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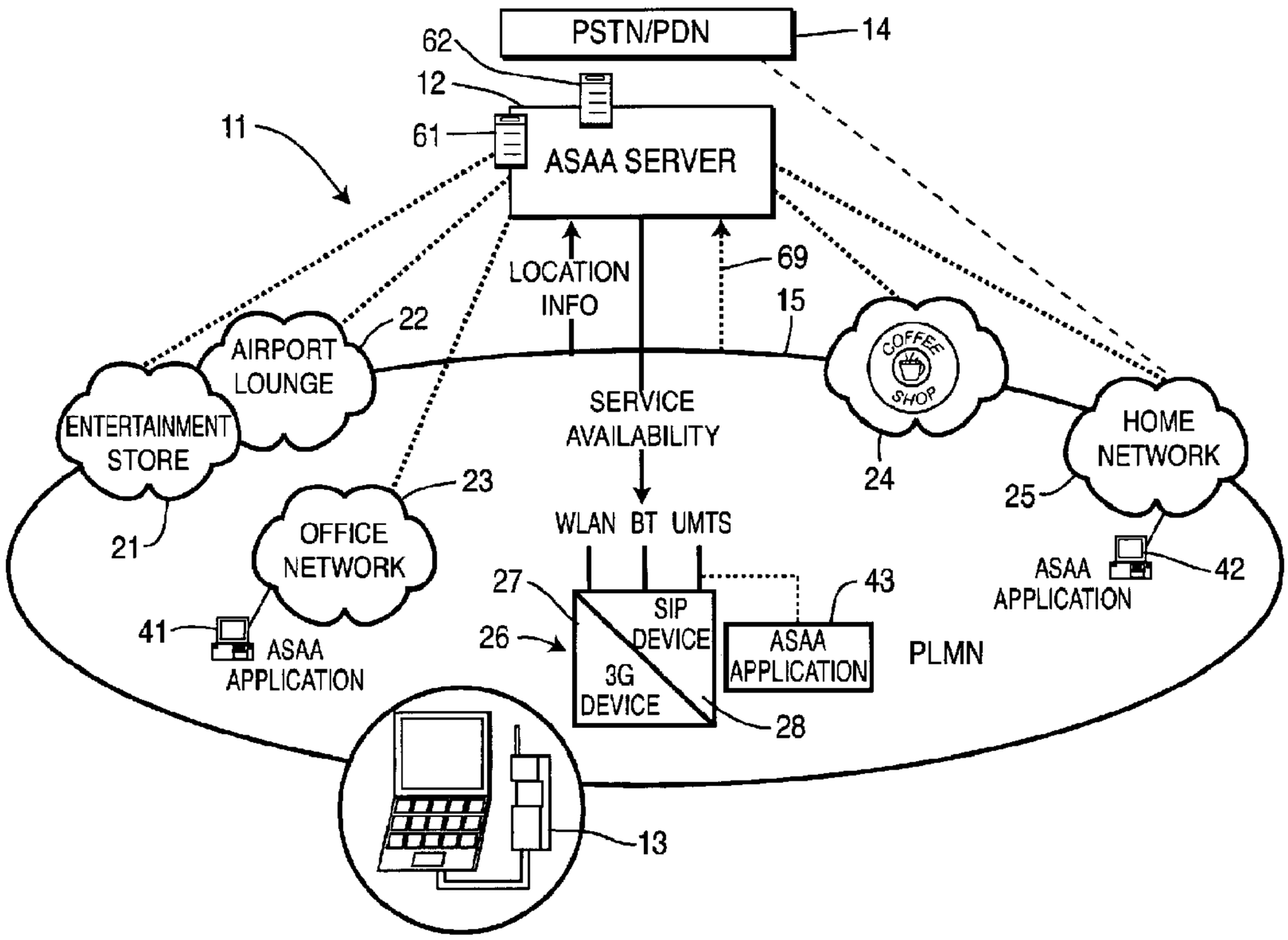
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(54) Titre : SYSTEME ET PROCEDE D'ACHEMINEMENT D'APPELS ET DE RADIOMESSAGERIE DANS DIFFERENTS TYPES DE RESEAUX

(54) Title: SYSTEM AND METHOD FOR CALL ROUTING AND PAGING ACROSS DIFFERENT TYPES OF NETWORKS



(57) Abrégé/Abstract:
A network architecture uses an Application Server Autonomous Access (ASAA) server (12) which allows paging and call routing across different types of wireless and wireline access networks. The ASAA server (12) provides connectivity between an external voice or data network (14) and a wireless transmit/receive unit (WTRU, 13). The external voice or data network (14) may be a public switched telephone network (PSTN) or a public data network (PDN), so that the connectivity between the external network (14) and the WTRU (13) is provided through the access networks using data from the ASAA server (12).

