US009270587B2

(12) **United States Patent**
Horn et al.

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(45) **Date of Patent: Feb. 23, 2016**

(54) **METHOD AND APPARATUS FOR ROUTING MESSAGES OF A POSITIONING PROTOCOL IN A WIRELESS NETWORK**

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(73) Assignee: **QUALCOMM Incorporated**, San Diego, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 238 days.

(21) Appl. No.: **12/985,551**

(22) Filed: **Jan. 6, 2011**

(65) **Prior Publication Data**

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Related U.S. Application Data

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(51) **Int. Cl.**
H04W 24/00 (2009.01)
H04L 12/721 (2013.01)
(Continued)

(52) **U.S. Cl.**
CPC ***H04L 45/566*** (2013.01); ***H04L 45/021*** (2013.01); ***H04W 4/02*** (2013.01); ***H04W 4/021*** (2013.01); *H04W 8/08* (2013.01)

(58) **Field of Classification Search**
CPC H04W 64/00; H04W 4/02; H04W 24/00; H04W 24/08; H04W 16/18; H04W 24/06; H04L 29/08657; H04L 12/2697
USPC 455/456.1, 456.2, 423; 370/328
See application file for complete search history.

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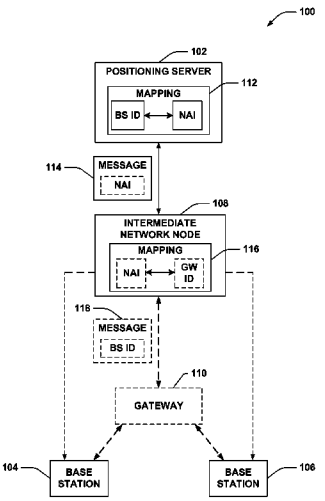
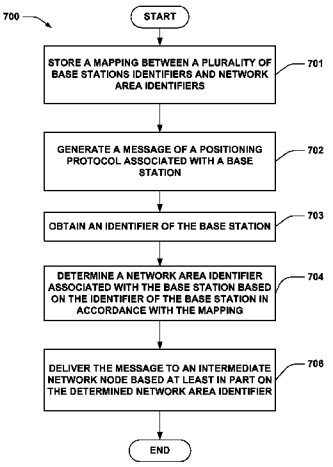
(74) *Attorney, Agent, or Firm* — Mahmoud Munes Tomeh

(57) **ABSTRACT**

Methods and apparatuses are provided that facilitate routing of messages of a positioning protocol, such as long term evolution (LTE) positioning protocol annex (LPPa). A positioning server can determine a network area identifier of one or more messages based at least in part on an identifier of a base station associated with the one or more messages. Based at least in part on the network area identifier, the positioning server can provide the one or more messages to an intermediate network node corresponding to the one or more base stations, such as a mobility management entity (MME). MME can similarly provide the one or more messages to an optional gateway between it and the one or more base stations based at least in part on receiving the network area identifier in the one or more messages. In addition, a base station can update positioning information with the positioning server.

40 Claims, 19 Drawing Sheets





(51) **Int. Cl.**

H04L 12/755	(2013.01)
H04W 4/02	(2009.01)
H04W 8/08	(2009.01)

(56) **References Cited**

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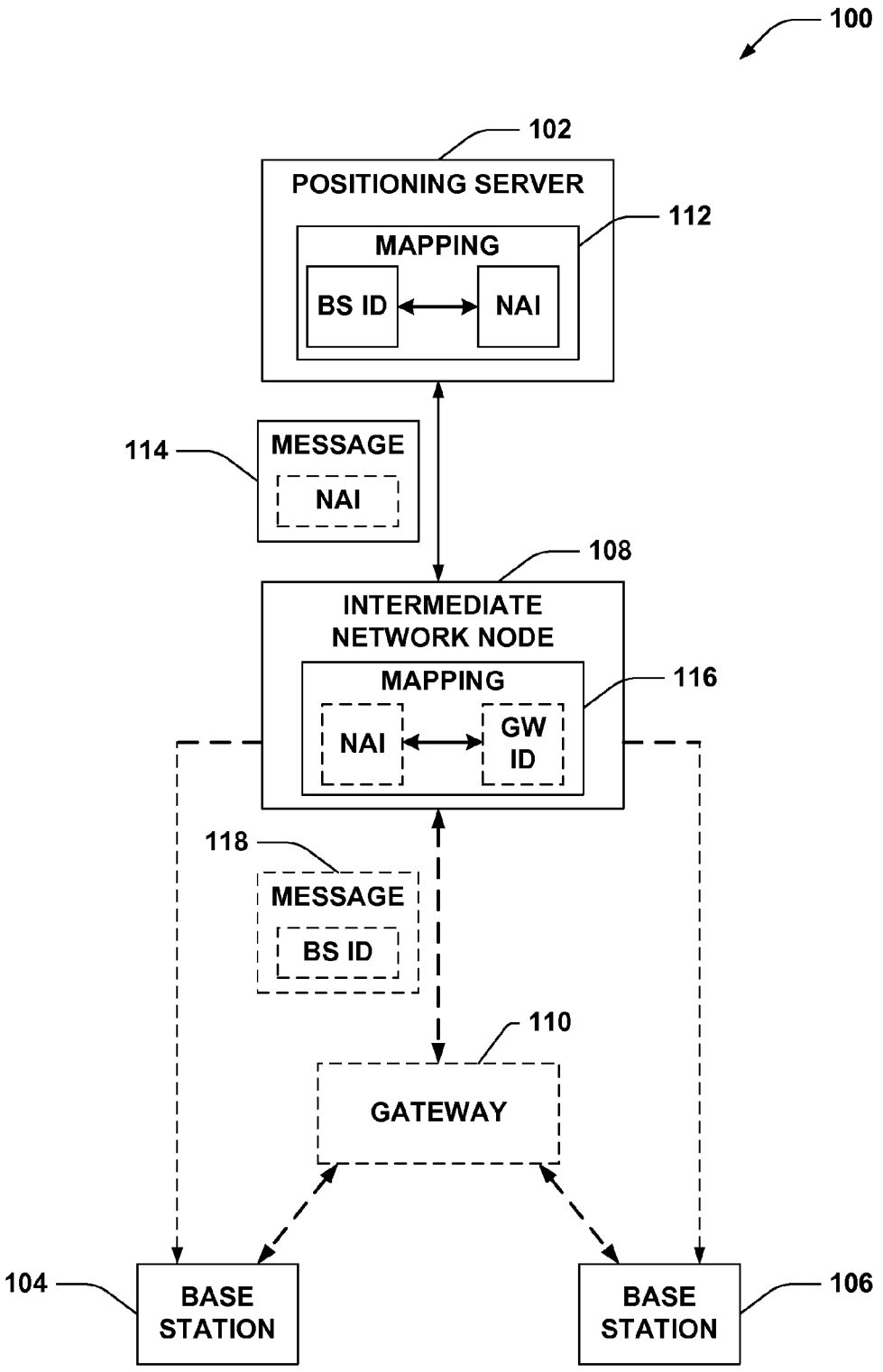
100
102
POSITIONING SERVER
MAPPING
BS ID
NAI
112
114
MESSAGE
NAI
108
INTERMEDIATE NETWORK NODE
MAPPING
NAI
GW ID
116
118
MESSAGE
BS ID
110
GATEWAY
104
BASE STATION
BASE STATION
106

FIG. 1

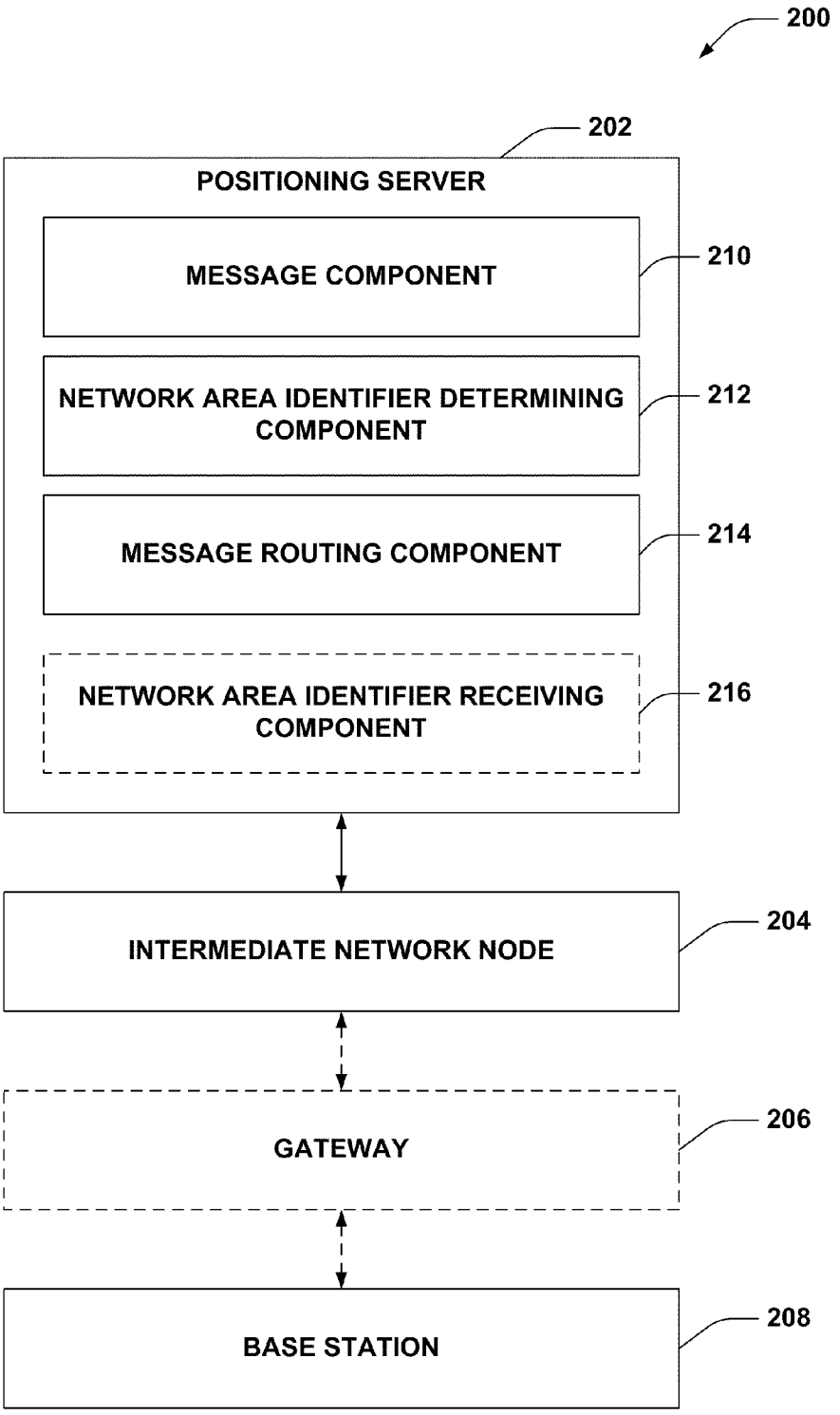
200
202
POSITIONING SERVER
MESSAGE COMPONENT
210
NETWORK AREA IDENTIFIER DETERMINING COMPONENT
212
MESSAGE ROUTING COMPONENT
214
NETWORK AREA IDENTIFIER RECEIVING COMPONENT
216
INTERMEDIATE NETWORK NODE
204
GATEWAY
206
BASE STATION
208

