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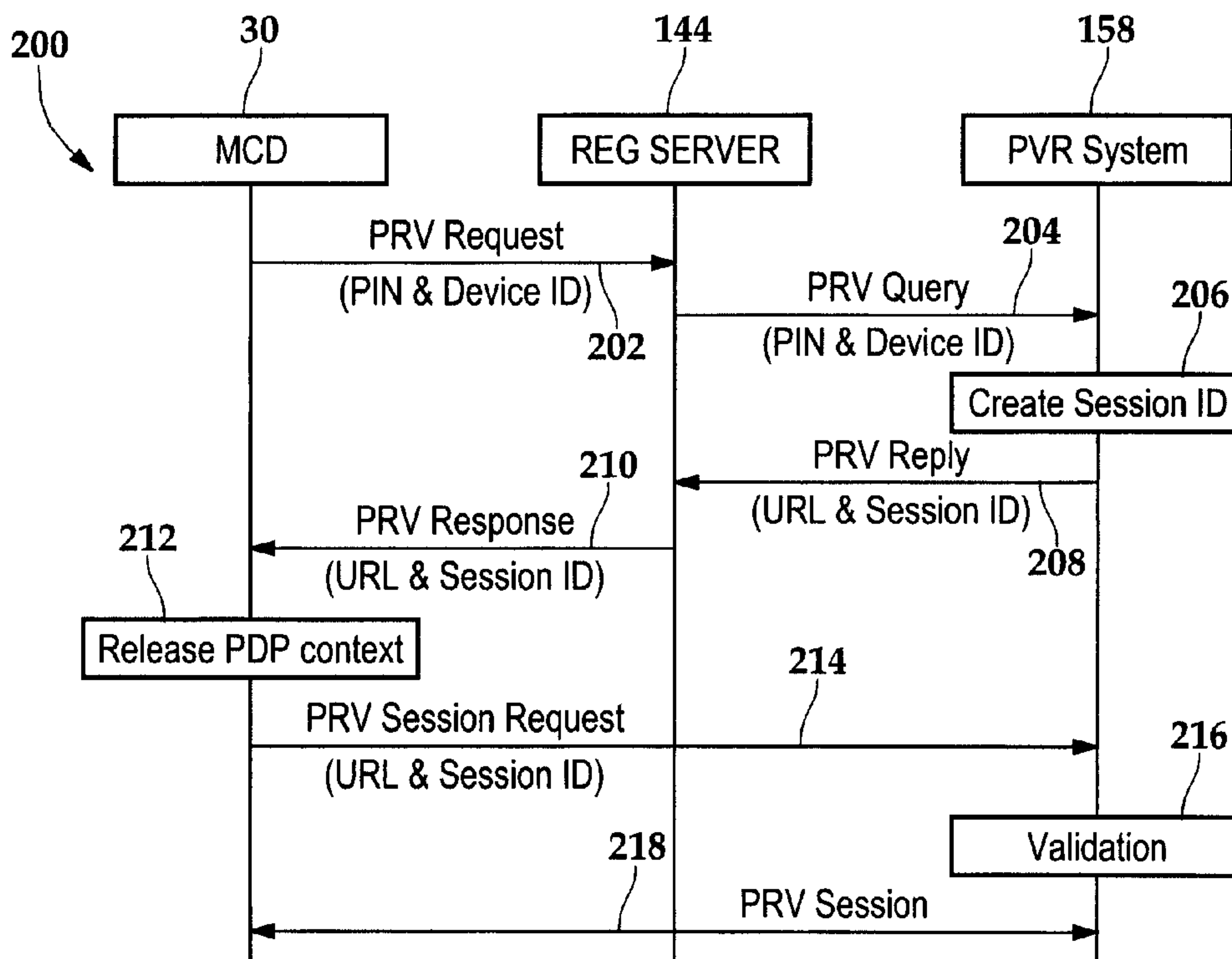
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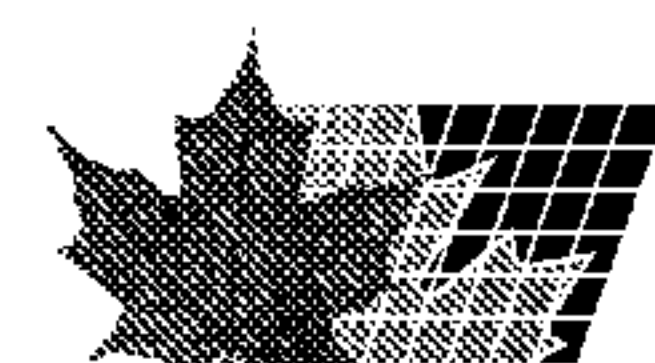
(54) Titre : SYSTEME ET METHODE PERMETTANT DE REPONDRE EN DIRECT A UN DISPOSITIF DE
COMMUNICATIONS MOBILE DANS UN CONTEXTE PDP SIMPLE

(54) Title: SYSTEM AND METHOD FOR OVER THE AIR PROVISIONING OF A SINGLE PDP CONTEXT MOBILE
COMMUNICATIONS DEVICE



(57) Abrégé/Abstract:

A single data context mobile communications device includes logic operable to establish a first data to transmit a request for parameters to a first network node and receive a response by the first network node including the parameters. The mobile communications device also has logic operable to automatically releasing the first data context responsive to receipt of the parameters and logic operable to establish a second data context by transmitting the parameters to a second network node, wherein the second network node is operable as part of a provisioning system to provision the mobile communications device.



ABSTRACT

A single data context mobile communications device includes logic operable to establish a first data to transmit a request for parameters to a first network node and receive a response by the first network node including the parameters. The mobile communications device also has logic operable to automatically releasing the first data context responsive to receipt of the parameters and logic operable to establish a second data context by transmitting the parameters to a second network node, wherein the second network node is operable as part of a provisioning system to provision the mobile communications device.

SYSTEM AND METHOD FOR OVER THE AIR PROVISIONING OF A SINGLE PDP CONTEXT MOBILE COMMUNICATIONS DEVICE

TECHNICAL FIELD OF THE APPLICATION

The present disclosure relates, in general, to wireless packet data service networks and, in particular, to a system and method for over the air provisioning of a single PDP context mobile communications device operable to be disposed in the wireless packet data service network.