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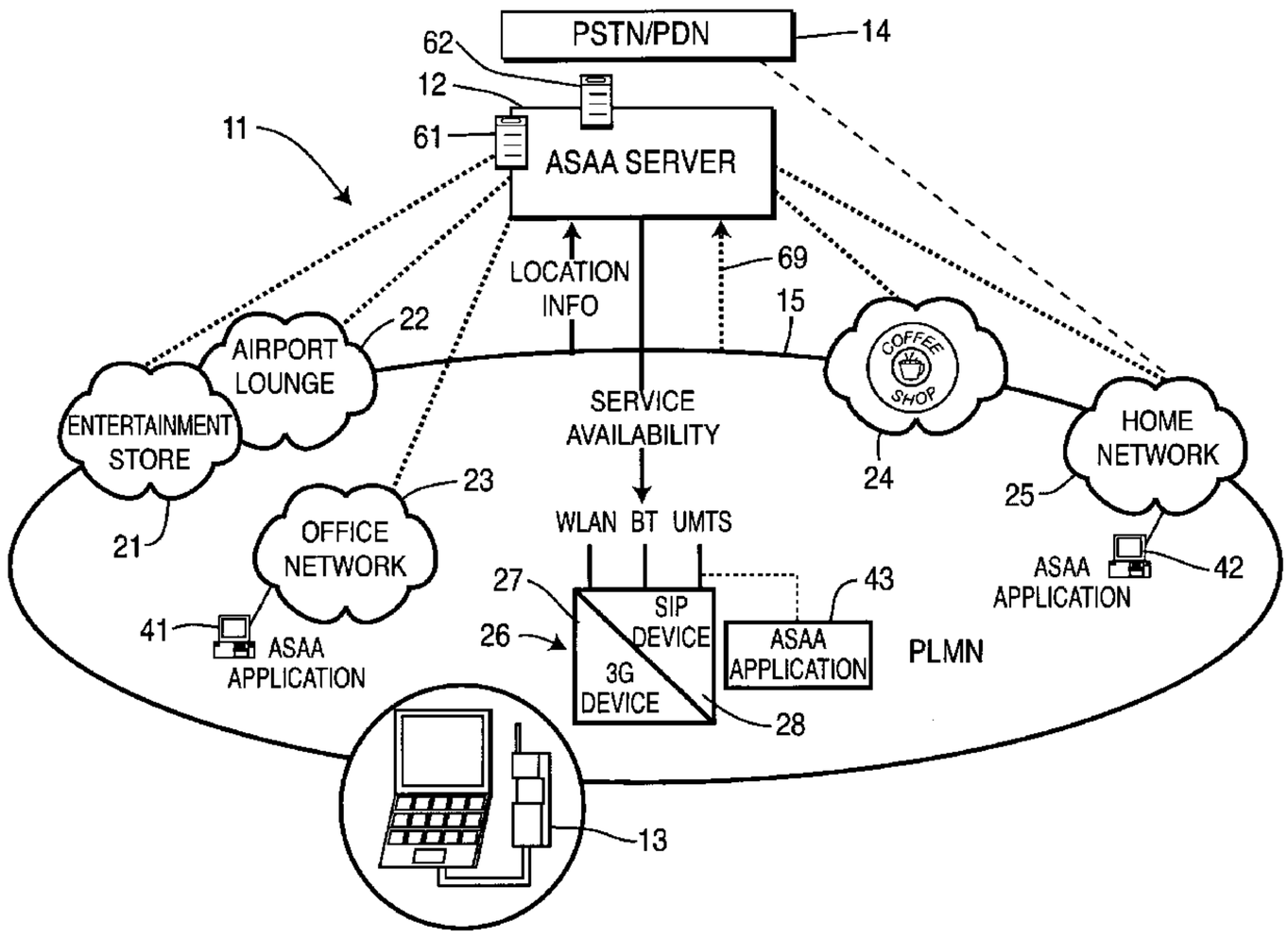
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(54) Title: SYSTEM AND METHOD FOR CALL ROUTING AND PAGING ACROSS DIFFERENT TYPES OF NETWORKS



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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

[0001] SYSTEM AND METHOD FOR CALL ROUTING AND PAGING ACROSS DIFFERENT TYPES OF NETWORKS

[0002] FIELD OF INVENTION

[0003] The present invention relates to networking architecture and wireless networking architecture. In particular the invention relates to the use of multiple network systems for communication services.

[0004] BACKGROUND

[0005] Current wireless technology allows a user to be paged for an incoming call, and for the call to be routed to the user's wireless transmit/receive unit (WTRU), within the domain of a single wireless access network. However, support of paging and call routing between different access technologies (e.g., 2G/3G wireless networks, CDMA 2000 networks, WLAN/Bluetooth networks) is not provided for with current mechanisms. A mechanism is desired whereby "application level" paging and call routing is possible across heterogeneous access networks, allowing a WTRU to roam between these networks and seamlessly receive calls via the currently connected access network.

[0006] SUMMARY

[0007] According to the present invention, an architecture for providing network services includes an Application Server Autonomous Access (ASAA) server which connects to a WTRU through at least a subset of the plurality of external voice and/or data communication networks. The ASAA server is responsive to received messages from the plurality of networks, such that a response to a paging request from a particular WTRU and received from one of the networks provides an indication of connectivity of the WTRU through said one of the networks. A communication is established between the network and the WTRU through network routing which includes said one of the networks in response to the received response to the paging request.

[0008] According to a further aspect of the present invention, wireless telecommunication services are provided to at least one WTRU by identifying one

or more wireless access networks capable of providing wireless links to the WTRU. A server is capable of communicating with a plurality of the wireless access networks and determines a status of the WTRU in the sense of an ability to establish a radio link to with one or more of the wireless access network. The server establishes a server communication link a wireless access networks with which the WTRU has an ability to establish a radio link and uses the communication link to establish communication with the WTRU. The server communication link is then used to establish communication between the WTRU and a further destination through one of the access networks.

[0008a] According to an embodiment of the present disclosure there is provided a method of providing wireless telecommunication services to a wireless transmit/receive unit (WTRU), the method comprising: issuing a paging request to the WTRU via a plurality of radio access networks based on a location of the WTRU; receiving a paging response from the WTRU via one of the radio access networks of the plurality of radio access networks, the paging response indicating the identity of the one radio access network; and routing a service to the WTRU via the one radio access network based on a WTRU user configured profile.

[0008b] According to another embodiment of the present disclosure there is provided a server for providing wireless telecommunication services to a wireless transmit/receive unit (WTRU), the server comprising: circuitry configured to issue a paging request to the WTRU via a plurality of radio access networks based on a location of the WTRU; circuitry configured to receive a paging response from the WTRU via one of the radio access networks of the plurality of radio access networks, the paging response indicating the identity of the one radio access network; and circuitry configured to route a service to the WTRU via the one radio access network based on a WTRU user configured profile.

[0009] BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Figure 1 is a schematic diagram showing an exemplary relationship between an ASAA server, network services and a WTRU according to the present invention.

[0011] Figure 2 is a diagram showing the relationship between a WTRU, an ASAA server and access networks.

[0012] Figure 3 is a flow diagram showing the functionality of one embodiment of the present invention.

[0013] Figure 4 is a flow diagram showing the functionality of an embodiment in which communications are initiated without prior establishment of an ASAA association with a WTRU.

[0014] DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0015] As used herein, the terminology "wireless transmit/receive unit" (WTRU) includes but is not limited to a user equipment, mobile station, fixed or mobile subscriber unit, pager, or any other type of device capable of operating in a wireless environment. The terminology "base station" includes but is not limited to a Node B, site controller, access point or any other type of interfacing device in a wireless environment. An "access point" (AP) is a station or device which provides a wireless access for devices to establish a wireless connection with a LAN, and establishes a part of a wireless LAN (WLAN). If the AP is a fixed device on a

WLAN, the AP is a station which transmits and receives data. The AP permits connection of a WTRU to a network, provided that the WLAN itself has a connection to the network.

