

SYSTEM, NETWORK ENTITY, TERMINAL, METHOD, AND COMPUTER
PROGRAM PRODUCT FOR PRESENCE PUBLICATION

BACKGROUND OF THE INVENTION

Wireless communication systems and networks are used in connection with many applications and devices, including for example, portable communication devices (PCDs) (e.g., cellular telephones), portable digital assistants (PDAs),
5 laptop computers, or any suitable device that is capable of communicating with a wireless network. PCDs are also known as mobile stations, mobile nodes, access terminals (AT), and by other names. Each of these portable communication devices may also function as an Internet Protocol (IP) client.

Examples of wireless communications networks include GSM (Global
10 Systems for Mobile Communication), WCDMA (Wideband Code Division Multiple Access), and CDMA (Code Division Multiple Access). CDMA systems operate by dividing a radio spectrum to be shared by multiple users through the assignment of unique codes. CDMA systems assign a unique code to each signal that is to be transmitted, and are thereby able to spread many simultaneous signals
15 across a wideband spread spectrum bandwidth. Using the respective codes, the signals can then be detected and isolated from the other signals that are being transmitted over the same bandwidth.

A feature of many mobile devices included in these wireless communication systems is presence enabling, which allows users of these devices
20 to determine whether other mobile devices are online and available for communication. Presence, or status, may be defined as the availability and willingness of a device (termed a "presentity") for communication. Presence, or status, information, in the form of a variety of presence states, can be published by users to other system users, known as "watchers" or "subscribers," to indicate the

user's communication status. Status, or presence, information can generally be broken down into information related to (1) the user; (2) the device; or (3) the network services. This information may vary depending on the type of device. For instance, for cellular telephones or other mobile devices, the status information
5 may include the user's geographic location and the latency of the network to which the mobile device is connected. Alternatively, the status information for a personal computer with a wired Internet connection may include, for example, whether the user is online.

Presence information has multiple sources, such as the user or device itself,
10 or a network-based presence source, also known as a Presence Network Agent (PNA). A PNA publishes presence information any time the presence information state of any device on the network changes, such as, when a particular device's availability changes (e.g., when the device first attaches to the network). A network-based Presence Server manages the collection and controlled
15 dissemination of the presence information over the network. In particular, the Presence Server aggregates the presence information received from the various sources and creates a presence document, which it then makes available to other users on the network. In order for the PNA to publish presence information relating to a particular device, and for the Presence Server to gather the
20 information, it is necessary that each device be readily identifiable.

A feature of some mobile devices that is becoming increasingly popular is push-to-talk over cellular (PoC). PoC is like having a 'walkie-talkie' feature on the mobile device that is implemented over the cellular network. PoC offers real-time, instant voice chat with one or many individuals or groups. PoC is a half-
25 duplex (i.e., communication can only occur in one direction at a time) voice over internet protocol (VoIP) system for mobile devices, and is based on IMS, an IP protocol layer positioned on top of the traditional wireless IP protocols in the mobile handset. The Open Media Alliance (OMA) PoC solution is based on the Session Initiation Protocol (SIP) and Real Time Protocol (RTP) defined by the
30 Internet Engineering Task Force (IETF).

Presence status may be used in conjunction with PoC service. For example, several presence attributes, such as availability for session, availability for alerts, and session participation, may be reported to a presence server such that

a PoC user's presence may be determined by a watcher. According to current wireless communication industry standards for PoC service, presence status reporting is an optional feature of PoC service. Additionally, presence status for a PoC client may optionally be reported to a presence server by either the PoC client, the PoC server associated with the client, or both. When both the PoC client and the PoC server are reporting presence status to a presence server, it is possible that conflicting information may be reported to the presence server. For example, as the presence status of a PoC client changes, the PoC server may also be aware of the changing status. If both the PoC client and the PoC server are reporting presence information to the presence server, the presence server may have conflicting information for some transitional period. The presence server would typically not have capability to reconcile such a conflict and would therefore report different statuses to a watcher. This conflicting information may cause confusion for the watcher. Additionally, if both the PoC server and the PoC client are reporting the same presence information, this results in unnecessary and redundant network traffic.

BRIEF SUMMARY OF THE INVENTION

Generally described, embodiments of the invention provide an improvement over the known prior art by providing a means by which the reporting of conflicting presence status information to a presence server may be avoided. In a system in which two different entities may be capable of reporting status information for the same entity, the two different entities may be capable of reporting status information corresponding to one or more of a predefined plurality of status attributes. The two different entities may each be capable of reporting status information corresponding to the same or different ones of the plurality of status attributes. In such a system, the first entity would typically inform the second entity which ones of the plurality of status attributes for which the first entity will be reporting status information to the presence server. For the ones of the plurality of status attributes for which the first entity will be reporting status information, the second entity will typically not report status information. For the ones of the plurality of status attributes for which the first entity will not be reporting status information, the second entity will typically report status

information if the second entity is capable of reporting status information for those attributes.

