



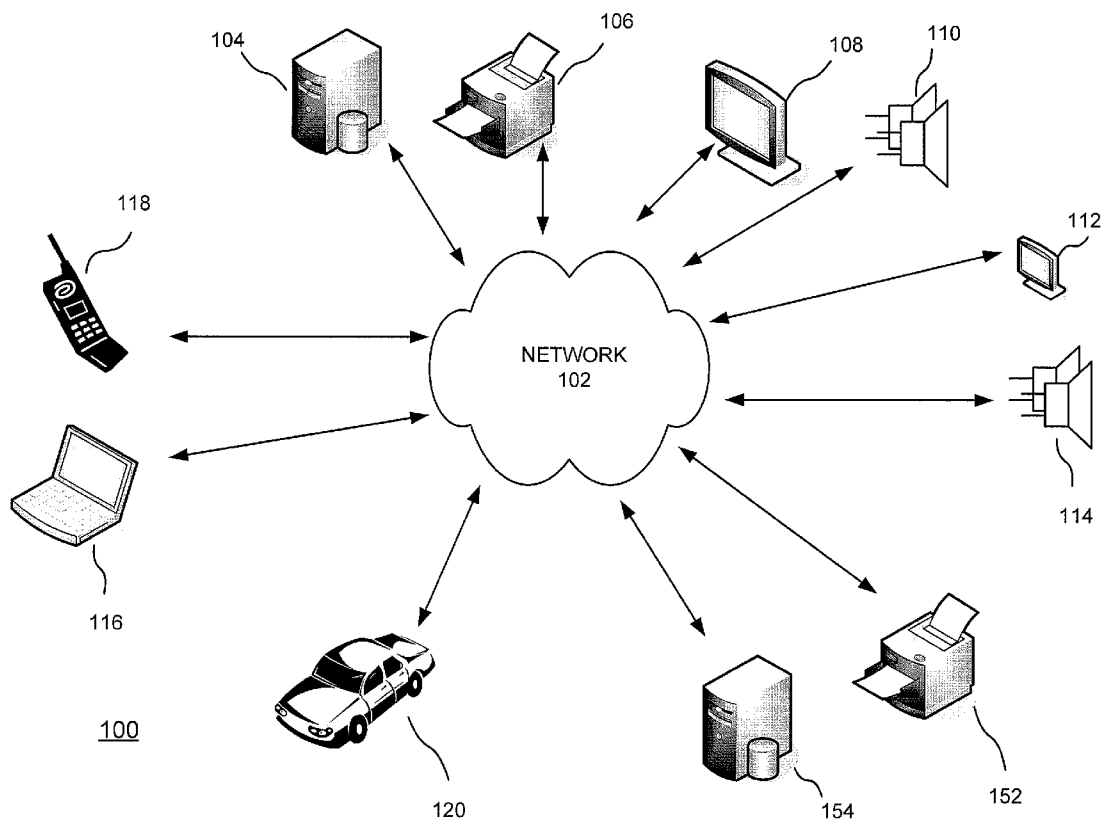
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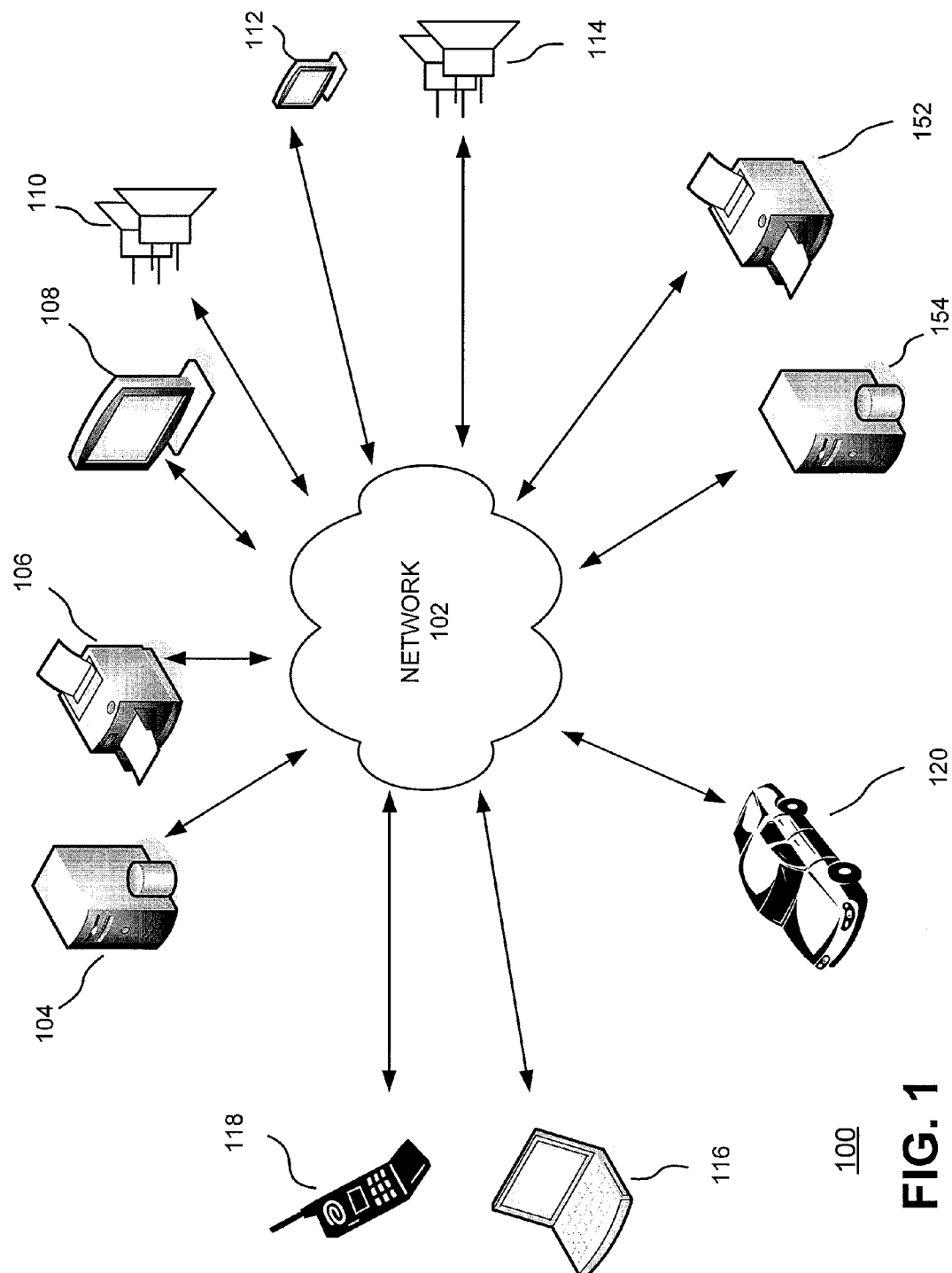
(19) **United States**(12) **Patent Application Publication**  
**LARSSON et al.**(10) **Pub. No.: US 2009/0027222 A1**(43) **Pub. Date: Jan. 29, 2009**(54) **PROVIDING SERVICES TO A MOBILE  
DEVICE IN A PERSONAL NETWORK**(22) Filed: **Sep. 14, 2007****Related U.S. Application Data**(75) Inventors: **Bo Hakan LARSSON**, Malmö  
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(SE)(21) Appl. No.: **11/855,341**(57) **ABSTRACT**

