pressing an “Ok” button). If a response is requested, flow proceeds to block **4005**. If no response is received, flow loops back to block **4005** on the “no” branch. If a response is received (line **37-21** of FIG. **37**A, line **37-67** of FIG. **37**B, line **39-15** of FIG. **39**), flow proceeds to block **4006**, where the handset processes the user input providing the response and generates a response message. The handset then sends the response message (line **37-22** of FIG. **37**A, line **37-68** of FIG. **37**B, line **39-16** of FIG. **39**) in block **4007**. Flow then returns from block **4007** to block **4002**.

(195) Although the examples of FIGS. **37**A, **37**B, **39** and **40** show setting of video notification preferences using the same device (handset **101**) over which notifications are later received, this

need not be the case. In at least some embodiments, preferences can be set using other end devices. For example, preferences could be set using a GUI presented on a television connected to STT **104**, using a different handset, using a PC or other computer, etc.

(196) FIG. **41**A is a flow chart showing operations performed by video notification server **3401** in at least some embodiments according to FIG. **37**A. In block **4101**, server **4101** receives a message from CPE gateway **111** indicating that the user wishes to access his or her video preferences. In block **4102**, server **3401** contacts AMS **119** to obtain authentication and profile data for the user. Server **3401** then receives that data at block **4103**, in response to which server **3401** provides a video notification preferences presentation layer in block **4104**. Server **3401** receives preferences data forwarded from CPE gateway **111** in block **4105** and forwards that preference data to video head end **3402** in block **4106**. Although shown as a single sequence of three blocks for convenience, the steps of blocks **4104** through **4106** could be repeated multiple times as part of a single video notification preferences editing session.

(197) Server **3401** then proceeds to block **4107** and waits for event trigger data or for notification response data. If no data is received, flow loops back to block **4107** on the “no” branch. If data is received, flow proceeds to block **4108** on the “yes” branch, where server **3401** determines if the received data is trigger data forwarded by video head end **3402** or notification response data forwarded by CPE gateway **111**. If the received data is event trigger data, flow proceeds on the “T” branch to block **4109**, where server **3401** forwards that data to CPE gateway **111**. If the received data in block **4108** is notification response data, flow proceeds on the “R” branch from block **4108** to block **4110**, where server **3401** forwards the response data to video head end **3402**. From block **4109** or block **4110**, flow returns to block **4107** to await further data.

(198) FIG. **41**B is a flow chart showing operations performed by video notification server **3401** in at least some embodiments according to FIG. **37**B. Blocks **4131** through **4135** are similar to blocks **4101** through **4105**, respectively, of FIG. **41**A. In block **4136** of FIG. **41**B, however, server **3401** stores received preference data instead of forwarding that data (as is the case in block **4106** of FIG. **41**A). Server **3401** then proceeds to block **4137** and waits for an event trigger. If no event trigger occurs, flow loops back to block **4137** on the “no” branch. If an event trigger occurs, flow proceeds to block **4138**, where server **3401** determines if a response will be requested. If not, flow proceeds on the “no” branch to block **4139**, where event trigger data is forwarded to CPE gateway **111**. If server **3401** determines in block **4138** that a response will be requested, flow proceeds on the “yes” branch to block **4140**, where the event trigger data is forwarded to CPE gateway **111**. From block **4140**, server **3401** proceeds to block **4141** to await the response data. Until a response is received, flow loops back to block **4141** on the “no” branch. Once a response is received, server **3401** proceeds on the “yes” branch to block **4142**, where the response is processed. As part of processing the response, server **3401** generates a command for STT **104** and forwards that command to video head end **3402**. From block **4109** or block **4110**, flow returns to block **4137** to await the next trigger.

(199) FIG. **42**A is a flow chart showing operations performed by STT **104** in at least some embodiments according to FIG. **37**A. In block **4201**, STT **104** receives user video notification preferences forwarded by video head end **3402** (line **37-13** of FIG. **37**A). STT **104** then stores the received preferences in block **4202**, after which flow proceeds to block **4203**. In block **4203**, STT **104** waits for an event trigger. Until a trigger occurs, flow loops back to block **4203** on the “no” branch. Once a trigger occurs, flow proceeds on the “yes” branch to block **4204**, where STT **104** sends event trigger data to video head **3402**. Flow then proceeds to block **4205**, where STT **104** determines if a response to the event trigger will be requested. If not, flow returns to block **4203** on the “no” branch to await the next trigger. If a response will be requested, flow proceeds on the “yes” branch from block **4205** to block **4206**, where STT **104** awaits the response. Until a response is received, flow loops back to block **4206** on the “no” branch. Once a response is received, flow proceeds on the “yes” branch to block **4207**, where the response is processed. From block **4207**,