[0016] According to the present invention, command, execution and user interface and paging and call routing is possible across heterogeneous access networks, allowing a user's wireless transmit/receive unit (WTRU) to roam between these networks and seamlessly receive calls via the currently connected access network. These services are deemed to be "application level" functions in that they are not dependent on a particular air interface. A system architecture allows paging and call routing across different types of wireless and wireline access networks. The system architecture is defined as adaptable to an Application Server Autonomous Access (ASAA) protocol and the protocol allows the paging and call routing across the different types of networks. According to the present invention, the services would come from the server, called an "ASAA Server". The individual networks would provide the wireless access in different domains, e.g. residence, enterprise, hotspot, and similar domains. The user may be subscribed to the different wireless access networks for access services, but also subscribe to consolidated services provisioning by the “ASAA operator”. Alternately, it is possible that the subscriber has one subscription with the ASAA operator, who pays access fees to the access operators. The handling within the access networks is achieved in the manner by which the various networks currently handle access.

[0017] ASAA provides a services framework for providing consistent, seamless services to the user, as the user roams between different access networks. The architecture allows the user to be reachable on incoming calls as the user roams between these different networks. It also allows the user to receive a consistent set of services as he/she roams between the access networks. The ASAA Server provides this service consolidation.

[0018] As the WTRU roams between these networks, the WTRU can seamlessly receive calls via the currently connected access network. In the architecture and system concept, a server provides a fixed point of interconnection

to the external voice/data network as the WTRU moves between different access networks. Examples of an external voice/data network are a public switched telephone network (PSTN) and a public data network (PDN). The ASAA architecture permits communication services at an application level to be provided a server independently of wireless connection services, and across different connection networks, and further permits transfer of application services between different connection networks. The ASAA architecture further permits services to be provided in a continuous manner with different WTRUs in the same communication session.

[0019] The ASAA architecture provides integration of network architecture such that different technology networks are interoperable with a wireless transmit/receive unit (WTRU). Examples of diverse networks include:

- third generation partnership program (3GPP) wideband code division multiple access (W-CDMA) communication system, which is an implementation of Universal Mobile Telecommunications System (UMTS);

- other wide-area public land mobile network (PLMN) systems;

- private networks, such as those implemented through WLAN systems, IEEE "802" systems and Bluetooth systems;

- private small office/home office (SOHO) networks, also implemented through WLAN systems, IEEE "802" systems and Bluetooth systems; and

- landline telephone network based systems.

[0020] In accordance with the present invention, the ASAA server consolidates location, service and routing information for subscribed users. The ASAA server routes calls and push services to the user's appropriate serving network, based on policy profiles. Policy profiles include location, technology network capabilities, behavioral factors, tariff criteria, and other criteria relevant to routing calls. The ASAA server permits use of Internet protocol (IP) based technologies, such as session initiation protocol (SIP), which supports technology convergence. The use of these standard protocols provide an ability for implementing ASAA architecture and services based on standard protocols such as IP and TCP/IP.

[0021] A WTRU configured in accordance with the present invention, with an ASAA application, will attempt to access the ASAA application server. This results in a registration action. Regular transmission of location information between the WTRU and the ASAA server provides the ASAA server with connection data. The ASAA protocol provides a consolidation of location, service and routing information for ASAA users across multiple technology networks. This allows seamless mobility between different technology networks, using a common IP-based scheme.

[0022] An ASAA server provides identification of network services available to the WTRU. When a call to the WTRU comes into the ASAA server, the ASAA server issues pages to the WTRU, via all the possible underlying access networks configured for the WTRU. The paging mechanism is IP-based, and functions at the application layer. The WTRU receives the paging request via the WTRU's current connected access network, and issues a paging response via the connected access network back to the ASAA server. The paging response informs the ASAA server of the identity of the WTRU's current connected access network. The ASAA server then routes the queued incoming call via that access network. This allows the user to be provided with a continuous service experience, as the WTRU moves between access networks. The ASAA server can provide a uniform set of supplementary services to the WTRU, regardless of which access network the WTRU is connected. The paging mechanism is at an end-to-end application level, preferably IP-based.

[0023] This allows seamless mobility, a seamless transfer function, and the ability to provide services which are transferable to different networks, providing that the particular network can support at least the communication of the service. This allows the user's profile to be applied across multiple networks, and allows the user to select services according to a single profile. Thus, if a particular service is free or offered at a flat rate, the user can predetermine to only accept the service according to the stated terms. Similarly, the use of the ASAA server permits the consolidation of services, such as billing.

[0024] Figure 1 is a schematic diagram of a network environment 11, showing an exemplary relationship between an ASAA server 12, network service entities and a WTRU 13 according to the present invention. Depicted in the figure, in addition to the network environment 11 and the ASAA server 12, is a public switched telephone network or public data network (PSTN/PDN) 14 and a public land mobile network (PLMN) 15.

[0025] The PLMN 15 includes a plurality of LANs 21-25, depicted as an entertainment store 21 at an airport location, an airport lounge 22, an office network 23, a coffee shop 24 offering WLAN services, and a home network 25. The PLMN 15 also includes large area mobile services 26, which in the example includes a 3G device 27 and a SIP device 28. The large area mobile services 26 provide communication via WLAN, BT and UMTS. The LANs 21-25 and large area mobile services 26 form access networks. Typical communications through the LANs 21-25 are according to the IP protocol, SIP protocol or other packet-switched protocols. Typically, such communications use a common channel and are assigned bandwidth according to demand.

[0026] A plurality of ASAA application servers 41-43 are provided at various locations including at WLAN 23, home network 25 and the large area mobile services 26. These provide application services through their respective access networks 23, 25 and 26, but are also accessible through other access networks.

[0027] The WTRU 13 is depicted and is able to communicate with various ones of the access networks 21-26. The ASAA server 12 is able to establish a communication link with the WTRU 13 by connecting directly or indirectly to individual ones of the networks 21-26 to which the WTRU 13 has established a communication link. The services come from the ASAA server in this architecture. The access networks provide access to the user and hence, calls and other interactions between the user and the ASAA server are routed through the access network to which the user is connected. This enables the ASAA server 12 to function as a service platform in order to deliver services to the user through the various ones of the access networks 21-26.

[0028] The WTRU 13 is able to communicate through various services as provided via the WLAN 23, but once connected, the ASAA server 12 can provide administrative functions to either provide services directly through the ASAA server 12, or request that services be routed between the various access networks 21-26 to an access network connected to the WTRU 13. The services are provided by the ASAA server 12 in this architecture. The access networks provide access to the WTRU 13, and hence calls and other interactions between the WTRU 13 and the ASAA server 12 are routed through the access network 21-26 to which the WTRU 13 is connected.