BACKGROUND

It is becoming commonplace to use wireless packet data service networks for effectuating data sessions with mobile communications devices. For example, mobile communications devices may be wirelessly synchronized with a desktop computer such that information is transferred therebetween to update each. Likewise, many mobile communications devices are capable of sending and receiving SMS messages and e-mails as well as conducting WAP sessions. Many of these mobile communications devices, however, are capable of supporting only one PDP context at a time. With many of these services, it has been found that the mobile communications device must be configured by the user in order for the user to take full advantage of the capabilities of the mobile communications device. It would be desirable for this configuration process to be as seamless as possible for the user. Accordingly, a need has arisen for system and method for over the air provisioning of the mobile communications device using the wireless packet data service network even when the mobile communications device is limited to a single PDP context.

SUMMARY

As disclosed herein, a network system is provided for over the air provisioning of a single PDP context mobile communications device such that the user of the mobile communications device may take full advantage of the capabilities of the device. The over the air provisioning may take place over a wireless packet data service network comprising one of a General Packet Radio Service (GPRS) network, an Enhanced Data Rates for Global System for Mobile Communications (GSM) Evolution (EDGE) network, a 3rd

Generation (3G) network, an Integrated Digital Enhanced Network (IDEN), a Code Division Multiple Access (CDMA) network, a Universal Mobile Telecommunications System (UMTS) network or the like.

The disclosed network system includes a first network node, which may be a relay network having a registration server. The first network node is operable to receive a request for parameters transmitted by the mobile communications device and provide a response to the mobile communications device including the requested parameters during a first data context such as a first PDP context. This request for parameters may include a personal information number and at least one device identifier associated with the mobile communications device such as its IMEI, IMSI, ESN, MIN, IP address or the like. The requested parameters may include a URL and a session ID which may be appended to the URL. The session ID may be based upon the personal information number and the at least one device identifier associated with the mobile communications device such as by hashing the personal information number and the at least one device identifier associated with the mobile communications device.

The network system also includes a second network node, which may be a provisioning system and may be colocated or integrated with the first network node. The second network node is operable to receive the parameters transmitted by the mobile communications device during a second data context, such as a second PDP context, after the mobile communications device has automatically released the first data context responsive to receipt of the parameters. In this communication session, at least one aspect of the mobile communications device may be provisioned over the air. In one embodiment, the first data context is of a first type, such as a non web based data context and the second data context is of a second type, such as a web based data context.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the features and advantages of the present method and mobile device, reference is now made to the detailed description along with the accompanying figures in which corresponding numerals in the different figures refer to corresponding parts and in which:

Figure 1 depicts an exemplary network environment including a wireless packet data service network wherein an embodiment of the present method may be practiced;

Figure 2 depicts a block diagram of a mobile communications device according to one embodiment of the present disclosure;

Figure 3 depicts a software architectural view of a mobile communications device according to one embodiment of the present disclosure;

Figure 4 depicts additional details of an exemplary relay network operable with a mobile communications device in accordance with an embodiment of the present disclosure;

Figure 5 depicts a flowchart of an embodiment for establishing a communication session for provisioning a single PDP context mobile communications device; and

Figure 6 depicts a message flow diagram with respect to establishing a communication session for provisioning a single PDP context mobile communications device.

DETAILED DESCRIPTION OF THE DRAWINGS

While various embodiments of a mobile communications device operating within a network system are discussed in detail below, it should be appreciated that the present disclosure provides many applicable inventive concepts which can be embodied in a wide variety of specific contexts. The specific embodiments discussed herein are merely illustrative of specific ways to use the mobile communications device within the network system, and do not delimit the scope of the present disclosure.

Referring now to the drawings, and more particularly to figure 1, depicted therein is an exemplary network environment 10 including a wireless packet data service network 12 wherein an embodiment of the present method may be practiced. An enterprise network 14 for serving a plurality of corporate users, which may be a packet-switched network, can include one or more geographic sites and be organized as a local area network (LAN), a wide area network (WAN), a metropolitan area network (MAN) or the like. A number of application servers 16-1 through 16-N disposed as part of the enterprise network 14 are operable to provide or effectuate a host of internal and external services such as email, video mail, Internet access, corporate data access, messaging, calendaring and scheduling, information management and the like. Accordingly, a diverse array of personal information appliances 18 such as desktop computers, laptop computers, palmtop

computers or the like may be operably networked to one or more of the application servers 16-i, $i = 1, 2, \dots, N$, with respect to the services supported in the enterprise network 14.

Additionally, a remote services server 20 may be interfaced with the enterprise network 14 for enabling a corporate user to access or effectuate any of the services from a remote location using a suitable single PDP context mobile communications device (MCD) 22. A secure communication link with end-to-end encryption may be established that is mediated through an external IP network, i.e., a public packet-switched network such as the Internet 24, as well as the wireless packet data service network 12 operable with MCD 22 via suitable wireless network infrastructure that includes a base station 26. In one embodiment, a trusted relay network 28 may be disposed between the Internet 24 and the infrastructure of wireless packet data service network 12. By way of example, MCD 22 may be a data-enabled handheld device capable of receiving and sending messages, web browsing, interfacing with corporate application servers and the like.

For purposes of the present disclosure, the wireless packet data service network 12 may be implemented in any known or heretofore unknown mobile communications technologies and network protocols, as long as a packet-switched data service is available therein for transmitting packetized information. For instance, the wireless packet data service network 12 may be comprised of a General Packet Radio Service (GPRS) network that provides a packet radio access for mobile devices using the cellular infrastructure of a Global System for Mobile Communications (GSM)-based carrier network. In other implementations, the wireless packet data service network 12 may comprise an Enhanced Data Rates for GSM Evolution (EDGE) network, an Integrated Digital Enhanced Network (IDEN), a Code Division Multiple Access (CDMA) network, a Universal Mobile Telecommunications System (UMTS) network, or any 3rd Generation (3G) network. As will be seen hereinbelow, the embodiments of the present disclosure for provisioning MCD 22 supporting a single PDP context will be described regardless of any particular wireless network implementation.

Figure 2 depicts a block diagram of a single PDP context mobile communications device that is generally designated 30. It will be recognized by those skilled in the art upon reference hereto that although an embodiment of MCD 30 may comprise an arrangement similar to one shown in figure 2, there can be any number of variations and modifications, in hardware, software or firmware, with respect to the various modules

depicted. Accordingly, the arrangement of figure 2 should be taken as illustrative rather than limiting with respect to the embodiments of the present disclosure. A microprocessor 32 providing for the overall control of MCD 30 is operably coupled to a communication subsystem 34 which includes a receiver 36 and transmitter 38 as well as associated components such as one or more local oscillator (LO) modules 40 and a processing module such as a digital signal processor (DSP) 42. As will be apparent to those skilled in the field of communications, the particular design of the communication module 34 may be dependent upon the communications network with which the mobile device is intended to operate.

