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(54) **SYSTEM, DEVICE AND COMPUTER READABLE MEDIUM FOR PROVIDING A MANAGED WIRELESS NETWORK USING SHORT-RANGE RADIO SIGNALS**

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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,442,680	A	8/1995	Schellinger et al.
5,457,737	A	10/1995	Wen
5,572,528	A	11/1996	Shuen
5,742,237	A	4/1998	Bledsoe
5,771,438	A	6/1998	Palermo et al.
5,774,791	A	6/1998	Strohallen et al.
5,793,763	A	8/1998	Mayes et al.
5,805,166	A	9/1998	Hall et al.
5,838,252	A	11/1998	Kikinis

(Continued)

FOREIGN PATENT DOCUMENTS

JP	3153213	4/2001

(Continued)

OTHER PUBLICATIONS

Hardwick et al, Project P946-GI Smart Devices "When Things Start to Think", pp. 1-30, Jan. 2000.*

(Continued)

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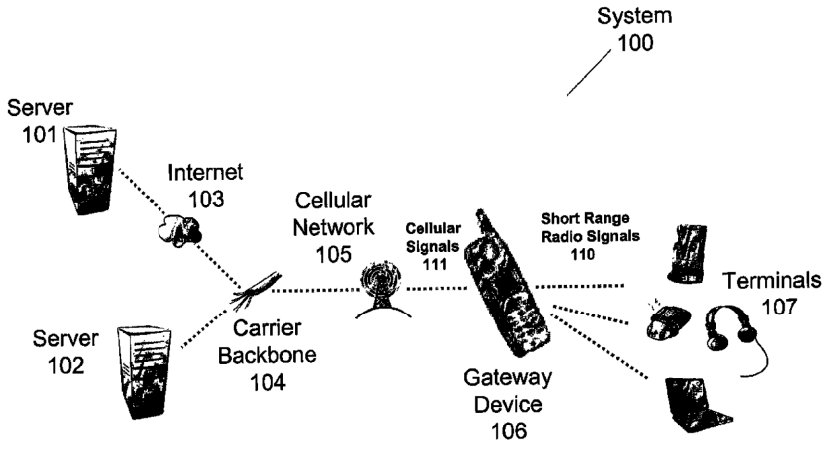
(57) **ABSTRACT**

A system, a wireless hand-held device, and software component for accessing information responsive to short-range radio signals is provided. The system includes a wireless gateway device coupled to a network, such as a cellular network. The wireless gateway device includes a network manager software component for accessing information from the network responsive to a first short-range radio signal. The network may be a corporate, private or public network, such as the Internet. A first wireless device is coupled to the wireless gateway device. The first wireless device provides the first short-range radio signal. In an embodiment of the present invention, the first wireless device is a cellular telephone, personal digital assistant or thin terminal having a Bluetooth™ processor and transmitter. In an embodiment of the present invention, the network manager software component includes a plug and play software component for loading and executing software for the first wireless device. In an embodiment of the present invention, a second wireless device accesses information on the first wireless device using the wireless gateway device.

56 Claims, 9 Drawing Sheets



U.S. PATENT DOCUMENTS

5,896,369	A	4/1999	Warsta et al.	
5,929,848	A	7/1999	Albukerk et al.	
5,978,386	A	11/1999	Hamalainen et al.	
5,987,011	A	11/1999	Toh	
5,987,033	A	11/1999	Boer et al.	
6,064,734	A	5/2000	Hasegawa et al.	
6,067,291	A	5/2000	Kamerman et al.	
6,069,896	A	5/2000	Borgstahl et al.	
6,078,789	A	6/2000	Bodenmann et al.	
6,085,098	A	7/2000	Moon et al.	
6,130,602	A	10/2000	O'Toole et al.	
6,151,628	A	11/2000	Xu et al.	
6,192,257	B1	2/2001	Ray	
6,198,948	B1	3/2001	Sudo et al.	
6,218,958	B1	4/2001	Eichstaedt et al.	
6,223,029	B1	4/2001	Stenman et al.	
6,243,581	B1	6/2001	Jawanda	
6,265,788	B1	7/2001	Davidson et al.	
6,282,183	B1	8/2001	Harris et al.	
6,298,443	B1	10/2001	Colligan et al.	
6,326,926	B1	12/2001	Shoobridge et al.	
6,333,973	B1	12/2001	Smith et al.	
6,343,276	B1	1/2002	Barnett	
6,405,027	B1	6/2002	Bell	
6,430,408	B1	8/2002	Dorenbosch	
6,434,537	B1	8/2002	Grimes	
6,446,127	B1 *	9/2002	Schuster et al.	709/227
6,452,910	B1 *	9/2002	Vij et al.	370/310
6,459,882	B1	10/2002	Palermo et al.	
6,463,078	B1	10/2002	Engstrom et al.	
6,487,180	B1	11/2002	Borgstahl et al.	
6,519,460	B1 *	2/2003	Haartsen	455/452.1
6,532,366	B1	3/2003	Chung et al.	
6,600,428	B1	7/2003	O'Toole et al.	
6,600,734	B1	7/2003	Gernert	
6,630,925	B1	10/2003	Östergård et al.	
6,633,759	B1	10/2003	Kobayashi	
6,636,489	B1	10/2003	Fingerhut	
6,654,616	B1	11/2003	Pope et al.	
6,665,549	B1	12/2003	Reed	
6,690,929	B1	2/2004	Yeh	
6,763,012	B1 *	7/2004	Lord et al.	370/338
6,763,247	B1	7/2004	Hollstrom et al.	
6,871,063	B1	3/2005	Schiffer	
2001/0047424	A1	11/2001	Alastalo et al.	
2002/0010008	A1	1/2002	Bork et al.	
2002/0010683	A1	1/2002	Aune	
2002/0037700	A1	3/2002	Dooley et al.	
2002/0055333	A1	5/2002	Davies et al.	
2002/0058502	A1	5/2002	Stanforth	
2002/0063472	A1	5/2002	Irvin	
2002/0065099	A1	5/2002	Bjorndahl	
2002/0065817	A1	5/2002	Ito et al.	
2002/0068559	A1	6/2002	Sharma et al.	
2002/0068600	A1	6/2002	Chihara et al.	
2002/0069037	A1	6/2002	Hendrickson et al.	
2002/0082054	A1	6/2002	Keinonen et al.	
2002/0086718	A1	7/2002	Bigwood et al.	
2002/0091633	A1	7/2002	Proctor	
2002/0102974	A1	8/2002	Raith	
2002/0118663	A1 *	8/2002	Dorenbosch et al.	370/338
2002/0128051	A1	9/2002	Liebenow	
2002/0132610	A1	9/2002	Chaplin et al.	
2002/0142762	A1	10/2002	Chmaytelli et al.	
2002/0143952	A1	10/2002	Sugiarto et al.	
2002/0155830	A1	10/2002	Iyer	
2002/0160764	A1	10/2002	Gorsuch	
2003/0013438	A1	1/2003	Darby	
2003/0017810	A1	1/2003	Janninck et al.	
2003/0022699	A1	1/2003	Lin	
2003/0027563	A1	2/2003	Herle et al.	
2003/0032417	A1	2/2003	Minear et al.	
2003/0050058	A1	3/2003	Walsh et al.	
2003/0054765	A1	3/2003	Botteck	
2003/0060188	A1	3/2003	Gidron	
2003/0060189	A1	3/2003	Minear et al.	
2003/0078036	A1	4/2003	Chang et al.	
2003/0091917	A1	5/2003	Davenport et al.	
2003/0114105	A1	6/2003	Haller et al.	
2003/0115351	A1	6/2003	Giobbi	
2003/0122856	A1	7/2003	Hubbard	
2003/0143992	A1	7/2003	Humphrey et al.	
2003/0153280	A1	8/2003	Kopp et al.	
2003/0187807	A1	10/2003	Matsubara et al.	
2003/0214940	A1	11/2003	Takken	
2003/0224773	A1	12/2003	Deeds	
2003/0232616	A1	12/2003	Gidron et al.	
2004/0001467	A1	1/2004	Cromer et al.	
2004/0048671	A1	3/2004	Rowe	
2004/0066769	A1	4/2004	Ahmavaara et al.	
2004/0192384	A1	9/2004	Anastasakos et al.	
2004/0196812	A1	10/2004	Barber	

FOREIGN PATENT DOCUMENTS

WO	WO 99/48315	9/1999
WO	WO 00/39967	7/2000
WO	WO 01/048977	7/2001

OTHER PUBLICATIONS

Guthery et al, The WebSIM- Clever Smartcards Listen to Port 80, pp. 1-16, Dec. 1999.*

Johansson et al, Short Range Radio Based Ad-hoc Networking: Performance and Properties, IEEE, pp. 1414-1420, 1999.*

Haartsen, BLUETHOOTH—The universal radio interface for ad hoc, wireless connectivity, Ericsson Review N. 3, pp. 110-117.*

Lee et al, Integrating Bluetooth with Wireless and Richocheting, IEEE, pp. 1310-1314, 2000.*

Karagiannis, Mobility support for ubiquitous Internet access, ERICSSON Open report, pp. 1-70, Dec. 21, 2000.*

Guthery et al., "The WebSIM—Clever Smartcards Listen to Port 80", version Dec. 15, 1999.

Project P946-GI, Smart Devices "When Things Start to Think", Jan. 2000, 2000 EURESCOM Participants in Project P946-GI.

Frodigh et al., "Wireless ad hoc networking—The art of networking without a network", Ericsson Review No. 4, 2000, pp. 248-263.

Faruque et al, "Design and Analysis of Ad Hoc Wireless Networks for Battlefield Applications", Part of the SPIE Conference on Digitization of the Battlespace IV, Orlando, Florida, Apr., 1999, pp. 118-122.

Garcia-Luna-Aceves et al., "Wireless Internet Gateways (Wings)", 1997 IEEE, pp. 1271-1276.

White Paper, Handheld Devices: Comparing the Major Platforms, www.dell.com/r&d, Dec. 2000.

Miyatsu, Bluetooth Design Background and Its Technological Features, IEICE Trans, Fundamentals, vol. E83-A, No. 11, Nov. 2000.

Parekh, Operating Systems on Wireless Handheld Devices, A Strategic Market Analysis, Massachusettes Institute of Technology, Sep. 28, 2000.

Johansson, et al., Short Range Radio Based Ad-hoc Neowrking: Performance and Properties, IEEE, 1999.