[0029] The ASAA server 12 also includes server function modules 61, 62. The server function modules 61, 62 provide administrative functions for operating the ASAA server 12, and maintain a database of locations of the WTRU 13 and availability of connections to the access networks 21-26. The server function modules 61, 62 also provide application functions which can be executed by the WTRU through connections to the access networks 21-26.

[0030] The ASAA server 12 provides an anchored interface to the PSTN/PDN 14 for receipt/transmission of call attempts, and routes incoming calls to the WTRU's serving access network based on the WTRU's location. In routing incoming calls, the ASAA server 12 pages all underlying possible serving access networks configured for the WTRU 13. The WTRU 13 responds with a paging response, routed through currently connected serving network. The ASAA server 12 then delivers incoming calls, via a serving access network to which the WTRU 13 is currently connected.

[0031] The WTRU 13 can also "force-route" incoming call through a specified serving access network by configuring the ASAA server 12 appropriately, with the identity of serving access network to route the call through to its destination. By specifying the access network, the WTRU 13 can control which services are used.

[0032] This architecture broadens the traditional cellular paging and call routing mechanisms to work across a range of access networks. In one embodiment, an IP based application-level paging mechanism, which operates across a variety of access networks to help locate the WTRU 13, is used.

[0033] One embodiment includes a provision of a consolidated interface, via the ASAA server 12, to allow PSTN/PDN 14 receipt of calls. The ASAA server 12 allows PSTN/PDN 14 receipt of calls to be effected through a single anchor point. The effect is that, from the user's standpoint, radio link services are provided by the particular radio links, which are the individual ones of the access networks 21-26. The service management, which is the user's interface, can be either one of the local network 21-26 or the ASAA server 12. Thus as indicated by dashed line 69, the system shifts the network administration for the user's services and the service management for the user "upward" from the individual access networks 21-26 to the ASAA server 12. The ASAA server 12 then becomes a virtual server from the user's perspective. Network services are provided by the individual access networks 21-26 for the radio link, and by the ASAA server 12 for services provided to the user other than the radio link. If the operator of the ASAA server 12 is able to obtain wireless services as provided by the individual access networks 21-26, then the user is able to make service subscription arrangements with the operator of the ASAA server 12.

[0034] This architecture supports mobility of the WTRU 13 across multiple access networks, and helps locate the WTRU 13 seamlessly. The use of the ASAA server 12 allows for user-configured routing of calls through a given access network. This also provides a uniform set of supplementary services and features across multiple access networks, resulting in a continuity of user's experience despite network changes. The architecture also may provide a configuration for a uniform mechanism for provision of push services to the WTRU 13 across multiple underlying access networks.

[0035] The role of the ASAA server 12 providing an administrative function concerning routing of services to various access networks 12-26 makes the ASAA server 12 able to maintain a common location for user profiles. The user can determine what services to use, and under which physical circumstances. Examples of parameters include call handling, selection of services by type, selection of services by cost and cost structure, selection of services by network ownership, notification of availability of connections to services, user determined

minimum quality of service (QOS), required bandwidth of services for a particular function. Call handling profile selection functions can include voicemail, selective admission of calls and "challenge" responses. In a similar manner, the ASAA server 12 can also provide the voicemail and other data management services.

[0036] Figure 2 is a diagram showing the relationship between a WTRU 81, an ASAA server 83 and access networks 91-95. The WTRU includes circuitry for establishing an RF link 87 and circuitry for processing data 88, although some of these functions are integrated circuit functions. The WTRU 81 establishes a communications link with the ASAA server 83, but in general the service connection is between the WTRU 81 and one of the service networks 91-95. Services may be communicated through the ASAA server 83 or through the service network in radio communication with the WTRU 81. Alternatively, services may be communicated from one service network to a service network which establishes a radio link with the WTRU 81 without passing through the ASAA server 83. In the case of ASAA server supervised communications, communications which do not pass through the ASAA server 83 or originate with the ASAA server 83 may still be supervised by the ASAA server 83. Since the processing circuitry 88 handles the data regardless of its source, the actual connection to a particular service network 91-95 can be transparent to the user.

[0037] Figure 3 is a flow diagram 100 showing the functionality of one embodiment of the present invention. An ASAA association is established with a WTRU by the WTRU connecting with an access network (step 111) and providing a communication to an ASAA server (step 112), thereby informing the server of the availability of the WTRU (step 113). While it is not necessary that the ASAA server be informed of the availability (step 113), this facilitates location of the WTRU should the ASAA server receive a request to communicate with the WTRU.

[0038] The WTRU initiates a request for services (step 121) by communicating the request through the access network to the ASAA server (step 123). The ASAA server then responds by determining the preferred access network for establishment of the communication (step 126). The preferred access network is based on database input of the preferred services (step 127), cost of

services and other variables (step 128) and responses from access networks of the availability of a connection with the WTRU (step 129). The ASAA then provides the services in the form of services offered through the ASAA server (step 131) or communication provided through the ASAA server (step 132). Alternatively, a connection for services can be effected directly through the access network (step 135).

[0039] In response to an external request for communications, the ASAA server issues a paging request to the WTRU (step 141), which is communicated through one or more access networks (step 142). In the event that the ASAA server has identified the location of the WTRU (step 144), this paging request can be limited to communication through one access network or a limited subset of access networks. A communication link is established between a WTRU and the access network (step 146), and between the access network and the ASAA server (step 147).

[0040] It is possible for the ASAA server to communicate with the WTRU without being informed *a priori* of the availability of the WTRU (step 113). Figure 4 is a flow diagram 200 showing the functionality of an embodiment of the present invention in which communications are initiated without prior establishment of an ASAA association with a WTRU. The WTRU connects with an access network (step 211) and provides a request for communication through the access network to the ASAA server (step 223). The ASAA server then uses that communication to determine an initial connection with the WTRU which has been established by the WTRU in the request for communication.

[0041] The ASAA server then responds by determining the preferred access network for establishment of the communication (step 226). The preferred access network is based on database input of the preferred services, cost of services and other variables and responses from access networks of the availability of a connection with the WTRU. The ASAA then provides the services in the form of services offered through the ASAA server (step 231) or communication provided through the ASAA server (step 232). Alternatively, a connection for services can be effected directly through the access network (step 235).

[0042] In response to an external request for communications, the ASAA server issues a paging request to the WTRU (step 241), which is communicated through one or more access networks (step 242). In the event that the ASAA server has identified the location of the WTRU (step 244), this paging request can be limited to communication through one access network or a limited subset of access networks. A communication link is established between a WTRU and the access network (step 246), and between the access network and the ASAA server (step 247).