5 In this regard, system for presence publication comprises a first network entity and a second network entity. The first network entity may be capable of advising the second network entity of which of a plurality of status attributes the first network entity will report to a presence server, such that the second network entity is configured to report at least one different status attribute to the presence server. The first network entity may be further capable of reporting presence status of the second network entity to the presence server for the status attributes for
10 which the first network entity advised the second network entity. The second network entity may be capable of reporting presence status to the presence server for at least one status attribute different than the status attributes for which the first network entity advised the second network entity.

15 In one embodiment, the second network entity is an access terminal. The first network entity may be a push-to-talk over cellular (PoC) server and the access terminal may be a PoC client.

The status attributes may be selected from the group comprising availability-for-sessions, availability-for-alerts, and session-participation. The first network entity may advise the second network entity by setting, in a parameter
20 value, a bit that is associated with a respective status attribute. The parameter value may comprise a plurality of bits, one of the plurality of bits being associated with each status attribute.

In one embodiment, the first network entity advises the second network entity using a provisioning procedure. The provisioning procedure may comprise
25 device management.

In a typical PoC system, the first entity would be a PoC server and the second entity would be a PoC client. However, embodiments of the invention may be used in any system in which two or more entities are capable of reporting presence information for the same entity.

30 In addition to the system for presence publication as described above, other aspects of the invention are directed to corresponding network entities, access terminals, methods and computer program products for presence publication.

BRIEF DESCRIPTION OF THE DRAWING

Having thus described the invention in general terms, reference will now be made to the accompanying drawing, which are not necessarily drawn to scale, and wherein:

5 FIG. 1 is a block diagram of one type of terminal and system that would benefit from embodiments of the invention;

 FIG. 2 is a schematic block diagram of an entity capable of operating as a mobile station, game server, routing server, personal computer (PC) system, game console, presence server, and/or PoC server, in accordance with embodiments of
10 the invention;

 FIG. 3 is a schematic block diagram more particularly illustrating a mobile station, in accordance with one embodiment of the invention; and

 FIG. 4 is flowchart of publishing presence capability, in accordance with one embodiment of the invention.

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DESCRIPTION OF THE INVENTION

Embodiments of the inventions now will be described more fully hereinafter with reference to the accompanying drawing, in which some, but not all embodiments of the inventions are shown. Indeed, these inventions may be
20 embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will satisfy applicable legal requirements. Like numbers refer to like elements throughout.

 Referring to FIG. 1, an illustration of one type of system that would benefit
25 from embodiments of the invention is provided. Embodiments of the invention will be primarily described in conjunction with mobile communications applications. It should be understood, however, that embodiments of the present invention can be utilized in conjunction with a variety of other applications, both in the mobile communications industries and outside of the mobile communications
30 industries. For example, embodiments of the invention can be utilized in conjunction with wireline and/or wireless network (e.g., Internet) applications.

 The system can include one or more mobile stations 10, each having an antenna 12 for transmitting signals to and for receiving signals from one or more

base stations (BS's) 14. The base station is a part of one or more cellular or mobile networks that each includes elements required to operate the network, such as one or more mobile switching centers (MSC) 16. As well known to those skilled in the art, the mobile network may also be referred to as a Base

5 Station/MSC/Interworking function (BMI). In operation, the MSC is capable of routing calls, data or the like to and from mobile stations when those mobile stations are making and receiving calls, data or the like. The MSC can also provide a connection to landline trunks when mobile stations are involved in a call.

The MSC 16 can be coupled to a data network, such as a local area network
10 (LAN), a metropolitan area network (MAN), and/or a wide area network (WAN). The MSC can be directly coupled to the data network. In one typical embodiment, however, the MSC is coupled to a Gateway (GTW) 18, and the GTW is coupled to a WAN, such as the Internet 20. In turn, devices such as processing elements (e.g., personal computers, server computers or the like) can be coupled to the mobile
15 station 10 via the Internet. For example, as explained below, the processing elements can include one or more processing elements associated with one or more game servers 22, routing servers 24, personal computer (PC) systems 26, game consoles 28, presence servers 25, or the like, one of each being illustrated in FIG. 1 and described below. As will be appreciated, the processing elements can
20 comprise any of a number of processing devices, systems or the like capable of operating in accordance with embodiments of the present invention.

The BS 14 can also be coupled to a Serving GPRS (General Packet Radio Service) Support Node (SGSN) 30. As known to those skilled in the art, the SGSN is typically capable of performing functions similar to the MSC 16 for packet
25 switched services. The SGSN, like the MSC, can be coupled to a data network, such as the Internet 20. The SGSN can be directly coupled to the data network. In a more typical embodiment, however, the SGSN is coupled to a packet-switched core network, such as a GPRS core network 32. The packet-switched core network is then coupled to another GTW, such as a GTW GPRS support node (GGSN) 34,
30 and the GGSN is coupled to the Internet.