FIG. 2

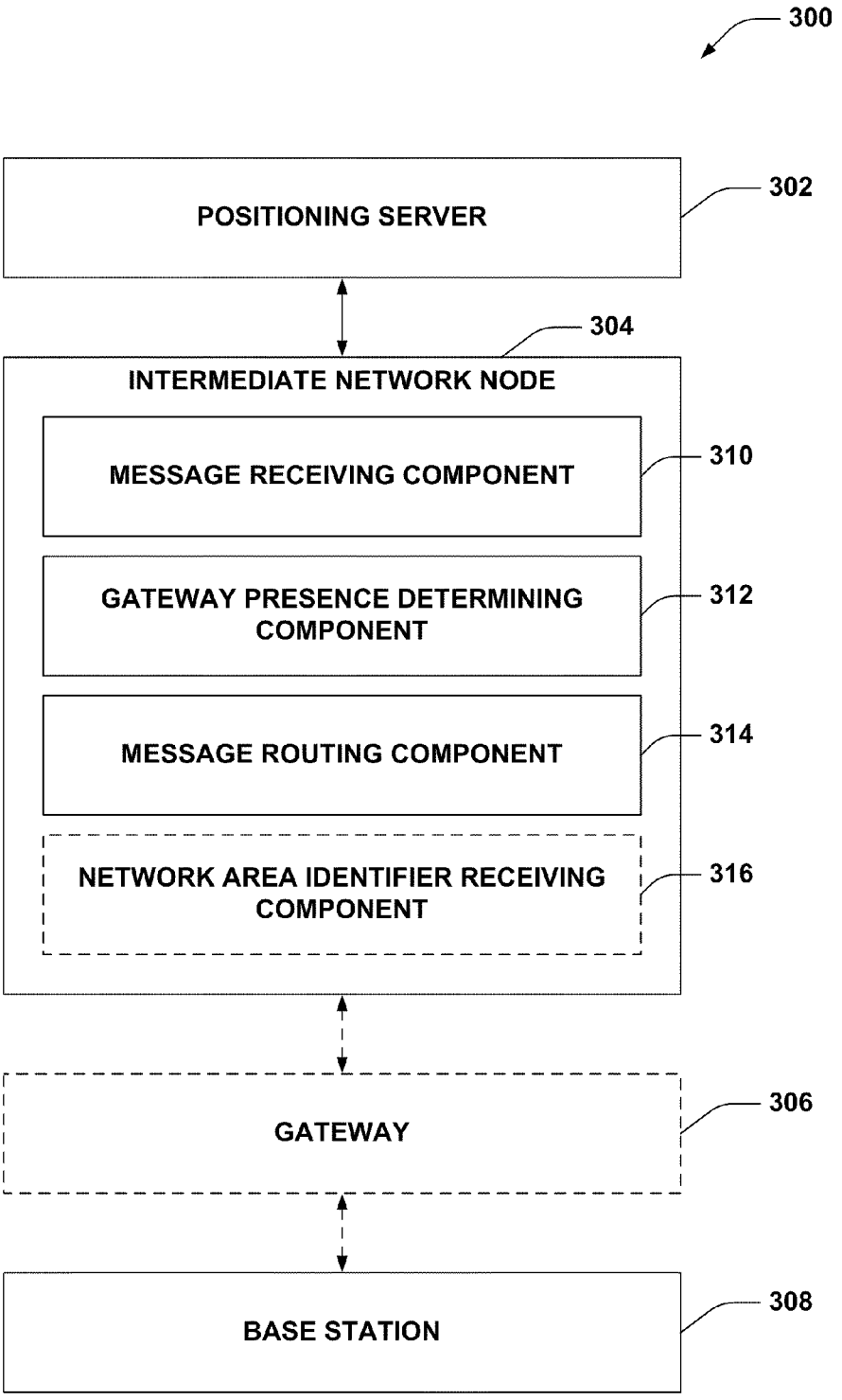
300
POSITIONING SERVER
302
304
INTERMEDIATE NETWORK NODE
MESSAGE RECEIVING COMPONENT
310
GATEWAY PRESENCE DETERMINING COMPONENT
312
MESSAGE ROUTING COMPONENT
314
NETWORK AREA IDENTIFIER RECEIVING COMPONENT
316
GATEWAY
306
BASE STATION
308

FIG. 3

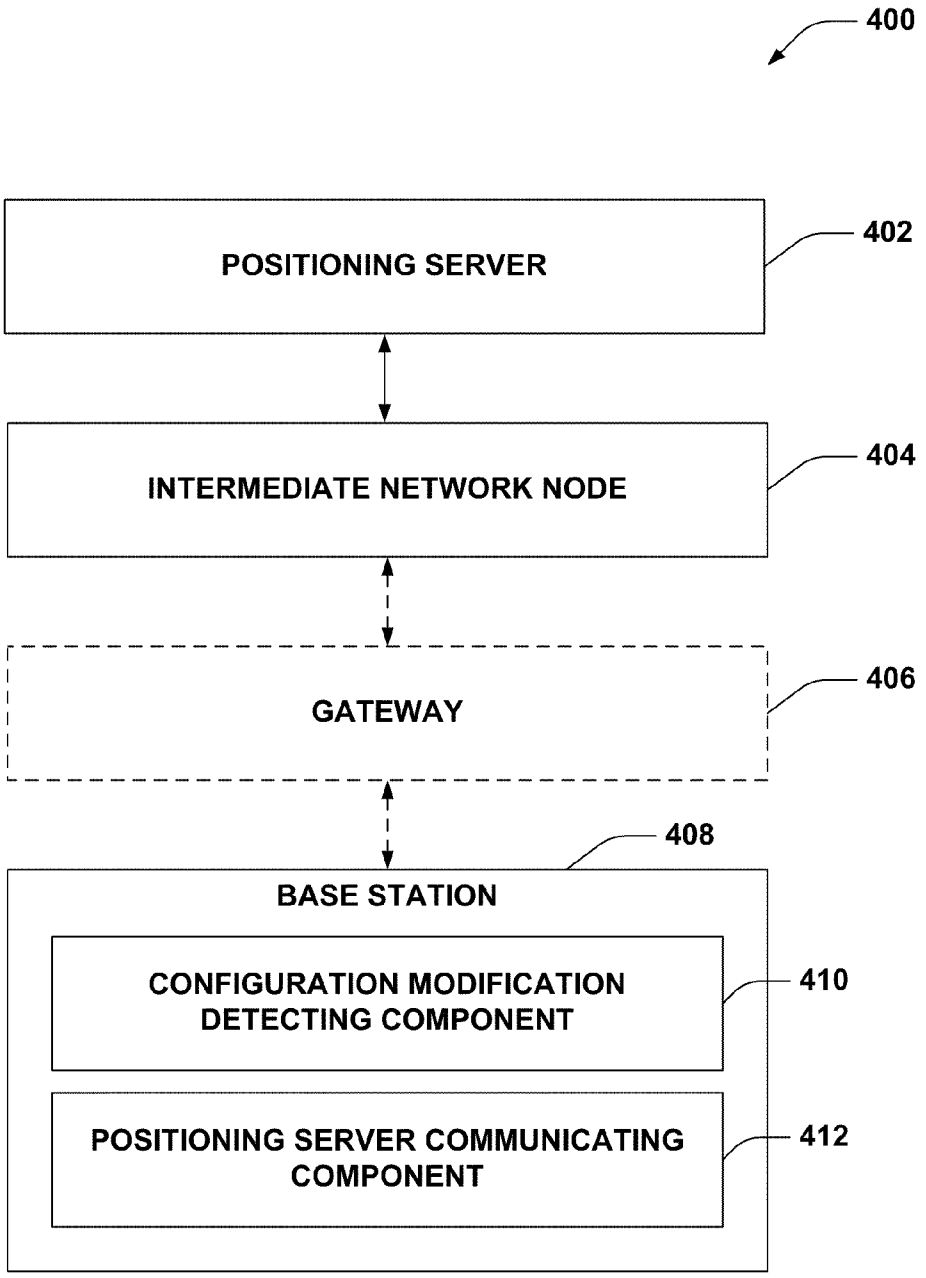
400
POSITIONING SERVER
402
INTERMEDIATE NETWORK NODE
404
GATEWAY
406
408
BASE STATION
CONFIGURATION MODIFICATION DETECTING COMPONENT
410
POSITIONING SERVER COMMUNICATING COMPONENT
412

FIG. 4

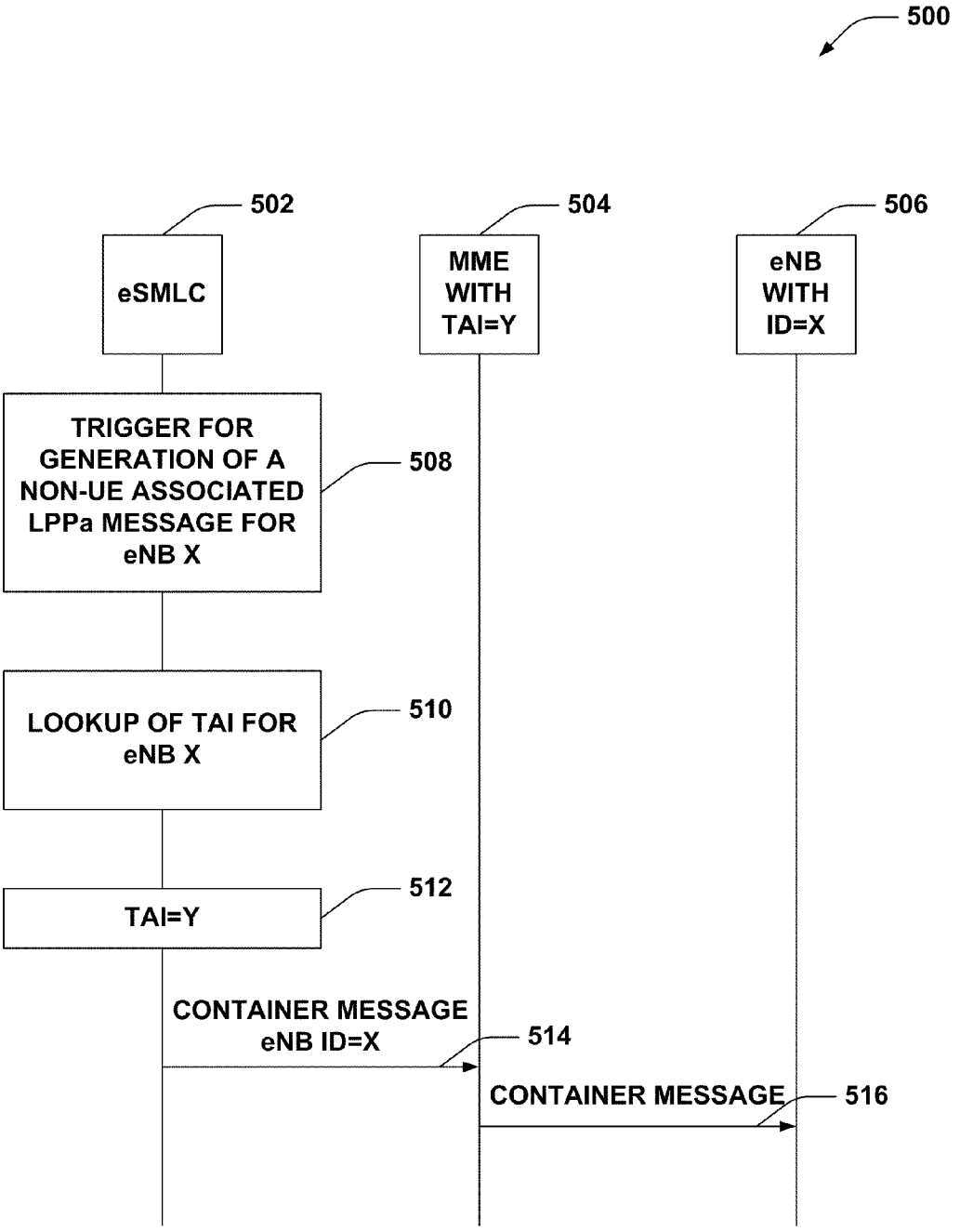
500
502
504
506
eSMLC
MME WITH TAI=Y
eNB WITH ID=X
TRIGGER FOR GENERATION OF A NON-UE ASSOCIATED LPPa MESSAGE FOR eNB X
508
LOOKUP OF TAI FOR eNB X
510
TAI=Y
512
CONTAINER MESSAGE eNB ID=X
514
CONTAINER MESSAGE
516