[0043] Although the features and elements of the present invention are described in the preferred embodiments in particular combinations, each feature or element can be used alone (without the other features and elements of the preferred embodiments) or in various combinations with or without other features and elements of the present invention.

* * *

CLAIMS

What is claimed is:

1. A method of providing wireless telecommunication services to a wireless transmit/receive unit (WTRU), the method comprising:

issuing a paging request to the WTRU via a plurality of radio access networks based on a location of the WTRU;

receiving a paging response from the WTRU via one of the radio access networks of the plurality of radio access networks, the paging response indicating the identity of the one radio access network; and

routing a service to the WTRU via the one radio access network based on a WTRU user configured profile.

2. The method of claim 1, wherein the issuing the paging request is performed in response to an incoming call to the WTRU; and

wherein the routing the service includes routing the incoming call.

3. The method of claim 1, wherein the WTRU user configured profile includes information relating to at least one of: technology network capabilities; behavioural factors; tariff criteria; selection of services by type; selection of services by cost and cost structure; selection of services by network ownership; minimum quality of service (QOS); call handling; voicemail; and selective admission of calls.

4. The method of claim 1, wherein the issuing the paging request is performed in response to an external request for communications with the WTRU.

5. The method of claim 4, wherein the external request for communications is received from a public switched telephone network (PSTN) or a public data network (PDN).

6. The method of claim 1, wherein the issuing the paging request is

performed using Internet Protocol (IP).

7. A server for providing wireless telecommunication services to a wireless transmit/receive unit (WTRU), the server comprising:

circuitry configured to issue a paging request to the WTRU via a plurality of radio access networks based on a location of the WTRU;

circuitry configured to receive a paging response from the WTRU via one of the radio access networks of the plurality of radio access networks, the paging response indicating the identity of the one radio access network; and

circuitry configured to route a service to the WTRU via the one radio access network based on a WTRU user configured profile.

8. The server of claim 7, wherein the circuitry configured to issue the paging request is configured to issue the paging requests in response to an incoming call to the WTRU, and wherein the circuitry configured to route the service is configured to route the incoming call.

9. The server of claim 7, wherein the WTRU user configured profile includes information relating to at least one of: technology network capabilities; behavioural factors; tariff criteria; selection of services by type; selection of services by cost and cost structure; selection of services by network ownership; minimum quality of service (QOS); call handling; voicemail; and selective admission of calls.

10. The server of claim 7, wherein the circuitry configured to issue the paging request is configured to issue the paging request in response to an external request for communications with the WTRU.

11. The server of claim 10, wherein the external request for communications is received from a public switched telephone network (PSTN) or a public data network (PDN).

12. The server of claim 10, wherein the circuitry configured to issue the paging request is configured to issue the paging requests using Internet Protocol (IP).

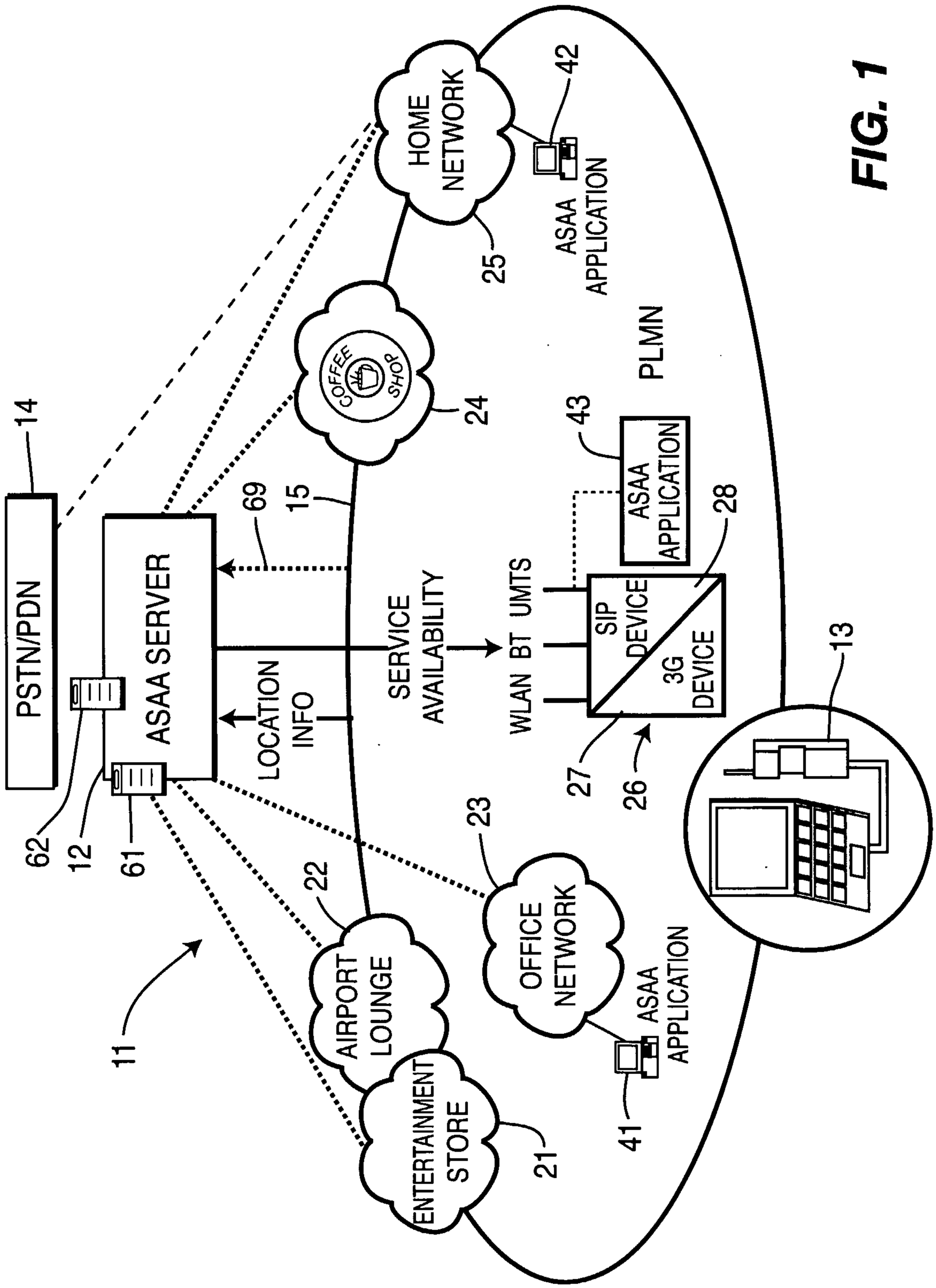

PSTN/PDN
14
62
12
61
ASAA SERVER
69
15
11
LOCATION INFO
SERVICE AVAILABILITY
HOME NETWORK
42
25
ASAA APPLICATION
COFFEE SHOP
24
PLMN
43
ASAA APPLICATION
28
WLAN BT UMTS
SIP DEVICE
3G DEVICE
27
26
13
23
OFFICE NETWORK
ASAA APPLICATION
41
22
AIRPORT LOUNGE
ENTERTAINMENT STORE
21