The GGSN 30 and Internet 20 can be coupled to a IP multimedia subsystem (IMS) 36 that includes various entities for the provision of multimedia services, such as in a manner defined by the third generation partnership project (3GPP). As

explained in greater detail below, the IMS can be coupled to an application server for providing the push-to-talk over cellular (PoC) service, also known as PTT, push-to-talk service or the like. Thus, as shown, the application server providing the PoC service is referred to as a PoC server 38.

5 Although not every element of every possible network is shown and described herein, it should be appreciated that the mobile station 10 may be coupled to one or more of any of a number of different networks. In this regard, mobile network(s) can be capable of supporting communication in accordance with any one or more of a number of first-generation (1G), second-generation (2G),
10 2.5G and/or third-generation (3G) mobile communication protocols or the like. More particularly, one or more mobile stations may be coupled to one or more networks capable of supporting communication in accordance with 2G wireless communication protocols IS-136 (TDMA), GSM, IS-95 (CDMA), and CDMA2000. Also, for example, one or more of the network(s) can be capable of
15 supporting communication in accordance with 2.5G wireless communication protocols GPRS, Enhanced Data GSM Environment (EDGE), or the like. In addition, for example, one or more of the network(s) can be capable of supporting communication in accordance with 3G wireless communication protocols such as Universal Mobile Telephone System (UMTS) network employing Wideband Code
20 Division Multiple Access (WCDMA) radio access technology. Some narrow-band AMPS (NAMPS), as well as TACS, network(s) may also benefit from embodiments of the present invention, as should dual or higher mode mobile stations (e.g., digital/analog or TDMA/CDMA/analog phones).

 One or more mobile stations 10 (as well as one or more processing
25 elements, although not shown as such in FIG. 1) can further be coupled to one or more wireless access points (APs) 36. The AP's can be configured to communicate with the mobile station in accordance with techniques such as, for example, radio frequency (RF), Bluetooth (BT), infrared (IrDA) or any of a number of different wireless networking techniques, including WLAN techniques.
30 The APs may be coupled to the Internet 20. Like with the MSC 14, the AP's can be directly coupled to the Internet. In one embodiment, however, the APs are indirectly coupled to the Internet via a GTW 18. As will be appreciated, by directly or indirectly connecting the mobile stations and the user processors (e.g.,

game servers 22, routing servers 24, personal computer (PC) systems 26, game consoles 28, PoC servers 38, presence servers 25, etc.) and/or any of a number of other devices to the Internet, whether via the AP's or the mobile network(s), the mobile stations and user processors can communicate with one another to thereby
5 carry out various functions of the respective entities, such as to transmit and/or receive data, content or the like. As used herein, the terms "data," "content," "information," and similar terms may be used interchangeably to refer to data capable of being transmitted, received and/or stored in accordance with embodiments of the present invention. Thus, use of any such terms should not be
10 taken to limit the spirit and scope of the present invention.

Although not shown in FIG. 1, in addition to or in lieu of coupling the mobile stations 10 to game servers 22, routing servers 24, personal computer (PC) systems 26 and/or game consoles 28 across the Internet 20, one or more such entities may be directly coupled to one another. As such, one or more network
15 entities may communicate with one another in accordance with, for example, RF, BT, IrDA or any of a number of different wireline or wireless communication techniques, including LAN and/or WLAN techniques.

Referring now to FIG. 2, a block diagram of an entity capable of operating as a mobile station 10, game server 22, routing server 24, personal computer (PC) system 26, game console 28, presence server 25, and/or PoC server 38, is shown in
20 accordance with one embodiment of the present invention. Although shown as separate entities, in some embodiments, one or more entities may support one or more of a mobile station, game server, routing server, personal computer (PC) system, PoC server, presence server, and/or game console, logically separated but
25 co-located within the entit(ies). For example, a single entity may support a logically separate, but co-located, game server and routing server. Also, for example, a single entity may support a logically separate, but co-located personal computer and game console. Additionally or alternatively, a single entity may support a logically separate, but co-located game server and one or more of a
30 mobile station, PC system and/or game console.

As shown, the entity capable of operating as a mobile station 10, game server 22, routing server 24, personal computer (PC) system 26, game console 28, presence server 25 and/or PoC server 38 includes various means for performing

one or more functions in accordance with exemplary embodiments of the invention, including those more particularly shown and described herein. It should be understood, however, that one or more of the entities may include alternative means for performing one or more like functions, without departing from the spirit and scope of the invention.

More particularly, for example, as shown in FIG. 2, the entity generally includes means, such as a processor 40, connected to a memory 42 for controlling operations of the entity. The memory can comprise volatile and/or non-volatile memory, and typically stores content, data or the like. For example, the memory typically stores content transmitted from, and/or received by, the entity. Also for example, the memory typically stores client applications, instructions or the like for the processor to perform steps associated with operation of the entity in accordance with embodiments of the present invention. As explained below, for example, the memory can store client application(s) including a configuration utility, content manager and/or display manager. In this regard, when executed, the configuration utility may function to configure a source of content to receive or otherwise provide content. The content manager, when executed, may function to manage the receipt of content from the source, and/or the use of content received from the source. And the display manager may function to manage presentation of content received from the source. As described herein, the client application(s) each comprise software operated by the respective entities. It should be understood, however, that any one or more of the client applications described herein can alternatively comprise firmware or hardware, without departing from the spirit and scope of the present invention.