flow returns to block **4203**.
(200) FIG. **42**B is a flow chart showing operations performed by STT **3804** in at least some embodiments according to FIG. **39**. In block **4231**, STT **3804** receives a message from CPE gateway **3811** indicating that the user wishes to access his or her video preferences. In block **4232**, STT **3804** provides a video notification preferences presentation layer to handset **3801** via gateway **3811**. STT **3804** receives preferences data forwarded from gateway **3811** in block **4233** and stores that data at block **4234**. Although shown as a single sequence of four blocks for simplicity, the steps corresponding to blocks **4231** through **4234** could be repeated multiple times as part of a single video notification preferences editing session. STT **3804** then proceeds to block **4235** and waits for an event trigger. Until a trigger occurs, flow loops back to block **4235** on the "no" branch. Once a trigger occurs, flow proceeds on the "yes" branch to block **4236**, where STT **3804** sends event trigger data to handset **3801** via gateway **3811**. Flow then proceeds to block **4237**, where STT **3804** determines if a response to the event trigger will be requested. If not, flow returns to block **4235** on the "no" branch to await the next trigger. If a response will be requested, flow proceeds on the "yes" branch to block **4238**, where STT **3804** awaits the response. Until a response is received, flow loops back to block **4238** on the "no" branch. Once a response is received, flow proceeds on the "yes" branch to block **4239**, where the response is processed. From block **4239**, flow returns to block **4235**.
(201) FIG. **43** is a block diagram of a local premises **4300** in another embodiment in which a separate video notification server can omitted. The embodiment of FIG. **43** shows a converged service delivery infrastructure in which device to device communication is possible, and each device can send commands and/or notifications to other devices. CPE gateway **4311**, DECT handset end devices **4301** and **4302**, PC end device **4303**, STT end device **4304** and smart phone end device **4316** are similar to CPE gateway **111**, DECT handset end devices **101** and **102**, PC end device **103**, STT end device **104** and smart phone end device **116**, respectively, described in connection with FIG. **34** and earlier figures. Specifically, the devices in FIG. **38** have hardware similar to that described in connection with similar earlier-described devices, but are programmed or otherwise configured to carry out operations as described below. Each of CPE gateway **4311**, DECT handset end devices **4301** and **4302**, PC end device **4303**, STT end device **4304** and smart phone end device **4316** may additionally include a local wireless communication interface (e.g., a BLUETOOTH interface) and associated software so as to permit device-to-device communication within premises **4300**. In some embodiments according to FIG. **43**, a handset end device (e.g., device **4301** or **4302**) and an STT end device (e.g., device **4304**) could each be a SIP end point and know the capabilities, addresses and routing mechanisms applicable other devices. In some such embodiments, a command from a handset could be routed to the STT without terminating the command in CPE gateway **4311** or in an external network element. Communications in the embodiment of FIG. **43** would be similar to those shown in FIG. **39**, but with most (or all) preference editing, notification and response communications passing directly between a handset and an STT without being relayed by CPE gateway **4311**.
(202) In some variations on the embodiments of FIG. **43**, a handset end device could derive the capabilities, addresses and commands for the STT via CPE gateway **4311** from an external network element (e.g., application server **118**). In further variations on the embodiments of FIG. **43**, notifications flow directly from the STT to a handset, but notification responses and other commands to the STT flow to an external network element (e.g., a server similar to video notification server **3401**). That external network element would then interpret the command received from the handset, convert it into a suitable form, and forward it to the STT. Personalization, device lookup, capabilities, etc. could be managed in the external network cloud.
(203) Referring again to FIG. **1**, one of the end devices shown in the local service domain of CPE gateway **111** is smart phone **116**. In at least some embodiments, a mobile device such as smart phone **116** is able to operate in a wide area wireless network and can become an end device in a

local service domain. Once the mobile device joins the local service domain, that device can receive any of the notifications or other above-described services provided to DECT handsets **101** and **102**, PC **103** or other end devices. As used herein, a “wide area wireless network” is a wireless network that provides telephony and/or data services in a region that can include multiple premises. Examples of such wide area wireless networks include but are not limited to cellular telephone networks, 3G mobile networking and telecommunication networks, EDGE (Enhanced Data rate for GSM Evolution) networks, and EVDO (EVolution Data Optimized) networks. A “mobile device” is a smart phone, PDA or other device that is able to directly communicate in a wide area wireless network using an appropriate transceiver.

(204) In at least some embodiments, a local service domain of a CPE gateway is dynamic and can be joined by an incoming mobile device. Upon coming within the range of one of the local wireless interfaces used by a CPE gateway for communication with end devices (e.g., within range of a WiFi interface, a femtocell interface, or a BLUETOOTH interface), the mobile device announces its presence to the CPE gateway. The CPE gateway then learns the capabilities of the mobile device and establishes a communication link with the mobile device over one of the gateway's local wireless interfaces. As part of establishing the communication link, the CPE gateway may authenticate the mobile device by consulting AMS **119** and user data profile database **120** (or some other database) and/or by requiring a local service domain password from the mobile device. The CPE gateway and the mobile device may also exchange encryption keys or other data to maintain privacy of communications within the local service domain. Once the communication link has been established, the CPE gateway adds the mobile device to its list of end devices in its local service domain and begins providing notifications and other services to the mobile device in accordance with profile data of a user associated with the mobile device. The user associated with the mobile device may be a member of a household or other group of users and who previously created a user profile. Alternatively, the user of the mobile device may be a “guest” user who receives notifications and services according to a default profile or according to some other profile specifically created for temporary users. When providing notifications and services to the mobile device, the CPE gateway may use the stored information about the mobile device capabilities to adjust or otherwise modify notifications and services so as to accommodate display size, display resolution, software versions, and/or other aspects that might be unique to the mobile device.