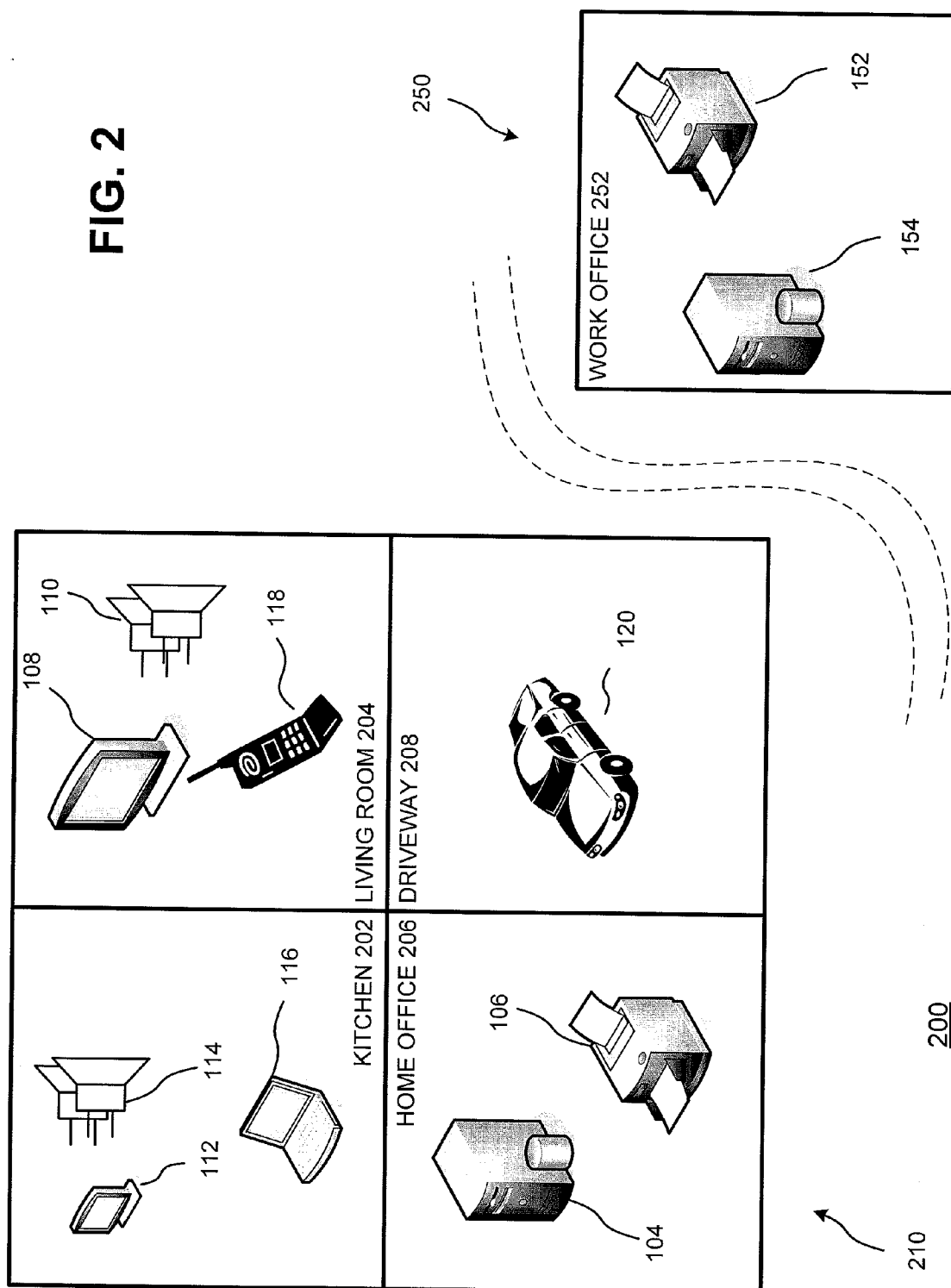
A method may include receiving a request from a device for a service; determining a location of the device; determining, based on the location of the device, one or more devices that may provide the requested service; providing information to the device regarding the one or more devices that may provide the requested service; receiving a selection from the device for one of the one or more devices for providing the requested service; and providing the service by the selected device.





**FIG. 1**

**FIG. 2**



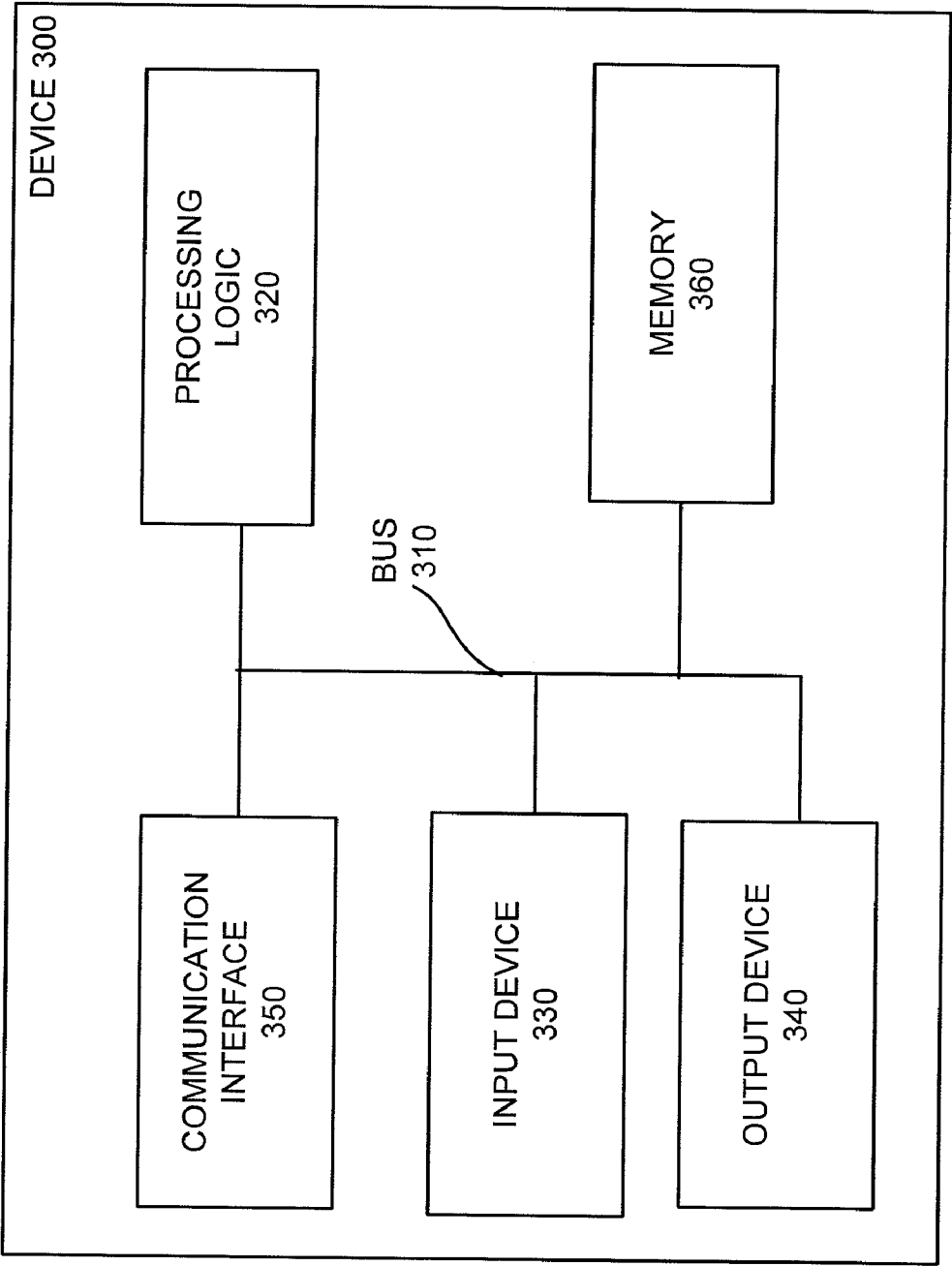


FIG. 3

452	DEVICE 402	LOCATION 404	SERVICES 406
454	FIRST SPEAKERS 110	LIVING ROOM 204	AUDIO OUT
456	WIDE-SCREEN TV 108	LIVING ROOM 204	VIDEO OUT
458	SECOND SPEAKERS 114	KITCHEN 202	AUDIO OUT
460	SMALL-SCREEN TV 112	KITCHEN 202	VIDEO OUT
462	PHONE 118	LIVING ROOM 204	AUDIO IN/OUT, VIDEO OUT
464	LAPTOP 116	KITCHEN 202	AUDIO IN/OUT, VIDEO OUT
466	HOME PRINTER 106	HOME OFFICE 206	PRINTED PAPER
468	HOME SERVER 104	HOME OFFICE 206	DATA IN/OUT
470	CAR 120	DRIVEWAY 208	VIDEO OUT, AUDIO IN/OUT, KEYPAD IN
472	WORK SERVER 154	WORK OFFICE 252	DATA IN/OUT
	WORK PRINTER 152	WORK OFFICE 252	PRINTED PAPER