In addition to the memory 42, the processor 40 can also be connected to at least one interface or other means for displaying, transmitting and/or receiving data, content or the like. In this regard, the interface(s) can include at least one communication interface 44 or other means for transmitting and/or receiving data, content or the like, as well as at least one user interface that can include a display 46 and/or a user input interface 48. The user input interface, in turn, can comprise any of a number of devices allowing the entity to receive data from a user, such as a keypad, a touch display, a joystick or other input device.

Reference is now made to FIG. 3, which illustrate one type of access terminal or mobile station 10, a mobile telephone, which would benefit from embodiments of the present invention. It should be understood, however, that the mobile station illustrated and hereinafter described is merely illustrative of one type of mobile station that would benefit from the present invention and, therefore, should not be taken to limit the scope of the present invention. While several embodiments of the mobile station are illustrated and will be hereinafter described for purposes of example, other types of mobile stations, such as portable digital assistants (PDAs), pagers, laptop computers, mobile gaming devices and other types of electronic systems, can readily employ the present invention.

The terminal 10 includes various means for performing one or more functions in accordance with exemplary embodiments of the present invention, including those more particularly shown and described herein. It should be understood, however, that the terminal may include alternative means for performing one or more like functions, without departing from the spirit and scope of the present invention. As shown, in addition to an antenna 12, the mobile station 10 can include a transmitter 50, receiver 52, and means, such as a controller 54 or other processor, that provides signals to and receives signals from the transmitter and receiver, respectively. These signals include signaling information in accordance with the air interface standard of the applicable cellular system, and also user speech and/or user generated data. In this regard, the mobile station can be capable of operating with one or more air interface standards, communication protocols, modulation types, and access types. More particularly, the mobile station can be capable of operating in accordance with any of a number of first generation (1G), second generation (2G), 2.5G and/or third-generation (3G) communication protocols or the like. For example, the mobile station may be capable of operating in accordance with 2G wireless communication protocols IS-136 (TDMA), GSM, and IS-95 (CDMA). Also, for example, the mobile station may be capable of operating in accordance with 2.5G wireless communication protocols GPRS, EDGE, or the like. Further, for example, the mobile station may be capable of operating in accordance with 3G wireless communication protocols such as UMTS network employing WCDMA radio access technology. Some NAMPS, as well as TACS, mobile stations may also benefit from the teaching of

this invention, as should dual or higher mode phones (e.g., digital/analog or TDMA/CDMA/analog phones).

It is understood that the controller 54 includes the circuitry required for implementing the audio and logic functions of the mobile station 10. For example, the controller may be comprised of a digital signal processor device, a microprocessor device, and various analog-to-digital converters, digital-to-analog converters, and other support circuits. The control and signal processing functions of the mobile station are allocated between these devices according to their respective capabilities. The controller can additionally include an internal voice coder (VC) 54a, and may include an internal data modem (DM) 54b. Further, the controller may include the functionality to operate one or more client software programs such as those indicated above, which may be stored in memory (described below).

The mobile station 10 also comprises a user interface including a conventional earphone or speaker 56, a ringer 58, a microphone 60, a display 62, and a user input interface, all of which are coupled to the controller 54. Although not shown, the mobile station can include a battery for powering the various circuits that are required to operate the mobile station, as well as optionally providing mechanical vibration as a detectable output. The user input interface, which allows the mobile station to receive data, can comprise any of a number of devices allowing the mobile station to receive data, such as a keypad 54, a touch display (not shown), a joystick (not shown) or other input device. In embodiments including a keypad, the keypad includes the conventional numeric (0-9) and related keys (#, *), and other keys used for operating the mobile station.

The mobile station 10 can also include one or more means for sharing and/or obtaining data. For example, the mobile station can include a short-range radio frequency (RF) transceiver or interrogator 66 so that data can be shared with and/or obtained from electronic devices in accordance with RF techniques. The mobile station can additionally, or alternatively, include other short-range transceivers, such as, for example an infrared (IR) transceiver 68, and/or a Bluetooth (BT) transceiver 70 operating using Bluetooth brand wireless technology developed by the Bluetooth Special Interest Group. The mobile station can therefore additionally or alternatively be capable of transmitting data to and/or

receiving data from electronic devices in accordance with such techniques. Although not shown, the mobile station can additionally or alternatively be capable of transmitting and/or receiving data from electronic devices according to a number of different wireless networking techniques, including WLAN techniques
5 such as IEEE 802.11 techniques or the like.