(205) As explained in further detail below, a mobile device may include multiple transceivers. One transceiver may be used for direct communications with the wide area wireless network and another transceiver may be used for communications with a WiFi, BLUETOOTH or other local area wireless network. A TN or other identifier may be associated with the mobile device by the operator of a wide area wireless network with which the mobile device is associated. For example, the mobile device may be associated with a particular subscriber having an account with the operator of the wide area wireless network associated with the mobile device (the “home wireless network” of the mobile device), which operator may be the same or different than the operator of network **100** (FIG. **1**). For convenience, the TN or other identifier used by the home wireless network of a mobile device will be referred to as the TN for that mobile device (e.g., “the device **116** TN”). In some embodiments, services received by a mobile device through its home wireless network can be linked to services received by that mobile device after joining the local service domain of a CPE gateway. In some such embodiments, the mobile device TN may also become available for use by other end devices through the joined local service domain. In other embodiments, services received by a mobile device through its home wireless network are not linked to services received through a joined local service domain, and the mobile device TN is not available for use by other end devices within the joined local service domain.

(206) FIG. **44** is a block diagram of smart phone **116** according to some embodiments. Smart phone **116** includes a transceiver **4410** used for direct communication over a wide area wireless network. The wide area wireless network in which device **116** communicates may be the home wireless

network or may be a wide area wireless network into which device **116** has roamed. Transceiver **4410** demodulates signals received over a wide area wireless network and that modulates data and transmits modulated data signals in the wide area wireless network. A second transceiver **4401** demodulates signals received in a local wireless network (e.g., a WiFi or BLUETOOTH network), modulates data and transmits modulated data signals in that local wireless network. A GPS (Global Positioning System) receiver **4312** receives GPS satellite signals, computes position data based on those signals, and outputs that position data to a processor **4402**. Transceiver **4410** and **4401** also exchange data with processor **4402**, which is configured to execute instructions so as to perform various operations as described herein and to control operation of other components of mobile device **116**. Those instructions may be stored in memory **4408** as executable instructions and/or as hard wired logic within processor **4402**. For example, stored in memory **4408** is a local service domain client **4311**. Client **4311** includes data and instructions that configure processor **4402** to communicate with CPE gateway **111** using transceiver **4301**, to output audio and video associated with notifications and other services to a user of device **116**, and to receive input from a user of device **116** as part of interaction with services in the local service domain of gateway **111**. Processor **4402** is also configured to perform one or more types of CODEC operations to convert data to audio for output through speaker **4403** and to convert sound received through microphone **4404** into data. Processor **4402** outputs video data to a display **4405** and receives user input through a keypad **4406** and/or through touch sensitive portions of display **4405**. Processor **4402** is configured to provide a browser or other graphical user interface (GUI) on display **4405** by which a user of device **116** can receive visual indicators for notifications, access various services, view displayed video, configure a user profile, etc. A battery **4409** provides electrical power to device **116**.

(207) In some embodiments, and as indicated above, the services received by device **116** through its home wireless network are not linked to the services received by device **116** after joining the local service domain of CPE gateway **111**. In effect, device **116** simply becomes another handset end device in the local service domain similar to handsets **101** and **102**. In some such embodiments, device **116** communicates with gateway **111** over a local wireless interface to receive telephone calls (using one of the TNs or other call session identifiers associated with the network **100** account corresponding to gateway **111**), to receive and attend notifications (including video service notifications), and to receive other of the above-described services available to handsets **101** and **102**. However, incoming telephone calls to the device **116** TN and other communications through the wide area wireless network will not pass through gateway **111**, and end devices in the gateway **111** local service domain will not be able to initiate calls through gateway **111** using the device **116** TN. In some such embodiments, wide area wireless network transceiver **4410** of device **116** may remain active, thereby permitting device **116** to simultaneously communicate over the wide area wireless network directly (using the device **116** TN) and communicate with (and receive services from) gateway **111**. In other such embodiments, transceiver **4410** may be disabled while device **116** is joined to a local service domain.

(208) FIG. **45** is a communication diagram showing information flows in connection with device **116** joining the local service domain of CPE gateway **111**, and where services received through the home wireless network (or through some other wide area wireless network into which device **116** might roam) are not linked to services received through CPE gateway **111**. The examples of FIG. **45** and of subsequent drawings assume that device **116** establishes communications with CPE gateway **111** over a WiFi interface such as an interface according to IEEE 802.11. However, the techniques and operations described below are also applicable to other types of local wireless networks. Adaptation of such techniques to a different type of local wireless network and protocols associated with such other local network type are routine matters within the abilities of a person of ordinary skill once such a person is provided with the information contained herein.