In one embodiment, the communication module 34 is operable with both voice and data communications. Regardless of the particular design, however, signals received by antenna 44 through base station 26 are provided to receiver 36, which may perform such common receiver functions as signal amplification, frequency down conversion, filtering, channel selection, analog-to-digital (A/D) conversion, and the like. Similarly, signals to be transmitted are processed, including modulation and encoding, for example, by DSP 42, and provided to transmitter 44 for digital-to-analog (D/A) conversion, frequency up conversion, filtering, amplification and transmission over the air-radio interface via antenna 46.

Microprocessor 32 also interfaces with further device subsystems such as auxiliary input/output (I/O) 48, serial port 50, display 52, keyboard 54, speaker 56, microphone 58, random access memory (RAM) 60, a short-range communications subsystem 62 and any other device subsystems generally labeled as reference numeral 64. To control access, a Subscriber Identity Module (SIM) or Removable user Identity Module (RUIM) interface 66 is also provided in communication with the microprocessor 32. In one implementation, SIM/RUIM interface 66 is operable with a SIM/RUIM card having a number of key configurations 68 and other information 70 such as identification and subscriber-related data.

Operating system software and software associated with transport stack 72 may be embodied in a persistent storage module (i.e., non-volatile storage) such as Flash memory 74. In one implementation, Flash memory 74 may be segregated into different areas, e.g., storage areas for computer programs 76, device states 78, address book 80, other personal information manager (PIM) data 82 and other data storage areas generally labeled as

reference numeral 84. Additionally, a provisioning (PRV) logic module 86 is provided for provisioning certain aspects of MCD 30 according to the teachings set forth herein.

Figure 3 depicts a software architectural view of a mobile communications device operable according to one embodiment for provisioning certain aspects of the MCD regardless of the manufacturer of the MCD or the wireless service provider. A multi-layer transport stack (TS) 100 is operable to provide a generic data transport protocol for any type of corporate data, including email, via a reliable, secure and seamless continuous connection to a wireless packet data service network. As illustrated in the embodiment of figure 3, an integration layer 102 is operable as an interface between the MCD's radio layer 104 and the transport stack 100. Likewise, another integration layer 106 is provided for interfacing between the transport stack 100 and the user applications 108 supported on the MCD, e.g., email 110, calendar/scheduler 112, contact management 114 and web browser 116. Although not specifically shown, the transport stack 100 may also be interfaced with the MCD's operating system. In another implementation, the transport stack 100 may be provided as part of a data communications client module operable as a host-independent virtual machine on a mobile device.

The bottom layer (Layer 1) of the transport stack 100 is operable as an interface to the wireless network's packet layer. Layer 1 handles basic service coordination within the exemplary network environment 10 shown in figure 1. For example, when an MCD roams from one carrier network to another, Layer 1 verifies that the packets are relayed to the appropriate wireless network and that any packets that are pending from the previous network are rerouted to the current network. The top layer (Layer 4) exposes various application interfaces to the services supported on the MCD. The remaining two layers, Layer 2 and Layer 3, are responsible for datagram segmentation/reassembly and security, compression and routing, respectively.

Figure 3 also depicts a registration logic module 118 provided as part of the MCD's software environment that is disposed in operable communication with the transport stack 100 as well as the OS environment for effectuating registration procedures, as and when needed, with the serving relay network. In one implementation, where a PIN is not otherwise provided or associated with the MCD, the registration logic module 118 includes logic means operable to execute a registration procedure with the serving relay

node to request and receive a PIN, which will allow identification of the MCD by this network node during future communication sessions therebetween.

A PRV logic module 120 provided as part of the MCD's software environment is disposed in operable communication with the transport stack 100 as well as the OS environment. In one embodiment, the PRV logic module 120 comprises logic operable to generate a request including the PIN and at least one hardware device identifier associated with the MCD for transmission in a message to a network node such as the above mentioned serving relay node with an associated registration server, provisioning server and the like. As stated above, the PIN may be a required parameter in communications between an MCD and the serving relay node for identification and verification purposes. As one of ordinary skill in the art should appreciate, the hardware device identifier may comprise International Mobile station Equipment Identity (IMEI) parameters, International Mobile Subscriber Identity (IMSI) parameters, Electronic Serial Number (ESN) parameters, Mobile Identification Number (MIN) parameters, or the like, that are hard-coded into MCDs depending on the wireless network technologies and protocols. Additionally, IP addresses corresponding to the MCDs may also operate as device identifiers. The PRV logic module 120 may then receive from the network node a URL having a session ID appended thereto or otherwise associated therewith that may be based upon such techniques as hashing of the PIN, the hardware device identifier or both. This URL and session ID is then available to browser 116 such that a suitable WAP communication session can be established between the MCD and an appropriate provisioning server such that certain aspects of the MCD may be provisioned.

Figure 4 depicts additional details of an exemplary relay network infrastructure 130 operable as part of relay network 28 interfacing with the wireless packet data service network 12 described above. A relay services node 132 is operable, at least in part, for providing connectivity between MCDs and various data application services such as enterprise services, external IP data services and the like, regardless of the geographic location of the MCDs and their respective wireless carriers. Also, since multiple relay services nodes can co-exist in a distributed network architecture, a relay bridge 134 may be provided in operable connection with the relay services node 132 for supporting inter-relay connectivity. In one implementation, relay bridge 134 connects with separate relay node

sites, forming tunnels between relays over which MCD messages can flow to and from services, irrespective of the region where the MCD is in.

Communication between the relay services node 132 and various application gateways and servers is effectuated using any suitable protocol, e.g., Server Relay Protocol (SRP), preferably over IP links. By way of illustration, remote services server 20 associated with the enterprise network 14 (shown in figure 1) communicates with the relay using SRP for effectuating internal data services with respect to the enterprise's mobile subscribers. Likewise, reference numerals 136 and 138 refer to external application gateways, such as Internet Service Provider (ISP) or Internet Access Provider (IAP) servers, and other gateways, respectively, which are also interfaced with the relay node 132 using SRP. A peer-to-peer server 140 may also be provided in operable connection with the relay node 132 for handling peer-level messaging between two MCDs.

Additionally, a database 142 may be provided in operable connection with the relay node 132 for handling and managing MCD location information. Preferably, this location information is stored by PIN of the MCDs, wherein the records maintain a particular device's last known location. A registration server 144 is operable for providing registration services for MCDs when they are initially activated or when the user re-registers due to moving to a different wireless network coverage area. In one implementation, the location information of registration server 144 may be programmed into an MCD. When the MCD registers successfully, registration server 144 is operable to provide the serving relay node's location, whereupon data sessions may be engaged by the MCD.