DEVICE TABLE 400

FIG. 4

USER 502	ROLE 504
554 — ERIK	ALL
556 — ANNA	ALL
558 — JENNIE	CHILD, FAMILY
560 — SABINA	GUEST

USER TABLE 500

FIG. 5

ROLE 602	PRIVILEGES 604
ALL	FULL
CHILD	SMALL-SCREEN TV 112, SECOND SPEAKERS 114, FIRST SPEAKERS 110 (1500- 1800), WIDE SCREEN TV 108 (1500-1800)
FAMILY	HOME SERVER 104
GUEST	FULL, NOT HOME SERVER 104, NOT LAPTOP 116, NOT PHONE 118, NOT WORK SERVER 154, NOT PRINTER 152

654

656

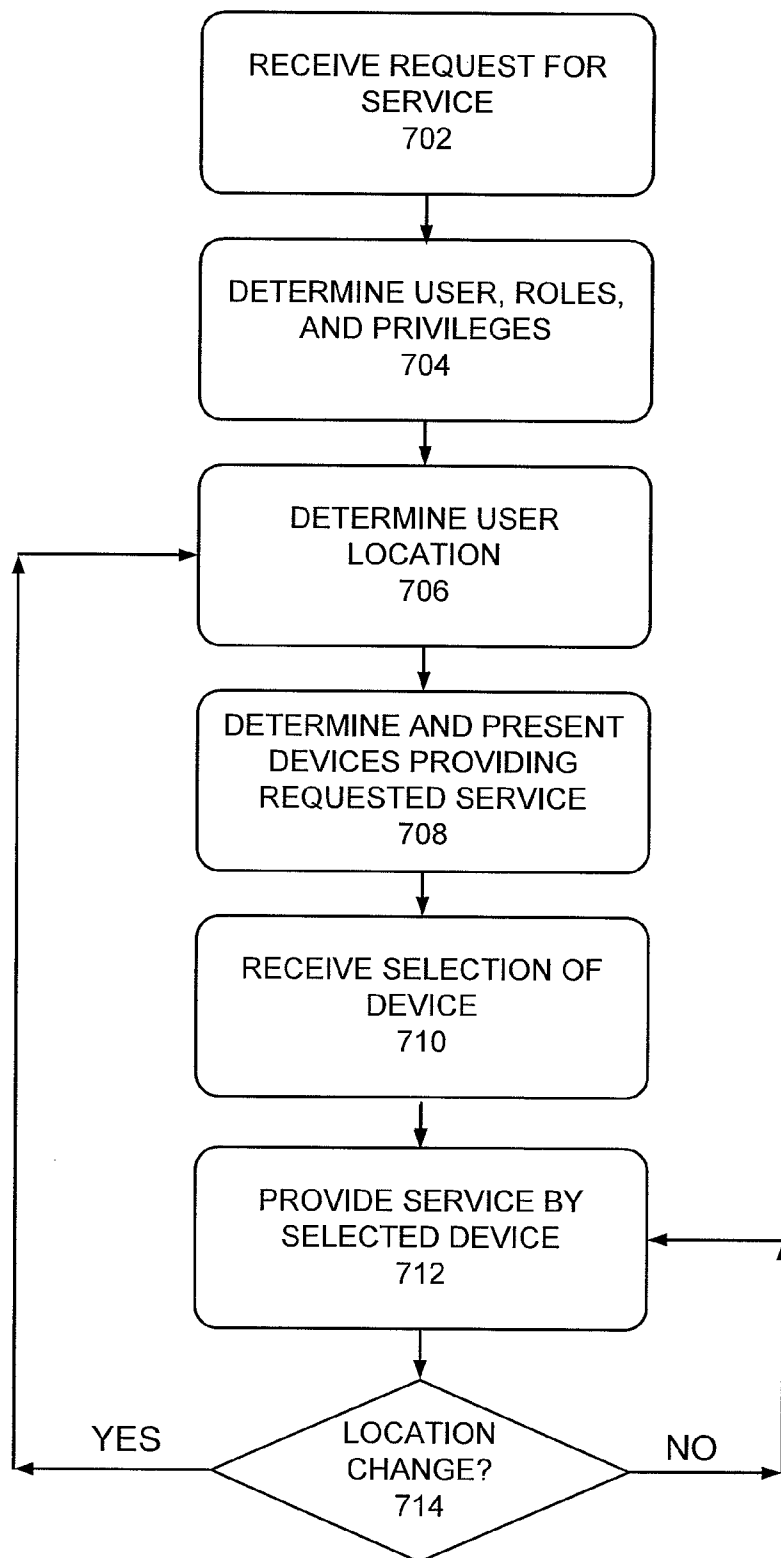
658

660

ROLE TABLE 600

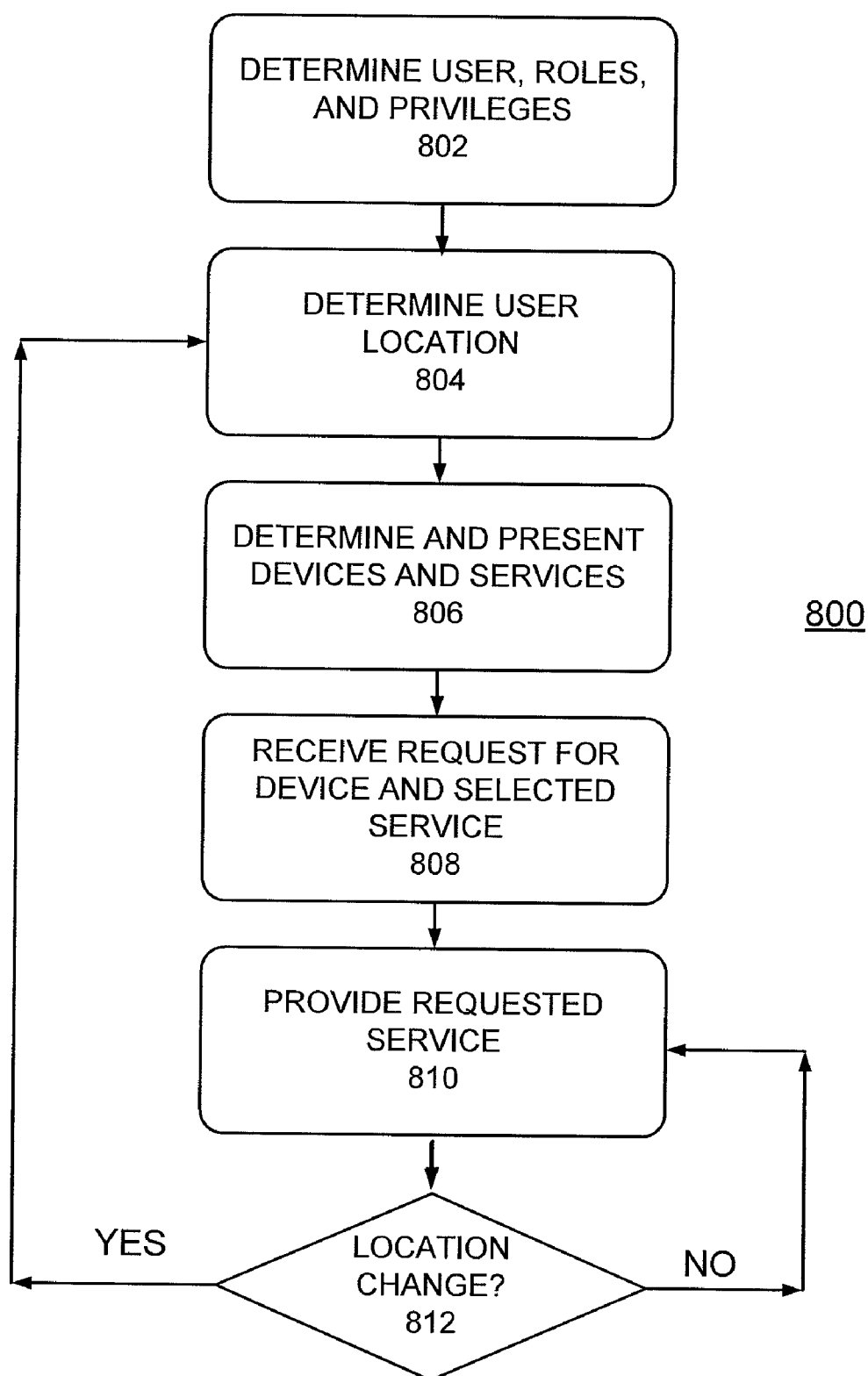
FIG. 6

700



**Fig. 7**





**Fig. 8**

## PROVIDING SERVICES TO A MOBILE DEVICE IN A PERSONAL NETWORK

### BACKGROUND

**[0001]** 1. Technical Field

**[0002]** Embodiments described herein may relate generally to providing services by devices associated with a personal network and may relate, more particularly, to providing services by a personal network to a mobile device.