(209) After entering premises **110** or otherwise coming within the range of a WiFi transceiver of

interface **414** or interface **413** of gateway **111** (see FIG. **4**), device **116** possessed by a user G receives the SSID (Service Set IDentifier) of the local wireless network gateway **111** (line **45-1**). User G may be a guest or may be a user who has a pre-existing profile for the gateway **111** local service domain. At line **45-2**, client **4311** determines that the received SSID corresponds to a joinable local service domain and initiates communications to join that local service domain. At lines **45-3-1** and through **45-3-***n*, device **116** and gateway **111** exchange authentication data and negotiate communication parameters, device **116** provides its capabilities, gateway **111** assigns an IP address to device **116**, and other aspects of the local wireless link setup are performed. After the link is set up (or as part of that setup), gateway **111** stores device capabilities of device **116**, the MAC and IP addresses of transceiver **4301**, and other data associated with device **116** (line **45-4**).
(210) Next, and as shown generally by lines **45-5-1** through **45-5-***n*, CPE gateway **111** associates profile data with device **116**. In some embodiments, CPE gateway **116** initially sends a message that causes device **116** to present a profile selection/configuration UI on display **4305**. This UI prompts user G to indicate whether he or she wishes to retrieve an existing profile, to create a new profile, or to use a default or guest profile. If user G selects retrieval of an existing profile corresponding to user G, a series of operations similar to those of lines **7-1** through **7-5** of FIG. **7** are performed, except that user G communicates using device **116** instead of device **101**. If user G selects creation of a new profile, operations similar to those of lines **6-1** through **6-17** of FIG. **6** are performed (with the user communicating using device **116** instead of device **101**). If user G selects use of a default profile, operations similar to those of lines **7-1** through **7-5** of FIG. **7** are performed, except that a default profile is retrieved from AMS **119**.
(211) After the operations of lines **45-5-1** through **45-5-***n*, device **116** is part of the CPE gateway **111** local service domain. At this point, device **116** can receive notifications, telephone calls and other services through gateway **111**, according to the user profile associated with device **116**, like other end devices in the local service domain. For example, and depending on the profile settings applicable to device **116**, user G may receive services and notifications listed in Table 1 as though device **116** were another DECT handset, may select one of the TNs associated with gateway **111** to make an outgoing call, may barge into an ongoing call, may receive PA messages, may access address book data, may receive video services, may receive data services (e.g., email, instant messaging, news feeds, Internet access) and/or may receive and respond to video service notifications.
(212) In some embodiments according to FIG. **45**, device **116** is dropped from the gateway **116** local service domain if gateway **111** does not detect activity from device **116**. As shown at line **45-6**, gateway **111** determines that it has received no communication from device **116** for a predetermined time period. In response, gateway **111** sends a polling message to device **116** (line **45-7**). After not receiving a poll response from device **116** (line **45-8**), gateway **111** clears data entries for device **116** stored by gateway **111** and deauthorizes device **116** as an end device (line **45-9**).
(213) In other embodiments, the services received by device **116** through a wide area wireless network are linked to services receivable through the local service domain of CPE gateway **111**. After device **116** joins the local service domain (or as part of the joining process) in such embodiments, CPE gateway **111** sends one or more notifications to external IMS network elements. In particular, gateway **111** notifies those elements that device **116** is now communicating through gateway **111**, and that communications directed to device **116** should be routed to gateway **111**. In addition to receiving notifications and services from gateway **111** as was described in connection with FIG. **45**, device **116** will thus also receive calls directed to the device **116** TN (or other identifier associated with device **116** in a wide area wireless network) through gateway **111** and the access sub-network **112** serving gateway **111**. Moreover, the device **116** TN will become available for association with outgoing calls initiated by other end devices in the gateway **111** local service domain.