* cited by examiner

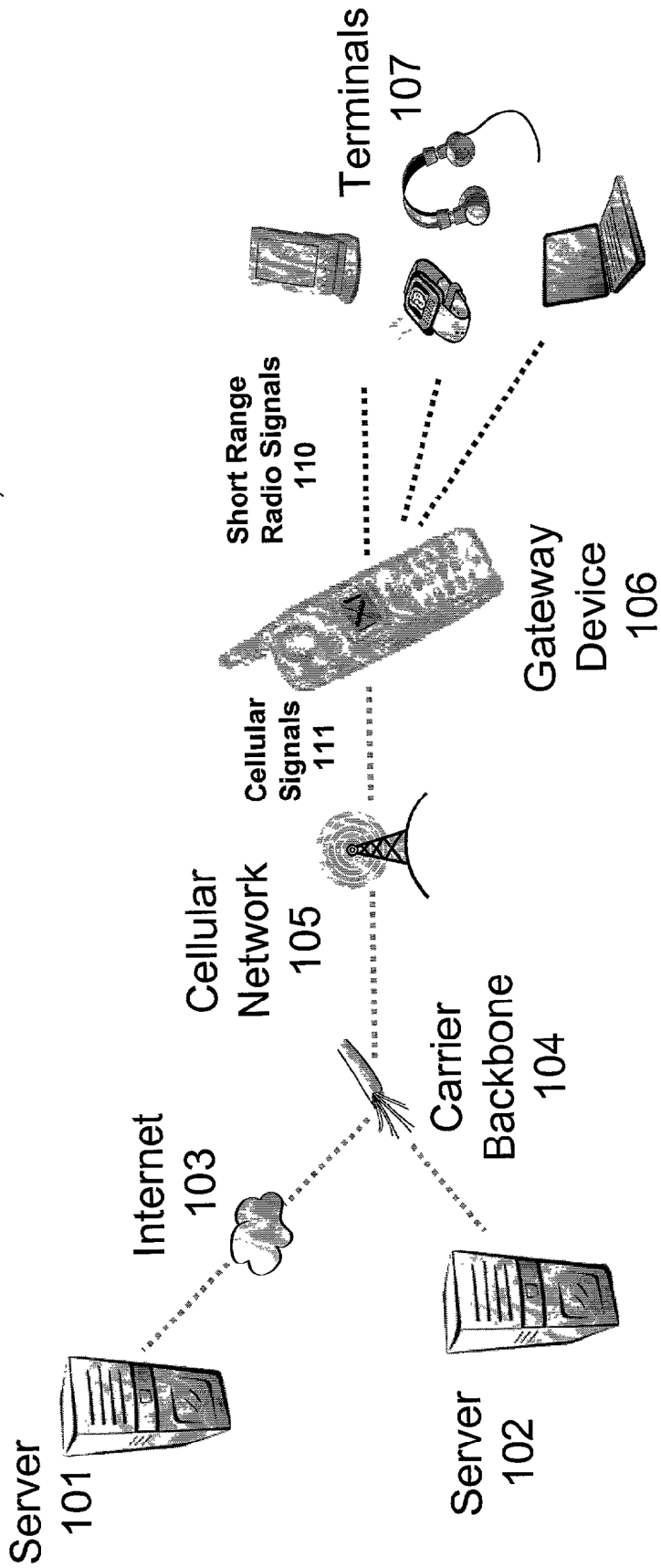

System
100
Terminals
107
Short Range
Radio Signals
110
Gateway
Device
106
Cellular
Signals
111
Cellular
Network
105
Carrier
Backbone
104
Internet
103
Server
101
Server
102