One or more wireless transport (WT) interfaces are provided as part of relay services node 132 for connecting with wireless carrier networks that service MCDs. By way of illustration, WT 146 and WT 148 communicate with respective packet routers 150 and 152 using TCP/IP links, which route data packets to and from respective wireless packet data service networks, exemplified in figure 4 as carrier network 154 and carrier network 156. Although not specifically shown, registration server 144, which handles administration and registration services for MCDs, may be provided with separate WT and packet routing for interfacing with the carrier networks 154, 156.

A provisioning system (PRV) 158 may be colocated, integrated or otherwise associated with the relay services node 132 for setting up and managing various service

providers (i.e., carrier networks), subscribers, MCD manufacturers, resellers and other entities in order to support any number of service and market differentiation requirements. Additionally, the provisioning system 158 may include logic for provisioning personal information and preferences with respect to certain aspects of the MCDs when they are initially activated for the associated services. Also, subscriber validation logic may be provided as part of the provisioning system 158. Accordingly, the provisioning system 158 may be implemented with a plurality of interfaces with respect to the various modules of the relay services node 132, e.g., interfaces to registration servers, peer-to-peer servers, location databases and the like, in addition to including attendant service logic processing that may be realized in suitable hardware, firmware and/or firmware logic blocks as well as database structures.

Figure 5 depicts a flowchart of an embodiment for establishing sequential PDP contexts with a MCD that supports a single PDP context such that the MCD can be provisioned over the air via a remote provisioning system. In the present embodiment, the communication sessions may be both web based and non web based communication sessions preferably using Wireless Application Protocol (WAP) or other suitable communication protocol. Prior to full utilization of the MCD, certain aspect of the device's overall functionality may need to be provisioned such as particular parameters to enable information to be pushed to the MCD. The provisioning of these aspects of the MCD may require authentication of the device, via a PIN, a device identifier or both, prior to provisioning. When the MCD is manufactured, one or more device identifiers such as IMEI, IMSI, ESN, MIN or the like are typically associated with the device. A PIN for these devices services, on the other hand, may not be assigned to the device upon manufacturing requiring the user to acquire such a PIN directly from the service provider via an over the air request and response sequence, which may take place with little or no user intervention. Additionally, once the MCD is deployed, it may be provided with an IP address since it is an IP appliance operable with a wireless packet data service network. Once the device has acquired the PIN relating to the aspects of the device the user desires to provision, it is now desirable to make the provisioning process as seamless as possible such as through the use of a web browser.

It has been found, however, that many web browsers used in MCDs are not capable of retrieving and using PIN and device identifier information. In addition, it has been

found that many MCDs are capable of only a single PDP context. The present disclosure, however, provides for sequential PDP contexts on the MCD and for communicating the PIN information to the web browser to allow the web browser to establish a communication session with the appropriate provisioning system. As such, those of ordinary skill in the art should recognize that the present disclosure is not only applicable to single PDP context MCDs but also to any MCD/network system wherein the two required PDP contexts cannot simultaneously be active including, but not limited to, a MCD currently conducting its maximum number of PDP contexts, a network capable of supporting only one PDP context with a given MCD or the like.

Specifically, as detailed in method 170 of figure 5, once the MCD has the appropriate PIN, the transport stack of the MCD establishes a first data context, which is preferably a non web based PDP context with the registration server (block 172). The transport stack accesses the PIN and device identifier information and transmits a request for parameters to the registration server (block 174). In one embodiment, this request for parameter includes the PIN and a device identifier. This information is then communicated from the registration server to the provisioning system which may be colocated, integrate or otherwise communicably associated with the registration server. The provisioning system can then generate the requested parameters which, in the present example, are a URL associated with the provisioning system and a session ID appended thereto which is preferably based upon the PIN and the device identifier such as by using a hashing technique. Preferably, the provisioning system starts a clock to establish a time frame within which the session ID will be valid. The provisioning system then communicates the requested parameters to the registration server which is still in communication with the MCD via the first data context. The registration server then provides a response including the requested parameters (the URL with session ID parameters) to the MCD which receives this information via the transport stack (block 176). Once the MCD has obtained the requested parameters, the first data context between the MCD and the registration server is automatically released (block 178). The requested parameters are then passed to the web browser which automatically launches the web page associated with the URL, which includes the session ID such that the device information of the MCD is known to the provisioning system. This establishes a second data context, which is preferably a web based PDP context with the provisioning system (block 180). In

this communication session, the aspects of the MCD that are associated with this service provider can now be provisioned over the air using well known data entry techniques via the web browser (block 182). As such, the MCD can be seamlessly provisioned by establishing one data context with a registration server to transmit a request for parameters and receive a response including the parameters then automatically releasing that data context and establishing a second data context by transmitting the parameters to a provisioning system.

Figure 6 depicts a message flow diagram with respect to establishing sequential PDP contexts with a MCD that supports a single PDP context such that the MCD can be provisioned over the air via a remote provisioning system that is generally designated 200. MCD 30 establishes a PDP context wherein a PRV request message 202 is transmitted by MCD 30 to a network node, e.g., registration server 144, wherein the request message 202 includes a PIN as well as a device identifier as parametric information. Registration server 144 queries suitable service logic, which may be embodied as the provisioning system 158 associated with the relay services network described above, by issuing a PRV query 204 thereto, which includes the parametric information received in the PRV request 202. The provisioning system's PRV logic is operable to validate the request and provide, via a PRV reply 208 to the registration server 144, a message including a URL having session ID parameters appended thereto. Within the first PDP context, this information is then transmitted to MCD 30 via PRV response message 210 from registration server 144. Thereafter, MCD 30 automatically releases the first PDP context 212 and establishes a second PDP context with the PVR system 158. This communication session is established by MCD 30 sending a PRV session request 214 including the URL having session ID parameters. In response thereto, the PVR system 158 is operable to validate 216 the request to, among other things, assure that the session ID has not expire. Upon successful validation, a provisioning session 218 between MCD 30 and PVR system 158 may occur to provision the associated aspects of MCD 30.

While this disclosure has described a mobile communications device operating within a network system with reference to illustrative embodiments, this description is not intended to be construed in a limiting sense. Various modifications and combinations of the illustrative embodiments as well as other embodiments, will be apparent to persons

skilled in the art upon reference to the description. It is, therefore, intended that the appended claims encompass any such modifications or embodiments.