(214) FIG. **46** is a communication diagram showing information flows in connection with device **116** joining the local service domain of CPE gateway **111**, and where services received through a home wireless network of device **116** are linked to services received through gateway **111**. Mobile device **116**, gateway **111**, server **118** and AMS **119** in embodiments according to FIGS. **46**-**50** may have hardware that is similar to the hardware of those elements in previously-described embodiments. In embodiments according to FIGS. **46**-**50**, however, these elements are configured (e.g., with modified software and/or firmware) to operate as described below. In alternate embodiments, a mobile device, CPE gateway, application server and/or AMS may have different hardware and be configured (e.g., with one or more ASICs) to operate as described below.
(215) Lines **46**-**1** through **46**-**4** represent operations similar to those described in connection with lines **45**-**1** through **45**-**4** of FIG. **45**, except that information provided by device **116** in lines **46**-**3**-**1** through **46**-**3**-*n* includes the device **116** TN (the TN associated with device **116** in its home wireless network) or some other identifier associated with device **116**. Device **116** may also provide a URI or other data that can be used to contact one or more servers or other elements in an IMS network that serves the home wireless network of device **116**. At lines **46**-**5**-**1** through **46**-**5**-*n*, CPE gateway contacts elements in the IMS network serving the home wireless network of device **116**. CPE gateway **111** provides the device **116** TN (or other identifier) and informs the network elements that device **116** is now associated with gateway **111**. The IMS network elements acknowledge that device **116** is now associated with gateway **111**, and begin forwarding communications directed to the device **116** TN via gateway **111**. The IMS network elements also begin accepting calls associated with the device **116** TN through gateway **111**.
(216) Next, and as shown generally by lines **46**-**6**-**1** through **46**-**6**-*n*, CPE gateway **111** associates profile data with device **116**. Lines **46**-**6**-**1** through **46**-**6**-*n* represent operations similar to those described in connection with lines **45**-**5**-**1** through **45**-**5**-*n* of FIG. **45**. After the operations of lines **46**-**6**-**1** through **46**-**6**-*n*, device **116** is part of the CPE gateway **111** local service domain and can receive notifications and other services through gateway **111**, according to the user profile associated with device **116**, like other end devices in the local service domain. However, the device **116** TN can now be added to the TNs available for calls from other end devices in the gateway **111** local service domain. Similarly, incoming calls directed to the device **116** TN may be receivable at other end devices. Use of the device **116** TN by other end devices is discussed in more detail below. As with other aspects of the services and notifications provided through gateway **111**, use of the device **116** TN by other devices in the gateway **111** local service domain is subject to the profile of the user associated with device **116** and/or to the profiles of other users. In some embodiments, for example, user G may create a profile that does not allow the device **116** TN to be used by other end devices.
(217) In some embodiments according to FIG. **46**, and using operations similar to those described in connection with lines **45**-**6** through **45**-**9** of FIG. **45**, gateway **111** drops device **116** from the local service domain if gateway **111** does not detect activity from device **116** after a predetermined amount of time. As shown by lines **46**-**7**-**1** through **46**-**7**-*n* of FIG. **46**, however, gateway **111** may also (or alternatively) drop device **116** from the local service domain in response to a message from one or more external IMS network elements. In certain embodiments, client **4411** in device **116** may be configured to detect when device **116** is no longer within range of the local wireless network transceiver of gateway **111** (e.g., based on non-receipt of the local wireless network SSID or other signal for a predetermined time period, based on an RSSI (received signal strength indicator) of the local wireless network below a predetermined value, etc.). In response to this detection, processor **4402** of device **116** (FIG. **44**) re-registers with a wide area wireless network using transceiver **4410**. In response to this re-registration, one or more elements of the IMS network serving the wide area wireless network send messages to gateway **111** indicating that device **116** is no longer in range and should be unassociated with the local service domain.
(218) In at least some embodiments according to FIG. **46**, integration of services provided by a

home wireless network with services available through a joined local service domain allow various service enhancements. For example, such integration can allow notifications of calls to a mobile device TN to be displayed through other end devices in the joined local service domain. Once the mobile device is part of the local service domain, a notification of a call to the mobile device TN could be provided to one or more end devices in the local service domain authorized to received such notifications by the applicable user profile(s). The notification could also include the caller identification (CID) of the calling party.

(219) FIG. **47** is a communication diagram showing information flows in an embodiment where a notification of an incoming call to the device **116** TN is displayed on a television connected to STT end device **104**. In the embodiment of FIG. **47**, application server **118** and AMS **119** are IMS application servers communicating with local CPE gateway **111** through one or more CSCF elements in the external network. At line **47-1**, user G enables receipt of incoming call notifications on a television (not shown) connected to STT **104**. User G can enable this feature, using a remote control device that communicates with STT **104**, through a GUI presented by STT **104** on the attached television. In response, STT **104** sends the profile update information to CPE gateway **111** (line **47-2**), which then forwards the profile update to AMS **119** at line **47-3**. AMS **119** then forwards the profile update to application server **118** at line **47-4**. The operations corresponding to lines **47-1** through **47-4** could occur before or after device **116** joins the local service domain of gateway **111**.

(220) Subsequent to the operations of lines **47-1** and **47-4**, and after device **116** has joined the local service domain of gateway **111**, an external user outside of premises **110** makes a call to the device **116** TN. The network in which an external user has made the call (which may be network **100** or another network) signals the initiation of that call (e.g., a SIP INVITE request message) to network **100**, which signal ultimately causes IMS elements within network **100** to signal application server **118** of the incoming call (line **47-5**). After determining that the user profile is configured so that incoming call notifications for the device **116** TN are to be sent to STT **104**, server **118** forwards a notification about the incoming call to gateway **111** (line **47-6**). Gateway **111** then forwards the notification to STT **104** (line **47-7**), which presents the notification on the video screen of the television connected to STT **104** (line **47-8**). If the notification has audio components (e.g., a beep or other sound the user has associated with notifications), those audio components can be presented through the audio system of the television.