**[0003]** 2. Description of Related Art

**[0004]** Devices coupled to a network may provide a myriad of services. For example, a home network may include a device to play music (e.g., a stereo), display videos (e.g., a television), print documents, store data (such as video or music), or retrieve data. Current technology does not provide adequate management of the services that these devices provide to users.

### SUMMARY

**[0005]** In one aspect of the invention, a method may include receiving a request from a mobile device for a service; determining a location of the mobile device; determining, based on the location of the mobile device, one or more devices capable of providing the requested service; providing information to the mobile device regarding the one or more devices capable of providing the requested service; receiving a selection from the mobile device for one of the one or more devices for providing the requested service; and providing the service by the selected device.

**[0006]** In another aspect, determining the one or more devices capable of providing the requested service may include determining the one or more devices based on privileges or roles associated with a user of the mobile device.

**[0007]** In another aspect, the service may include one or more of playing audio, playing video, printing, storing data, viewing pictures, or retrieving data.

**[0008]** In another aspect, providing information to the mobile device regarding the one or more devices capable of providing the requested service may include providing information indicating one or more devices located closest to the mobile device.

**[0009]** In another aspect, the method may include re-determining the location of the mobile device; and re-determining, if the location of the mobile device has changed, the one or more devices capable of providing the requested service; providing information to the mobile device regarding the re-determined one or more devices capable of providing the requested service; and receiving a new selection from the mobile device for one of the one or more re-determined devices for providing the requested service.

**[0010]** In another aspect, the service may include one or more of playing audio, playing video, printing, storing data, viewing pictures, or retrieving data.

**[0011]** In another aspect, re-determining the one or more devices capable of providing the requested service may include re-determining the one or more devices based on privileges or roles associated with a user of the mobile device.

**[0012]** In another aspect, providing information to the mobile device regarding the re-determined one or more devices capable of providing the requested service may include: providing information indicating one or more devices located closest to the mobile device.

**[0013]** A system may include a storage medium to store a database regarding devices, services provided by the devices, and locations of the devices; a receiver to receive a request from a device for a service; and a processor to: determine a location of the device; and determine, based on the location of the device and information in the database, one or more devices capable of providing the requested service; a transmitter to: provide information to the device regarding the one or more devices capable of providing the requested service.

**[0014]** In another aspect, the processor determines the one or more devices capable of providing the requested service based on at least one of privileges or roles associated with a user of the device.

**[0015]** In another aspect, the receiver receives a selection from the device for one of the one or more devices for providing the requested service; and wherein the service may include one or more of playing audio, playing video, printing, storing data, viewing pictures, or retrieving data.

**[0016]** In another aspect, the processor provides information to the device indicating one or more devices located closest to the device.

**[0017]** In another aspect, the processor: re-determines the location of the device; and if the location of the device has changed, re-determines, based on the changed location of the device, the one or more devices capable of providing the requested service; and provides information to the device regarding the re-determined one or more devices capable of providing the requested service; and wherein the receiver receives a new selection from the device for one of the re-determined one or more devices for providing the requested service.

**[0018]** In another aspect, the service may include one or more of playing audio, playing video, printing, storing data, viewing pictures, or retrieving data.

**[0019]** In another aspect, the processor re-determines the one or more devices based on privileges or roles associated with a user of the device.

**[0020]** In another aspect, the processor provides information indicating one or more devices located closest to the device.

**[0021]** In another aspect, an apparatus may include means for receiving a request from a mobile device for a service; means for determining a location of the mobile device; means for determining, based on the location of the mobile device, one or more devices capable of providing the requested service; means for providing information to the mobile device regarding the one or more devices capable of providing the requested service; and means for receiving a selection from the mobile device for one of the one or more devices for providing the requested service.

**[0022]** In another aspect, the means for determining the one or more devices capable of providing the requested service may include: means for determining the one or more devices based on privileges or roles associated with a user of the mobile device.

**[0023]** In another aspect, the apparatus may include means for providing the service by the selected device.

**[0024]** In another aspect, the means for providing information to the mobile device regarding the one or more devices capable of providing the requested service may include means for providing information indicating the one or more devices located closest to the mobile device.

**[0025]** In another aspect, the apparatus may include means for re-determining the location of the mobile device; and if

the location of the mobile device has changed, means for re-determining, based on the location of the mobile device, the one or more devices capable of providing the requested service; means for providing information to the mobile device regarding the re-determined one or more devices capable of providing the requested service; and means for receiving a new selection from the mobile device for one of the re-determined one or more devices for providing the requested service.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0026] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate one or more embodiments and, together with the description, explain the embodiments. In the drawings,

[0027] FIG. 1 shows an exemplary personal network for embodiments described herein;

[0028] FIG. 2 shows an exemplary environment for embodiments described herein;

[0029] FIG. 3 is a block diagram of exemplary components of a device;

[0030] FIG. 4 is a block diagram of an exemplary device table;

[0031] FIG. 5 is a block diagram of an exemplary user table;

[0032] FIG. 6 is a block diagram of an exemplary role table; and

[0033] FIGS. 7 and 8 are flowcharts of exemplary processes for providing services in embodiments described herein.

## DETAILED DESCRIPTION

[0034] The following detailed description refers to the accompanying drawings. The same reference numbers in different drawings may identify the same or similar elements. Also, the following detailed description does not limit the scope of the claims. Rather, the claims define the scope of the inventions described herein.

### Overview

[0035] Embodiments described herein allow users to define a “personal network.” A personal network is a collection of devices that provide services to users. Services may include playing music or movies, viewing pictures, printing documents, storing movies and music, among other things. In one embodiment, when a user requests a service, the system may recommend one or more devices best suited and/or more likely to adequately provide the requested service. For example, a recommended device and service may include recommending the stereo in the same room for playing music—as opposed to recommending a stereo in a distant room or another building. As another example, the recommended device and service may include recommending a printer at home for printing a document when the user is at home—as opposed to recommending a printer at work for printing a document when the user is at home.

[0036] The devices associated with the personal network and the services that these devices provide to the users may be defined. In addition, the users allowed to access the services and devices may also be defined. Further, the users allowed to access the services and devices may have limited roles and privileges to access the devices and services. For example, a

guest to a personal network may not have full access to the devices and services associated with the personal network.

### Exemplary Personal Network

[0037] FIG. 1 shows an exemplary personal network 100 in which embodiments described herein may be implemented. As shown, personal network 100 may include a network 102 communicating with a group of devices 104-154. These devices may include, among other things, a home server 104, a home printer 106, a wide-screen TV 108 (e.g., a display or monitor), a first pair of speakers 110 (first speakers 110), a small-screen TV 112 (e.g., a display or monitor), a second pair of speakers 114 (second speakers 114), a laptop 116, a mobile phone 118, a car 120, a work printer 152, and a work server 154. In other embodiments, personal network 100 may include more, fewer, or different components. Moreover, one or more devices 104-154 associated with personal network 100 may perform one or more functions of any other device of personal network 100. Furthermore, one or more of devices 104-154 may be remotely located from each other. Although FIG. 1 shows devices 104-154 coupled to network 102, devices 104-154 may also be coupled with each other and may be able to communicate directly with each other.