FIG. 5

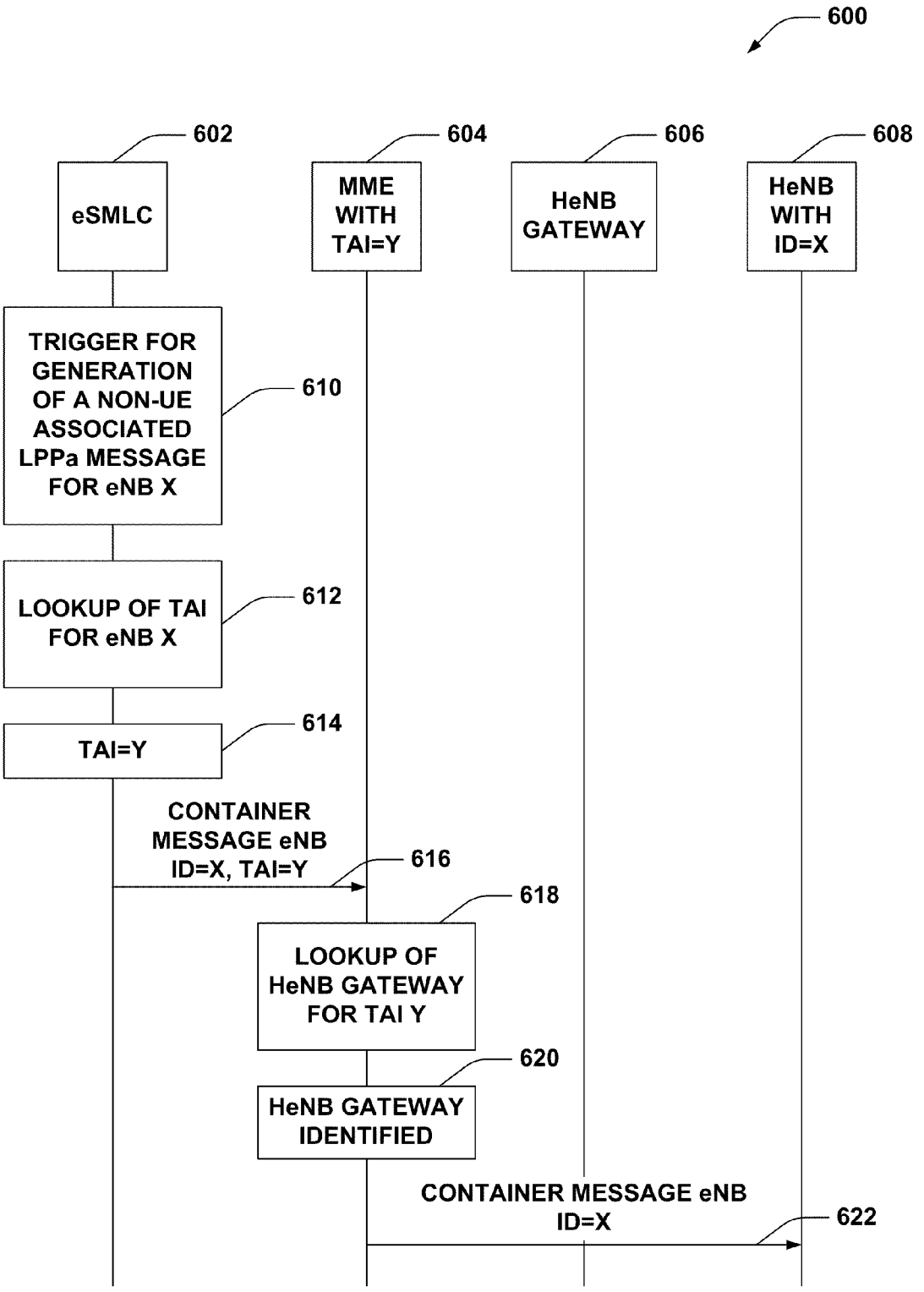
600
602
eSMLC
604
MME WITH TAI=Y
606
HeNB GATEWAY
608
HeNB WITH ID=X
TRIGGER FOR GENERATION OF A NON-UE ASSOCIATED LPPa MESSAGE FOR eNB X
610
LOOKUP OF TAI FOR eNB X
612
TAI=Y
614
CONTAINER MESSAGE eNB ID=X, TAI=Y
616
LOOKUP OF HeNB GATEWAY FOR TAI Y
618
HeNB GATEWAY IDENTIFIED
620
CONTAINER MESSAGE eNB ID=X
622

FIG. 6

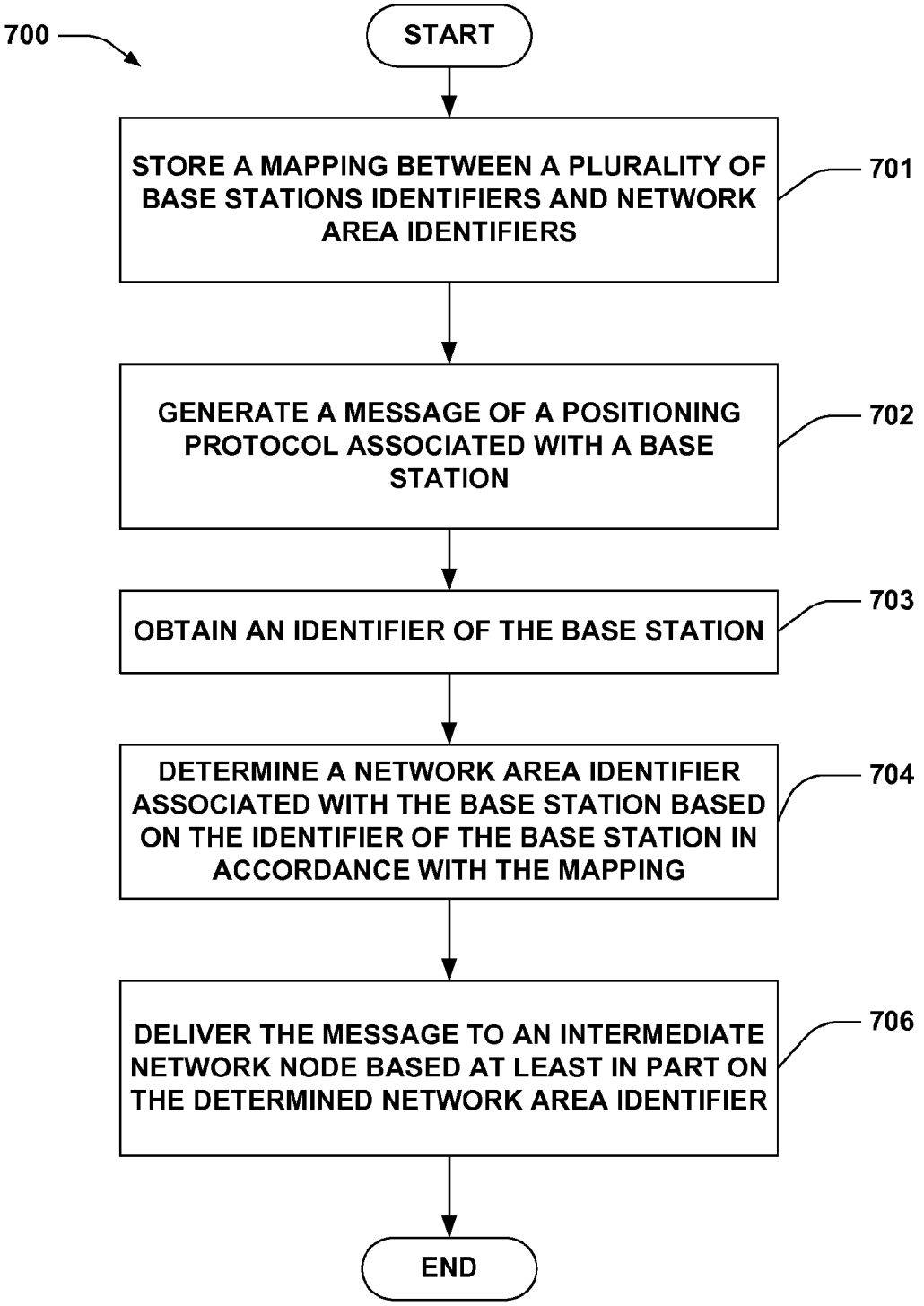
700
START
STORE A MAPPING BETWEEN A PLURALITY OF BASE STATIONS IDENTIFIERS AND NETWORK AREA IDENTIFIERS
701
GENERATE A MESSAGE OF A POSITIONING PROTOCOL ASSOCIATED WITH A BASE STATION
702
OBTAIN AN IDENTIFIER OF THE BASE STATION
703
DETERMINE A NETWORK AREA IDENTIFIER ASSOCIATED WITH THE BASE STATION BASED ON THE IDENTIFIER OF THE BASE STATION IN ACCORDANCE WITH THE MAPPING
704
DELIVER THE MESSAGE TO AN INTERMEDIATE NETWORK NODE BASED AT LEAST IN PART ON THE DETERMINED NETWORK AREA IDENTIFIER
706
END

FIG. 7

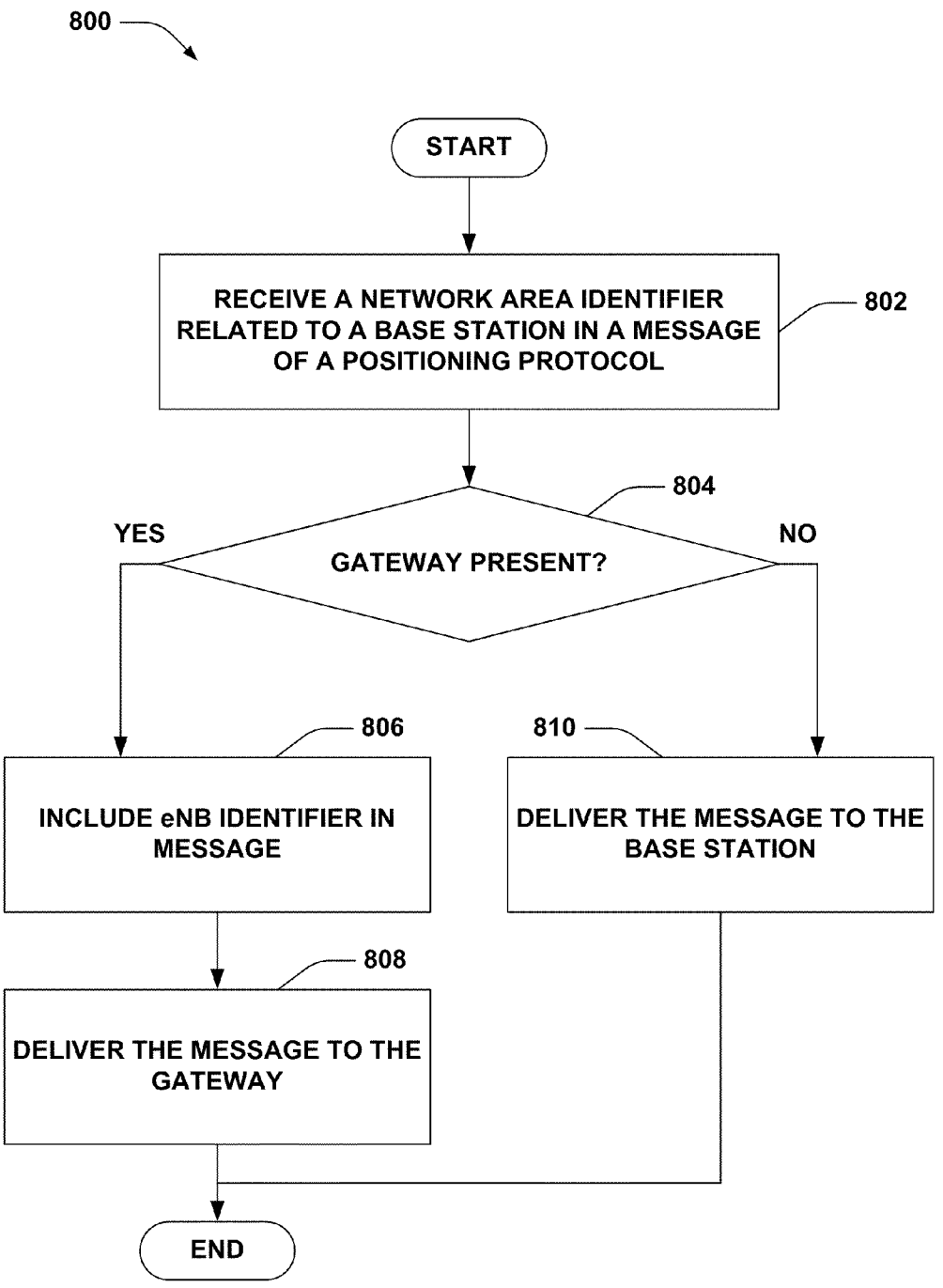
800
START
RECEIVE A NETWORK AREA IDENTIFIER RELATED TO A BASE STATION IN A MESSAGE OF A POSITIONING PROTOCOL
802
804
GATEWAY PRESENT?
YES
NO
806
INCLUDE eNB IDENTIFIER IN MESSAGE
808
DELIVER THE MESSAGE TO THE GATEWAY
810
DELIVER THE MESSAGE TO THE BASE STATION
END