The mobile station 10 can further include memory, such as a subscriber identity module (SIM) 72, a removable user identity module (R-UIM) or the like, which typically stores information elements related to a mobile subscriber. In addition to the SIM, the mobile station can include other removable and/or fixed
10 memory. In this regard, the mobile station can include volatile memory 74, such as volatile Random Access Memory (RAM) including a cache area for the temporary storage of data. The mobile station can also include other non-volatile memory 76, which can be embedded and/or may be removable. The non-volatile memory can additionally or alternatively comprise an EEPROM, flash memory or the like. The
15 memories can store any of a number of software applications, instructions, pieces of information, and data, used by the mobile station to implement the functions of the mobile station.

In the embodiments of the invention discussed below, Session Initiation Protocol (SIP) is typically used when communicating the publication requests
20 between entities on the communication network, so as to advise the various entities of presence information. SIP is a calling model that provides Application layer signaling protocol related to multimedia sessions (see e.g., Internet Engineering Task Force (IETF) request for comment RFC 3261, entitled *SIP: Session Initiation Protocol*, June 2002, the contents of which are hereby incorporated by reference in
25 its entirety). In particular, SIP is an IETF standard protocol for initiating an interactive user session that involves multimedia elements such as video, voice, chat, gaming, and virtual reality. Like Hypertext Transfer Protocol (HTTP) or Simple Mail Transfer Protocol (SMTP), SIP works in the Application layer of the Open Systems Interconnection (OSI) communications model. The Application
30 layer is the level responsible for ensuring that communication is possible.

SIP can establish multimedia sessions or Internet telephony calls, and modify or terminate them. Furthermore, SIP also has the ability to request asynchronous notification about changes of event states (see IETF request for

comment RFC 3265, entitled *Session Initiation Protocol (SIP)-Specific Event Notification*, June 2002), while the manipulation of the event states happens via the SIP PUBLISH method (see IETF request for comment RFC 3903, entitled *Session Initiation Protocol (SIP) Extension for Event State Publication*, October 2004).

5 The protocol can invite participants to unicast or multicast sessions that do not necessarily involve the initiator. Because the SIP supports name mapping and redirection services, it makes it possible for users to initiate and receive communications and services from any location, and for networks to identify the users wherever they are. SIP is a request-response protocol, dealing with requests
10 from clients and responses from servers. Participants are identified by SIP URLs. Requests can be sent through any transport protocol, such as User Datagram Protocol (UDP), Simple Control Transport Protocol (SCTP), or Transmission Control Protocol (TCP). SIP determines the end system to be used for the session, the communication media and media parameters, and the called party's desire to
15 engage in the communication. Once these are assured, SIP establishes call parameters at either end of the communication, and handles call transfer and termination.

While some embodiments are discussed in terms of SIP, they are exemplary in nature, and therefore, do not limit the invention to use with SIP.
20 Rather, embodiments of the invention can operate generally in accordance with other protocols that would be capable of collecting and publishing presence information.

Referring now to FIG. 4, a flowchart of publishing presence capability is illustrated, in accordance with one embodiment of the invention. The PoC server
25 may inform the PoC client of the PoC server's capability to publish presence information corresponding to the presence status of the PoC client. In one embodiment, the PoC server may be capable of publishing presence information corresponding to one or more of a plurality of predefined presence or status attributes. These predefined attributes may be: (1) application-specific (PoC)
30 availability for session, (2) application-specific (PoC) availability for alerts, and (3) session participation. The information sent from the PoC server to the PoC client would typically indicate which one or more of these predefined attributes that the PoC server is capable of publishing presence information. In another

embodiment of the invention, the PoC server may indicate only whether or not the PoC server is capable of publishing presence status information.

The presence publishing capability information may be sent from the PoC server to the PoC client using a static provisioning procedure. See block 80 of FIG. 4. One such static provisioning procedure is published by the Open Mobile Alliance (OMA). Additional information on the OMA provisioning procedure may be found in *SyncML Device Management Protocol*, Version 1.1.2, Open Mobile Alliance, December 2003, and *Provisioning Content* Candidate Version 1.1, Open Mobile Alliance, April 28, 2005, the contents of which are herein incorporated in their entirety. This method enables the PoC server to indicate to the PoC client the server's presence publishing capability as a provisioning parameter. If the PoC server supports a Presence Information Element, the PoC server can inform the PoC client using a binary value. As such, the provisioning parameter can give individual indications for all five attributes listed above. For example if the PoC server supports publishing the following presence attributes: "Application-specific (PoC) Availability for sessions," "Application-specific (PoC) Availability for alerts," and "Session Participation," then the corresponding provisioning parameter value may be '111xxxxx' (assuming the attributes are ordered as listed above, with "1" indicating availability and "0" indicating unavailability). To allow for future extension of this method, such as for Instant Messaging related features, the unused five bits (indicated as "x") could be reserved.

An alternative embodiment may use a single binary value to indicate to the PoC client whether or not the PoC Server is presence capable. In the above example, for this alternative embodiment the provisioning parameter value would be a simple '1'.