[0038] Besides the devices shown in FIG. 1 coupled to network 102, coupled devices may include any computational device, including among other things: a camcorder, a personal computer, a telephone, such as a radio telephone; a personal communications system (PCS) terminal that may combine a cellular radiotelephone with data processing, facsimile, and/or data communications capabilities; an electronic notepad; a personal music player (PMP); a personal digital assistant (PDA) that may provide Internet/intranet access, web browser, organizer, calendar, and a global positioning system (GPS).

[0039] Network 102 may include the Internet, an ad hoc network, a local area network (LAN), a wide area network (WAN), a metropolitan area network (MAN), a cellular network, a public switched telephone network (PSTN), any other network, or combinations of networks.

[0040] Home server 104 may include one or more computer systems for hosting server programs, databases, and/or applications. Home server 104 may receive a request for uploading or downloading data from other devices, such as devices coupled to network 102, process the request, and transmit or receive data to and from other devices, such as devices coupled to network 102. Home server 104 may be located in a home of a user, but home server 104 may be located elsewhere.

[0041] Printer 106 and printer 152 may include any black and white or color printer, such as a laser printer, ink-jet printer, dot matrix printer, etc. Wide-screen display 108 and small-screen display 112 may include a liquid crystal display (LCD), a cathode ray tube (CRT), a plasma display, etc. First speakers 110 and second speakers 114 may include one or more speakers that output audio signals, such as stereo or mono audio. Laptop 116 may include any portable computing device, PDA, PMP, etc. Mobile phone 118 may include any portable computing device, PDA, PMP, etc. Car 120 may include any mobile transportation device, automobile, truck, etc.

[0042] Work server 154 may include one or more computer systems for hosting server programs, databases, and/or applications. Work server 154 may receive a request for uploading or downloading data from other devices, such as devices

coupled to network 102, process the request, and transmit or receive data to and from other devices, such as devices coupled to network 102. Work server 154 may be located in a work place of a user, but work server 154 may be located elsewhere.

#### Exemplary Environment

[0043] FIG. 2 is a diagram of an exemplary environment 200 in which embodiments disclosed herein may be implemented. Environment 200 may include a home environment 210 and a work environment 250. Environment 200 may include more, fewer, or different environments than shown in FIG. 2. Home environment may include a kitchen 202, a living room 204, a home office 206, and a driveway 208. Work environment 250 may include a work office 252. Home environment 210 and work environment 250 may include more, fewer, or different locations other than those shown in FIG. 2. [0044] In exemplary environment 200, kitchen 202 may include laptop 116, small-screen TV 112, and second speakers 114; living room 204 may include phone 118, wide-screen TV 108, and first speakers 110; home office 206 may include home server 104 and home printer 106; driveway 208 may include car 120.

#### Exemplary Device

[0045] FIG. 3 is a block diagram of exemplary components of a device, such as any one of devices 104-154 associated with personal network 100 in FIG. 1. Device 300 may include a bus 310, processing logic 320, an input device 330, an output device 340, a communication interface 350, and a memory 360. Device 300 may include other components (not shown) that aid in receiving, transmitting, and/or processing data. Moreover, other configurations of components in device 300 are possible. Further, one or more components of device 300 may be remotely located.

[0046] Bus 310 may include a path that permits communication among the components of device 300. Processing logic 320 may include any type of processor or microprocessor (or groups of processors or microprocessors) that interprets and executes instructions. In other embodiments, processing logic 320 may include an application-specific integrated circuit (ASIC), a field-programmable gate array (FPGA), or the like.

[0047] Input device 330 may include a device that permits a user to input information into device 300, such as a keyboard, a keypad, a mouse, a pen, a microphone, a remote control, a touch-screen display, one or more biometric mechanisms, or the like.

[0048] Output device 340 may include a device that outputs information to the user, such as a display, a printer, a speaker, etc. Output device 340 may include a vibrator to alert a user.

[0049] Input device 330 and output device 340 may allow the user of device 300 to receive a menu of options. The menu may allow the user to select various functions or services associated with applications executed by device 300 or other devices coupled to network 102. Input device 330 and output device 340 may allow the user to activate a particular service or application, such as a service defined by a device table described below.

[0050] Communication interface 350 may include any transceiver-like mechanism that enables device 300 to communicate with other devices and/or systems. Communication interface 350 may include a transmitter that may convert

baseband signals from processing logic 320 to radio frequency (RF) signals and/or a receiver that may convert RF signals to baseband signals. Alternatively, communication interface 350 may include a transceiver to perform functions of both a transmitter and a receiver. Communication interface 350 may be coupled to an antenna for transmission and reception of the RF signals. Communications interface 350 may include a network interface card, e.g., Ethernet card, for wired communications or a wireless network interface (WiFi) card for wireless communications.

[0051] Communications interface 350 may include global satellite navigation and positioning system receiver for assisting in the determination of the location of the respective device. Communication interface 350 may also include, for example, a universal serial bus (USB) port for communications over a cable, a Bluetooth wireless interface for communicating with other Bluetooth devices, a near-field communication (NFC) device, etc. Communication interface 350, for example, may send signals, such as Bluetooth signals and/or electromagnetic signals, to other devices within a vicinity of the device 300, such as within 1 meter, 10 meters, 15 meters, 20 meters, 25 meters, or 30 meters, for example. Communications device 350 may receive, transmit and/or process digital or analog audio inputs/outputs and/or digital or analog video inputs/outputs.

[0052] Memory 360 may include a random access memory (RAM) or another type of dynamic storage device that may store information and instructions, e.g., an application, for execution by processing logic 320; a read-only memory (ROM) device or another type of static storage device that may store static information and instructions for use by processing logic 320; and/or some other type of magnetic or optical recording medium and its corresponding drive, e.g., a hard disk drive (HDD), for storing information and/or instructions.

[0053] Device 300 may perform certain operations, as described in detail below. Device 300 may perform these operations in response to processing logic 320 executing software instructions contained in a computer-readable medium, such as memory 360. A computer-readable medium may be defined as a physical or logical memory device and/or carrier wave. The software instructions may be read into memory 360 from another computer-readable medium or from another device via communication interface 350. The software instructions contained in memory 360 may cause processing logic 320 to perform processes that are described below.

#### Exemplary Data Structures

[0054] FIG. 4 is a block diagram of an exemplary device table 400. Device table 400, e.g., a database, may define the devices associated with a personal network, such as personal network 100, the locations of the devices, and the services the devices may provide. Device table 400 may be stored, for example, in memory 360 of device 300, or in a memory of any device coupled to network 102. In one embodiment, device table 400 may be stored in memory 360 of home server 104. In one embodiment, portions of device table 400 may be stored in various devices coupled to network 102. Device table 400 may include a device field 402, a location field 404, and a services field 406. Device table 400 may include additional, different, or fewer fields than illustrated in FIG. 4.

[0055] Device field 402 may include the name of a device associated with personal network 100. In exemplary device

table 400, the devices 104-154 associated with personal network 100 of FIG. 1 are listed in eleven records (records 452 through 472).

[0056] Location field 404 may include the location of the device in the corresponding device field 402. In exemplary device table 400, the location (as shown in environment 200 of FIG. 2) of devices 104-154 associated with personal network 100 of FIG. 1 are listed in location field 404 of the eleven records (records 452 through 472).

[0057] For mobile devices, such as laptop 116 and mobile phone 118, the location of the device may have to be determined. In one embodiment, location may be determined by GPS. For example, the location of car 120 may be determined by using a GPS navigation device onboard car 120. In another embodiment, location may also be determined using Bluetooth or NFC. For example, personal network 100 may determine that phone 118 is in car 120 when phone 118 pairs (using Bluetooth) with the car 120's audio system. In another embodiment, location may be determined using WiFi. For example, when phone 118 enters kitchen 202, a wireless router in kitchen 202 may determine that phone 118 is in kitchen 202. In another embodiment, location may be determined using information received by one or more cell towers in a mobile communication network (using triangulation, for example). In another embodiment, location may be determined by asking a user of a device and/or user entry. For example, a user may enter his/her location via phone 118 and transmit the location to home server 104. Location may also be determined using a combination of the embodiments described above.