Fig. 1

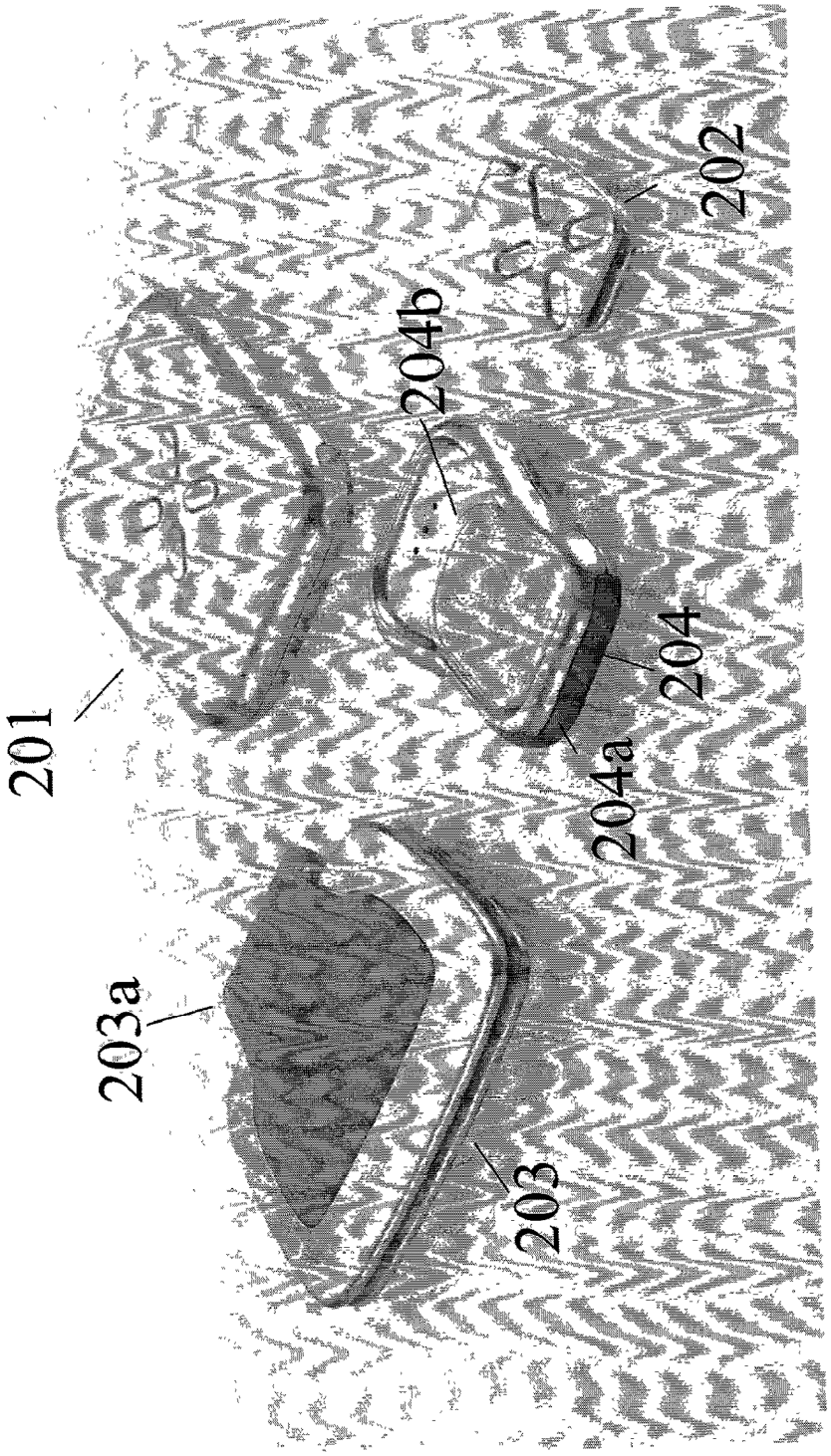


Fig. 2

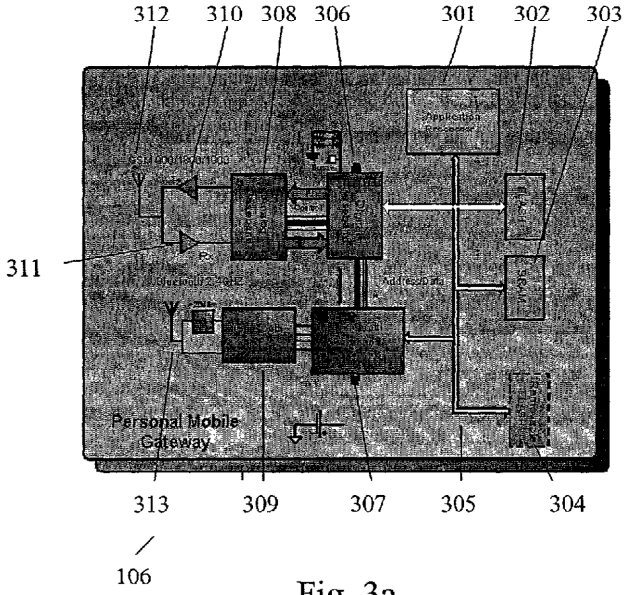

312
310
308
306
301
302
303
311
Personal Mobile Gateway
313
309
307
305
304
106

Fig. 3a

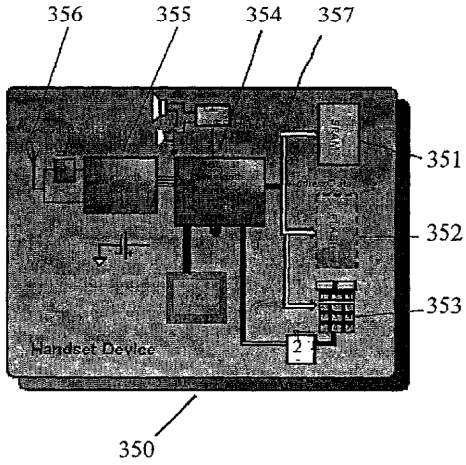

356
355
354
357
351
352
353
Handset Device
350

Fig. 3b

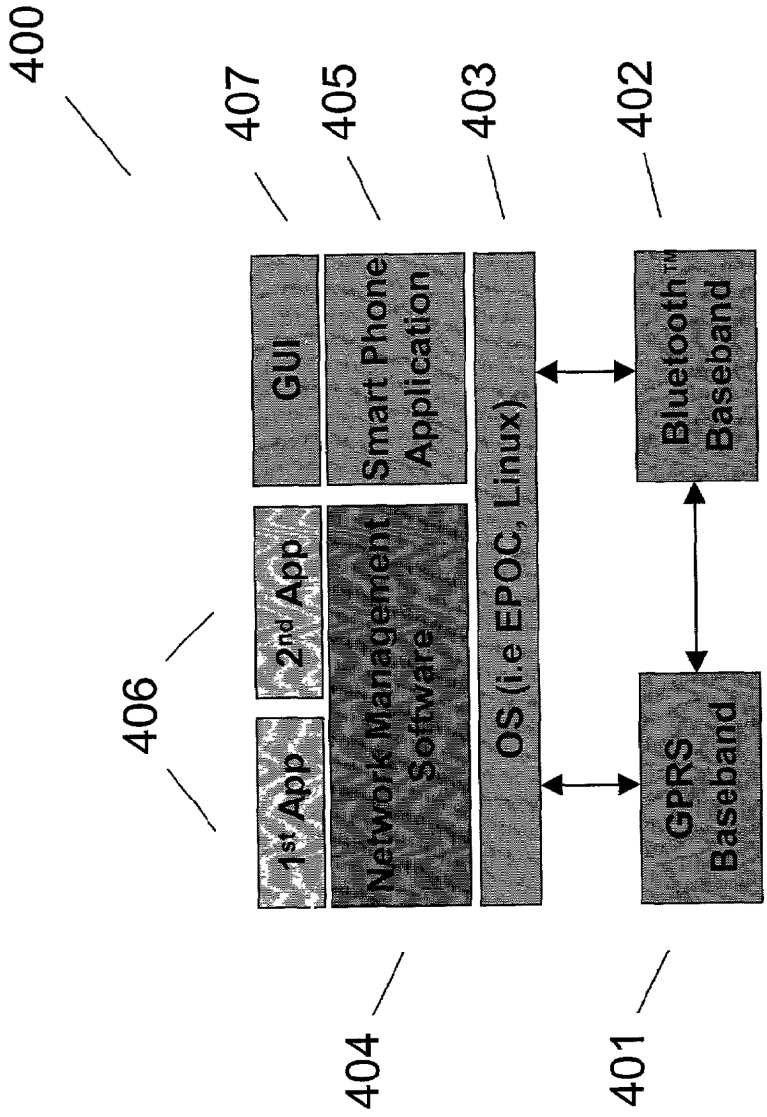

400
407
405
403
402
GUI
Smart Phone Application
OS (i.e EPOC, Linux)
Bluetooth™ Baseband
2nd App
Network Management Software
406
1st App
GPRS Baseband
404
401

Fig. 4

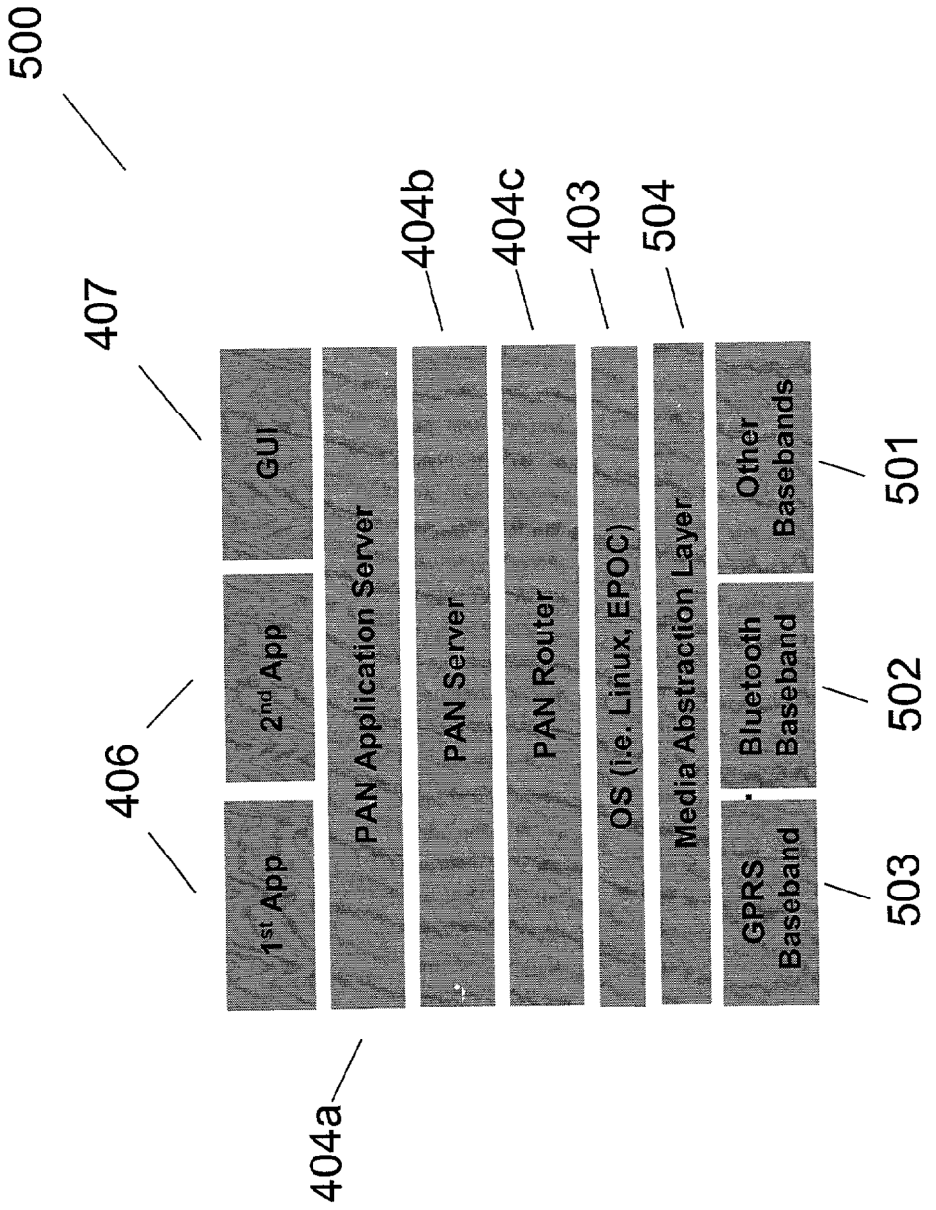

500
407
406
404a
404b
404c
403
504
501
502
503
GUI
2nd App
1st App
PAN Application Server
PAN Server
PAN Router
OS (i.e. Linux, EPOC)
Media Abstraction Layer
Other Basebands
Bluetooth Baseband
GPRS Baseband

Fig. 5a

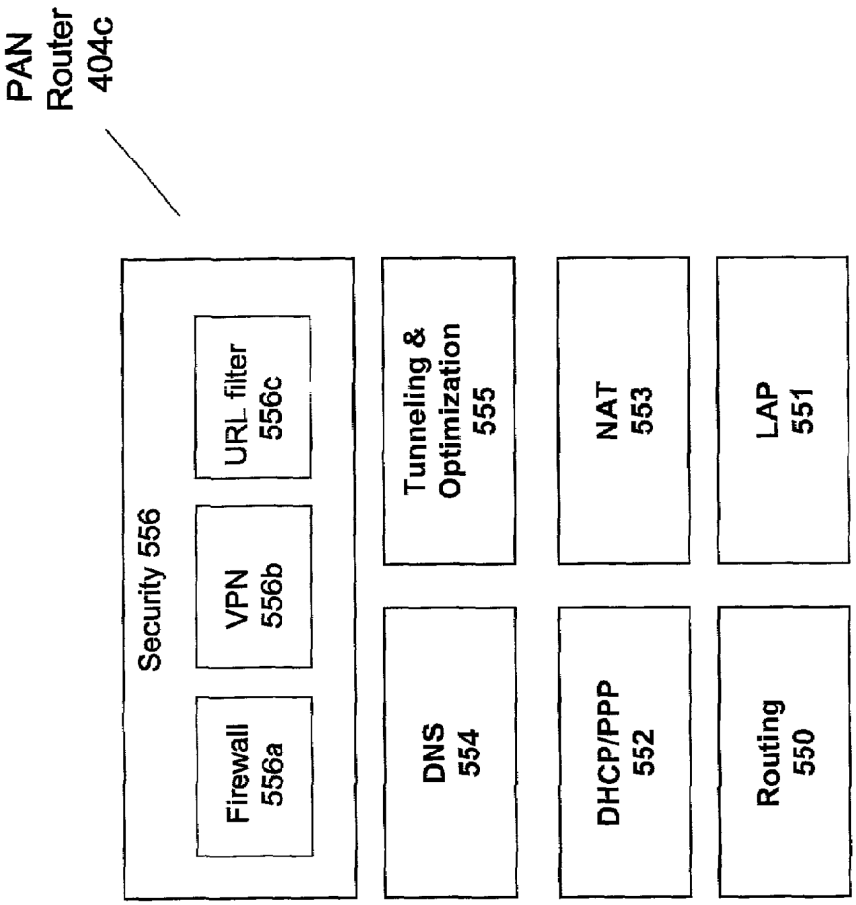

PAN Router 404c
Security 556
Firewall 556a
VPN 556b
URL filter 556c
Tunneling & Optimization 555
NAT 553
LAP 551
DNS 554
DHCP/PPP 552
Routing 550

Fig. 5b

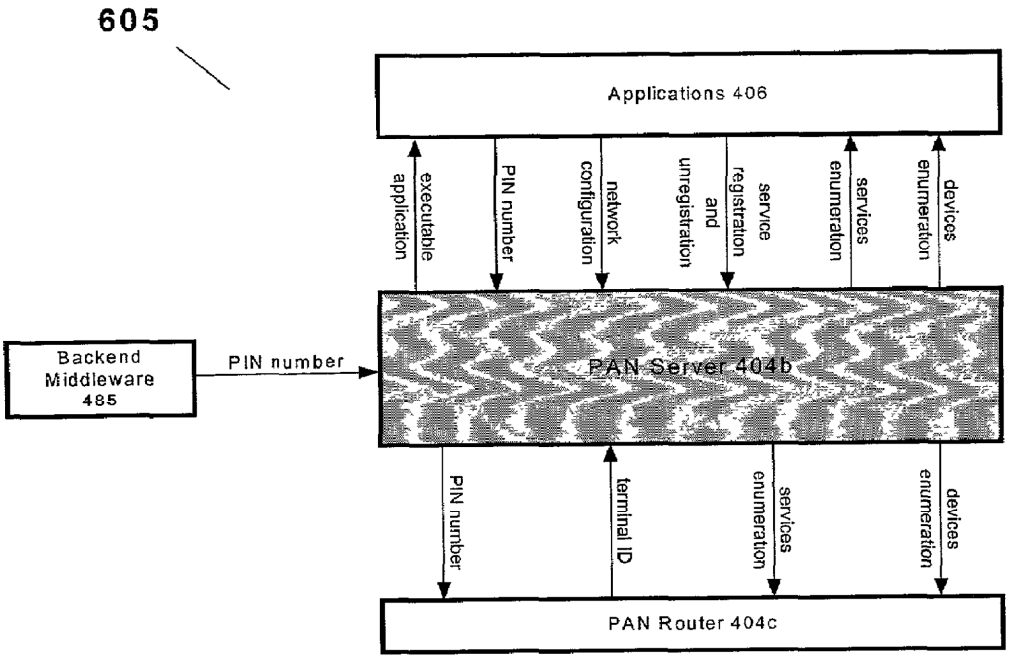

605
Applications 406
executable application
PIN number
network configuration
service registration and unregistration
services enumeration
devices enumeration
Backend Middleware 485
PIN number
PAN Server 404b
PIN number
terminal ID
services enumeration
devices enumeration
PAN Router 404c