The PoC client typically uses the provisioning parameters when deciding the Presence Information Element the PoC client publishes. The PoC client typically then will not publish the Presence Information Elements that are published by the PoC Server. In this regard, the PoC client determines what, if any, presence status information to report based on the presence publishing capability information sent from the PoC server to the PoC client. If it is determined in block 82 of FIG. 4 that the PoC server is not capable of publishing

presence status for any of the presence attributes, then the PoC client would typically report presence status for all presence attributes (that the PoC client is capable of reporting). See block 84. If it is determined in block 82 of FIG. 4 that the PoC server is capable of publishing presence status for any of the presence attributes, then it may be determined in block 86 if the PoC server is capable of publishing presence status for all of the presence attributes. If the PoC server is capable of publishing presence status for all of the presence attributes, then the PoC server will report presence status for all the attributes and the PoC client will not report presence status for any of the attributes. See block 88. If it is determined that the PoC server is capable of publishing presence status for some but not all of the presence attributes, then the PoC server will report presence status for the attributes that the PoC server is capable of publishing and the PoC client will report presence status for those attributes that the PoC server is not capable of publishing. See block 90. In this regard, the PoC server and the PoC client should not publish presence status information for the same attributes, thereby preventing conflicting status information from being sent to the presence server and preventing redundant presence status reporting.

Embodiments of the invention have been described above in which the PoC server informs the PoC client which ones of the plurality of presence attributes for which the PoC server will be reporting status information to the presence server. For the ones of the plurality of presence attributes for which the PoC server will be reporting status information, the PoC client will typically not report status information. For the ones of the plurality of presence attributes for which the PoC server will not be reporting status information, the PoC client will typically report status information if the PoC client is capable of reporting status information for those attributes. As such, the PoC server may control which entity reports presence status to the presence server. It should be appreciated, however, that alternative embodiments of the invention may enable the PoC client to control which entity reports presence status to the presence server. In such an alternative embodiment, the PoC client informs the PoC server which ones of the plurality of presence attributes for which the PoC client will be reporting status information to the presence server. For the ones of the plurality of presence attributes for which the PoC client will be reporting status information, the PoC server will typically

not report status information. For the ones of the plurality of presence attributes for which the PoC client will not be reporting status information, the PoC server will typically report status information if the PoC server is capable of reporting status information for those attributes.

5 While described above in conjunction with presence publication in a PoC service, presence publication in accordance with embodiments of the present invention may be utilized with other services relying upon various types of wireless communication techniques including, but not limited to, cellular communication. Moreover, while described above in a client-server architecture in
10 which both the client and the server are considered network entities, presence publication may be performed in accordance with embodiments of the present invention by any number of network entities, such as two or more servers. Finally, the presence attributes described above are exemplary and entities may publish additional or different presence attributes in other embodiments of the present
15 invention.

 Based on the foregoing description, as read in view of the appended drawing figures, it should be apparent that some examples of the invention relate to a method of presence publication, such as in a push-to-talk over cellular (PoC) service, wherein the method comprises the steps of: (1) sending information from a
20 first entity to a second entity, wherein the information defines which of a predefined plurality of presence attributes the first entity will report to a presence server; (2) reporting presence status of the second entity by the first entity to the presence server for the presence attributes in the information sent from the first entity to the second entity; and (3) reporting presence status of the second entity by
25 the second entity to the presence server for at least some of the presence attributes not in the information sent from the first entity to the second entity. In one embodiment, the first entity is a PoC server and the second entity is a PoC client. In one embodiment, the presence attributes are selected from the group comprising availability for sessions, availability for alerts, and session participation. In one
30 embodiment, the information is sent from the first entity to the second entity by setting, in a parameter value, a bit that is associated with a respective presence attribute. The parameter value generally includes a plurality of bits, one of which is associated with each presence attribute.

Another example of the invention relates to a computer program product for presence publication, such as in a push-to-talk over cellular (PoC) service, the computer program product comprising at least one computer-readable storage medium having computer-readable program code portions stored therein, the computer-readable program code portions comprising: (1) a first executable portion capable of sending information from a first entity to a second entity, wherein the information defines which of a predefined plurality of presence attributes the first entity will report to a presence server; (2) a second executable portion capable of reporting presence status of the second entity by the first entity to the presence server for the presence attributes in the information sent from the first entity to the second entity; and (3) a third executable portion capable of reporting presence status of the second entity by the second entity to the presence server for at least some of the presence attributes not in the information sent from the first entity to the second entity. In one embodiment, the first entity is a PoC server and the second entity is a PoC client. In one embodiment, the presence attributes are selected from the group comprising availability for sessions, availability for alerts, and session participation. In one embodiment, the first executable portion sends information from the first entity to the second entity by setting, in a parameter value, a bit that is associated with a respective presence attribute. The parameter value generally includes a plurality of bits, one of which is associated with each presence attribute.