FIG. 8

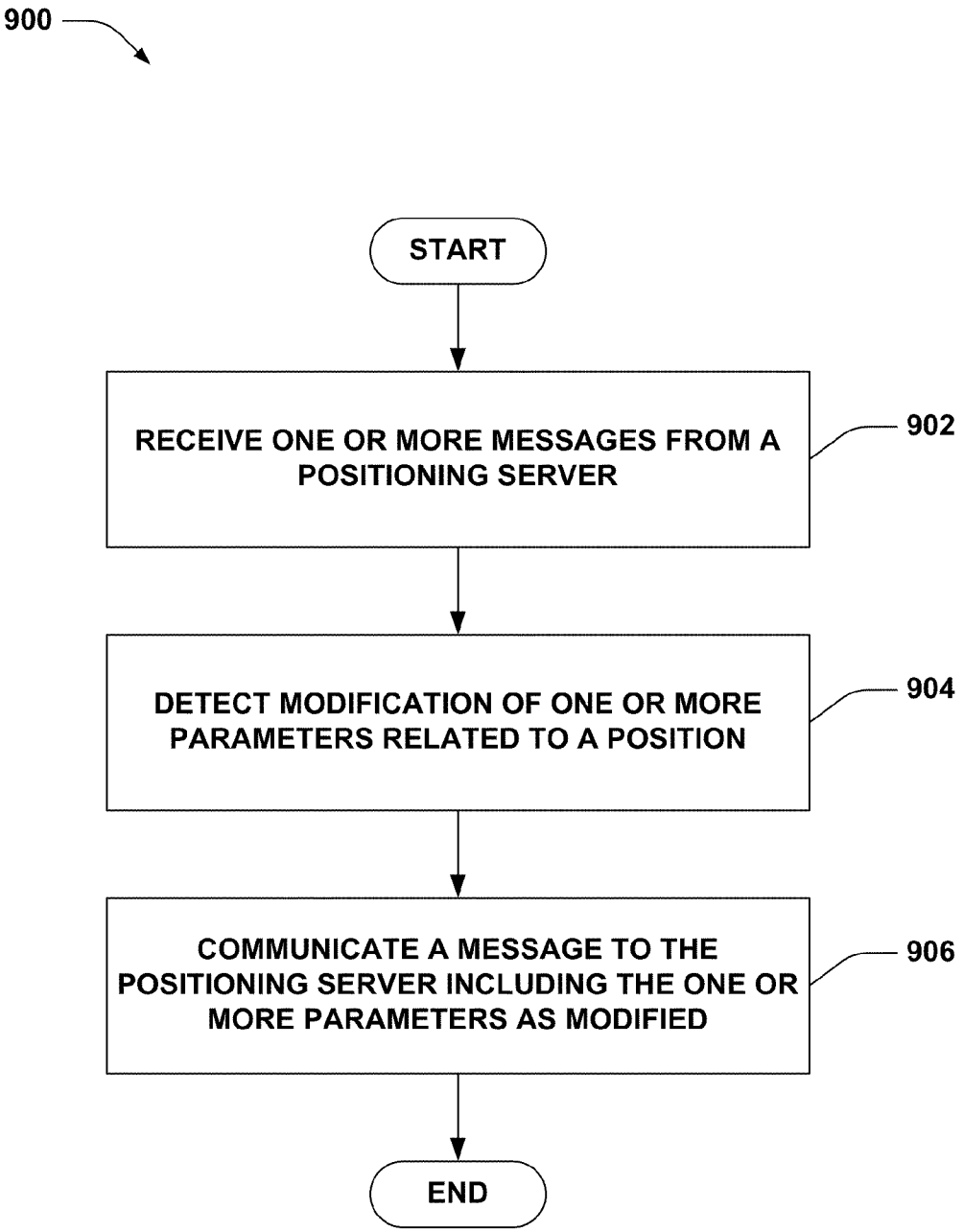
900
START
RECEIVE ONE OR MORE MESSAGES FROM A POSITIONING SERVER
902
DETECT MODIFICATION OF ONE OR MORE PARAMETERS RELATED TO A POSITION
904
COMMUNICATE A MESSAGE TO THE POSITIONING SERVER INCLUDING THE ONE OR MORE PARAMETERS AS MODIFIED
906
END

FIG. 9

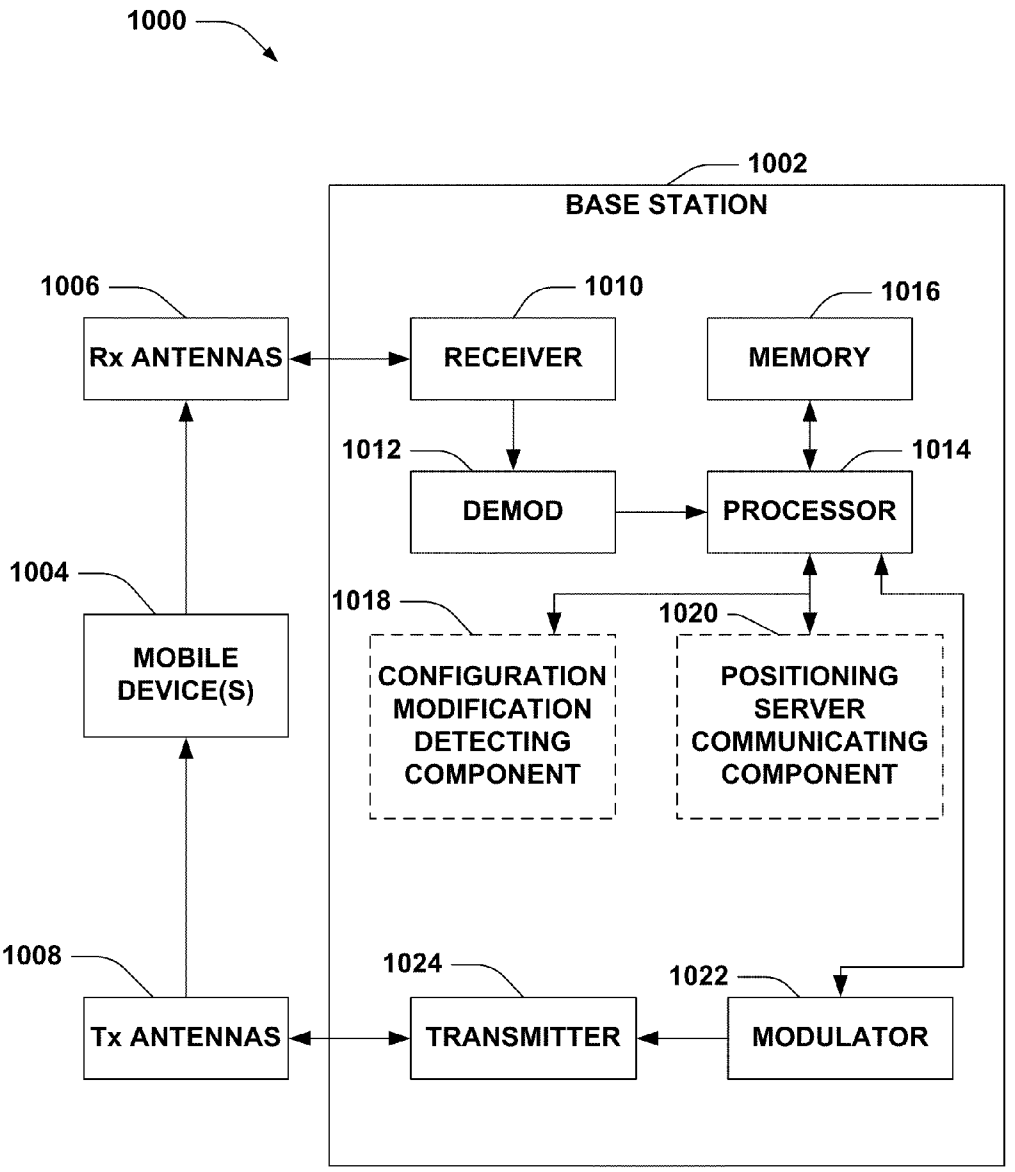
1000
1002
BASE STATION
1006
Rx ANTENNAS
1010
RECEIVER
1016
MEMORY
1012
DEMOD
1014
PROCESSOR
1004
MOBILE DEVICE(S)
1018
CONFIGURATION MODIFICATION DETECTING COMPONENT
1020
POSITIONING SERVER COMMUNICATING COMPONENT
1008
Tx ANTENNAS
1024
TRANSMITTER
1022
MODULATOR