Fig. 6

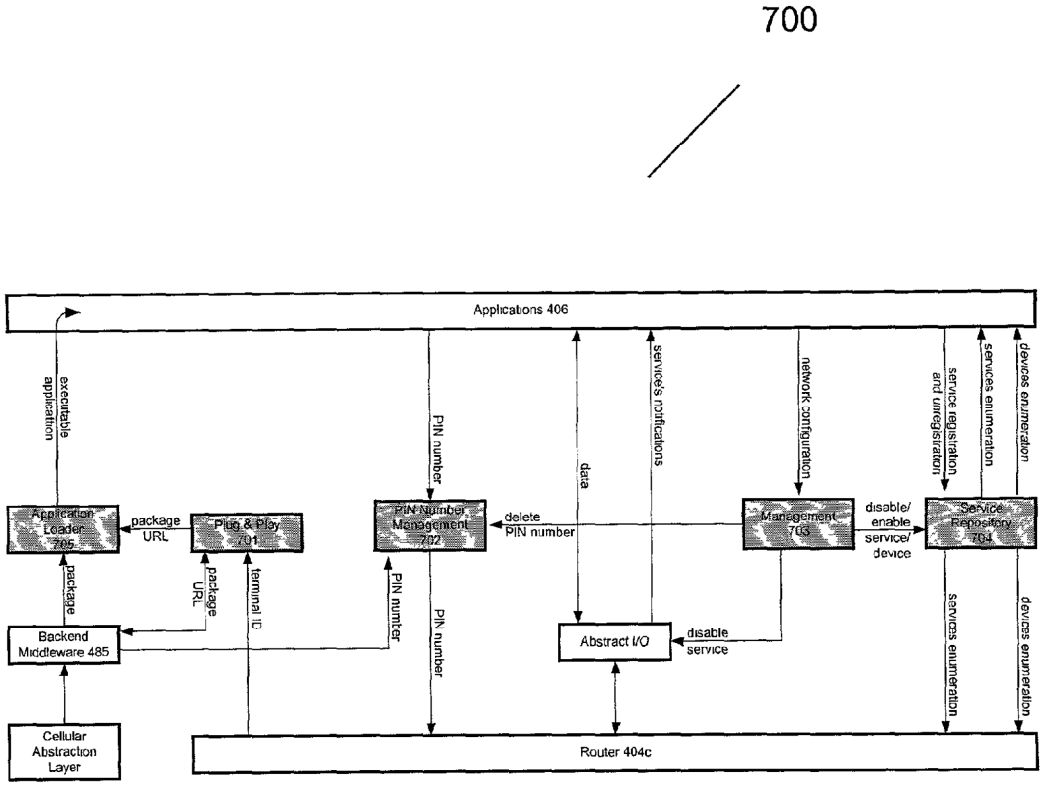

700
Applications 406
executable application
PIN number
data
services notifications
network configuration
service registration and unregistration
services enumeration
devices enumeration
Application Loader 705
package URL
Plug & Play 701
PIN Number Management 702
delete PIN number
Management 703
disable/ enable service/ device
Service Repository 704
package
package URL
terminal ID
PIN number
PIN number
Backend Middleware 485
Abstract I/O
disable service
services enumeration
devices enumeration
Cellular Abstraction Layer
Router 404c

Fig. 7

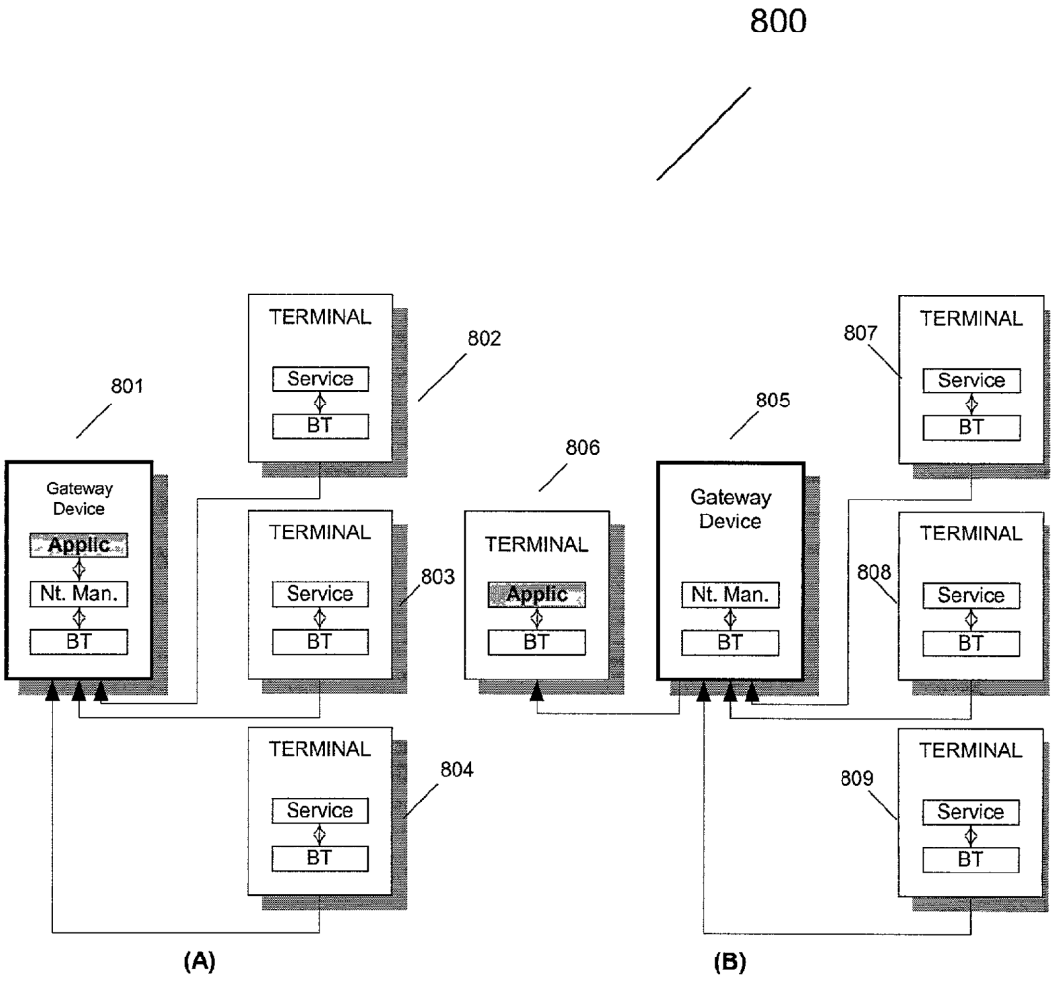

800
801
802
803
804
805
806
807
808
809
Gateway Device
Applic
Nt. Man.
BT
TERMINAL
Service
BT
(A)
(B)

Fig. 8

SYSTEM, DEVICE AND COMPUTER READABLE MEDIUM FOR PROVIDING A MANAGED WIRELESS NETWORK USING SHORT-RANGE RADIO SIGNALS

FIELD OF THE INVENTION

This invention relates generally to wireless devices in a wireless network using short-range radio signals.

BACKGROUND OF THE INVENTION

A user has numerous wireless devices for accessing and processing information. For example, a user may have a cellular telephone for communicating with others, a personal digital assistant ("PDA") for storing contact information, a laptop computer for storing and processing files, a digital camera for obtaining images and a pager for being contacted. Each one of these devices also may access remote information on a private or public network, such as the Internet. However, this system suffers from several disadvantages.

First, typically only a single device originates and can access the Internet at a time.

Second, Internet protocol ("IP") addresses are held while connected to the Internet. This can be expensive and use scarce IP address resources.

Third, each device requires its own security management, such as a Virtual Private Network ("VPN") and firewall software component.

Fourth, there is no ability to share, add to or manage the services of the numerous wireless devices. In particular, there is no communication between wireless devices. If a user obtains a wireless device having an additional service, such as extra persistence storage, other wireless devices typically are not capable of using the extra persistence storage.

Bluetooth™ technology (www.bluetooth.com) provides wireless communications between devices. Yet, Bluetooth™ technology also suffers from many disadvantages. Bluetooth™ technology does not allow for a "plug and play" capability at a wireless device application level. In other words, a wireless device cannot merely be turned on and Bluetooth™ technology recognizes it and establishes a communication protocol. If a user desires a wireless device to communicate with a Bluetooth™ technology device, the added wireless device must have software drivers and applications loaded to operate. Otherwise, the Bluetooth™ technology device is not able to communicate with the newly added wireless device. This makes it difficult to add new functionality or types of wireless devices. Bluetooth™ technology does not provide an open environment for software programmers to provide application software components for wireless devices. Further, Bluetooth™ technology does not allow devices to share information and resources at an application level.

Therefore, it is desirable to provide a system of wireless devices which can effectively communicate with each other and access information on the Internet. The system of wireless devices should efficiently use IP resources and security management. The wireless devices should effectively share and manage services and allow for seamless plug and play capability. The system should allow for new functionality and types of wireless devices.

SUMMARY OF THE INVENTION

A system, coupled to a cellular network, provides access to the Internet according to an embodiment of the present invention. The system comprises a wireless gateway device, coupled to the cellular network, having a network manager software component for accessing information from the Internet responsive to a first short-range radio signal. A first wireless device is coupled to the wireless gateway device. The first wireless device provides the first short-range radio signal.

According to an embodiment of the present invention, the first wireless device is selected from a group consisting of a desktop computer, a laptop computer, a personal digital assistant, a headset, a printer, a pager, a watch, digital camera and an equivalent thereof.

According to an embodiment of the present invention, the wireless gateway device is a cellular telephone using a Global System for Mobile communications ("GSM") protocol.

According to an embodiment of the present invention, the wireless gateway device is a cellular telephone using a Code Division Multiple Access ("CDMA") protocol.

According to an embodiment of the present invention, the wireless gateway device is a cellular telephone using a Time Division Multiple Access ("TDMA") protocol.