Another example of the invention relates to an access terminal capable of presence publication such as in a push-to-talk over cellular (PoC) service. The access terminal may comprise means, such as a processor, capable of: (1) receiving information from a network entity, wherein the information defines which of a predefined plurality of presence attributes the network entity will report to a presence server; and (2) reporting presence status of the access terminal to the presence server for at least some of the presence attributes not in the information sent from the network entity to the access terminal. In one embodiment, the network entity is a PoC server and the access terminal is a PoC client. In one embodiment, the presence attributes are selected from the group comprising availability for sessions, availability for alerts, willingness for session, willingness for alerts, and session participation. In one embodiment, the information received

from the network entity comprises a bit in a parameter value that is associated with a respective presence attribute. The parameter value generally includes a plurality of bits, one of which is associated with each presence attribute.

Another example of the invention relates to a network entity capable of presence publication, such as in a push-to-talk over cellular (PoC) service. The network entity may comprise means, such as a processor, capable of: (1) sending information to an access terminal, wherein the information defines which of a predefined plurality of presence attributes the network entity will report to a presence server; and (2) reporting presence status of the access terminal by the network entity to the presence server for the presence attributes in the information sent from the network entity to the access terminal. In one embodiment, the network entity is a PoC server and the access terminal is a PoC client. In one embodiment, the presence attributes are selected from the group comprising availability for sessions, availability for alerts, and session participation. In one embodiment, the information is sent from the network entity to the access terminal by setting, in a parameter value, a bit that is associated with a respective presence attribute. The parameter value generally includes a plurality of bits, one of which is associated with each presence attribute.

Another example of the invention relates to a system capable of presence publication, wherein the system comprises an access terminal and a network entity. The network entity may be capable of: (1) sending information to the access terminal, wherein the information defines which of a predefined plurality of presence attributes the network entity will report to a presence server; and (2) reporting presence status of the access terminal to the presence server for the presence attributes in the information sent from the network entity to the access terminal. The access terminal may be capable of: (1) reporting presence status to the presence server for at least some of the presence attributes not in the information sent from the network entity to the access terminal. In one embodiment, the network entity is a PoC server and the access terminal is a PoC client. In one embodiment, the presence attributes are selected from the group comprising availability for sessions, availability for alerts, and session participation. In one embodiment, the information is sent from the network entity to the access terminal by setting, in a parameter value, a bit that is associated with

a respective presence attribute. The parameter value generally includes a plurality of bits, one of which is associated with each presence attribute.

Another example of the invention relates to a processor capable of presence publication. The processor may be capable of: (1) sending information from a first entity to a second entity, wherein the information defines which of a predefined plurality of presence attributes the first entity will report to a presence server; and (2) reporting presence status of the second entity to the presence server for the presence attributes in the information sent from the first entity to the second entity. In one embodiment, the first entity is a PoC server and the second entity is a PoC client. In one embodiment, the presence attributes are selected from the group comprising availability for sessions, availability for alerts, and session participation. In one embodiment, the information is sent from the first entity to the second entity by setting, in a parameter value, a bit that is associated with a respective presence attribute. The parameter value generally includes a plurality of bits, one of which is associated with each presence attribute.

Another example of the invention relates to a system capable of presence publication, wherein the system comprises: (1) means for sending information from a first entity to a second entity, wherein the information defines which of a predefined plurality of presence attributes the first entity will report to a presence server; (2) means for reporting presence status of the second entity by the first entity to the presence server for the presence attributes in the information sent from the first entity to the second entity; and (3) means for reporting presence status of the second entity by the second entity to the presence server for at least some of the presence attributes not in the information sent from the first entity to the second entity. In one embodiment, the first entity is a PoC server and the second entity is a PoC client. In one embodiment, the presence attributes are selected from the group comprising availability for sessions, availability for alerts, and session participation. In one embodiment, the information is sent from the first entity to the second entity by setting, in a parameter value, a bit that is associated with a respective presence attribute. The parameter value generally includes a plurality of bits, one of which is associated with each presence attribute.

Many modifications and other embodiments of the inventions set forth herein will come to mind to one skilled in the art to which these inventions pertain

having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the inventions are not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims.

- 5 Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

THAT WHICH IS CLAIMED:

1. A system for presence publication comprising:
a first network entity; and
5 a second network entity;
wherein the first network entity is capable of advising the second network entity of which of a plurality of status attributes the first network entity will report to a presence server, such that the second network entity is configured to report presence status to the presence server for at least one status attribute different than
10 the status attributes for which the first network entity advised the second network entity.
2. The system of claim 1, wherein the first network entity is capable of reporting presence status of the second network entity to the presence server for the
15 status attributes for which the first network entity advised the second network entity.
3. The system of claim 1, wherein the second network entity is an access terminal.
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4. The system of claim 3, wherein the first network entity is a push-to-talk over cellular (PoC) server and the access terminal is a PoC client.
5. The system of claim 1, wherein the status attributes are selected
25 from the group comprising availability-for-sessions, availability-for-alerts, and session-participation.
6. The system of claim 1, wherein the first network entity advises the second network entity by setting, in a parameter value, a bit that is associated with
30 a respective status attribute.

7. The system of claim 6, wherein the parameter value comprises a plurality of bits, one of the plurality of bits being associated with each status attribute.

5 8. The system of claim 1, wherein the first network entity advises the second network entity using a provisioning procedure.