CLAIMS:

1. A method for provisioning a mobile communications device comprising:
 - establishing a first data context between the mobile communications device and a first network node;
 - transmitting a request for parameters from the mobile communications device to the first network node;
 - receiving the parameters at the mobile communications device;
 - responsive to receipt of the parameters, the mobile communications device automatically releasing the first data context; and
 - establishing a second data context between the mobile communications device and a second network node by transmitting the parameters from the mobile communications device to the second network node.
2. The method for provisioning a single data context mobile communications device as recited in claim 1 wherein the first network node is operable as part of a relay network.
3. The method for provisioning a single data context mobile communications device as recited in claim 1 wherein the second network node is operable as part of a provisioning system.
4. The method for provisioning a single data context mobile communications device as recited in claim 1 wherein the first and second data contexts are PDP contexts.
5. The method for provisioning a single data context mobile communications device as recited in claim 1 wherein the first data context is non web based and the second data context is web based.
6. The method for provisioning a single data context mobile communications device as recited in claim 1 wherein the request for parameters further comprises a request including a personal information number and at least one device identifier associated with the mobile communications device.

7. The method for provisioning a single data context mobile communications device as recited in claim 6 wherein the parameters further comprise a URL and a session ID based upon the personal information number and the at least one device identifier associated with the mobile communications device.

8. The method for provisioning a single data context mobile communications device as recited in claim 1 wherein the establishing a second data context further comprises establishing a communication session to provision at least one aspect of the mobile communications device.

9. A mobile communications device comprising:

means operable to establish a first data context to transmit a request for parameters to a first network node and receive a response from the first network node including the parameters;

means operable to automatically release the first data context responsive to receipt of the parameters from the first network node; and

means operable to establish a second data context by transmitting the parameters to a second network node.

10. The mobile communications device as recited in claim 9 wherein the first and second data contexts are PDP contexts.

11. The mobile communications device as recited in claim 9 wherein the first data context is non web based and the second data context is web based.

12. The mobile communications device as recited in claim 9 wherein the request for parameters further comprises a request including a personal information number and at least one device identifier associated with the mobile communications device.

13. The mobile communications device as recited in claim 12 wherein the parameters further comprise a URL and a session ID based upon the personal information number and the at least one device identifier associated with the mobile communications device.

14. A network system for provisioning a mobile communications device comprising:
a first network node and a second network node;

the first network node being operable to receive a request for parameters transmitted by the mobile communications device, to transmit a query for parameters to the second network node, to receive a reply from the second network node including the parameters and to provide a response including the parameters to the mobile communications device during a first data context; and

the second network node being operable to receive the query for parameters from the first network node, to provide the reply to the first network node including the parameters and to receive the parameters transmitted by the mobile communications device during a second data context after the mobile communications device has automatically released the first data context responsive to receipt of the parameters.

15. The network system as recited in claim 14 wherein the first network node is operable as part of a relay network.

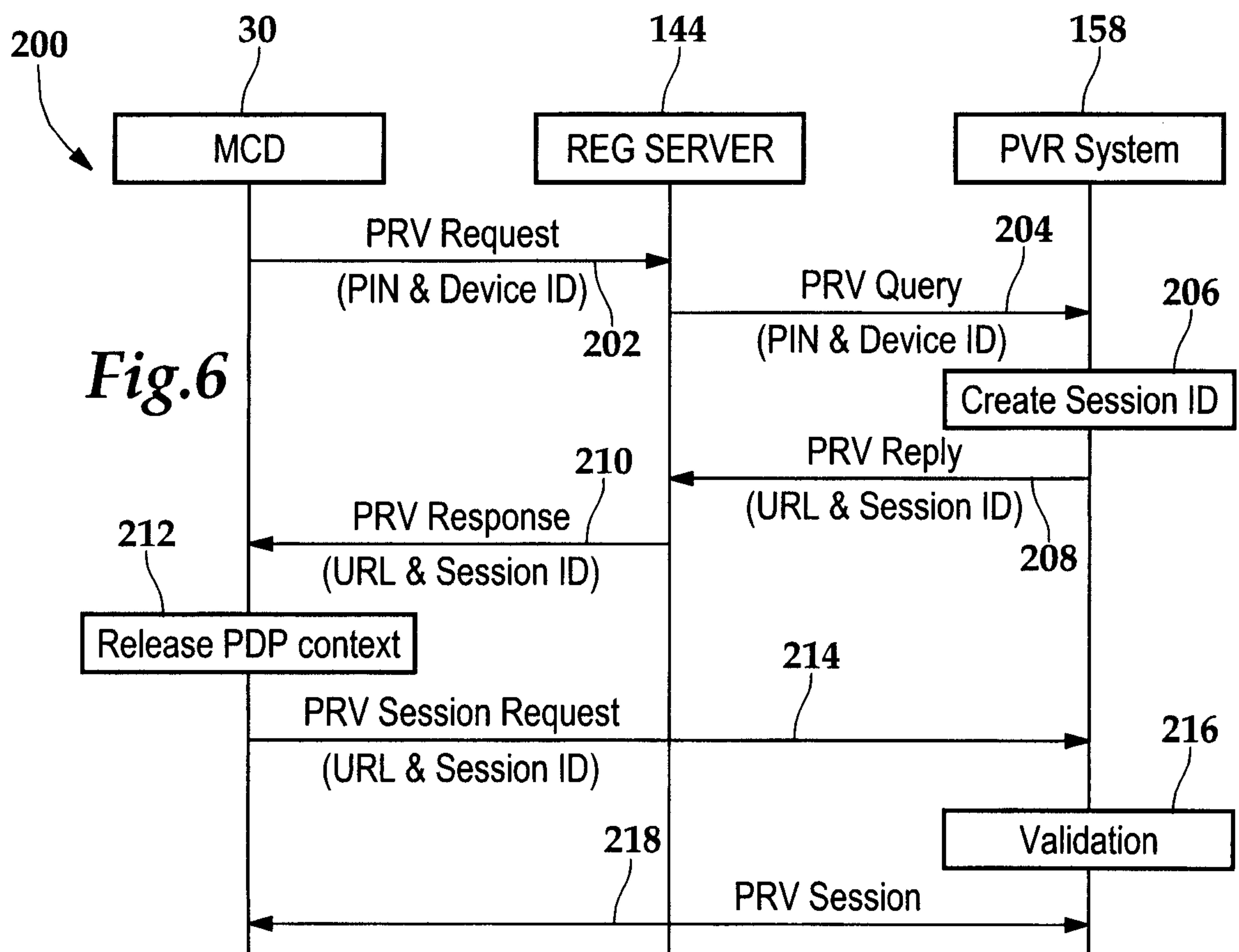
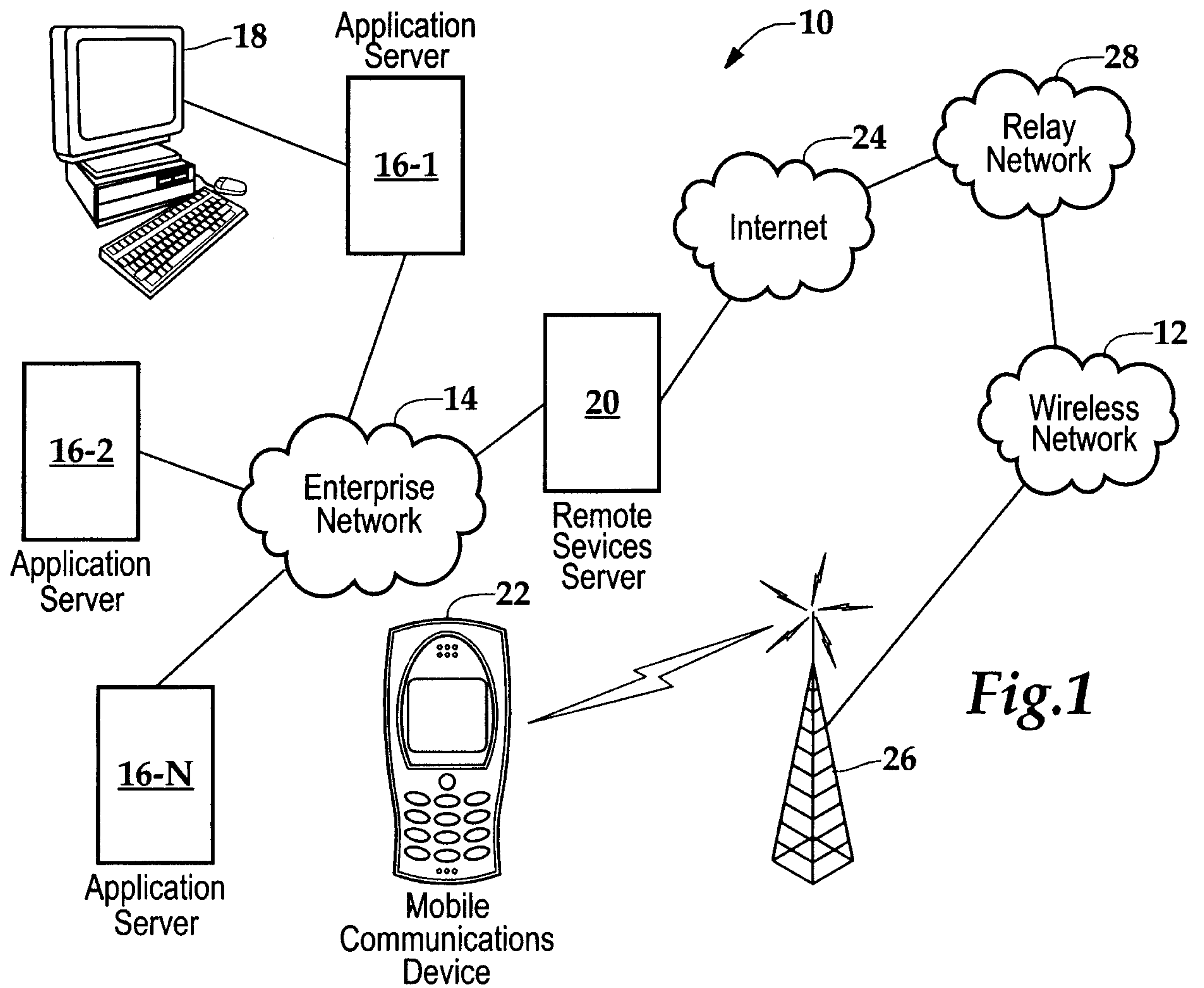
16. The network system as recited in claim 14 wherein the second network node is operable as part of a provisioning system.