According to an embodiment of the present invention, the first wireless device is a thin terminal.

According to an embodiment of the present invention, the first wireless device includes a Bluetooth™ processor having a 2.4 GHZ transmitter.

According to an embodiment of the present invention, the wireless gateway device includes a Bluetooth™ processor having a 2.4 GHZ transmitter.

According to an embodiment of the present invention, the network manager software component includes a plug and play software component for loading and executing software for the first wireless device.

According to an embodiment of the present invention, the network manager software component includes a PIN number management software component for obtaining and supplying PIN numbers.

According to embodiment of the present invention, the network manager software component includes a service repository software component for obtaining and providing an availability of a service from the first wireless device.

According to an embodiment of the present invention, the first wireless device includes an application software component for providing a service. The network manager software component includes a management software component for accessing the service.

According to an embodiment of the present invention, the system further comprises a second wireless device coupled to the wireless gateway device. The second wireless device provides a short-range signal. The first wireless device communicates with the second wireless device through the wireless gateway device.

According to an embodiment of the present invention, the system further comprises a second wireless device coupled to the wireless gateway device. The wireless gateway device provides access to the Internet for the first and second wireless devices.

According to an embodiment of the present invention, the network manager software component operates with an operating system software component.

According to an embodiment of the present invention, the operating system component is a Linux, EPOC or a PocketPC operating system.

According to an embodiment of the present invention, the wireless gateway device includes 1) an application software component for providing a service, and 2) an application server software component coupled to the network management software component.

According to an embodiment of the present invention, the wireless gateway device further includes a firewall software component.

According to an embodiment of the present invention, the wireless gateway device includes a VPN software component.

According to an embodiment of the present invention, a hand-held device for providing a personal area network is provided. The hand-held device comprises a storage device coupled to a processor. The storage device stores a software component for controlling the processor. The processor operates with the component to provide a short-range radio Internet protocol communication between the first hand-held wireless device and a second hand-held wireless device.

According to an embodiment of the present invention, a Bluetooth™ transmitter is coupled to the processor.

According to an embodiment of the present invention, a GSM transmitter is coupled to the processor.

According to an embodiment of the present invention, a wireless hand-held device accesses a router in a personal network. The wireless hand-held device comprises a storage device coupled to a processor. The storage device stores a software component for controlling the processor. The processor operates with the component to provide a first short-range radio signal to the router for accessing the Internet and a second short-range radio signal to the router for accessing another wireless hand-held device.

According to an embodiment of the present invention, an article of manufacture, including a computer readable medium is provided. The article of manufacture comprises an application software component for providing a service. An application server software component provides the application software component. The article of manufacture also includes an Internet protocol network manager software component and an operating system software component. Also, a short-range radio software component for providing a short-range radio signal and a cellular software component for providing a communications signal to a cellular network is included with the article of manufacture.

Other aspects and advantages of the present invention can be seen upon review of the figures, the detailed description, and the claims that follow.

BRIEF DESCRIPTION OF THE FIGURES

FIG. **1** illustrates a system according to an embodiment of the present invention.

FIG. **2** illustrates thin terminals and a wireless gateway device according to an embodiment of the present invention.

FIGS. **3***a–b* are hardware block diagrams of a wireless gateway device and wireless hand held device according to an embodiment of the present invention.

FIGS. **4** and **5***a–b* are software block diagrams for a wireless gateway device according to an embodiment of the present invention.

FIG. **6** illustrates network management software interfaces according to an embodiment of the present invention.

FIG. **7** illustrates network management software components according to an embodiment of the present invention.

FIGS. **8***a–b* illustrate multiple wireless devices coupled to a wireless gateway device according to an embodiment of the present invention.

DETAILED DESCRIPTION

I. System Overview

The following description and claims relate to a system that accesses information from a wide area network ("WAN"), such as the Internet, and local wireless devices in response to short-range radio signals. The network may also be an IP based public or private network, such as a corporate secured network using VPN.

FIG. **1** illustrates system **100** according to an embodiment of the present invention. System **100** includes terminals **107** coupled to wireless gateway device **106**. In an embodiment of the present invention, gateway device **106** and one or more terminals **107** communicate to form a personal area network ("PAN"). In an embodiment of the present invention, terminals **107** are coupled to gateway device **106** by short-range radio signals **110**. In an embodiment of the present invention, terminals **107** are a desktop computer, a laptop computer, a personal digital assistant, a headset, a pager, a printer, a watch, thin terminal, digital camera or an equivalent thereof. In an embodiment of the present invention, terminals **107** include a Bluetooth™ 2.4 GHz transmitter/receiver. Likewise, gateway device **106** includes a Bluetooth™ 2.4 GHZ transmitter/receiver. In an alternate embodiment of the present invention, a Bluetooth™ 5.7 GHZ transmitter/receiver is used. Gateway device **106** and terminals **107** hardware are illustrated in FIGS. **3***a–b*.

In alternate embodiments of the present invention, other local wireless technologies such as 802.11 or HomeRF signals are used to communicate between gateway device **106** and terminals **107**.

In an embodiment of the present invention, gateway device **106** is coupled to cellular network **105** by cellular signals **111** using a protocol, such as a Global and System for Mobile communications ("GSM") protocol. In alternate embodiments, a Code Division Multiple Access ("CDMA"), CDMA 2000 or Time Division Multiple Access ("TDMA"), or General Packet Radio Service ("GPRS") protocol is used.

In an alternate embodiment of the present invention, gateway device **106** is coupled to a landline network by an Ethernet, Digital Subscriber Line ("DSL"), or cable modem connection, singly or in combination.

In an embodiment of the present invention, gateway device **106** is a cellular telephone.

Cellular network **105** is coupled to a wireless carrier internal network or carrier backbone **104**. In an embodiment of the present invention, server **102** is coupled to carrier backbone **104**. In an alternate embodiment of the present invention, carrier backbone **104** is coupled to Internet **103**. Server **101** is coupled to Internet **103**. In an embodiment of the present invention, servers **101** and **102** provide information, such as web pages or application software components to terminals **107** by way of gateway device **106**. In an embodiment of the present invention, terminals **107** share services and communicate by way of gateway device **106**.

II. Gateway/Handheld Device Hardware

FIG. **2** illustrates terminals **107**. In an embodiment of the present invention, there are two types of terminals: 1) Smart terminals and 2) Thin terminals. Smart terminals have a relatively powerful central processor, operating system and applications. Their main needs from a PAN are access to a WAN through TCP/IP and other network services such as

storage and execution. For example, a computer notebook and PDA are smart terminals. Thin terminals have a relatively low power central processor and operating system. They are mainly used as peripherals to an Application server in a PAN and their main task is user interaction, rendering output for a user and providing an Application server with a user's input. For example, a watch or a messaging terminal are thin terminals.

FIG. **2** illustrates thin terminals. Voice terminal **204** includes a display **204***b* and a retractable keypad **204***a*. Messaging Terminal **203** is illustrated in a closed position with a hinge **203***a* used to open and close terminal **203**. Terminal **203** also includes a miniature QWERTY keyboard and display when opened. Gateway device **201** includes clip **202** for a belt.

In an embodiment, PMG device **201** is also illustrated in FIG. **2**.

FIG. **3***a* illustrates a hardware block diagram of gateway device **106** in an embodiment of the present invention. Gateway device **106** includes both internal and removable memory. In particular, gateway device **106** includes internal FLASH (or Electrically Erasable Programmable Read-Only Memory ("EEPROM") and static Random Access Memory ("SRAM") memory **302** and **303**, respectively. Removable FLASH memory **304** is also used in an embodiment of the present invention. Memories **302**, **303** and **304** are coupled to bus **305**. In an embodiment of the present invention, bus **305** is an address and data bus. Application processor **301** is likewise coupled to bus **305**. In an embodiment of the present invention, processor **301** is a 32 bit processor.

Bluetooth™ processor **307** is also coupled to bus **305**. Bluetooth™ RF circuit **309** is coupled to Bluetooth™ processor **307** and antenna **313**. Processor **307**, RF circuit **309** and antenna **313** transmit and receive short-range radio signals to and from terminals **107** illustrated in FIG. **1**, or device **350** illustrated in FIG. **3***b*.

Cellular, such as GSM, signals are transmitted and received using digital circuit **306**, analog circuit **308**, transmitter **310**, receiver **311** and antenna **312**. Digital circuit **306** is coupled to bus **305**. In alternate embodiments, gateway device **106** includes a display, a speaker, a microphone, a keypad and a touchscreen, singly or in combination thereof.

FIG. **3***b* illustrates device **350** that is a hand-held device in an embodiment of the present invention. Device **350**, in an embodiment of the present invention, is one of the terminals **107** illustrated in FIG. **1**. Similar to gateway device **106**, device **350** includes SRAM and FLASH memory **351** and **352**, respectively. Memories **351** and **352** are coupled to bus **357**. In an embodiment of the present invention, bus **357** is an address and data bus. Keypad **353** is also coupled to bus **357**. Short-range radio signals are transmitted and received using Bluetooth™ processor **354** and Bluetooth™ RF circuit **355**. Antenna **356** is coupled to Bluetooth™ RF circuit **355**. In an embodiment of the present invention, antenna **356** transmits and receives short-range radio signals from gateway device **300**. In alternate embodiments, device **350** includes a display, a speaker, a microphone, a keypad and a touchscreen, singly or in combination thereof.

III. Gateway Software

FIG. **4** illustrates a software architecture **400** for gateway device **106** illustrated in FIG. **3***a* according to an embodiment of the present invention. Gateway software **400** is stored in FLASH **302**. In an embodiment of the present invention, software components referenced in FIGS. **4**–**7** represent a software program, a software object, a software function, a software subroutine, a software method, a software instance, a code fragment, singly or in combination. In an alternate embodiment, functions performed by software components illustrated in FIGS. **4**–**7** are carried out completely or partially by hardware.

In an embodiment of the present invention, gateway software **400**, or components of gateway software **400**, is stored in an article of manufacture, such as a computer readable medium. For example, gateway software **400** is stored in a magnetic hard disk, an optical disk, a floppy disk, CD-ROM (Compact Disk ReadOnly Memory), RAM (Random Access Memory), ROM (Read-Only Memory), or other readable or writeable data storage technologies, singly or in combination. In yet another embodiment, gateway software **400**, or components thereof, is downloaded from server **101** illustrated in FIG. **1**.