FIG. 10

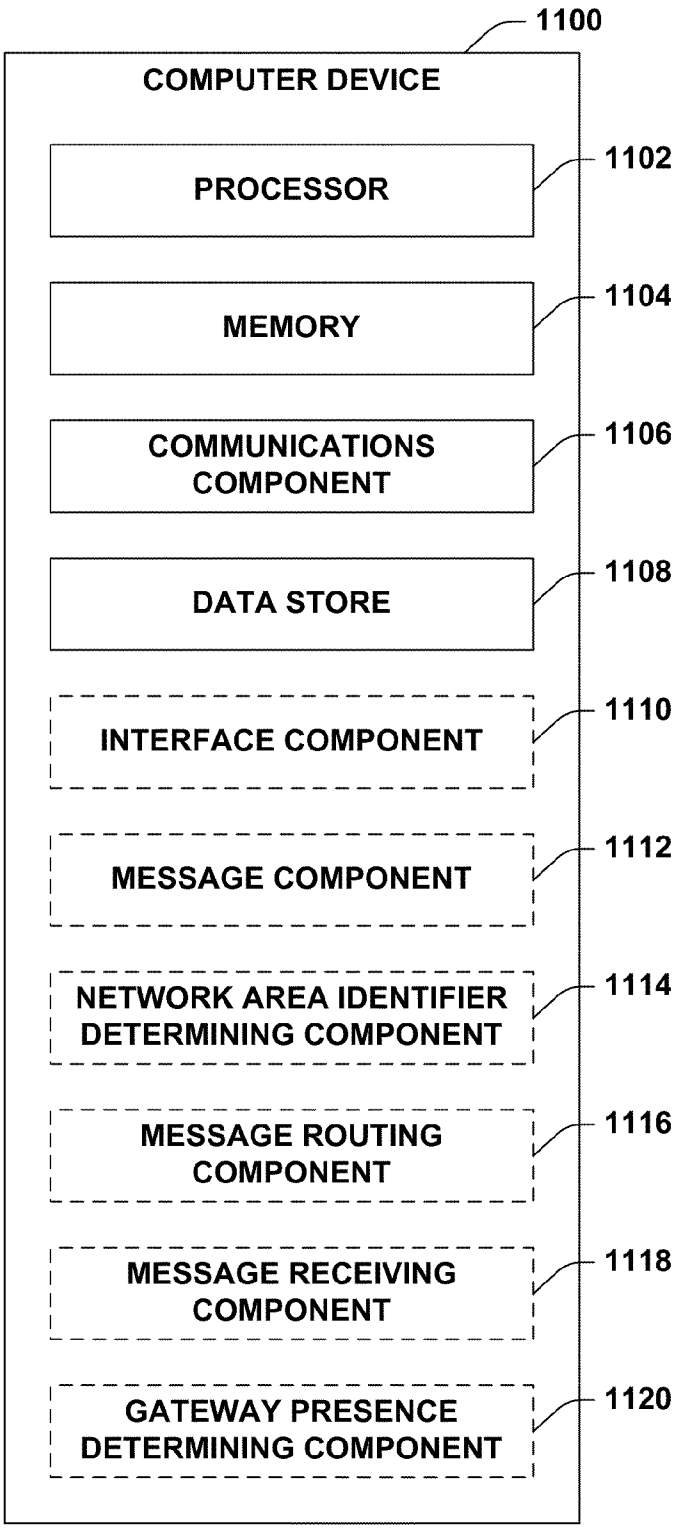
1100
COMPUTER DEVICE
PROCESSOR
1102
MEMORY
1104
COMMUNICATIONS COMPONENT
1106
DATA STORE
1108
INTERFACE COMPONENT
1110
MESSAGE COMPONENT
1112
NETWORK AREA IDENTIFIER DETERMINING COMPONENT
1114
MESSAGE ROUTING COMPONENT
1116
MESSAGE RECEIVING COMPONENT
1118
GATEWAY PRESENCE DETERMINING COMPONENT
1120

FIG. 11

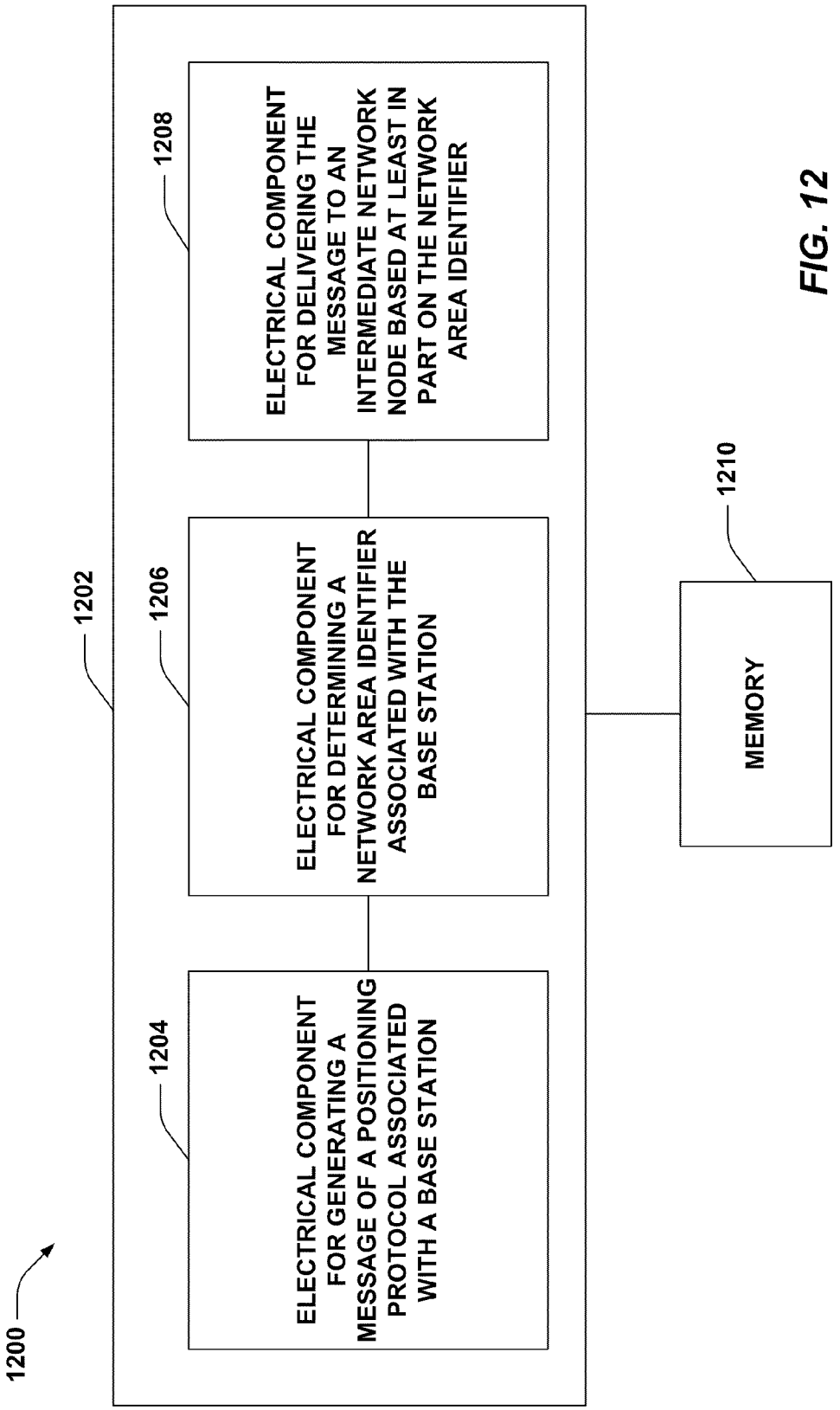
1200
1202
1204
ELECTRICAL COMPONENT FOR GENERATING A MESSAGE OF A POSITIONING PROTOCOL ASSOCIATED WITH A BASE STATION
1206
ELECTRICAL COMPONENT FOR DETERMINING A NETWORK AREA IDENTIFIER ASSOCIATED WITH THE BASE STATION
1208
ELECTRICAL COMPONENT FOR DELIVERING THE MESSAGE TO AN INTERMEDIATE NETWORK NODE BASED AT LEAST IN PART ON THE NETWORK AREA IDENTIFIER
1210
MEMORY

FIG. 12

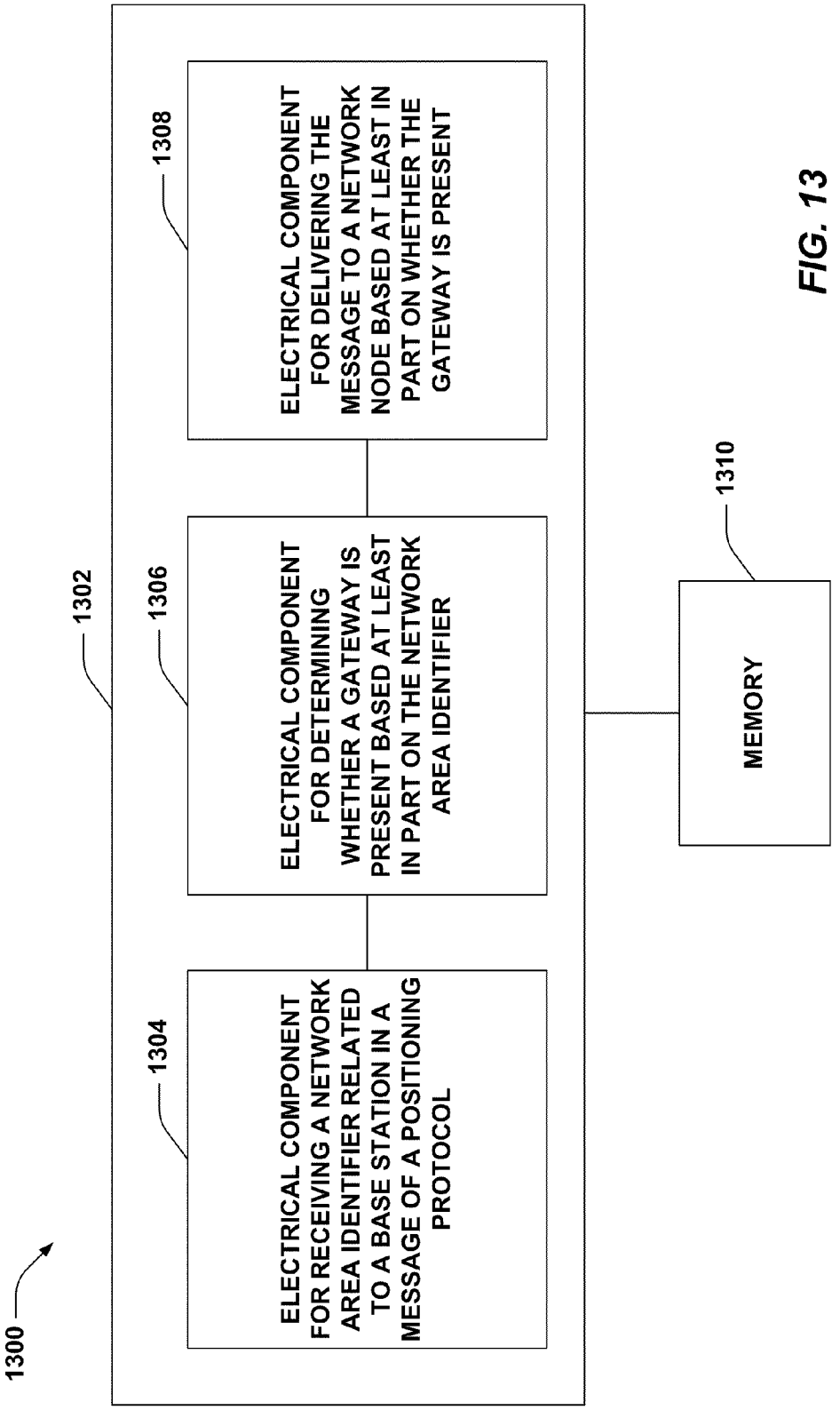
1300
1302
1304
ELECTRICAL COMPONENT FOR RECEIVING A NETWORK AREA IDENTIFIER RELATED TO A BASE STATION IN A MESSAGE OF A POSITIONING PROTOCOL
1306
ELECTRICAL COMPONENT FOR DETERMINING WHETHER A GATEWAY IS PRESENT BASED AT LEAST IN PART ON THE NETWORK AREA IDENTIFIER
1308
ELECTRICAL COMPONENT FOR DELIVERING THE MESSAGE TO A NETWORK NODE BASED AT LEAST IN PART ON WHETHER THE GATEWAY IS PRESENT
1310
MEMORY