17. The network system as recited in claim 14 wherein the first and second data contexts are PDP contexts.

18. The network system as recited in claim 14 wherein the first data context is non web based and the second data context is web based.

19. The network system as recited in claim 14 wherein the request for parameters further comprises a request including a personal information number and at least one device identifier associated with the mobile communications device.

20. The network system as recited in claim 19 wherein the parameters further comprise a URL and a session ID based upon the personal information number and the at least one device identifier associated with the mobile communications device.



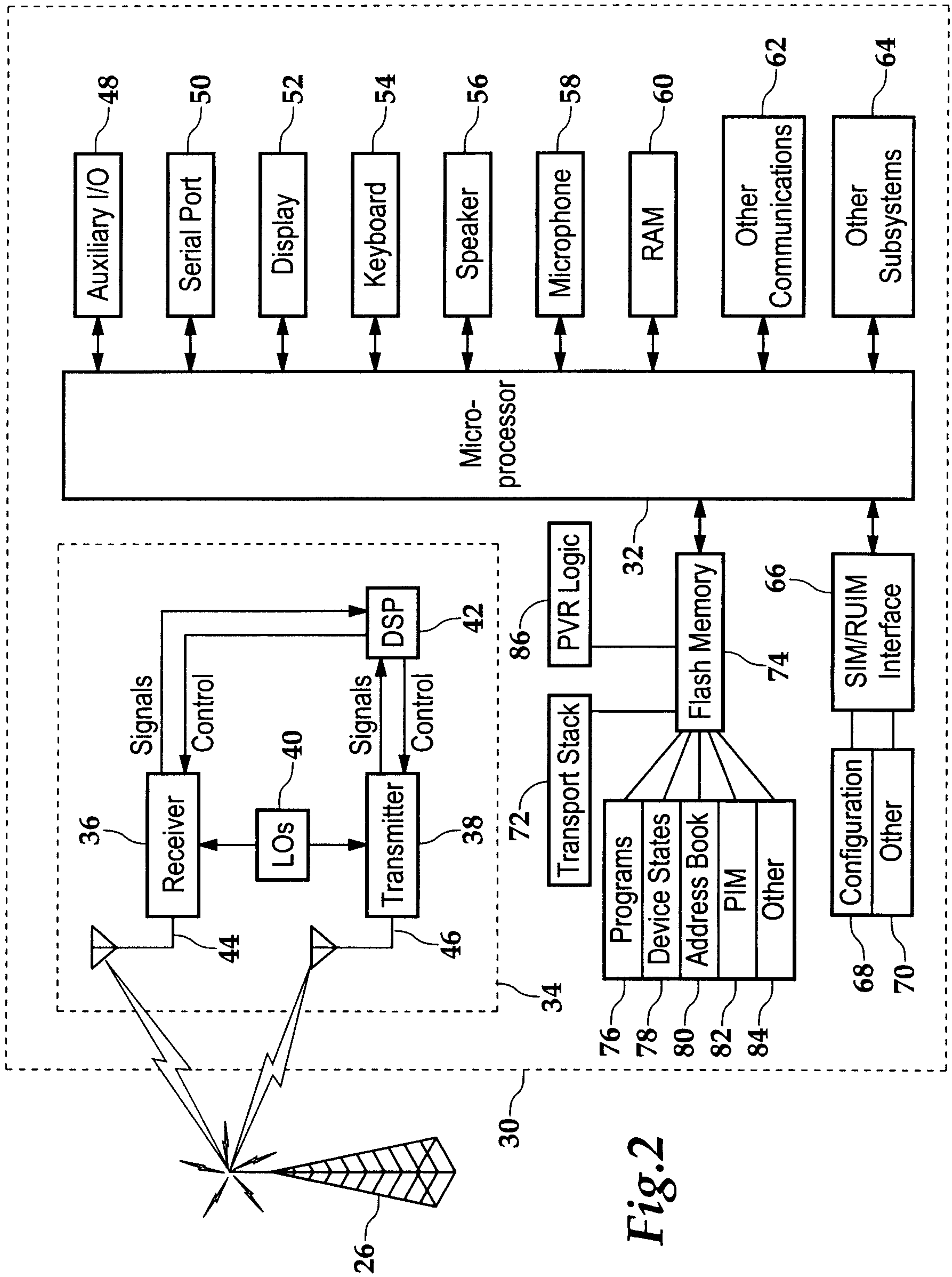
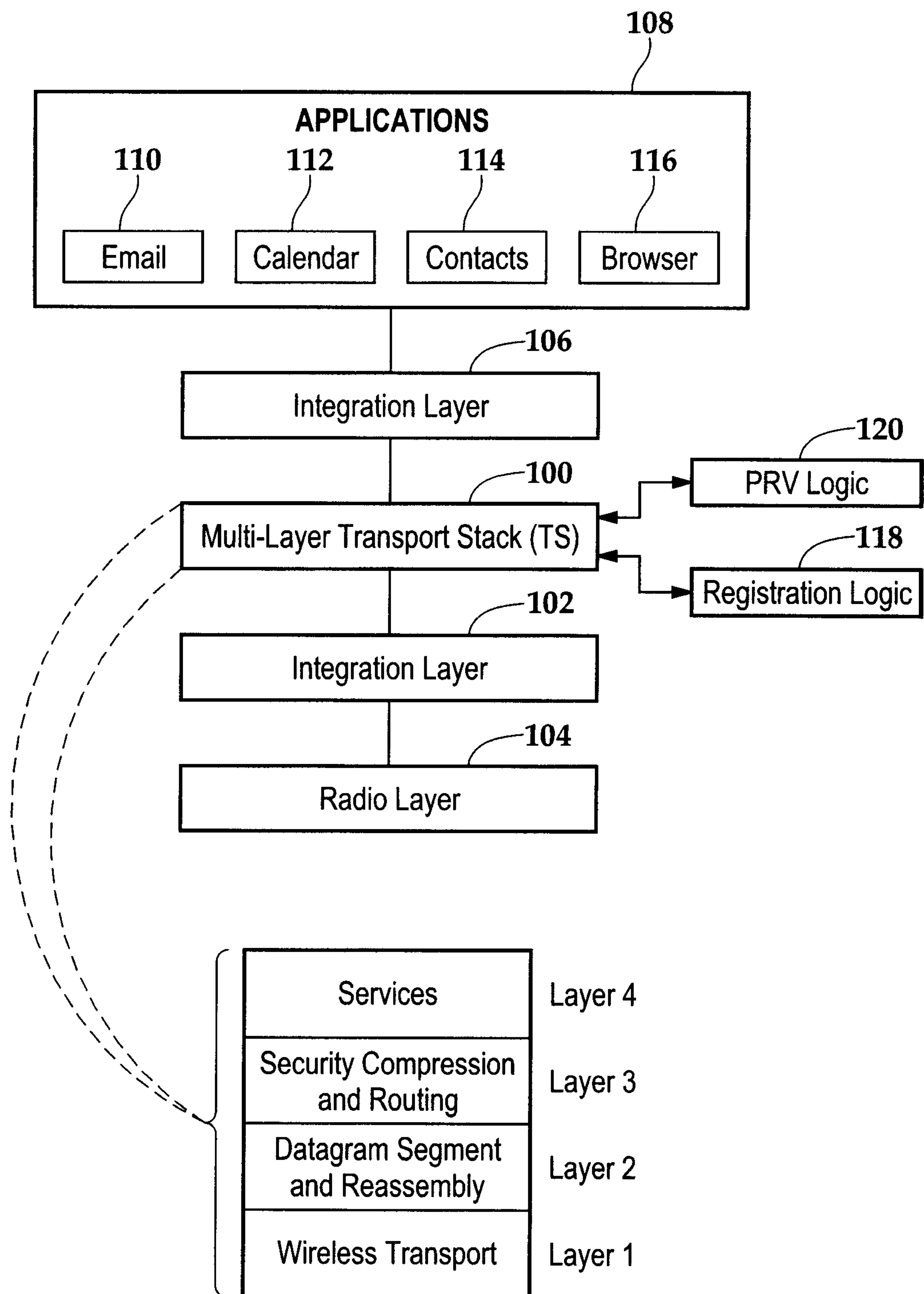