Gateway software **400** includes telecommunication software or physical layer protocol stacks, in particular cellular communications software **401** and short-range radio communications software **402**. In an embodiment, communication software **401** is a GPRS baseband software component used with processor **306** to transmit and receive cellular signals. In an embodiment, communication software **402** is a Bluetooth™ baseband software component used with processor **307** to transmit and receive short-range radio signals.

In an embodiment of the present invention, operating system **403** is used to communicate with telecommunications software **401** and **402**. In an embodiment of the present invention, operating system **403** is a Linux operating system, EPOC operating system available from Symbian software of London, United Kingdom or a PocketPC or a Stinger operating system available from Microsoft of Redmond, Wash. Operating system **403** manages hardware and enables execution space for gateway device software components.

Network Management software **404** is used to provide a number of functions according to embodiments of the present invention: 1) routing, 2) device plug and play, 3) PIN number management, 4) network device management, and 5) service repository. In an embodiment of the present invention, network management software **404** is programmed in C++ software language.

Smart phone application software **405** communicates with operating system **403** and is used in a cellular telephone embodiment of the present invention.

1st and 2nd software application components **406** communicate with management software **404** and provide additional services to a user. For example, application components **406** may include: 1) a stock quote application for providing stock quotes, 2) a personal information manager application including calendars, to do lists, emails, or contacts, 3) a synchronization software application for synchronizing databases, 4) a telephony application for providing telephone services, or 5) a location application for providing a current location of a gateway device.

Furthermore, Graphics User Interface ("GUI") **407** is provided to allow a user-friendly interface.

FIG. **5***a* illustrates detailed gateway software architecture **500**. In an embodiment of the present invention, network management software **404** illustrated in FIG. **4** includes three software components as illustrated in FIG. **5***a*: 1) PAN router **404***c*; 2) PAN server **404***b*; and 3) Application server **404***a*. GPRS baseband **503** and Bluetooth™ baseband **502** are software components used to generate communication signals to a cellular network **105** and terminals **107** as illustrated in FIG. **1**. In an alternate embodiment, other baseband software components **501** are used to generate

communication signals. Media abstraction layer **504** allows operating system **403** to communicate with basebands **503**, **502**, and **501**, respectively. Media abstraction layer **504** and other abstraction layers, described herein, translate a particular communication protocol, such as GPRS, into a standard command set used by a gateway device and/or terminal. The purpose of an abstraction layer is to isolate the physical stacks from the rest of the gateway device software components. This enables future usage of different physical stacks without changing any of the upper layer software and allows the gateway device software to work with any communication protocol.

PAN router **404***c* establishes a PAN network, implementing communication primitives, IP networking, IP services and similar tasks.

PAN server **404***b* is responsible for implementing PAN oriented services such as plug and play, terminal enumeration, application loading, storage space and other services. In an embodiment, PAN server **404***b* communicates directly with applications **406** using application drivers.

PAN application server **404***a* is responsible for implementing user and terminal oriented services and enables thin terminals. In an embodiment of the present invention, PAN application server **404***a* implements such applications as a GUI **407**, a remote terminal driver application, a location application, a telephony application or an equivalent thereof.

FIG. **5***a*, like FIG. **4**, illustrates 1st and 2nd software component applications **406** and GUI **407**.

A. PAN Router

PAN router **404***c* enables a fully meshed IP based network. In an embodiment of the present invention, each terminal can leverage the existing IP protocol, exchange data with other terminals and gain access to a WAN through PAN router **404***c*.

FIG. **5***b* illustrates software components of PAN router **404***c*. In an embodiment of the present invention, routing component **550**, Bluetooth™ LAN access Profile component **551**, Dynamic Host Configuration Protocol/Point-to-Point Protocol ("DHCP/PPP") component **552** and Network Address Translator ("NAT") component **553** are used in PAN router **404***c*. In an alternate embodiment, Domain Naming Service ("DNS") component **554**, Tunneling and Optimization component **555** and Security component **556**, singly or in combination are used in PAN router **404***c*.

1. Routing Component

Routing component **550** is implemented in Router **404***c* in order to realize a fully meshed IP network with access to a WAN. A routing component is responsible for imitating a fully meshed network based on a Master/Slave network.

Routing component **550** enables exchange of IP packets between two terminals, broadcasting of IP packets between all terminals on a PAN and routing of IP packets to and from a WAN.

2. Bluetooth™ LAN Access Profile ("LAP") Component

A Bluetooth™ LAN Access Profile ("LAP") component **551** is used in order to enable terminals to seamlessly use IP base networking. LAP component **551** enables terminals to exchange IP packets between themselves and PAN router **404***c*. LAP component **551** is implemented over a PPP serial Bluetooth™ connection. In an embodiment of the present invention, terminals, such as Smart terminals, include LAP chipsets.

3. DHCP/PPP Component

DHCP and PPP components **552** are used in order to enable an IP network. PPP realizes an IP network layered over LAP component **551**.

DHCP component manages a PAN's IP address space and IP services, enabling terminals to get IP networking properties, such as an IP address for a terminal, an address of a DNS and an address of a default gateway device.

4. NAT Component

NAT component **553** translates a private IP address to and from a real IP address. Since mobile networks are typically capable of only providing a single IP address, the terminals will have to use private IP addresses supplied by NAT component **553**.

5. DNS Component

DNS component **554** translates services between human readable names and IP addresses. DNS component **554** enables a terminal to query another terminal's address based on the other terminal's name and to query for the IP address of a named service on a WAN.

6. Tunneling and Optimization Component

Tunneling and Optimization component **555** allows terminals to use standard protocols. For example, accessing a WAN through a cellular GPRS/CDMA network using TCP/IP yields poor results because TCP/IP does not behave well over a bandwidth limited, high latency and high packet loss network, such as GPRS/CDMA.

Tunneling and Optimization component **555** is used to enable practical usage of IP in such networks. When using cellular, the tunnel will be between a mobile device having a PAN router and a landline operator's network. The tunneling and optimization network translates IP packets to more efficient transport methods for the specific access technology, and vice versa in a fully transparent fashion.

7. Security Component

Accessing a WAN can typically be done in two ways: unsecured when accessing a public network, such as the Internet, or secured when accessing a private network, such as an Enterprise network, file system or Exchange server.

Security component **556** is a centralized managed way for controlling access to a secured private WAN. In order to avoid each one of the terminals from implementing its own security scheme and methods, a centralized security component **556** is used. In an embodiment of the present invention, security component **556** is a firewall **556***a*, VPN **556***b* or URL filter **556***c*, singly or in combination.

8. Usage Scenario

In this scenario, a user is a traveling professional, who has a PDA and needs to synchronize the PDA against a corporate Exchange server while on the road. This synchronization needs to be done securely as the only way to enter the

corporate network is via a certified and an information technology ("IT") manager approved VPN.

The user has a gateway device enabled handset with an embedded PAN router **404***c* and VPN client, which the IT manager installed.

As the user turns on the PDA, which is a Bluetooth™ equipped PDA with a LAP component **551**, the PDA connects to a gateway device handset via the LAP. The PDA receives a local PAN IP address.

The user loads the PDA synchronization software, which is configured to synchronize against the corporate Exchange server. When hitting the "Synchronize" button, the PDA opens a TCP connection to the IP address

The IP packets travel across the Bluetooth™ air interface to the handset using a PPP protocol. At the handset, the packets go through a NAT component and a local IP address is translated to a real Internet IP address. The real IP address goes to the VPN, which identifies the destination as the corporate LAN. The VPN packages the packet over its Internet tunnel, encrypts and signs it. The packet is then sent through the cellular air interface to the operator and the Internet, reaching the corporate VPN and Exchange servers. The PDA is totally unaware of this process.

B. PAN Server

PAN server **404***b* allows code to be downloaded to a PAN and executed in a central way. Similarly, PAN server **404***b* shares and stores data in a centralized manner.

1. PAN Server Interfaces

FIG. **6** illustrates software interfaces for PAN server **404***b*shown in FIG. **5***a*. PAN server **404***b* provides application program interfaces ("API") to applications **406**. Applications **406** also queries PAN server **404***b* for specific services and/or terminal attributes in a PAN. Applications **406** provide at least three types of information to PAN server **404***b*. Applications **406** provide a Personal Identification Number ("PIN") number, network configuration information, service registration and unregistration information. PAN server **404***a* provides services and devices enumeration information to applications **406**. In an embodiment of the present invention, a PIN number is an authorization code to enable a terminal to connect to a PAN.

PAN server **404***b* uses media abstraction layer **504** in order to communicate with terminals **107**. PAN server **404***b* transfers services and devices enumerations to PAN router **404***c*; while, a terminal ID number is provided to PAN server **404***b* from PAN router **404***c*. A terminal ID is a unique code for identifying a particular terminal. Finally, a PIN number is transferred from PAN server **404***b* to PAN router **404***c*.

In an embodiment of the present invention, PAN server **404***b* loads an executable application software component to a selected terminal. Application server **404***a* retrieves the application software component locally from gateway device **106** memory or from either server **102** or **103** as illustrated in FIG. **1**.

Backend middleware **485** provides a PIN number to router **404***c*. In an embodiment of the present invention, backend middleware **485** is stored on a server coupled to cellular network **105** shown in FIG. **1**. In an embodiment of the present invention, backend middleware **485** is a software component for supplying PIN numbers and accessing application components for a particular terminal.

2. PAN Server Components

FIG. **7** illustrates software components of PAN server **404***a* according to an embodiment of the present invention: 1) plug and play software component **701**, 2) PIN number management software component **702**, 3) management software component **703**, 4) service repository software component **704**, and 5) application loader **705**. In alternate embodiments, more or less components are used.

a. Plug and Play Component

When a new terminal is introduced to a PAN, the software to support this terminal needs to be located, downloaded and executed. The Plug and Play component is responsible for identifying the introduction of the new terminal and deciding on the software needed to be downloaded.

An example of the Plug and Play usage is when a new thin terminal, like a messaging terminal, is introduced to a PAN. The terminal itself, being thin, has no embedded application code or data. The appropriate software package (messaging software in this case) needs to be found, downloaded and executed. The Plug and Play component will identify the messaging terminal and resolve the needed software to support it.