FIG. 13

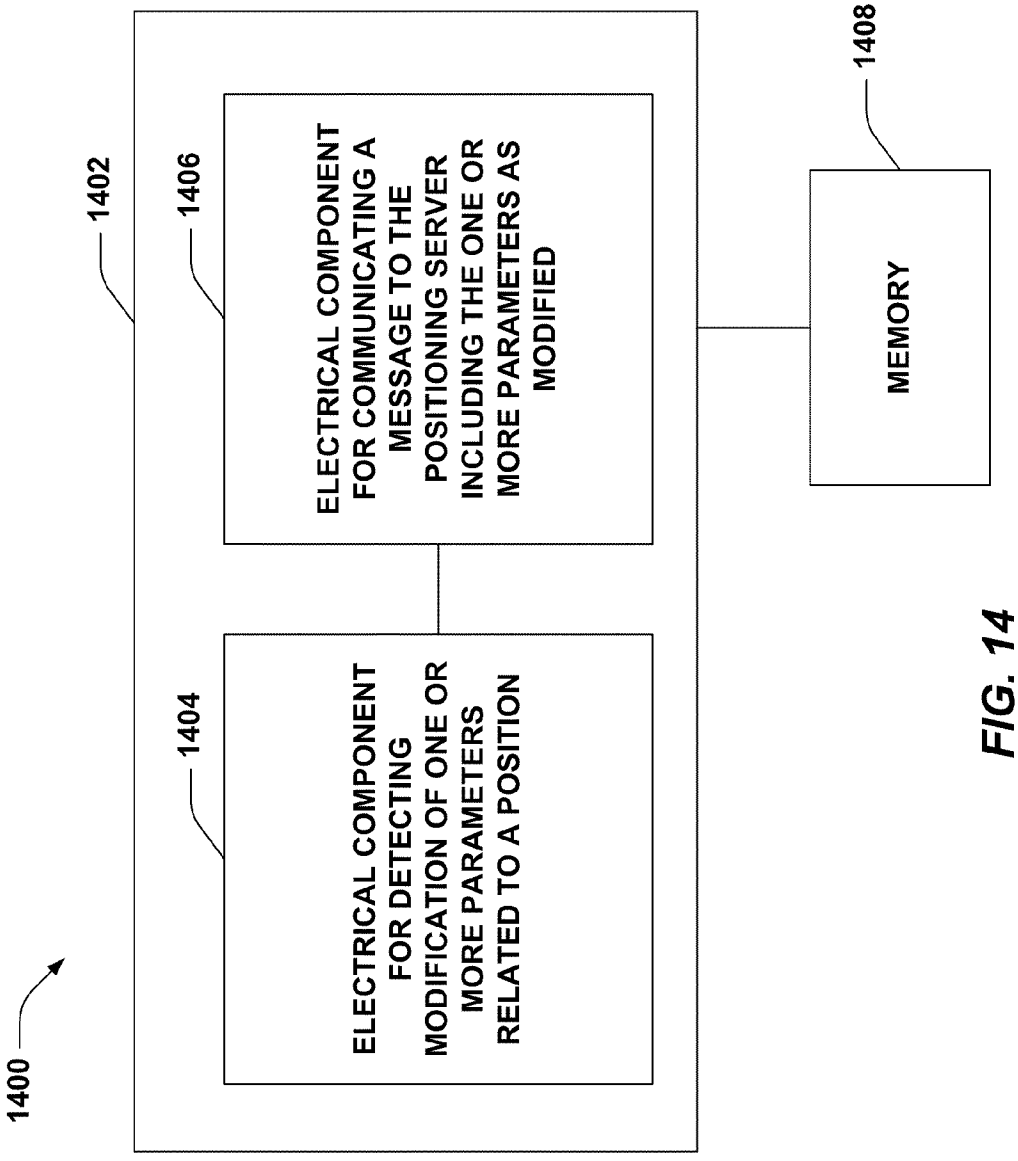
1400
1402
1404
ELECTRICAL COMPONENT FOR DETECTING MODIFICATION OF ONE OR MORE PARAMETERS RELATED TO A POSITION
1406
ELECTRICAL COMPONENT FOR COMMUNICATING A MESSAGE TO THE POSITIONING SERVER INCLUDING THE ONE OR MORE PARAMETERS AS MODIFIED
1408
MEMORY

FIG. 14

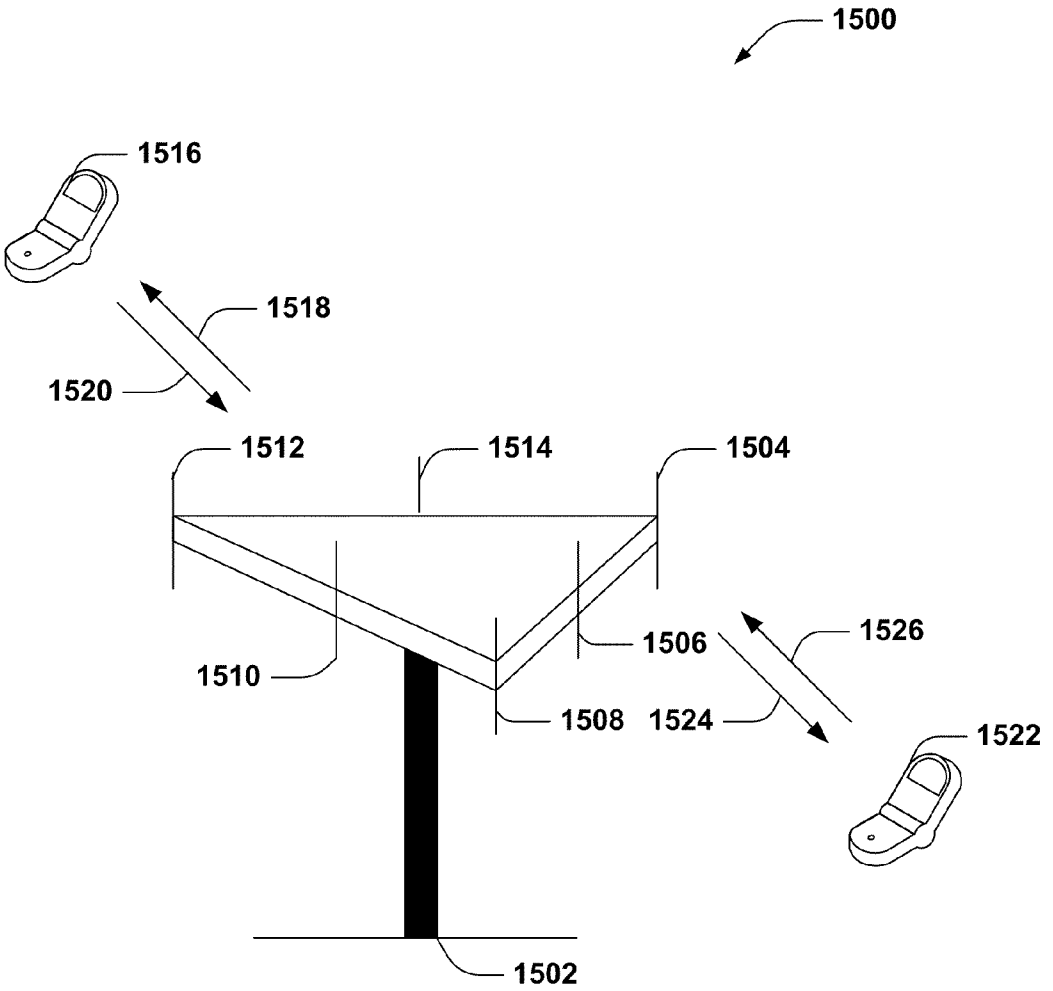
1500
1516
1518
1520
1512
1514
1504
1506
1526
1510
1508
1524
1522
1502

FIG. 15

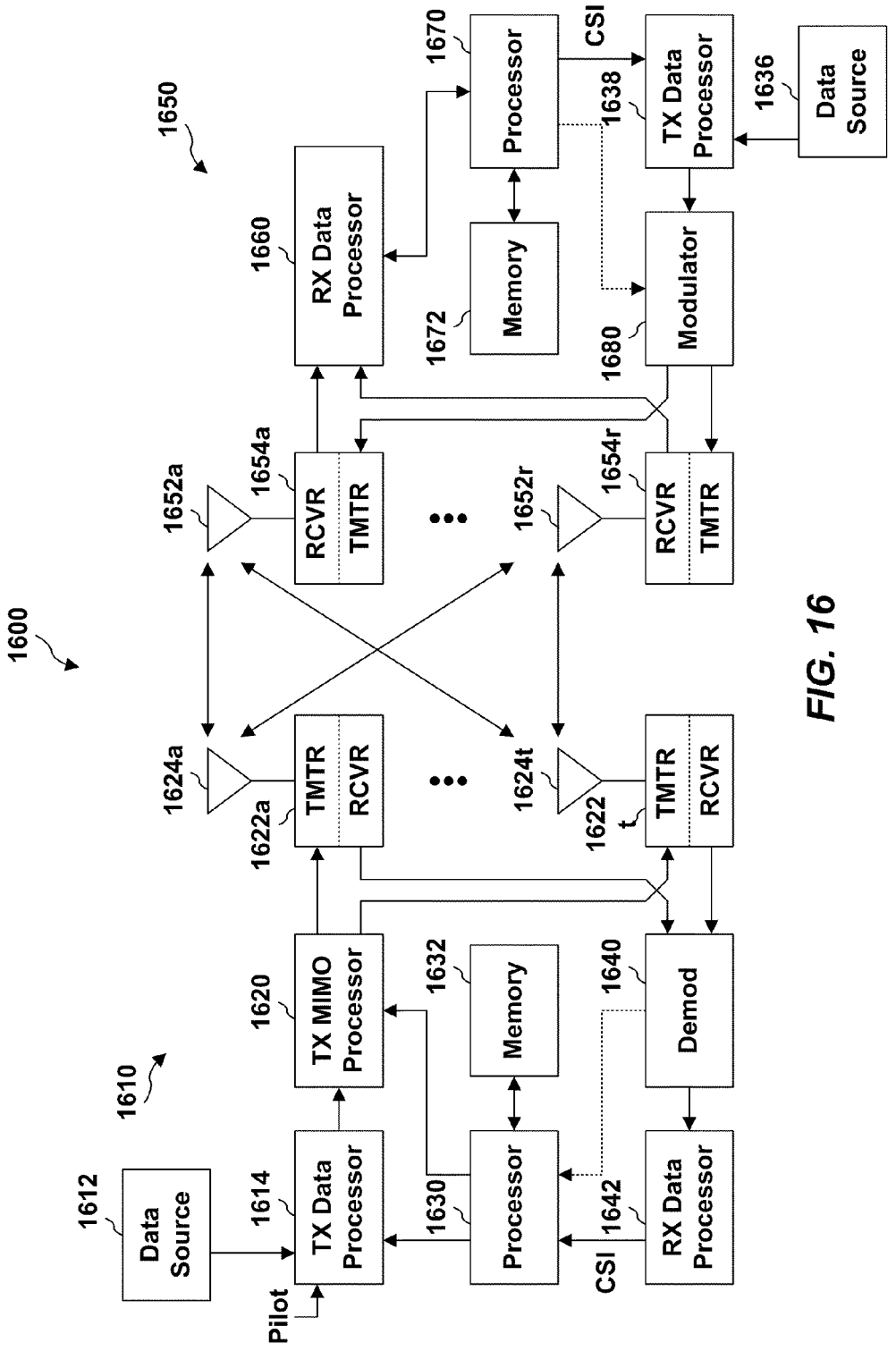
1600
1610
1612
Data Source
1614
TX Data Processor
Pilot
1620
TX MIMO Processor
1622a
1622t
1624a
1624t
TMTR
RCVR
1630
Processor
1632
Memory
1640
Demod
1642
RX Data Processor
CSI
1650
1652a
1652r
1654a
1654r
RCVR
TMTR
1660
RX Data Processor
1670
Processor
1672
Memory
1680
Modulator
1636
Data Source
1638
TX Data Processor
CSI