FIG. 1

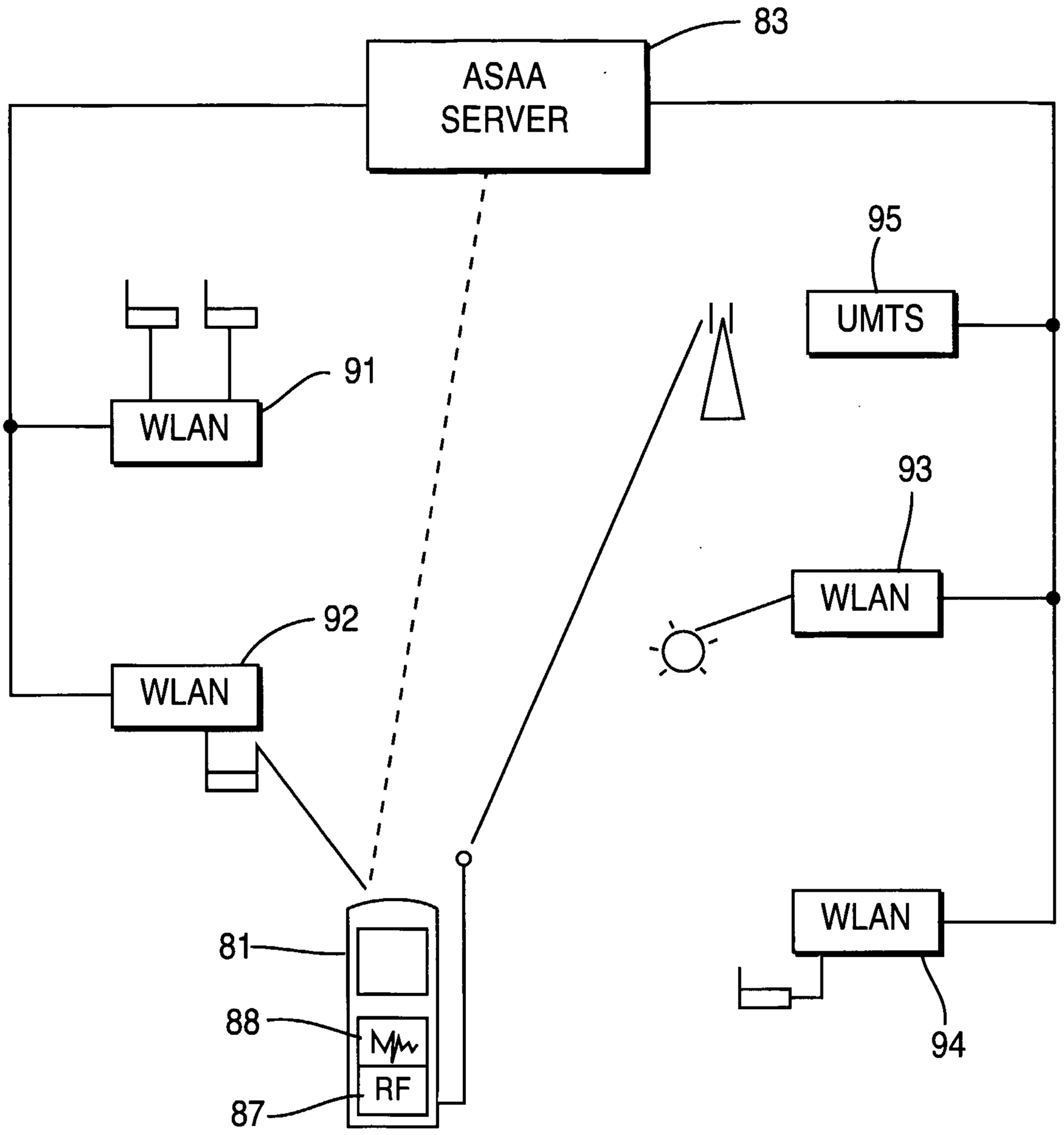

83
ASAA SERVER
95
UMTS
91
WLAN
93
WLAN
92
WLAN
WLAN
81
88
M
RF
87
94

FIG. 2

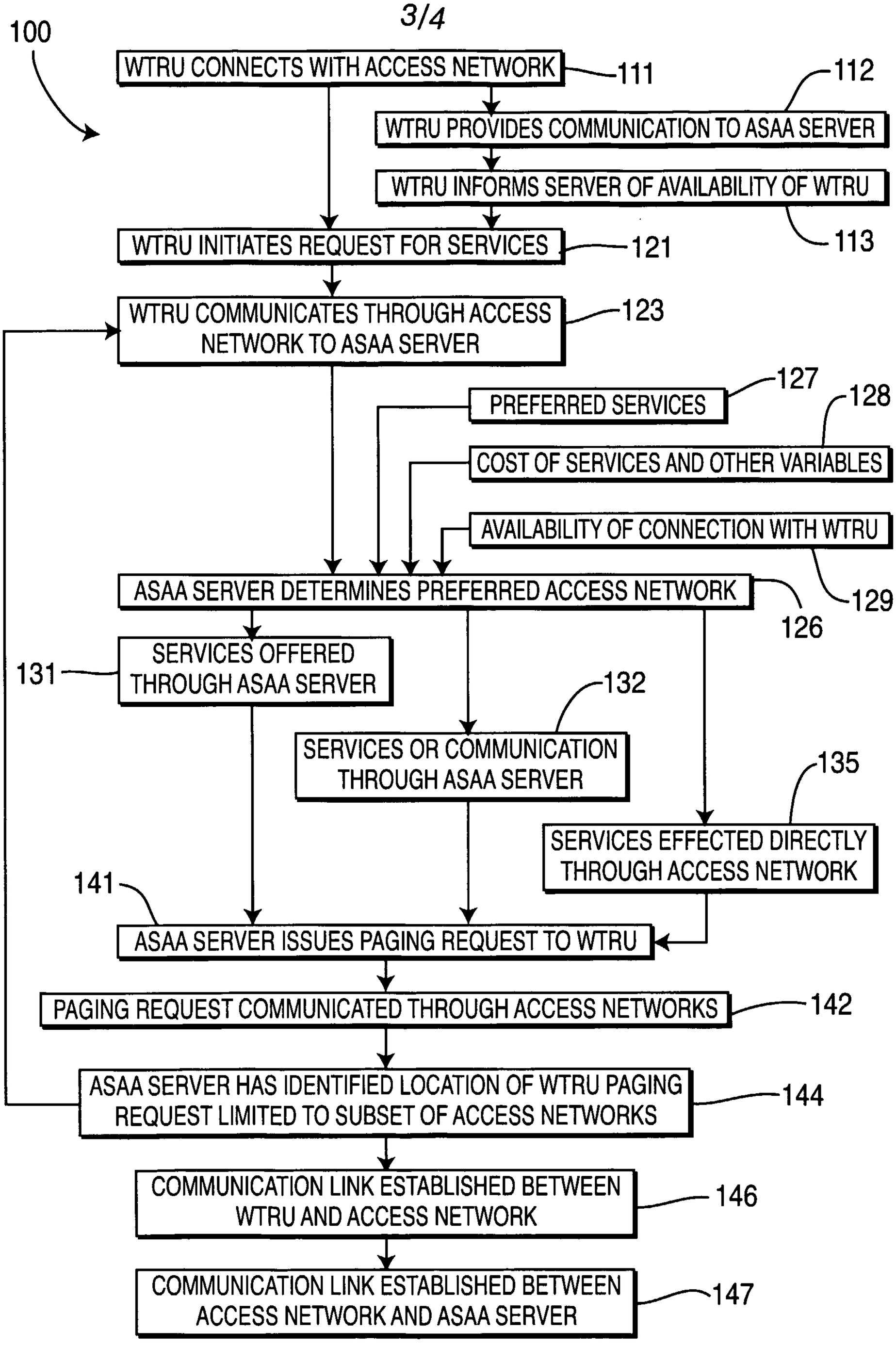

100
WTRU CONNECTS WITH ACCESS NETWORK
111
112
WTRU PROVIDES COMMUNICATION TO ASAA SERVER
WTRU INFORMS SERVER OF AVAILABILITY OF WTRU
113
WTRU INITIATES REQUEST FOR SERVICES
121
WTRU COMMUNICATES THROUGH ACCESS NETWORK TO ASAA SERVER
123
PREFERRED SERVICES
127
128
COST OF SERVICES AND OTHER VARIABLES
AVAILABILITY OF CONNECTION WITH WTRU
129
ASAA SERVER DETERMINES PREFERRED ACCESS NETWORK
126
SERVICES OFFERED THROUGH ASAA SERVER
131
132
SERVICES OR COMMUNICATION THROUGH ASAA SERVER
135
SERVICES EFFECTED DIRECTLY THROUGH ACCESS NETWORK
141
ASAA SERVER ISSUES PAGING REQUEST TO WTRU
PAGING REQUEST COMMUNICATED THROUGH ACCESS NETWORKS
142
ASAA SERVER HAS IDENTIFIED LOCATION OF WTRU PAGING REQUEST LIMITED TO SUBSET OF ACCESS NETWORKS
144
COMMUNICATION LINK ESTABLISHED BETWEEN WTRU AND ACCESS NETWORK
146
COMMUNICATION LINK ESTABLISHED BETWEEN ACCESS NETWORK AND ASAA SERVER
147