FIG. **7** illustrates the operation of Plug & Play component **701**. In response to a terminal ID from PAN router **404***c*, Plug and Play component **701** will access the software package for a selected terminal from backend middleware **485** or locally from gateway device **106** memory. If the selected package is not locally available in gateway device **106** memory, a URL is provided from backend middleware **485** for accessing the package remotely. In an embodiment of the present invention, the selected package will install and run on different modules (typically but not necessarily a shell, service/terminal drivers and applications that can run on the terminal).

b. Application Loader Component

Adding new capabilities to a PAN involves the loading of executable code to a PAN execution environment. Application loading can be a result of many events: plug and play component **701** can generate an application loading for supporting a new terminal on a PAN, a user can decide to actively load an application to a PAN or an operator on a cellular network can decide to load an application to a PAN. Application loader **705** is responsible for application software code transfer and execution.

c. PIN Number Management Component

Whenever gateway device **106** and a terminal become aware of each other, a pairing process takes place between them. For example, gateway device **801** and terminal **802** are paired as illustrated in FIG. **8***a*. When this pairing takes place for a first time (or when the link key that they were sharing has been lost in one or both sides for any reason), a claimant side (for example, gateway device **801**) must know a PIN number of terminal **802** in order to carry out a successful pairing. PAN server **404***b*will supply PIN number information to PAN router **404***c* for that purpose. A PIN number is used to generate an initialization key that is used as an encryption key for the exchange of initial parameters between a gateway device and terminals. In an embodiment of the present invention, PAN server **404***b* must be able to supply PIN number information according to different cri-

teria. For example, PAN server **404***b* supplies PIN numbers for only those terminals that are associated with a certain terminal class or ID number.

PAN server **404***b* will supply a PIN number upon an explicit request of another component, such as PAN router **404***c*. In an alternate embodiment, Application server **404***b* will supply PIN number information for terminals in order for them to establish a Bluetooth™ channel with other terminals without a gateway device **107** as a mediator.

In an embodiment of the present invention, PIN numbers are available from backend middleware **485**. In alternate embodiments of the present invention, applications **406** provide a PIN number. For example, an application may allow a user to enter a PIN number or an application may cause backend middleware **485** to generate a PIN number. In an embodiment of the present invention, an application that supplies a PIN number states its origin.

There are two methods for obtaining PIN numbers. First, a push method occurs when the source of the PIN number transfers the PIN number when it becomes available. Second, a query method occurs when router **404***c* queries the source of the PIN number for a PIN number according to a certain criteria. A push method is preferred because it enables an immediate response to a request for a PIN number. However, if the PIN number is not available when a request arrives at the source of the PIN number, PAN server **404***b* attempts to obtain the PIN number using the query method. When the push method is used, the stimulus comes from the PIN number information source.

PIN number management software component **702** maintains a local database of PIN numbers with some attributes. An attribute may include a terminal class or terminal ID. PIN number management software component **702** adds, deletes and retrieves PIN numbers from the database. PIN number software component **702** also may retrieve all PIN numbers associated with a screen terminal class. In an embodiment, PIN number management software component **702** will have a persistent database. In an alternate embodiment, PIN number management software component **702** will not have a persistent database.

In alternate embodiments of the present invention, PIN number management **702** is a central storage location for PAN databases and/or caching. The storage component supports implementation of a file system that can be accessed by a terminal. Also, a storage component may have automatic backup to a backend server or transparent storage.

d. Network Management Component

Management software component **703** provides functions to configure a PAN.

First, management software component **703** provides a disconnect service function that forces specific applications to disconnect from a specific service.

Second, management software component **703** provides a disconnect terminal function that forces specific applications to disconnect from all services of a specific terminal.

Third, management software component **703** provides a disable service function that halts any usage of a specific terminal's service.

Fourth, management software component **703** provides a disable terminal function that halts any usage of all services of a specific terminal.

The disconnecting functions described above allow a high priority application to obtain a service from an application using the service. The disabling functions allow for high priority applications to create personal area network restrictions.

Service repository software component **704** is used to cease offering services. PIN Number management **702** is used to delete a PIN number and abstraction layer I/O is used to halt service's data traffic.

e. Enumeration or Service Repository Component

Service repository software component **704** allows applications **406**, which run on a gateway device **106** or terminals **107**, to discover what services are offered by a PAN, and to determine the characteristics of the available services. The service could be offered by remote terminal, such as an application in terminal **806** illustrated in FIG. **8***b*. For example, terminal **806** could be a printer having a printing service. Also, the service could be offered by an application stored on gateway device **106**, such as the application in gateway device **801** illustrated in FIG. **8***a*. For example, gateway device **801** is a cellular telephone having a telephony service provided by a cellular telephone application. Remote services are offered with the assistance of service logical drivers (SLDs) that are stored on gateway device **106**. Whenever an application is interested in using a terminal service, the terminal interoperates with the corresponding gateway device SLD. For example, an application on terminal **809**, shown in FIG. **8***b*, accesses a driver in gateway device **805** for a service provided by an application on terminal **806**. Therefore, from an application's point of view, the SLD of the remote service acts the same way as a local application.

Service repository software component **704** offers a plurality of functions.

First, service repository software component **704** provides service registration of a service offered by application, or a hardware capability offered by terminal driver.

Second, service repository software component **704** provides service unregistration that cancels a registered service.

Third, service repository software component **704** provides registered services that suit a specific class.

Fourth, service repository software component **704** also provides searching of services. This function describes whether listed terminals support listed services. This function enables an application to quickly locate a specific service. A search of a general class of service, such as a search for a printers may be performed. Likewise, a search for specific attributes associated with that service, for example laser or color, is provided. Further, a search for specific instance of a service, for example a HP LaserJet model GTI, is also provided.

Fifth, service repository software component **704** provides the capability of describing the participating terminals in a personal area network. The existence of these terminals is derived from a service registration function.

Sixth, service repository software component **704** provides a disabling function that ceases offering an unfriendly service.

Seventh, service repository software component **704** also provides an enabling function that cancels service disabling.

Eighth, service repository software component **704** provides a terminal disabling function that ceases offering all the services associated with an unfriendly terminal.

Ninth, service repository software component **704** provides a terminal enabling function that cancels terminal disabling.

In an embodiment, an application does not have to discover a service in order to connect with a terminal. If an application has previous knowledge of a terminal's service, the application needs to only search for the specific terminal.

In an embodiment of the present invention, service repository component **704** describes the terminals and the services that are available at a particular time, but service repository software component **704** does not describe the current status of the services. A service might be available in a PAN but not necessarily accessible since another application is exclusively using the service.

Since service repository software component **704** operates with local and remote applications, a uniform interface is used. In an embodiment of the present invention, remote applications use a Bluetooth™ Service Discovery Protocol ("SDP") to discover what services gateway device **106** offers. Similarly, local applications use SDP in an embodiment of the present invention.

C. Application Server

Application Server component **404***a* illustrated in FIG. **5***a* allows for removing redundant capabilities from terminals and consolidating them in a centralized application server. This allows significant added value in minimizing the cost and complexity of the terminals in a PAN, as well as making their design intuitive and easy to use.

In an embodiment of the present invention, application server component **404***a* includes two components: 1) an execution environment and 2) services for being able to successfully execute software on a multi-terminal PAN, such as a file system.

Thin terminals, being optimized for low cost will not include an IP capability in most cases. Instead, they will use the native protocols offered by the PAN's physical layer. This does not conflict with the PAN router **404***c* since thin terminals are an extended remote I/O for applications running on a PAN application server **404***a*. All the logic, protocols and standard compatibility is implemented in the application server, in which standard protocols like IP are implemented and used.

1. Usage Scenario

In an embodiment of the present invention, a thin messaging terminal includes a color Liquid Crystal Display ("LCD"), QWERTY keypad, Bluetooth™ chipset and a small software stack for displaying graphical screens received over the Bluetooth™ air interface and transmit keypad actions back over the Bluetooth™ air interface.

When a terminal is turned on for the first time, a Plug and Play component **701** in the gateway device **106** identifies that this is a new terminal. Gateway device **106** communicates with Plug and Play component **701** in order to retrieve the needed software package to be executed on an application server **404***a*. In an embodiment of the present invention, a Plug and Play component **701** contains a URL for a chatting application package.

Application loader **705** gets the URL and loads the new package to PAN application server **404***a* in a gateway device **106** and executes the chatting software application. The chatting application software identifies the messaging device by enumerating a PAN for terminals and capabilities, and attaches itself to the right remote graphical driver and the remote keypad driver.

Now, all user interactions for the chatting application is displayed on the messaging terminal, and the keypad entries on the terminal are sent to the chatting application.

In this embodiment of the present invention, the terminal is used only for I/O and user interaction. The actual chatting logic is executed in application server **404***a*, which is located in gateway device **106**.

IV. Gateway Device/Terminal Operations

A. Terminal Joins Personal Area Network

First, PAN router **404***c* requests a PIN number from PIN number management component **702**. Second, if a PIN number is available, PIN number management **702** transfers the PIN number to PAN router **404***c*. Otherwise, PIN number management **702** attempts to obtain the PIN number from other sources, such as applications **406** or backend middleware **485**, and transfers the PIN number to PAN router **404***c*. Third, PAN router **404***c* notifies plug and play **701** that a pairing has ended and delivers a terminal ID to plug and play **701**. Fourth, plug and play **701** resolves the terminal package URL with backend middleware **485** if a package is not locally available; otherwise, the package is loaded and executed. Finally, if the package contains drivers, the driver's services are offered to service repository **704**.

B. Pin Number Received

Backend middleware **485** or an application acquires a PIN number. Second, the acquired PIN number is offered to PIN number management **702** by either backend middleware **485** or applications **406**. In an alternate embodiment of the present invention, a PIN number is offered with additional characteristics of the associated terminal. PIN number information is then accepted and stored with the attributes in a database of PIN number management **702**.

C. Gateway Device Application Queries for a Specific Service

There are two methods for a gateway device **106** application to inquire for a specific service. The first terminal method includes the application asking service repository **704** to describe the terminals in the current personal area network and to describe whether any of these terminals provide the requested service. In an embodiment of the present invention, an application sorts the available terminals in order of preference. The application then queries abstraction layer I/O whether the most preferred terminal's service is available.

The second service method includes an application querying service repository **704** to provide the registered services that suit a requested service class. The application then searches the registered services to determine which capabilities are provided by the registered services. In an embodiment of the present invention, an application sorts the available services in order of preference. The application then queries abstract layer I/O whether the most preferred service is available.

D. Terminal Application Queries for a Gateway Device Service

Media abstraction layer **504** obtains an SDP of a remote terminal application. Media abstraction layer **504** passes the SDP call to service repository **704**. Service repository **704** answers media abstraction layer **504**, using SDP, according to services that are registered. The abstraction layer **504** then sends the answers to an application on remote terminal.

In an alternate embodiment, service repository **704** pushes new services to a Bluetooth™ stack SDP database. The Bluetooth™ stack replies automatically and generates an SDP request.