Fig.2

**Fig.3**

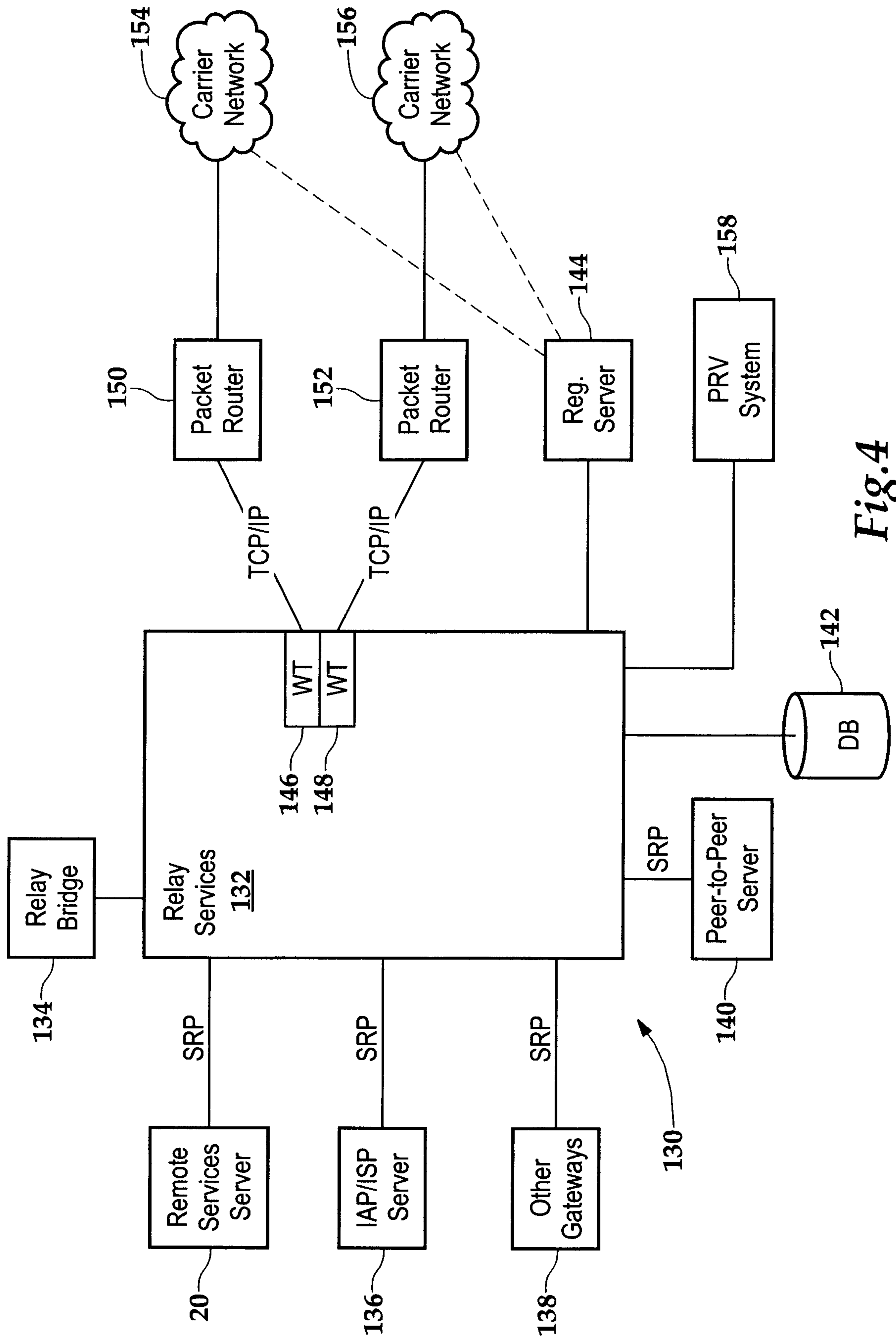
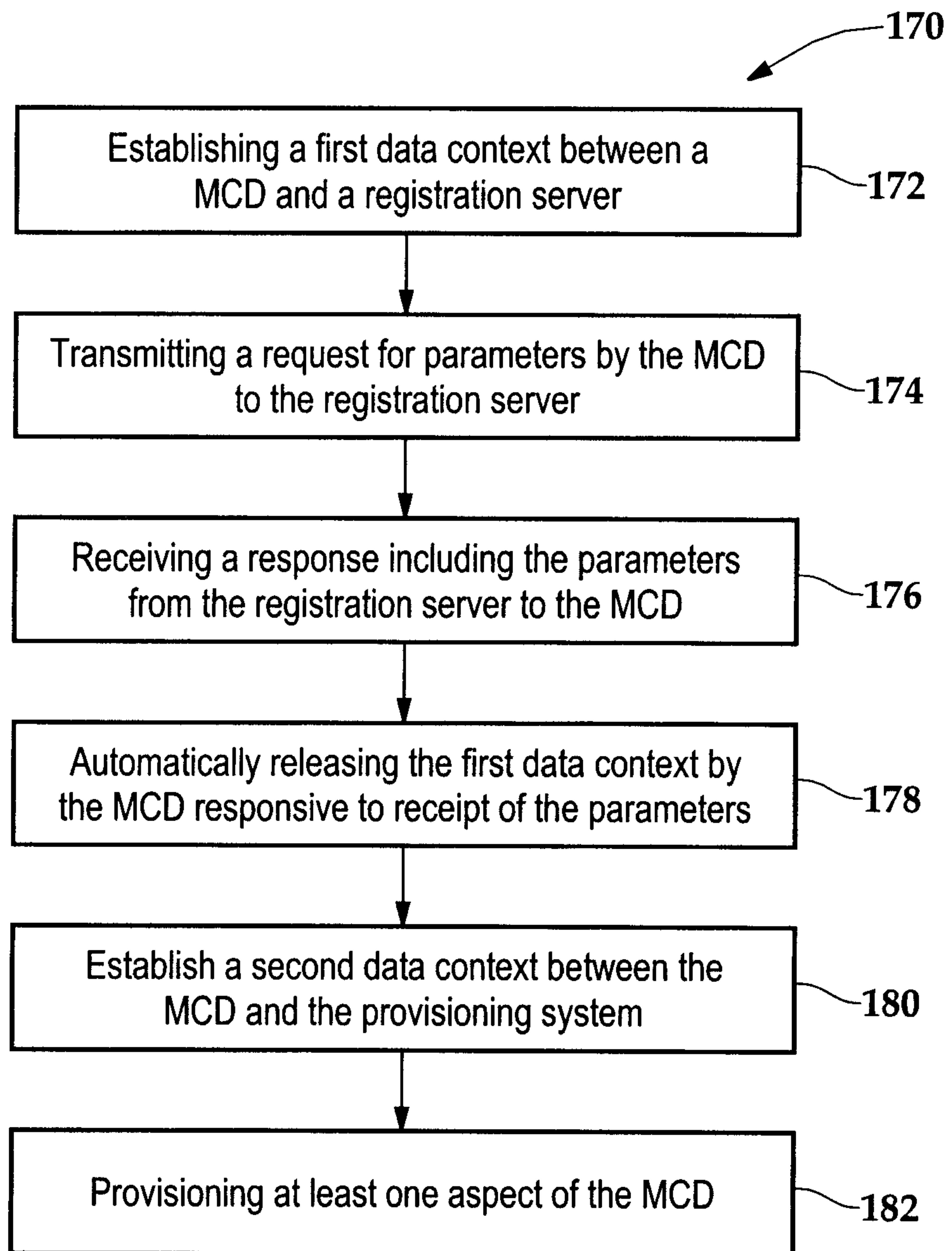


Fig.4

*Fig.5*