FIG. 16

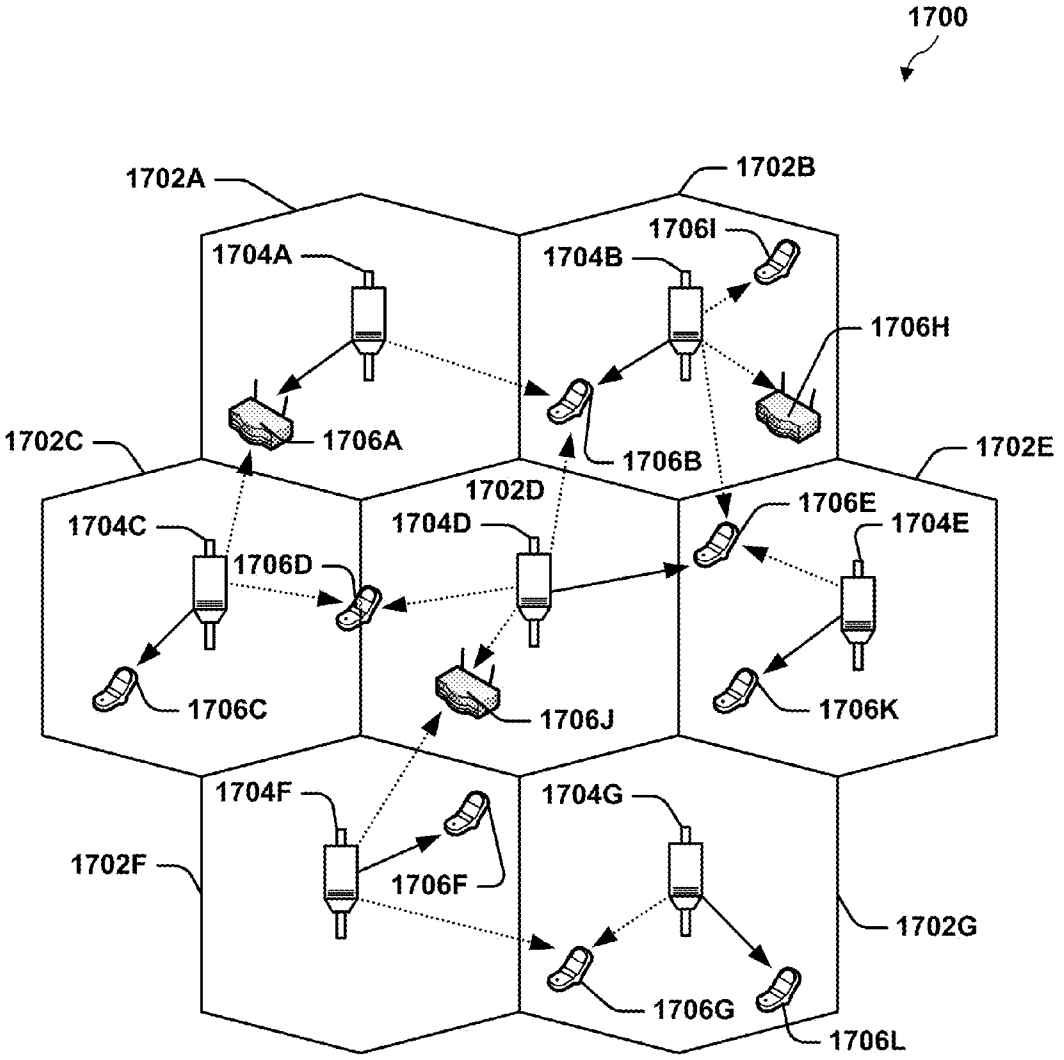
1700
1702A
1702B
1704A
1706I
1704B
1706H
1706A
1706B
1702C
1702E
1702D
1704C
1704D
1706E
1704E
1706D
1706C
1706J
1706K
1704F
1704G
1702F
1706F
1702G
1706G
1706L

FIG. 17

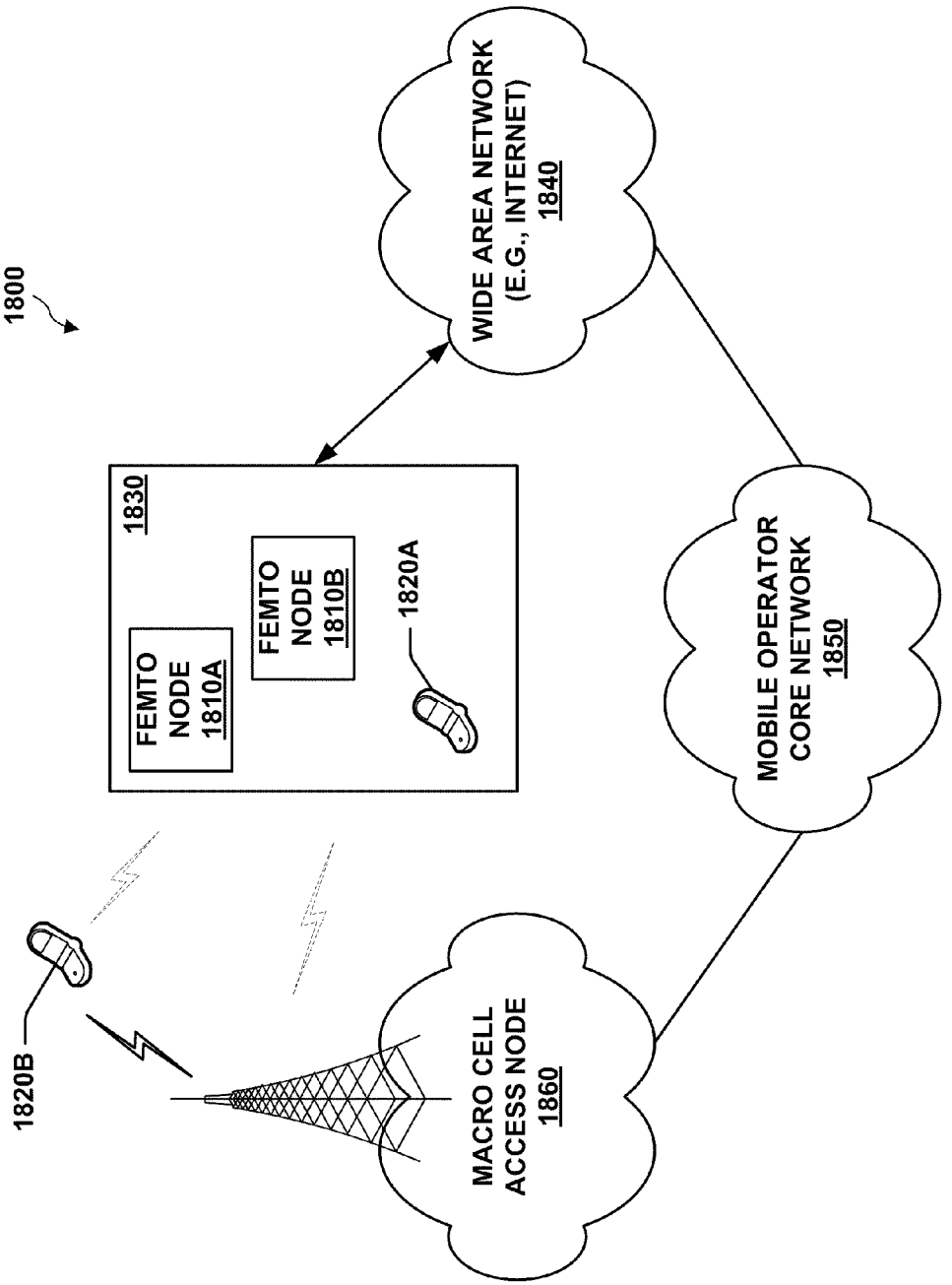
1800
WIDE AREA NETWORK
(E.G., INTERNET)
1840
1830
FEMTO
NODE
1810A
FEMTO
NODE
1810B
1820A
MOBILE OPERATOR
CORE NETWORK
1850
1820B
MACRO CELL
ACCESS NODE
1860

FIG. 18

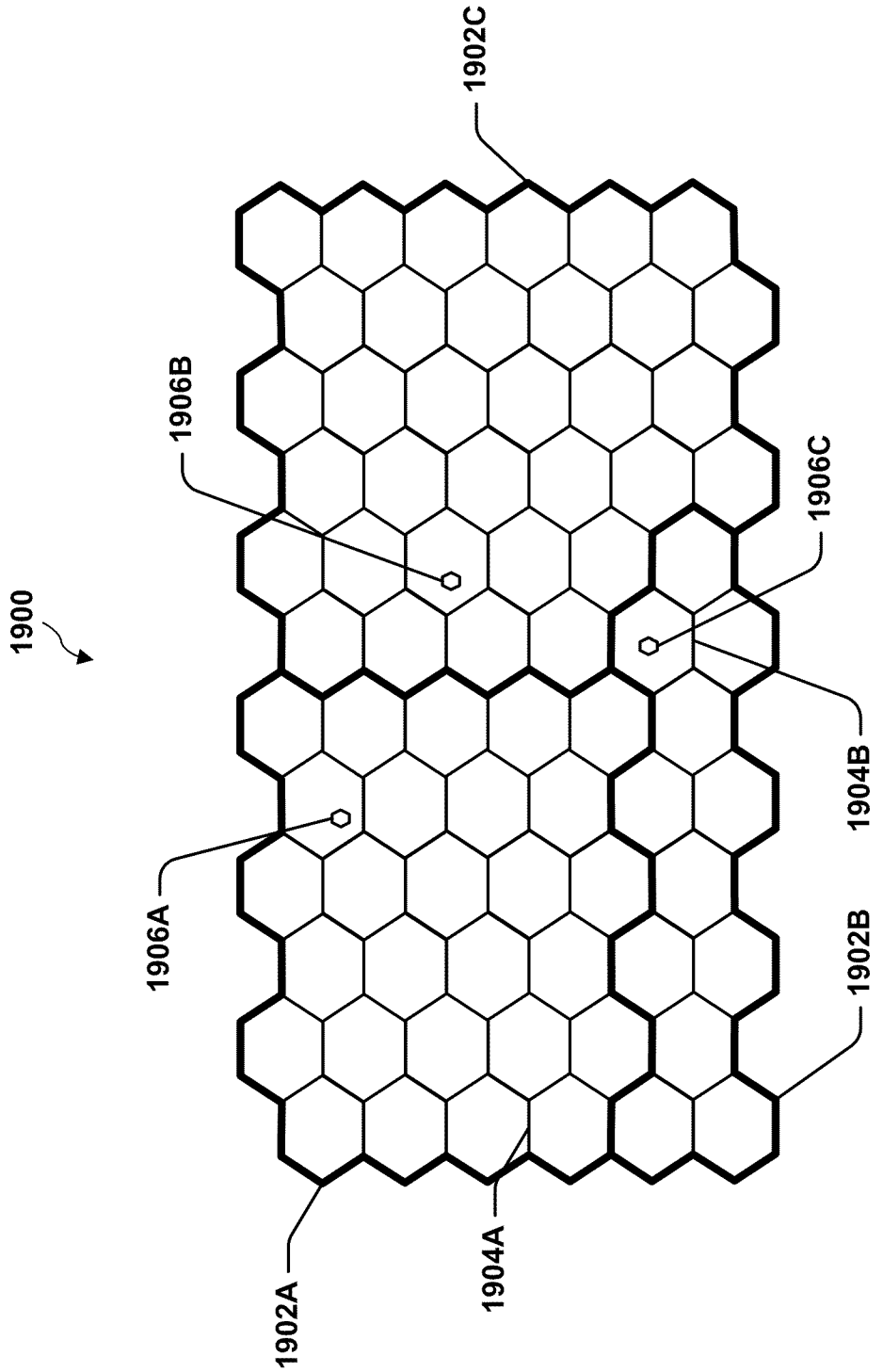

FIG. 19

METHOD AND APPARATUS FOR ROUTING MESSAGES OF A POSITIONING PROTOCOL IN A WIRELESS NETWORK

CLAIM OF PRIORITY UNDER 35 U.S.C. §119

The present Application for Patent claims priority to Provisional Application No. 61/293,534 entitled "TRACKING AREA-BASED ROUTING OF POSITIONING MESSAGES" filed Jan. 8, 2010, and assigned to the assignee hereof and hereby expressly incorporated by reference herein.

BACKGROUND

1. Field

The following description relates generally to wireless network communications, and more particularly to routing messages of a positioning protocol across network nodes.