[0058] Services field 406 may include the services that the device in the corresponding device field 402 may provide. In exemplary device table 400, services of the devices 104-154 associated with personal network 100 of FIG. 1 are listed in services field 406 of the eleven records (records 452 through 472). Exemplary services may include, among others, audio output (e.g., a speaker playing music), video output (e.g., a monitor displaying a video), printed paper (e.g., a printer outputting paper), audio input (e.g., a microphone), and a keypad input. Other services not shown in FIG. 4, device table 400, are possible.

[0059] As indicated in exemplary device table 400 and consistent with environment 200 of FIG. 2. First speakers 110 may be located in living room 204 and its services may include outputting audio (record 452); wide-screen TV 108 may also be located in living room 204 and its services may include outputting video (record 454); second speakers 114 may be located in kitchen 202 and its services may include outputting audio (record 456); small-screen TV 112 may be located in kitchen 202 and its services may include outputting video (record 458); phone 118 may be located in living room 204 and its services may include outputting audio and video and inputting audio (record 460); laptop 116 may be located in kitchen 202 and its services may include outputting video and audio and inputting audio (record 462); home printer 106 may be located in home office 206 and its services may include printing paper (record 464); home server 104 may be located in home office 206 and its services may include inputting (e.g., receiving, storing) and outputting (e.g., retrieving, displaying) data (record 466); car 120 may be located in driveway 208 and its services may include outputting video and audio, inputting audio, and inputting user data from a keypad (record 468); work server 154 may be located in work office 252 and its services may include inputting (e.g., receiving,

storing) and outputting (e.g., retrieving, displaying) data (record 470); work printer 152 may be located in work office 252 and its services may include printing to paper (record 472).

[0060] Devices and/or services may be added or removed from personal network 100, for example, by adding, removing, or editing entries in device table 400. Such editing of device table 400 may be done, for example, through laptop computer 116 or phone 118.

[0061] In one embodiment, a device listed in device table 400 may store the portion of device table 400 that relates to it. For example, first speakers 110 may store record 452; wide-screen TV 108 may store record 454; second speakers 114 may store record 456, etc. In some embodiments, devices may store more than one record, however.

[0062] FIG. 5 is a block diagram of an exemplary user table 500. User table 500, e.g., a database, may define the users associated with a personal network, such as personal network 100, and the roles (e.g., set of privileges or permissions) afforded these users. User table 500 may be stored in memory 360 of device 300, e.g., a memory of any device coupled to network 102, among other places. In one embodiment, user table 500 may be stored in memory 360 of home server 104. User table 500 may include a user field 502 and a role field 504. User table 500 may include additional, different, or fewer fields than illustrated in FIG. 5.

[0063] User field 502 may include the name of a user allowed to access personal network 100 in some way. Exemplary user table 500 lists five users that may access personal network 100, including Erik, Anna, Jennie, and Sabina. Role field 504 may include the name of a set of privileges afforded the corresponding user in user field 502. Exemplary user table 500 lists four different roles, including ALL, CHILD, FAMILY, and GUEST. The privileges (e.g., permissions) associated with these roles may be defined in role table 600, described below with respect to FIG. 6.

[0064] According to exemplary user table 500, Erik may be afforded the role of ALL (record 554); Anna may be afforded the role of ALL as well (record 556); Jennie may be afforded the role of CHILD and FAMILY (record 558); Sabina may be afforded the role of GUEST (record 560).

[0065] The ability of a user to access personal network 100 may be changed by adding, removing, or editing entries in user table 500. Such editing of user table 500 may be done, for example, through laptop computer 116 or phone 118.

[0066] FIG. 6 is a block diagram of an exemplary role table 600. Role table 600, e.g., a database, may define the set of privileges (e.g., permissions) afforded each role. Role table 600 may be stored in memory 360 of device 300, e.g., a memory of any device coupled to network 102, among other places. In one embodiment, role table 600 may be stored in memory 360 of home server 104. Role table 600 may include a role field 602 and a privileges field 604. Role table 600 may include additional, different, or fewer fields than illustrated in FIG. 6.

[0067] Role field 602 may include the name of the role. The name(s) listed in this field may correspond to the roles afforded users in user table 500. Exemplary role table 600 may include four roles: ALL, CHILD, FAMILY, and GUEST. These roles are the same four roles listed in user table 500 described above with respect to FIG. 5.

[0068] Privileges field 604 may include the privileges (e.g., permissions) afforded the role in the corresponding role field 602. Privileges field 604 may include the devices and services

that users having the corresponding role may access. For example, a privileges field **604** including “small-screen TV 112” may indicate permission to access the services of small-screen TV **112**. Privileges field **604** may also provide other limitations to permissions, such as the time of day access may be allowed. For example, a privileges field **604** including “wide-screen TV 108 (1500-1800)” may indicate permission to access the services of wide-screen TV **108** between the hours of 1500 and 1800. Permissions may be indicated negatively, e.g., by indicating what permissions are not allowed. For example, a permission of “NOT work server 154” may indicate that a lack of permission to access the services of work server **154**. Permissions may also be limited to particular services provided by devices. For example, a permissions field **604** including “phone 118 (AUDIO IN)” may indicate permission to access phone **118**’s audio-in service.

[0069] In role table **600**, users with the role ALL are provided the privilege of FULL (record **654**), e.g., permissions to access all devices and all services on the devices. Users with the role CHILD may be provided the privileges of accessing the services of small-screen TV **112**, home server **104**, first speakers **110** (between the hours of 1500 and 1800), and wide-screen TV (between the hours of 1500 and 1800) (record **656**); users with the role FAMILY may be provided the privileges of accessing the services of home server **104** (record **658**); users with the role GUEST may be provided the privilege of FULL, but are not allowed to access home server **104**, laptop **116**, phone **118**, work printer **152**, and work server **154** (record **660**).

[0070] The privileges afforded users with particular roles may be changed, for example, by adding, removing, or editing entries in role table **600**. Such editing of role table **600** may be done, for example, through laptop computer **116** or phone **118**.

#### Exemplary Processes

[0071] FIG. 7 is a flowchart of an exemplary process **700** for one embodiment. In one embodiment, process **700** may be performed by home server **104**. In another embodiment, process **700** may be performed by any device coupled to network **102**. In yet another embodiment, process **700** may be performed in a distributed environment by more than one device.

[0072] Process **700** may begin with a user requesting a service. For example, Erik may be sitting in living room **204** with his mobile phone **118**. Erik may wish to listen to music, e.g., his favorite ABBA song, stored in phone **118**. Erik may select his favorite song using phone **118** and may request a service provided by personal network **100**, e.g., the service of playing music through a speaker. A request for a service may be received (block **702**). In one embodiment, Erik’s request to play a song may be received in home server **104**. In this embodiment, home server **104** may also store device table **400**, user table **500**, and role table **600**. The identity of the user, the roles of the user, and associated privileges may be determined (block **704**). Server **104** may determine that the request is coming from Erik because, for example, Erik is logged into his phone. Accessing user table **500**, server **104** may determine that Erik has a role of ALL, which means that Erik has FULL privileges as indicated in role table **600**. The location of the user may be determined (block **706**). Server **104** may determine that Erik is in living room **204**. Server **104** may make this determination because Erik’s phone **118** may include a GPS device, for example, and Erik’s phone **118** forwarded location information indicating to home server

**104** that it is in living room **204**. Alternatively, server **104** may determine that Erik’s phone **118** is in living room **204** because of relevant WiFi, Bluetooth, NFC, or cellular tower signals.

[0073] The devices matching the requested services may be determined (block **708**). Server **104** may query device table **400** to determine what devices located near Erik may provide the requested service, e.g., playing music or AUDIO OUT. Server **104** may query device table **400** and determine that the relevant devices are (1) first speakers **110** also in living room **204** that provide an AUDIO OUT service; (2) Erik’s own phone **118**, also in living room **204** that provides an AUDIO OUT service; (3) second speakers **114** located in kitchen **202** that provide an AUDIO OUT service; and (4) laptop **116** located in kitchen **202** that provides an AUDIO OUT service. Server **104** may determine that the AUDIO OUT service provided by car **120** may not be as relevant because Erik is not in car **120**. Options (1) through (4) may be listed on phone **118** in that order, e.g., in order of closest to farthest by location to Erik (block **708**). In one embodiment, Erik may ask for or automatically receive all the devices providing the requested service, not just the closest devices.