(221) In the example of FIG. **47**, the notification may include a GUI in a portion of the screen (e.g., an overlay on a movie or other program being watched) offering the user various options. A first option may be to answer the call through device **116** over the wide area wireless network in which device **116** is currently located. For example, premises **110** may be located outside the geographic region served by the home wireless network of device **116**, and device **116** may be roaming in a wide area wireless network serving the geographic region in which premises **110** is located. A second option may be to answer the call through the local service domain using device **116** or another end device in the local service domain. A third option may be to forward the call to another user identity (e.g., another identity of the user or the identity of a different user), and a fourth option may be to ignore the call. After seeing and/or hearing the notification, user G responds (e.g., using the STT **104** remote control to select a desired option from the GUI) at line **47-9**. In the present example, user G selects the first option (answer the call through a wide area wireless network). STT **104** then forwards the user G response to gateway **111** (line **47-10**), which forwards the response to server **118** (line **47-11**). Server **118** then signals the appropriate IMS network elements that the incoming call is to be connected to device **116** over the wide are wireless network in currently serving device **116** (line **47-12**). This results in the call being connected to device **116** over that wide area wireless network (not shown) at line **47-13**.

(222) If user G had selected the second option at line **47-9** (answer the call through the local service domain), this selection would instead have been passed to the appropriate IMS network elements,

which would then have routed the call to device **116** and/or other end devices through gateway **111**. If user G had selected the third option (forward the call to another user identity), the GUI presented by STT **104** could then list available user identities to which the call could be transferred. After user G selects one of those identities, the selection would have been passed to the appropriate IMS network elements. The call would then have been routed to device **116** and/or other end devices through gateway **111**, but with the notification(s) on the end device(s) being in accordance with the profile of the user identity selected as the forwardee. If the fourth option had been selected, the appropriate IMS network elements could route the call to the voice mail of user G.

(223) FIG. **48** is a communication diagram showing information flows where notification of an incoming call to the device **116** TN is displayed on multiple end devices in the local service domain. As in FIG. **47**, application server **118** and AMS **119** in the example of FIG. **48** are IMS application servers communicating with local CPE gateway **111** through one or more CSCF elements in the external network. Unlike the example of FIG. **47**, however, user G has not configured a profile to cause notification of incoming calls to the device **116** TN to be treated differently from incoming calls to other TNs associated with gateway **111**. After device **116** has joined the gateway **111** local service domain, an external user outside of premises **110** makes a call to the device **116** TN. The network in which external user has made the call (which may be network **100** or another network) signals the initiation of that call (e.g., a SIP INVITE request message) to network **100**, which signal ultimately causes IMS elements within network **100** to signal application server **118** of the incoming call (line **48-1**). After checking the profile for user G, server **118** forwards a notification about the incoming call to gateway **111** (line **48-2**). Gateway **111** then forwards the notification to handset **102** at line **48-3**, which presents the incoming call notification at line **48-4**. Gateway **111** similarly forwards the notification to handset **101** (line **48-5**) and to device **116** (line **48-7**), each of which also presents the notification (lines **48-6** and **48-8**). Depending on the applicable profile for user G, other end devices might also receive and present the notification. If device **116** is not active (e.g., if device **116** has been turned off), the notification to device **116** could be omitted.

(224) User G attends the notification on device **102** at line **48-9** and by selecting an option (e.g., an “answer” icon on the screen of handset **102**) indicating the call will be taken on handset **102**. This selection is forwarded to gateway **111** at line **48-10**, which then forwards the indication to server **118** at line **48-11**. After forwarding the user G selection at line **48-11**, gateway **111** also causes handset **101** and device **116** to cease the notification of the incoming call (lines **48-12** and **48-13**). Server **118** signals the appropriate IMS elements that the call will be answered using handset **102** (line **48-14**), and the call is then routed to handset **102** through gateway **111** (lines **48-15** and **48-16**).

(225) Integrating wide area wireless network services of device **116** with services available through the local service domain of gateway **111** can also allow use of the device **116** TN for outgoing calls initiated from end devices in the local service domain. As previously explained in connection with FIGS. **18-20**, users in premises **110** may be permitted to select one of multiple TNs for an outgoing call and/or to barge in on a pre-existing call using one of those TNs. Once device **116** joins the local service domain of gateway **111**, the device **116** TN is added to the available TNs. FIG. **49** shows a display of active calls and available TNs similar to that of FIG. **19**, but with the device **116** TN (“(mobile) 5555555555”) added to the numbers that can be selected to make a new call. If the device **116** TN were selected for an outgoing call, that TN would appear as the calling number in the recipient's CID.

(226) FIG. **50** is a communication diagram showing information flows in connection with a location identification feature according to some embodiments. As in FIGS. **47** and **48**, application server **118** is an IMS application server communicating with local CPE gateway **111** through one or more CSCF elements in the external network. After device **116** has joined the local service domain of gateway **111**, user G (not shown) uses device **116** to send an SMS message to mobile devices

5002 and **5003** of users X and Y, respectively. Devices **5002** and **5003** are currently communicating in a wide area wireless network **5001**. For simplicity, FIG. **50** shows communication of the SMS message to network **5001** as a single line. However, the SMS message could be delivered in any of various manners. For example, transceiver **4410** of device **116** (see FIG. **44**) could still be active, thereby allowing device **116** to communicate directly with network **5001** or with another wide area wireless network that then forwards the SMS message to network **5001**. As another example, the SMS message could be communicated through gateway **111** and elements of the IMS network serving gateway **111**.