9. The system of claim 8, wherein the provisioning procedure comprises device management.

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10. A network entity capable of presence publication comprising:
a processing element capable of sending information to another network entity, the information defining which of a predefined plurality of status attributes the network entity will report to a presence server, the processing element further
15 capable of reporting presence status to the presence server for the status attributes in the information sent from the network entity to the other network entity.

11. The network entity of claim 10, wherein the processing element is capable of reporting presence status of the other network entity to the presence
20 server.

12. The network entity of claim 10, wherein the other network entity is an access terminal.

25 13. The network entity of claim 12, wherein the network entity is a push-to-talk over cellular (PoC) server and the access terminal is a PoC client.

14. The network entity of claim 10, wherein the status attributes are selected from the group comprising availability-for-sessions, availability-for-alerts,
30 and session-participation.

15. The network entity of claim 10, wherein the network entity sends the information to the other network entity by setting, in a parameter value, a bit that is associated with a respective status attribute.

5 16. The network entity of claim 15, wherein the parameter value comprises a plurality of bits, one of the plurality of bits being associated with each status attribute.

10 17. The network entity of claim 10, wherein the processing element sends information to the other network entity using a provisioning procedure.

18. The network entity of claim 17, wherein the provisioning procedure comprises device management.

15 19. An access terminal capable of presence publication comprising:
a processing element capable of receiving provisioning information, the provisioning information defining which of a predefined plurality of status attributes a network entity will report to a presence server on behalf of the access terminal, and the processing element further capable of reporting presence status of
20 the access terminal to the presence server for at least one status attribute different than the status attributes defined by the provisioning information received by the access terminal.

25 20. The access terminal of claim 19, wherein the network entity is a push-to-talk over cellular (PoC) server and the access terminal is a PoC client.

21. The access terminal of claim 19, wherein the status attributes are selected from the group comprising availability-for-sessions, availability-for-alerts, and session-participation.

30 22. The access terminal of claim 19, wherein the information received from the network entity comprises a bit in a parameter value that is associated with a respective status attribute.

23. The access terminal of claim 22, wherein the parameter value generally includes a plurality of bits, one of the plurality of bits being associated with each status attribute.

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24. The access terminal of claim 22, wherein the processing element receives the provisioning information via a provisioning procedure.

25. The access terminal of claim 24, wherein the provisioning
10 procedure comprises device management.

26. A method of presence publication comprising:
sending information from a first entity to a second entity, the information
defining which of a predefined plurality of status attributes the first entity will
15 report to a presence server on behalf of the second entity; and
reporting presence status by the first entity to the presence server on behalf
of the second entity for the status attributes defined by the information sent from
the first entity to the second entity.

20 27. The method of claim 26, further comprising:
reporting presence status by the second entity to the presence server for at
least one status attribute different than the status attributes defined by the
information sent from the first entity to the second entity.

25 28. The method of claim 26, wherein the first entity is a push-to-talk
over cellular (PoC) server and the second entity is a PoC client.

29. The method of claim 26, wherein the status attributes are selected
from the group comprising availability-for-sessions, availability-for-alerts, and
30 session-participation.

30. The method of claim 26, wherein sending the information from the first entity to the second entity comprises setting, in a parameter value, a bit that is associated with a respective status attribute.

5 31. The method of claim 30, wherein the parameter value comprises a plurality of bits, one of the plurality of bits being associated with each status attribute.

10 32. The method of claim 26, wherein the information is sent from the first entity to the second entity using a provisioning procedure.

33. The method of claim 32, wherein the provisioning procedure comprises device management.

15 34. A computer program product for presence publication, the computer program product comprising at least one computer-readable storage medium having computer-readable program code portions stored therein, the computer-readable program code portions comprising:

20 a first executable portion capable of sending information from a first entity to a second entity, the information defining which of a predefined plurality of status attributes the first entity will report to a presence server on behalf of the second entity; and

25 a second executable portion capable of reporting presence status by the first entity to the presence server on behalf of the second entity for the status attributes in the information sent from the first entity to the second entity.

35. The computer program product of claim 34, further comprising:

30 a third executable portion capable of reporting presence status by the second entity to the presence server for at least one status attribute different than the status attributes defined by the information sent from the first entity to the second entity.

36. The computer program product of claim 34, wherein the first entity is a push-to-talk over cellular (PoC) server and the second entity is a PoC client.

5 37. The computer program product of claim 34, wherein the status attributes are selected from the group comprising availability-for-sessions, availability-for-alerts, and session-participation.

10 38. The computer program product of claim 34, wherein the first executable portion sends information from the first entity to the second entity by setting, in a parameter value, a bit that is associated with a respective status attribute.

15 39. The computer program product of claim 38, wherein the parameter value comprises a plurality of bits, one of the plurality of bits being associated with each status attribute.

20 40. The computer program product of claim 34, wherein the first executable portion sends information from a first entity to a second entity using a provisioning procedure.

41. The computer program product of claim 40, wherein the provisioning procedure comprises device management.