[0074] A selection of the device to provide the requested service may be received (block **710**). Erik may select option (1) listed above, e.g., first speakers **110**. The service may be provided by the selected device (block **712**). Server **104** may instruct the music file on Erik’s phone **118** to be output to first speakers **110** for Erik’s listening pleasure based on Erik’s selection. In one embodiment, music may stream directly from Erik’s phone **118** to first speakers **110** after server **104** negotiates a session between phone **118** and server **104**. In one embodiment, server **104** may act as a session-initiation protocol (SIP) proxy, for example, to establish a real-time protocol (RTP) session between phone **118** and first speakers **110** for playing music. The RTP streams may travel through network **102** from phone **118** to first speakers **110**. The RTP streams may also travel directly from phone **118** to first speakers **110**, for example, using Bluetooth or NFC. Protocols other than RTP are possible, e.g., file-transfer protocol (FTP), hypertext transfer protocol (HTTP), Object Exchange (OBEX), Microsoft Media Services (MMS) protocol, etc. In addition, signaling protocols other than SIP are possible, e.g., H.323, etc.

[0075] If the user’s location does not change (block **714**: NO), then the requested service may continue to be provided by the selected device (block **712**). For example, as long as Erik remains in living room **204**, he may continue to listen to his favorite ABBA song on first speakers **110**.

[0076] If the user’s location changes (block **714**: YES), process **700** may return to block **706** where the user’s location may be determined again. For example, Erik may go to kitchen **202** to greet his wife, Anna. Home server **104** may re-determine Erik’s location as being in kitchen **202** because Erik is carrying his mobile phone **118**. Home server **104** may query device table **400** and may provide Erik with a new list of devices to meet the requested service, e.g., AUDIO OUT. These devices may include: (a) second speakers **114** located in kitchen **202** that provide an AUDIO OUT service; (b) Erik’s own phone **118**, also in kitchen **202** that provides an AUDIO OUT service; (c) laptop **116** located in kitchen **202** that provides an AUDIO OUT service; and (d) first speakers **110** in living room **204** that provide an AUDIO OUT service. Although these determined devices (when Erik is in kitchen **202**) may be the same as when Erik is in living room **204**, they may be presented to Erik in a different order (a) through (d)

because of Erik's new location. Erik may select a new device, such as second speakers **114** if he wishes the music to follow him to kitchen **202**. Erik may select both first speakers **110** and second speakers **114** if he wishes the music to remain playing in living room **204** and also play in kitchen **202**. In one embodiment, second speakers **114** may be selected automatically when Erik moves to kitchen **202**.

[0077] Erik may decide he wants to go for a car ride and enters car **120**. Home server **104** may re-determine Erik's location as being in car **120** because Erik is carrying his mobile phone **118** which may be paired (using Bluetooth) with the stereo in car **120**. Home server **104** may query device table **400** and may provide Erik with a new list of devices to meet the requested service. These devices may include (1) car **120** that provides AUDIO OUT service, e.g., a car stereo; and (2) Erik's mobile phone **118** itself which provides AUDIO OUT service. Erik may select a new device, e.g., car **120**, if he wishes the music to follow him to car **120**. In one embodiment, car **120** may automatically be selected as providing the AUDIO OUT service to Erik when his location is car **120**.

[0078] In one embodiment, Erik's phone **118** may communicate with local devices and may receive the relevant portions of device table **400**. For example, when in living room **204**, phone **118** may communicate with first speakers **110** and wide-screen TV **108** and may receive records **452** and **454** that relate to first speakers **110** and wide-screen TV **108**. In addition, phone **118** may already have stored record **460**, e.g., the record relating to phone **118**. Phone **118** may then determine that first speakers **110** and phone **118** are devices that may provide the requested service (block **708**) of playing music, e.g., AUDIO OUT. Phone **118** may present these devices to Erik (block **708**).

[0079] In this embodiment, when Erik moves to kitchen **202**, phone **118** may receive record **456** (describing second speakers **114**), record **458** (describing small-screen TV), and record **462** (describing laptop **116**). Recognizing that its location has changed, phone **118** may determine that the requested service (AUDIO OUT) may be provided by second speakers **114**. Phone **118** may present this option to Erik, which he may choose if he wishes. In this embodiment, phone **118** and first speakers **110** may negotiate for a RTP stream, for example, to pass between them without the use of a proxy, such as a SIP proxy.

[0080] Thus, the user interface to Erik's phone **118** may change depending on his location, such as living room **204**, kitchen **202**, or car **210**, for example.

[0081] In another example, Anna may wish to print a document from laptop **116**. After receiving a request of a printing service (block **702**), server **104** may determine that the request is coming from Anna because, for example, Anna is logged into laptop **116** (and not, for example, Erik). Server **104** may determine, after querying user table **500** and role table **600**, that Anna has a role of ALL and FULL privileges (block **704**). Server **104** may determine Anna's location (block **706**). Server **104** may determine that Anna is in kitchen **202** because she may be logged into a local LAN in home environment **210**. If Anna is in kitchen **202**, server **104** may query device table **400** (block **708**) and may present Anna with the option to print a document in home environment **210** on printer **106** in home office **206**. If Anna is in her work office **252** at work environment **250**, however, server **104** may query device table **400** (block **708**) and present Anna with the option to print a document in work environment **250** on work printer **152**. Server **104** may determine that Anna is in work environ-

ment **250** because she may be logged into a LAN at work office **252**. In one embodiment, the selection of the device to provide the printing service may be automatic. In another embodiment, if Anna does not like the list of devices provided to perform the requested service, Anna may ask for all devices associated with personal network **100** that may provide the requested service.

[0082] Thus, the user interface to Anna's laptop **116** may change depending on her location, such as home environment **210** or work environment **250**. In addition, the device may be automatically selected to provide a service based on Anna's location.

[0083] FIG. **8** is a flowchart of an exemplary process **800** for one embodiment. In one embodiment, process **800** may be performed by home server **104**. In another embodiment, process **800** may be performed by any device coupled to network **102**. In yet another embodiment, process **800** may be performed in a distributed environment by more than one device.

[0084] Process **800** may begin with a user requesting available services. For example, Anna's and Erik's daughter Jennie may be home from school at 1500 and may be looking for something to do. Jennie may log into wide-screen TV **108** as a user and may query personal network **100** as to available services. The identity of the user, the roles of the user, and associated privileges may be determined (block **802**). Server **104** may determine that Jennie is the user by virtue of her logging into wide-screen TV **108**. By querying user table **500**, server **104** may determine that user Jennie has the role of CHILD and FAMILY. By querying role table **600**, server **104** may determine that Jennie may access the services of home server **104**, small-screen TV **112**, second speakers **114**, wide-screen TV (but only between the hours of 1500 and 1800), and first speakers (but only between the hours of 1500 and 1800).

[0085] The location of the user may be determined (block **804**). Server **104** may determine that Jennie is in living room **204** by virtue of her logging into wide-screen TV **108**. Available devices and services may be determined (block **806**). Because of Jennie's location (in living room **204**), server **104** may determine that the services available to her include first speakers **110** and wide-screen TV **108** (for playing content) and home server **104** (where content may be stored). The available services may be presented via wide-screen TV **108**. A selection of the device and a requested service may be received (block **808**). Jennie may select wide-screen TV **108** and first speakers **110** to watch and listen to available content. The service may be provided by the selected device (block **810**), e.g., Jennie can channel surf using wide-screen TV **108**. If the user's location does not change (block **812**: NO), then the requested service may continue to be provided by the selected device (block **810**). For example, if Jennie stays logged into wide-screen TV **108**, then it will continue to provide content—at least until the hour of 1800 as indicated in Jennie's privileges (e.g., CHILD). If the user's location changes (block **812**: YES), then the process may return to block **804** where the user's location may be determined again. For example, if Jennie moves to kitchen **202** and logs into small-screen TV **112**, the content Jennie was watching on wide-screen TV **108** may be transferred to small-screen TV **112**. In one embodiment, Jennie's movement to kitchen **202** from living room **204** may be determined based on her logging into small-screen TV **112**. Alternatively, Jennie's movement to kitchen **202** may be determined by virtue of her cell phone being tracked, for example, from relevant WiFi, Bluetooth, or NFC signals. In one embodiment, Jennie may be

prompted before transferring content to small-screen TV **112**. In another embodiment, content may be transferred to small-screen TV **112** automatically.