(227) At lines **50-2** and **50-3**, the SMS message is delivered to devices **5002** and **5003**. Upon receiving the SMS, user X activates a locator application stored in device **5002** that causes the device to send a location query message regarding the sender of the just received SMS (line **50-4**). Network **5001** forwards this query to the IMS network serving gateway **111** (line **50-5**), which forwards the query to server **118** (line **50-6**). If the location of device **116** is not already stored by server **118**, a location query is then sent to device **116** via gateway **111** (lines **50-7** and **50-8**). Using its GPS receiver **4412** (FIG. **44**), device **116** determines its location and then sends that location to server **118** via gateway **111** (lines **50-9** and **50-10**). That location is then forwarded by server **118** via the IMS network to network **5001** (lines **50-11** and **50-12**), which then forwards the location to device **5002** (line **50-13**). If user Y were to also activate a locator application in device **5003**, a similar series of communications would follow so as to provide the device **116** location to device **5003**.

(228) Notably, a local service domain joined by device **116** in some embodiments need not be a residence. For example, a restaurant or other business may have its own CPE gateway and local service domain that can be joined by patrons' mobile devices. This could permit a restaurant customer to send an SMS invite to his friends asking them to join him at the restaurant, with the friend then able to learn the restaurant's location using the locator applications in their mobile devices. In some embodiments, a location request may include the telephone number associated with a received SMS message, and a location request response could include a map and/or driving directions. In still other embodiments, an application server or a gateway receiving a location request provides the gateway location instead of a GPS location of the device sending an SMS.

(229) FIG. **51** is a flow chart showing operations performed by mobile device **116** according to various embodiments described above. After coming within range of a WiFi transceiver in CPE gateway **111**, device **116** receives an SSID of the local wireless network for gateway **111** (block **5101**). Block **5101** corresponds to operations performed by device **116** in connection with line **45-2** of FIG. **45** or line **46-2** of FIG. **46**. Device **116** next sets up a wireless link with gateway **111** at block **5102** (which corresponds to operations performed by device **116** in connection with lines **45-3-1** through **45-3-***n* of FIG. **45** or lines **46-3-1** through **46-3-***n* of FIG. **46**). Next, and as represented by block **5103**, device **116** creates, selects or otherwise becomes associated with a user profile (lines **45-5-1** through **45-5-***n* of FIG. **45** or lines **46-6-1** through **46-6-***n* of FIG. **46**). Device **116** then enters a ready state at block **5104**. In the ready state of block **5104**, device **116** is able to receive services through the local service domain of gateway **111** as described above.

(230) FIG. **52** is a flow chart showing operations performed by CPE gateway **111** according to various embodiments described above. At block **5201**, gateway **111** receives a message from device **116** seeking to join the local service domain. Block **5201** generally corresponds to initial operations performed by gateway **111** in connection with lines **45-3-1** through **45-3-***n* of FIG. **45** or to initial operations performed by gateway **111** in connection with lines **46-3-1** through **46-3-***n* of FIG. **46**. At block **5202**, gateway **111** then sets up the wireless link with device **116**. Block **5202** generally corresponds to subsequent operations performed by gateway **111** in connection with lines **45-3-1** through **45-3-***n* of FIG. **45** or to subsequent operations performed by gateway **111** in connection with lines **46-3-1** through **46-3-***n* of FIG. **46**. At block **5203**, gateway **111** stores data regarding device **116** and adds device **116** to a list of end devices in the local service domain (line **45-4** of