E. High Priority Application Prevents Terminal Usage

In response to a network configuration signal from a high priority application in applications **406**, management component **703** generates a delete PIN number signal to PIN number management component **702** which deletes the PIN number associated with the selected terminal. Management component **703** generates a disable signal to service repository component **704** to cease offering all the services associated with the selected terminal. Management component **703** generates a disable service signal to abstraction layer I/O in order to halt all the transport to and from the selected terminal's services.

Abstraction layer I/O sends halt notifications to the applications that are currently using the selected terminal's services. Abstraction layer I/O then stops any data transport to and from the selected terminal's services.

V. Conclusion

The foregoing description of the preferred embodiments of the present invention has been provided for the purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise forms disclosed. Obviously, many modifications and variations will be apparent to practitioners skilled in the art. The embodiments were chosen and described in order to best explain the principles of the invention and its practical applications, thereby enabling others skilled in the art to understand the invention for various embodiments and with the various modifications as are suited to the particular use contemplated. It is intended that the scope of the invention be defined by the following claims and their equivalents.

What is claimed is:

1. A system for providing access to the Internet, comprising:

a first wireless device, in a short distance wireless network, having a software component to access information from the Internet by communicating with a cellular network in response to a first short-range radio signal, wherein the first wireless device communicates with the cellular network and receives the first short-range radio signal; and,

a second wireless device, in the short distance wireless network, to provide the first short-range radio signal,

wherein the software component includes a network address translator software component to translate between a first Internet Protocol ("IP") address provided to the first wireless device from the cellular network and a second address for the second wireless device provided by the first wireless device,

wherein the software component includes a service repository software component to identify a service provided by the second wireless device.

2. The system of claim **1**, wherein the second wireless device is selected from a group consisting of a desktop computer, a laptop computer, a personal digital assistant, a headset, a pager, a printer, a watch, and a digital camera.

3. The system of claim **1**, wherein the first wireless device is a cellular telephone using a protocol selected from a group consisting of a Global System for Mobile Communications ("GSM") protocol, a Code Division Multiple Access ("CDMA") protocol, a cellular telephone using a CDMA 2000 protocol, and a Time Division Multiple Access ("TDMA") protocol.

4. The system of claim 1, wherein the service repository software component identifies whether the service is available at a particular time.

5. The system of claim **1**, wherein the software component includes a domain naming service ("DNS") software component to translate between a human readable name and a second Internet Protocol ("IP") address.

6. The system of claim **1**, wherein the software component includes a security software component to control access between the cellular network and the first wireless device.

7. The system of claim **1**, wherein the second wireless device is a thin terminal.

8. The system of claim **1**, wherein the second wireless device includes a Bluetooth™ processor and a 2.4 GHZ transmitter.

9. The system of claim **1**, wherein the first wireless device includes a Bluetooth™ processor and a 2.4 GHZ transmitter.

10. The system of claim **1**, wherein the second wireless device includes a Bluetooth™ processor and a 5.7 GHZ transmitter.

11. The system of claim **1**, wherein the first wireless device includes a Bluetooth™ processor and a 5.7 GHZ transmitter.

12. The system of claim **1**, wherein the software component includes a plug and play software component to load and execute software for the second wireless device.

13. The system of claim **1**, wherein the software component includes a PIN number management software component to obtain and provide PIN numbers.

14. The system of claim **1**, wherein the second wireless device includes an application software component that registers an availability of the service with the service repository software component.

15. The system of claim **1**, furthering comprising:

a third wireless device, in the short distance wireless network, having an application software component to obtain the service from the second wireless device.

16. The system of claim **15**, wherein the first wireless device includes a service logical driver corresponding to the service, and wherein the application software component uses the service logical driver to obtain the service from the second wireless device.

17. The system of claim **1**, wherein the software component operates with an operating system software component.

18. The system of claim **17**, wherein the operating system software component is a Stinger operating system.

19. The system of claim **17**, wherein the operating system software component is a Linux operating system.

20. The system of claim **17**, wherein the operating system software component is a EPOC operating system.

21. The system of claim **17**, wherein the operating system software component is a PocketPCoperating system.

22. The system of claim **1**, wherein the service repository software component identifies a class, attribute and instance of the service.

23. The system of claim **1**, wherein the first wireless device further includes a virtual private network ("VPN") software component.

24. The system of claim **1**, wherein the first wireless device further includes a firewall software component.

25. A system for providing access to information on a cellular network, comprising:

a first wireless device, in a short distance wireless network, to provide a first short-range radio signal; and,

a second wireless device, in the short distance wireless network and the cellular network, to selectively transfer information, including Internet Protocol ("IP") data packets, between the first wireless device and the cellular network in response to a security software component,

wherein the second wireless device includes a service repository software component that identifies a plurality of services, in the short distance wireless network, associated with a plurality of wireless devices, and wherein the service repository software component searches for a service, in the plurality of services, to be used by an application software component stored in the first wireless device.

26. The system of claim **25**, wherein the first wireless device provides execution space for executable software from the second wireless device.

27. The system of claim **25**, wherein the security software component is a firewall software component to control access to the cellular network.

28. The system of claim **25**, wherein the security software component is a virtual private network ("VPN") to control access to the cellular network.

29. The system of claim **25**, wherein the security software component is a uniform resource locator ("URL") filter to control access to the cellular network.

30. The system of claim **25**, wherein the first short-range radio signal is selected from a group consisting of a HomeRF signal, an 802.11 signal and Bluetooth™.

31. The system of claim **25**, wherein the information is provided in the form of data packets.

32. The system of claim **25**, wherein the second wireless device is coupled to the cellular network by a landline network.

33. The system of claim **25**, wherein the second wireless device is coupled to the cellular network by either an Ethernet connection, DSL connection or a cable modem.

34. A handheld device for providing a short distance wireless network, comprising:

a storage device;

a processor, coupled to the storage device; and,

the storage device to store a software component; and, the processor operative with the software component to:

provide an Internet Protocol ("IP") data packet from the handheld device to a terminal using short-range radio signals,

control access between the short distance wireless network and a cellular network,

translate between a first IP address provided to the handheld device and a second IP address for the terminal provided by the handheld device in the short distance wireless network,

enumerate a list of services available from the handheld device and the terminal, wherein the handheld device and terminal register services available on the list, and

search the list of services for a service to be used by an application software component stored on the terminal.

35. The device of claim **34**, wherein the software component includes a management software component.

36. The device of claim **34**, wherein the application software component uses a service logical driver stored in the storage device to obtain a service available on the handheld device.

37. The device of claim **34**, further comprising: a Bluetooth™ transmitter, coupled to the processor, to generate the short-range radio signals.

38. The device of claim **34**, further comprising: a GSM transmitter, coupled to the processor.

39. The device of claim **34**, wherein the search includes searching the list of services by class, attribute or instance.

40. The device of claim **34**, wherein the software component includes a plug and play software component to identify the terminal in the short distance wireless network and obtain the application software component for the terminal.

41. The device of claim **34**, wherein the software component includes a PIN number management software component to provide a PIN number used in pairing the handheld device to the terminal in the short distance wireless network.

42. A first wireless handheld device, comprising:

a storage device;

a processor, coupled to the storage device; and,

the storage device to store a software component; and, the processor operative with the software component to:

access the Internet through a cellular network,

provide a first short-range radio signal to a second wireless handheld device and a second short-range radio signal to a third wireless handheld device,

control access between the Internet and the first, second and third wireless handheld devices,

translate between a first Internet Protocol ("IP") address provided to the first wireless handheld device from the cellular network and a second address for the second wireless handheld device provided by the first wireless handheld device, and a third address for the third wireless handheld device provided by the first wireless device,

enumerate a list of services available from the first, second and third wireless handheld devices, wherein the first, second and third wireless handheld devices register services available on the list, and

search the list of services for a class of service to be used by an application software component at a particular time, the application software component stored on the second wireless handheld device.

43. The first wireless handheld device of claim **42**, wherein the first wireless handheld device includes a service logical driver corresponding to a service available from the third wireless device, and the application software component uses the service logical driver to obtain the service from the third wireless device.

44. The first wireless handheld device of claim **42**, wherein the first wireless handheld device includes a 5.7 GHZ transmitter coupled to the processor.

45. The first wireless handheld device of claim **42**, wherein the second wireless handheld device is selected from a group consisting of a desktop computer, a laptop computer, a personal digital assistant, a headset, a pager, a watch, and a thin terminal a digital camera.

46. The first wireless handheld device of claim **42**, wherein the second wireless handheld device is a thin terminal.

47. The first wireless handheld device of claim **42**, wherein the first wireless handheld device includes a 2.4 GHZ transmitter coupled to the processor.

48. An article of manufacture, including a computer readable medium, comprising:

a short-range radio software component to communicate with a device in a short distance wireless network by using a short-range radio signal;

a cellular software component to communicate with a cellular network by using a cellular signal;

a network software component to selectively transfer an Internet Protocol ("IP") data packet between the device and the cellular network;

a service repository software component to identify a plurality of available services from a plurality of devices in the short distance wireless network, the service repository software component having a uniform interface so that both a local application software component and a remote application software component identifies the plurality of available services; and

a plurality of service logical drivers corresponding to the plurality of available services that are used to obtain the plurality of services, the plurality of service logical drivers are used in obtaining the plurality of services.

49. The article of manufacture of claim **48**, wherein the cellular software component is a GSM component.

50. The article of manufacture of claim **48**, wherein the short-range radio software component is a Bluetooth™ component.

51. The article of manufacture of claim **48**, further comprising security software component to control access between the short distance wireless network and the cellular network.

52. The article of manufacture of claim **48**, further comprising a network address translator software component to translate between a first Internet Protocol ("IP") address and a second IP address.

53. The article of manufacture of claim **48** further comprising a domain naming service ("DNS") software component to translate between a human readable name and an Internet Protocol ("IP") address.

54. The article of manufacture of claim **48**, further comprising a plug and play software component to identify the terminal in the short distance wireless network and obtain an application software component for the terminal.

55. The article of manufacture of claim **48**, wherein the article of manufacture is a memory storage device in a cellular telephone.

56. A handheld device for providing a short distance wireless network, comprising:

a storage device;

means for identifying an availability of a plurality of services to a plurality of application software components in the short distance wireless network;

means for selectively providing the plurality of services to the plurality of application software components in the short distance wireless network; and

means for selectively transferring an Internet Protocol ("IP") data packet between a cellular network and a selected application software component in the plurality of application software components in the short distance wireless network.

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