FIG. 3

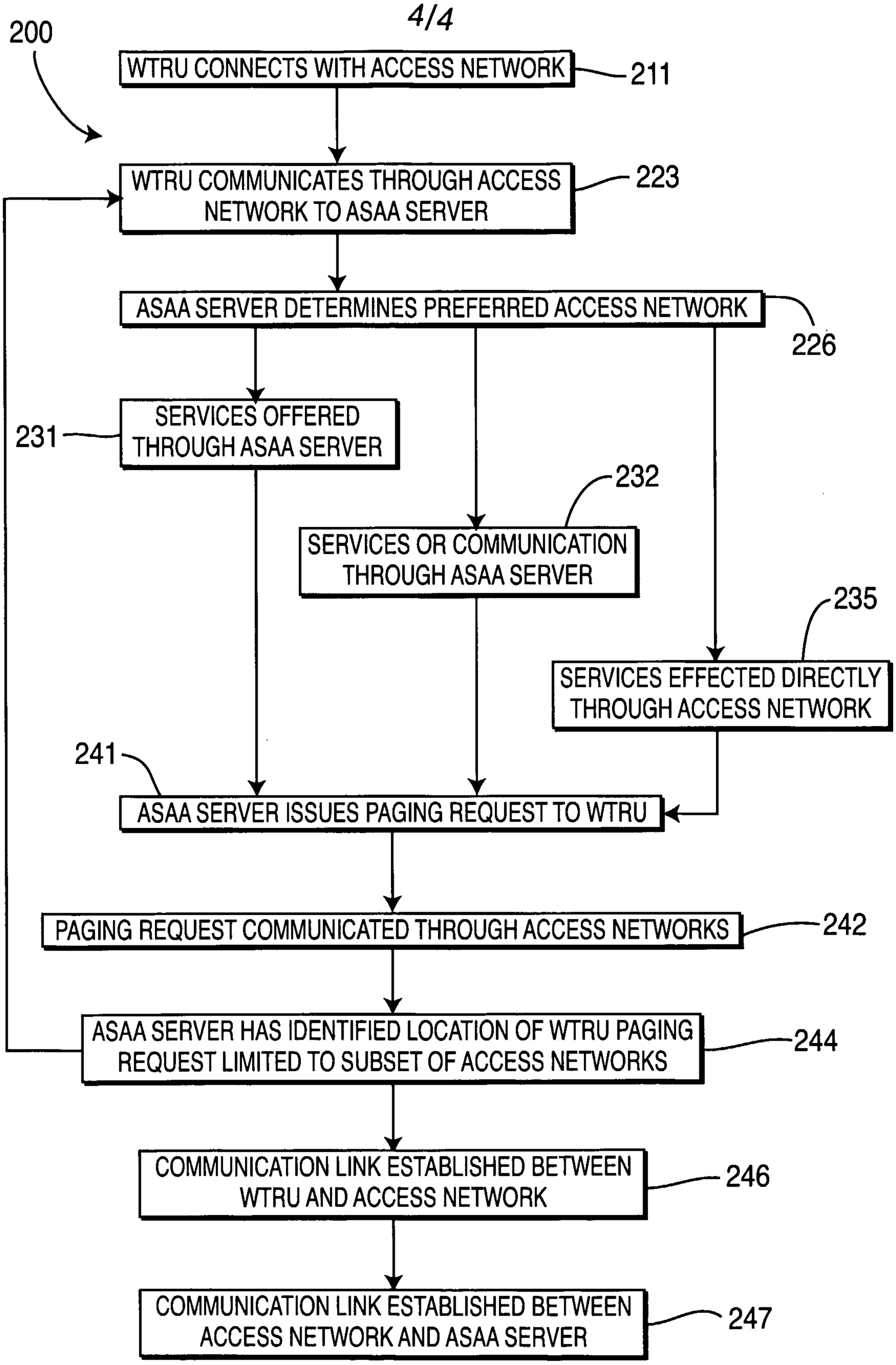
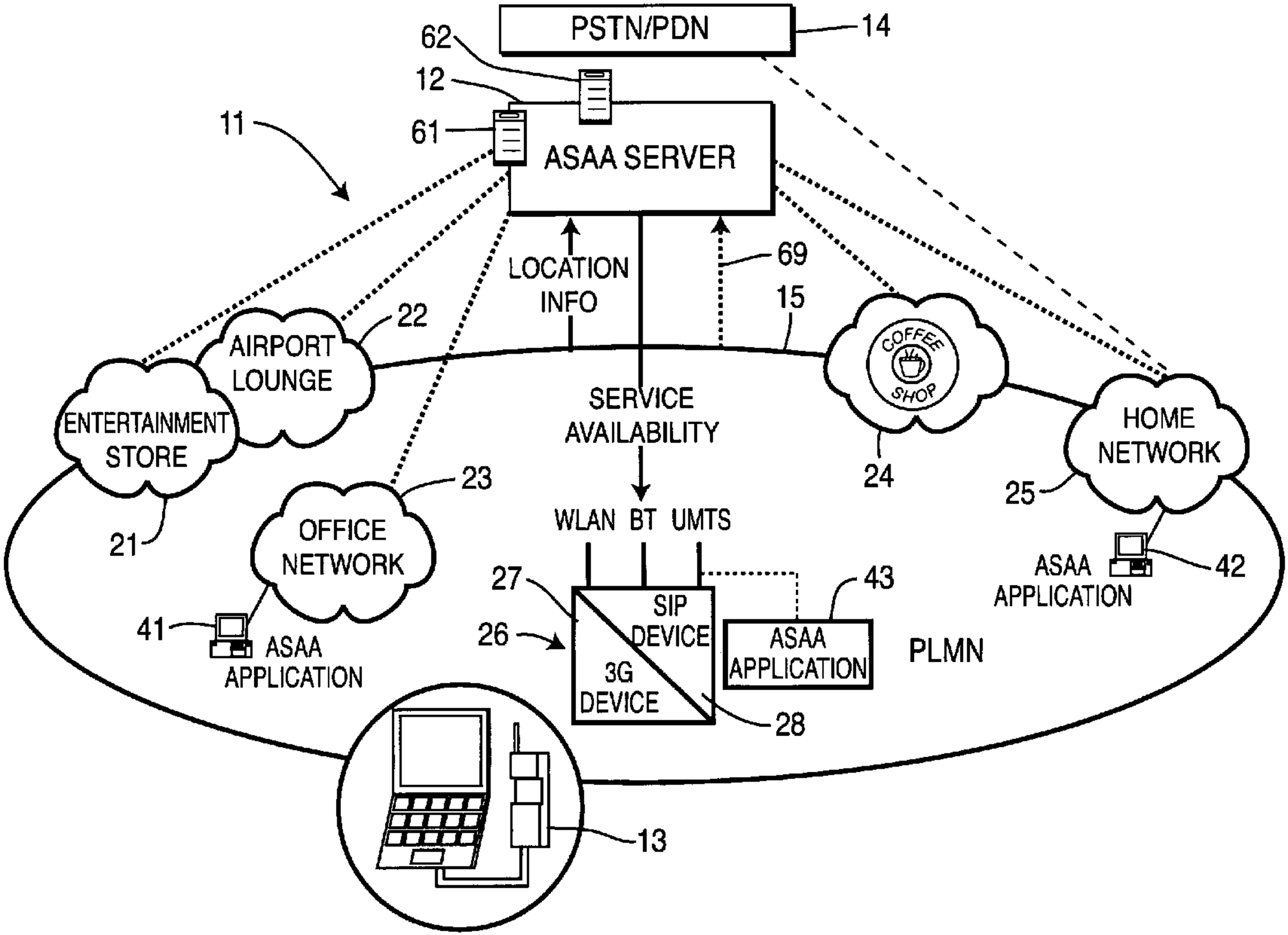

200
WTRU CONNECTS WITH ACCESS NETWORK
211
WTRU COMMUNICATES THROUGH ACCESS NETWORK TO ASAA SERVER
223
ASAA SERVER DETERMINES PREFERRED ACCESS NETWORK
226
231
SERVICES OFFERED THROUGH ASAA SERVER
232
SERVICES OR COMMUNICATION THROUGH ASAA SERVER
235
SERVICES EFFECTED DIRECTLY THROUGH ACCESS NETWORK
241
ASAA SERVER ISSUES PAGING REQUEST TO WTRU
PAGING REQUEST COMMUNICATED THROUGH ACCESS NETWORKS
242
ASAA SERVER HAS IDENTIFIED LOCATION OF WTRU PAGING REQUEST LIMITED TO SUBSET OF ACCESS NETWORKS
244
COMMUNICATION LINK ESTABLISHED BETWEEN WTRU AND ACCESS NETWORK
246
COMMUNICATION LINK ESTABLISHED BETWEEN ACCESS NETWORK AND ASAA SERVER
247

FIG. 4


PSTN/PDN
14
62
12
11
61
ASAA SERVER
LOCATION INFO
69
15
22
AIRPORT LOUNGE
ENTERTAINMENT STORE
SERVICE AVAILABILITY
COFFEE SHOP
HOME NETWORK
24
25
23
21
OFFICE NETWORK
WLAN BT UMTS
27
SIP DEVICE
43
ASAA APPLICATION
42
ASAA APPLICATION
26
3G DEVICE
28
PLMN
41
ASAA APPLICATION
13