**[0086]** In another example, Erik's and Anna's neighbor, Sabina, may be granted privileges to access personal network **100**. When visiting Erik and Anna, Sabina may log into small-screen TV **112** as a user and may query personal network **100** as to available services. By querying user table **500**, server **104** may determine that user Sabina has the role of GUEST. By querying role table **600**, server **104** may determine that Sabina may have FULL privileges, excluding any privileges to access services of home server **104**, laptop **116**, Erik's phone **118**, work server **154**, or work printer **152**. Server **104** may determine that Sabina is in kitchen **202** by virtue of Sabina logging into small-screen TV **112**. Because of Sabina's location (in kitchen **202**), server **104** may determine that the services available to her include (1) small-screen TV **112**; and (2) second speakers **114**. Sabina could request a list of all the services available to her, not just the ones in her immediate vicinity. In this case, server **104** may list all the services listed in privileges table **600** for GUEST.

**[0087]** In one embodiment, Sabina may log into personal network **100** from her own laptop (not shown), for example, even though her laptop may not be listed in device table **400** and may not be associated with personal network **100**. That is, Sabina's laptop computer may not be part of personal network **100** even though it is coupled to network **102**. In this embodiment, services may be accessed by a device, such as Sabina's laptop, that are not associated with personal network **100**.

**[0088]** Devices associated with personal network **100** may include public devices, such as public printers, public displays, etc. For example, if Erik is a frequent visitor of a public library, he may add the public printer in the library to personal network **100**. In this situation, when he has his laptop (not shown) in the library, he may be presented with the public printer as the first choice when he prints a document.

**[0089]** In one embodiment, Erik may be in car **120** with phone **118**. Erik may not wish to handle his phone **118** while driving, so he may request a user interface service (e.g., VIDEO OUT, KEYPAD IN, or AUDIO IN (for voice recognition)). In this embodiment, car **120** may include VIDEO OUT and KEYPAD/AUDIO IN services. Erik may then effectively move phone **118**'s user interface to that of car **120** for safe driving.

**[0090]** In one embodiment, a user's preferences may be learned over time. Devices providing services may be presented to a user not only based on location, but based on previous choices by the same user.

### Conclusion

**[0091]** Embodiments described herein allow users to define a "personal network." Embodiments described herein may allow devices associated with the personal network and the services that these devices provide to the users to be defined. In addition, embodiments described herein may define users permitted to access the services and devices may also be defined. Further, embodiments described herein may limit the roles and privileges of users' access to the personal network.

**[0092]** The foregoing description of embodiments provides illustration and description, but is not intended to be exhaustive or to limit the invention to the precise form disclosed. Modifications and variations are possible in light of the above teachings.

**[0093]** For example, while series of blocks have been described with regard to some figures, the order of the blocks may be modified in other embodiments. Further, non-dependent acts may be performed in parallel.

**[0094]** The term "comprises/comprising" when used in this specification is taken to specify the presence of stated features, integers, steps or components but does not preclude the presence or addition of one or more other features, integers, steps, components or groups thereof.

**[0095]** It will be apparent that aspects of the invention, as described above, may be implemented in many different forms of software, firmware, and hardware in the embodiments illustrated in the figures. The actual software code or specialized control hardware used to implement aspects consistent with principles of the invention is not limiting of the invention. Thus, the operation and behavior of the aspects were described without reference to the specific software code—it being understood that one would be able to design software and control hardware to implement the aspects based on the description herein.

**[0096]** No element, act, or instruction used in the present application should be construed as critical or essential to the invention unless explicitly described as such. Also, as used herein, the article "a" is intended to include one or more items. Where only one item is intended, the term "one" or similar language is used. Further, the phrase "based on" is intended to mean "based, at least in part, on" unless explicitly stated otherwise.

What is claimed is:

1. A method comprising:

- receiving a request from a mobile device for a service;
- determining a location of the mobile device;
- determining, based on the location of the mobile device, one or more devices capable of providing the requested service;
- providing information to the mobile device regarding the one or more devices capable of providing the requested service;
- receiving a selection from the mobile device for one of the one or more devices for providing the requested service; and
- providing the service by the selected device.

2. The method of claim 1, wherein determining the one or more devices capable of providing the requested service includes:

- determining the one or more devices based on privileges or roles associated with a user of the mobile device.

3. The method of claim 1, wherein the service comprises one or more of playing audio, playing video, printing, storing data, viewing pictures, or retrieving data.

4. The method of claim 1, wherein providing information to the mobile device regarding the one or more devices capable of providing the requested service includes providing information indicating one or more devices located closest to the mobile device.

5. The method of claim 1, further comprising:

- re-determining the location of the mobile device; and
  - re-determining, if the location of the mobile device has changed, the one or more devices capable of providing the requested service;
- providing information to the mobile device regarding the re-determined one or more devices capable of providing the requested service; and



receiving a new selection from the mobile device for one of the one or more re-determined devices for providing the requested service.

6. The method of claim 5, wherein the service comprises one or more of playing audio, playing video, printing, storing data, viewing pictures, or retrieving data.

7. The method of claim 5, wherein re-determining the one or more devices capable of providing the requested service includes:

re-determining the one or more devices based on privileges or roles associated with a user of the mobile device.

8. The method of claim 5, wherein providing information to the mobile device regarding the re-determined one or more devices capable of providing the requested service includes: providing information indicating one or more devices located closest to the mobile device.

9. A system comprising:

a storage medium to store a database regarding devices, services provided by the devices, and locations of the devices;

a receiver to receive a request from a device for a service; and

a processor to:

determine a location of the device; and

determine, based on the location of the device and information in the database, one or more devices capable of providing the requested service;

a transmitter to:

provide information to the device regarding the one or more devices capable of providing the requested service.

10. The system of claim 9, wherein the processor determines the one or more devices capable of providing the requested service based on at least one of privileges or roles associated with a user of the device.

11. The system of claim 9, wherein the receiver receives a selection from the device for one of the one or more devices for providing the requested service; and

wherein the service comprises one or more of playing audio, playing video, printing, storing data, viewing pictures, or retrieving data.

12. The system of claim 9, wherein the processor provides information to the device indicating one or more devices located closest to the device.

13. The system of claim 9, wherein the processor:

re-determines the location of the device; and

if the location of the device has changed,

re-determines, based on the changed location of the device, the one or more devices capable of providing the requested service; and

provides information to the device regarding the re-determined one or more devices capable of providing the requested service; and

wherein the receiver receives a new selection from the device for one of the re-determined one or more devices for providing the requested service.

14. The system of claim 13, wherein the service comprises one or more of playing audio, playing video, printing, storing data, viewing pictures, or retrieving data.

15. The system of claim 13, wherein the processor re-determines the one or more devices based on privileges or roles associated with a user of the device.

16. The system of claim 13, wherein the processor provides information indicating one or more devices located closest to the device.

17. An apparatus comprising:

means for receiving a request from a mobile device for a service;

means for determining a location of the mobile device;

means for determining, based on the location of the mobile device, one or more devices capable of providing the requested service;

means for providing information to the mobile device regarding the one or more devices capable of providing the requested service; and

means for receiving a selection from the mobile device for one of the one or more devices for providing the requested service.

18. The apparatus of claim 17, wherein the means for determining the one or more devices capable of providing the requested service includes:

means for determining the one or more devices based on privileges or roles associated with a user of the mobile device.

19. The apparatus of claim 17, further comprising:

means for providing the service by the selected device.

20. The apparatus of claim 19, wherein means for providing information to the mobile device regarding the one or more devices capable of providing the requested service includes means for providing information indicating the one or more devices located closest to the mobile device.

21. The apparatus of claim 20, further comprising:

means for re-determining the location of the mobile device; and

if the location of the mobile device has changed,

means for re-determining, based on the location of the mobile device, the one or more devices capable of providing the requested service;

means for providing information to the mobile device regarding the re-determined one or more devices capable of providing the requested service; and

means for receiving a new selection from the mobile device for one of the re-determined one or more devices for providing the requested service.

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