FIG. **45** or line **46-4** of FIG. **46**).
(231) Next, gateway **111** determines at block **5204** whether device **116** is a device for which wide area wireless network services can be integrated with services in the local service domain. In particular, gateway **111** determines whether the home wireless network of device **116** will support routing of calls to the device **116** TN through gateway **111** and initiation of calls using the device **116** TN from within the gateway **111** local service domain. In some embodiments, gateway **111** makes this determination based on information communicated by device **116**. For example, client **4411** (FIG. **44**) can be configured to communicate a specific command to gateway **111** that indicates whether the device **116** home wireless network will support integration with a local service domain (and if so, to also provide necessary information for communications with that home wireless network).
(232) If the device **116** home network will support integration, as is the case in at least some embodiments according to FIGS. **46-50**, gateway **111** proceeds on the "yes" branch to block **5205**. In block **5205**, gateway **111** contacts that home wireless network of device **116** and communicates that device **116** has joined the gateway **111** local service domain. In such a case, block **5205** generally corresponds to operations performed by gateway **111** in connection with lines **46-5-1** through **46-5-***n* of FIG. **46**. From block **5205**, gateway **111** continues to block **5206** to establish profile information for device **116**. In circumstances where block **5206** is reached from block **5205**, block **5206** generally corresponds to operations performed by gateway **111** in connection with lines **46-6-1** through **46-6-***n* of FIG. **46**. If gateway **111** determines in block **5204** that the home wireless network will not support integration, as is the case in at least some embodiments according to FIG. **45**, flow instead proceeds to block **5206** directly. In such a case, block **5206** generally corresponds to operations performed by gateway **111** in connection with lines **45-5-1** through **45-5-***n* of FIG. **45**. From block **5206**, gateway **111** proceeds to block **5207** and enters a ready state. In the ready state, gateway **111** is able to provide services to device **116**. The services available to device **116** through gateway **111** in block **5207** will depend on whether the home wireless network supports integration and on the applicable profile(s) associated with device **116**.
(233) In some embodiments, a mobile device joining a local service domain may establish a wireless link with a CPE gateway using the same transceiver used for communication with a wide area wireless network (e.g., transceiver **4410** of FIG. **44**). For example, a CPE gateway may also include a femtocell interface and an associated short range transceiver for communications using one or more of the frequencies used by the wide area wireless network. In such an embodiment, the mobile device simply registers with the CPE gateway in a manner similar to that in which a mobile device would register with any other base station of the wide area wireless network. After registration all communications from or to the mobile device would use the CPE gateway and it associated network for backhaul communications instead of directly communicating with the wide area wireless network.
(234) Embodiments 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.
(235) 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: determining, by a gateway device, that a mobile device has been added to a local service domain associated with the gateway device; receiving, by the gateway device and from a different service domain, data indicating that the mobile device is outside a range of the local service domain and has joined the different service domain; and causing, by the gateway device and based on the data, removal of the mobile device from the local service domain.
2. The method of claim 1, wherein the data is received from a network device serving a wide area wireless network.
3. The method of claim 1, wherein the mobile device being added to the local service domain comprises authorizing the mobile device to: access one or more services available in the local service domain; control one or more services available in the local service domain; control one or more end devices in the local service domain; access content items from one or more content delivery networks; join a communication initiated by an end device in the local service domain; or allow an end device to initiate a communication using a communication service associated with the mobile device.
4. The method of claim 1, wherein the local service domain is associated with a premises and provides wireless communication capabilities between the mobile device and a plurality of end devices in the premises.
5. The method of claim 1, wherein the mobile device comprises a smartphone or a wireless mobile device.
6. The method of claim 1, wherein the local service domain provides wireless communication capabilities between a plurality of end devices comprising: one or more telecommunications handsets; one or more user computing devices; one or more set-top boxes; or one or more smart televisions.
7. The method of claim 1, wherein the causing removal of the mobile device from the local service domain comprises: sending, to the mobile device, a polling message; and causing, based on a determination that a reply for the polling message has not been received, removal of the mobile device.
8. The method of claim 1, wherein the causing removal of the mobile device from the local service domain is further based on determination that the mobile device has been inactive for a threshold time period.
9. A system comprising: a gateway device; and a mobile device added to a local service domain associated with the gateway device; wherein the mobile device is configured to: determine that the mobile device is outside a range of the local service domain; and join a different service domain, and wherein the gateway device is configured to: receive, after the mobile device has been added to the different service domain and from the different service domain, data indicating that the mobile device is outside the range of the local service domain; and cause, based on receiving the data, removal of the mobile device from the local service domain.
10. The system of claim 9, wherein the local service domain is associated with a premises and provides wireless communication capabilities between the mobile device and a plurality of end devices in the premises, and wherein the plurality of end devices comprises: one or more telecommunications handsets; one or more user computing devices; one or more set-top boxes; or

one or more smart televisions.
11. The system of claim 9, wherein the gateway is configured to cause removal of the mobile device from the local service domain further based on determination that the mobile device has been inactive for a threshold time period.
12. The system of claim 9, wherein the mobile device being added to the local service domain comprises the mobile device being authorized to: access one or more services available in the local service domain; control one or more services available in the local service domain; control one or more end devices in the local service domain; access content items from one or more content delivery networks; join a communication initiated by an end device in the local service domain; or allow an end device to initiate a communication using a communication service associated with the mobile device.
13. The system of claim 9, wherein the data is received from a network device serving a wide area wireless network.
14. The system of claim 9, wherein the local service domain is associated with a premises and provides wireless communication capabilities between the mobile device and a plurality of end devices in the premises.
15. The system of claim 9, wherein the gateway device is further configured to: send, to the mobile device, a polling message; and cause, based on a determination that a reply for the polling message has not been received, removal of the mobile device from the local service domain.
16. A gateway device comprising: one or more processors; and memory storing instructions that, when executed by the one or more processors, cause the gateway device to: determine that a mobile device has been added to a local service domain associated with the gateway device; receive, from a different service domain, data indicating that the mobile device is outside a range of the local service domain and has joined the different service domain; and cause, based on the data, removal of the mobile device from the local service domain.
17. The gateway device of claim 16, wherein the data is received from a network device serving a wide area wireless network.
18. The gateway device of claim 16, wherein the instructions, when executed by the one or more processors, cause the gateway device to: send, to the mobile device, a polling message; and cause, based on a determination that a reply for the polling message has not been received, removal of the mobile device.
19. The gateway device of claim 16, wherein the instructions, when executed by the one or more processors, cause the gateway device to cause removal of the mobile device from the local service domain further based on determination that the mobile device has been inactive for a threshold time period.
20. The gateway device of claim 16, wherein the local service domain is associated with a premises and provides wireless communication capabilities between the mobile device and a plurality of end devices in the premises.