2. Background

Wireless communication systems are widely deployed to provide various types of communication content such as, for example, voice, data, and so on. Typical wireless communication systems may be multiple-access systems capable of supporting communication with multiple users by sharing available system resources (e.g., bandwidth, transmit power, . . .). Examples of such multiple-access systems may include code division multiple access (CDMA) systems, time division multiple access (TDMA) systems, frequency division multiple access (FDMA) systems, orthogonal frequency division multiple access (OFDMA) systems, and the like. Additionally, the systems can conform to specifications such as third generation partnership project (3GPP), 3GPP long term evolution (LTE), ultra mobile broadband (UMB), evolution data optimized (EV-DO), etc.

Generally, wireless multiple-access communication systems may simultaneously support communication for multiple mobile devices. Each mobile device may communicate with one or more base stations via transmissions on forward and reverse links. The forward link (or downlink) refers to the communication link from base stations to mobile devices, and the reverse link (or uplink) refers to the communication link from mobile devices to base stations. Further, communications between mobile devices and base stations may be established via single-input single-output (SISO) systems, multiple-input single-output (MISO) systems, multiple-input multiple-output (MIMO) systems, and so forth. In addition, mobile devices can communicate with other mobile devices (and/or base stations with other base stations) in peer-to-peer wireless network configurations.

In addition, devices can determine positioning at least in part by utilizing assisted global positioning system (GPS), observed time difference of arrival (OTDOA) or other triangulation techniques involving one or more base stations, enhanced cell identifier (E-CID), and/or the like. For example, a positioning server, such as a serving mobile location center (SMLC), evolved SMLC (eSMLC), etc., can provide positioning messages over an LTE positioning protocol (LPP), LPP annex (LPPa), etc. to the device and/or to other nodes in the network to facilitate performing such measurements for computing a position of the device. In one example, the positioning messages can include assistance information, such as a location of one or more base stations. In this regard, positioning messages can be requested by a device, and the request routed through at least a base station and a mobility management entity (MME) to the positioning server. Thus, the positioning server can route corresponding positioning messages to the device through the mobility management entity (MME) and related base station, based at least in part on the request.

SUMMARY

The following presents a simplified summary of one or more aspects in order to provide a basic understanding of such aspects. This summary is not an extensive overview of all contemplated aspects, and is intended to neither identify key or critical elements of all aspects nor delineate the scope of any or all aspects. Its sole purpose is to present some concepts of one or more aspects in a simplified form as a prelude to the more detailed description that is presented later.

In accordance with one or more embodiments and corresponding disclosure thereof, various aspects are described in connection with facilitating utilizing a mapping of a network area identifier to a base station identifier at a positioning server for routing messages of a positioning protocol. In this regard, the positioning server can appropriately route messages to a base station that are not associated with a particular device through an intermediate network node, such as a mobility management entity (MME). In another example, the positioning server can include the network area identifier in a message to allow the intermediate network node to identify a possible gateway node between the intermediate network node and the base station, and accordingly route the messages to the gateway node for providing to the base station. It is to be appreciated that the positioning server can include the network area identifier in the message regardless of whether the message is associated with a particular device or not. In addition, in this example, the intermediate network node can include an identifier of the base station in the messages to the gateway node.

According to an example, a method of communicating a message of a positioning protocol in a wireless network is provided that includes generating a message of a positioning protocol associated with a base station and determining a network area identifier associated with the base station. The method further includes delivering the message to an intermediate network node based at least in part on the network area identifier.

In another aspect, an apparatus for routing messages of a positioning protocol in a wireless network is provided that includes at least one processor configured to generate a message of a positioning protocol associated with a base station and determine a network area identifier associated with the base station. The at least one processor is further configured to provide the message to an intermediate network node based at least in part on the network area identifier. In addition, the apparatus includes a memory coupled to the at least one processor.

In yet another aspect, an apparatus for routing messages of a positioning protocol in a wireless network is provided that includes means for generating a message of a positioning protocol associated with a base station and means for determining a network area identifier associated with the base station. The apparatus further includes means for delivering the message to an intermediate network node based at least in part on the network area identifier.

Still, in another aspect, a computer-program product is provided routing messages of a positioning protocol in a wireless network including a computer-readable medium having code for causing at least one computer to generate a message of a positioning protocol associated with a base station and code for causing the at least one computer to determine a network area identifier associated with the base

station. The computer-readable medium further includes code for causing the at least one computer to provide the message to an intermediate network node based at least in part on the network area identifier.

Moreover, in an aspect, an apparatus for routing messages of a positioning protocol in a wireless network is provided that includes a message component for generating a message of a positioning protocol associated with a base station and a network area identifier determining component for discerning a network area identifier associated with the base station. The apparatus further includes a message routing component for delivering the message to an intermediate network node based at least in part on the network area identifier.

According to another example, a method for routing messages of a positioning protocol in a wireless network is provided that includes receiving a network area identifier related to a base station in a message of a positioning protocol and determining whether a gateway is present based at least in part on the network area identifier. The method further includes delivering the message to a network node based at least in part on whether the gateway is present.

In another aspect, an apparatus for routing messages of a positioning protocol in a wireless network is provided that includes at least one processor configured to receive a network area identifier related to a base station in a message of a positioning protocol and determine whether a gateway is present based at least in part on the network area identifier. The at least one processor is further configured to provide the message to a network node based at least in part on whether the gateway is present. In addition, the apparatus includes a memory coupled to the at least one processor.

In yet another aspect, an apparatus for routing messages of a positioning protocol in a wireless network is provided that includes means for receiving a network area identifier related to a base station in a message of a positioning protocol and means for determining whether a gateway is present based at least in part on the network area identifier. The apparatus further includes means for delivering the message to a network node based at least in part on whether the gateway is present.

Still, in another aspect, a computer-program product is provided for routing messages of a positioning protocol in a wireless network including a computer-readable medium having code for causing at least one computer to receive a network area identifier related to a base station in a message of a positioning protocol and code for causing the at least one computer to determine whether a gateway is present based at least in part on the network area identifier. The computer-readable medium further includes code for causing the at least one computer to provide the message to a network node based at least in part on whether the gateway is present.

Moreover, in an aspect, an apparatus for routing messages of a positioning protocol in a wireless network is provided that includes a message receiving component for obtaining a network area identifier related to a base station in a message of a positioning protocol and a gateway presence determining component for discerning whether a gateway is present based at least in part on the network area identifier. The apparatus further includes a message routing component for delivering the message to a network node based at least in part on whether the gateway is present.

In another example, a method for updating positioning information in a wireless network is provided that includes receiving one or more messages from a positioning server and detecting modification of one or more parameters related to a position. The method further includes communicating a message to the positioning server including the one or more parameters as modified.

In another aspect, an apparatus for updating positioning information in a wireless network is provided that includes at least one processor configured to receive one or more messages from a positioning server and detect modification of one or more parameters related to a position. The at least one processor is further configured to communicate a message to the positioning server including the one or more parameters as modified. In addition, the apparatus includes a memory coupled to the at least one processor.

In yet another aspect, an apparatus for updating positioning information in a wireless network is provided that includes means for detecting modification of one or more parameters related to a position. The apparatus further includes means for communicating a message to a positioning server including the one or more parameters as modified.

Still, in another aspect, a computer-program product is provided for updating positioning information in a wireless network including a computer-readable medium having code for causing at least one computer to receive one or more messages from a positioning server and code for causing the at least one computer to detect modification of one or more parameters related to a position. The computer-readable medium further includes code for causing the at least one computer to communicate a message to the positioning server including the one or more parameters as modified.

Moreover, in an aspect, an apparatus for updating positioning information in a wireless network is provided that includes a configuration modification detecting component for determining modification of one or more parameters related to a position. The apparatus further includes a positioning server communicating component for transmitting a message to a positioning server including the one or more parameters as modified.

To the accomplishment of the foregoing and related ends, the one or more aspects comprise the features hereinafter fully described and particularly pointed out in the claims. The following description and the annexed drawings set forth in detail certain illustrative features of the one or more aspects. These features are indicative, however, of but a few of the various ways in which the principles of various aspects may be employed, and this description is intended to include all such aspects and their equivalents.

BRIEF DESCRIPTION OF THE DRAWINGS

The disclosed aspects will hereinafter be described in conjunction with the appended drawings, provided to illustrate and not to limit the disclosed aspects, wherein like designations denote like elements, and in which:

FIG. **1** illustrates an example system for communicating messages of a positioning protocol across various network nodes.

FIG. **2** illustrates an example system for communicating messages at least from a positioning server to an intermediate network node.

FIG. **3** illustrates an example system for communicating messages at least from an intermediate network node to a gateway or base station.

FIG. **4** illustrates an example system that facilitates updating positioning information with a positioning server.

FIG. **5** illustrates an example system for communicating messages of a positioning protocol between various network nodes.

FIG. **6** illustrates an example system for communicating messages of a positioning protocol between various network nodes including at least one gateway.

FIG. **7** illustrates an example methodology that routes messages of a positioning protocol.

FIG. **8** illustrates an example methodology that routes received messages of a positioning protocol.

FIG. **9** illustrates an example methodology for updating positioning information.

FIG. **10** illustrates an example system that updates positioning information.

FIG. **11** illustrates an example computing device for routing messages of a positioning protocol.

FIG. **12** illustrates an example system for routing messages of a positioning protocol.

FIG. **13** illustrates an example system that routes received messages of a positioning protocol.

FIG. **14** illustrates an example system that updates positioning information.

FIG. **15** illustrates an example wireless communication system in accordance with various aspects set forth herein.

FIG. **16** illustrates an example wireless network environment that can be employed in conjunction with the various systems and methods described herein.

FIG. **17** illustrates a wireless communication system, configured to support a number of devices, in which the aspects herein can be implemented.

FIG. **18** illustrates an exemplary communication system to enable deployment of femtocells within a network environment.

FIG. **19** illustrates an example of a coverage map having several defined tracking areas.

DETAILED DESCRIPTION

Various aspects are now described with reference to the drawings. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of one or more aspects. It may be evident, however, that such aspect(s) may be practiced without these specific details.

As described further herein, a mapping of network area identifiers to base station identifiers can be utilized by a positioning server to determine an intermediate network node related to a base station for routing one or more messages of a positioning protocol. In addition, for example, the network area identifier can be indicated in the messages where one or more gateway nodes exist between the intermediate network node and the base station. Thus, the intermediate network node can determine an appropriate gateway node to which to forward the message based at least in part on the network area identifier. Moreover, in this example, the intermediate network node can include an identifier of the base station in the message to allow the gateway node to determine the base station to which to forward the message. Furthermore, for example, a base station can be a home evolved Node B (HeNB), which can update its configuration to the positioning server upon detecting a modification to it position or other configuration parameters.

As used in this application, the terms "component," "module," "system" and the like are intended to include a computer-related entity, such as but not limited to hardware, firmware, a combination of hardware and software, software, or software in execution. For example, a component may be, but is not limited to being, a process running on a processor, a processor, an object, an executable, a thread of execution, a program, and/or a computer. By way of illustration, both an application running on a computing device and the computing device can be a component. One or more components can reside within a process and/or thread of execution and a component may be localized on one computer and/or distributed between two or more computers. In addition, these components can execute from various computer readable media having various data structures stored thereon. The components may communicate by way of local and/or remote processes such as in accordance with a signal having one or more data packets, such as data from one component interacting with another component in a local system, distributed system, and/or across a network such as the Internet with other systems by way of the signal.

Furthermore, various aspects are described herein in connection with a terminal, which can be a wired terminal or a wireless terminal. A terminal can also be called a system, device, subscriber unit, subscriber station, mobile station, mobile, mobile device, remote station, remote terminal, access terminal, user terminal, terminal, communication device, user agent, user device, or user equipment (UE). A wireless terminal may be a cellular telephone, a satellite phone, a cordless telephone, a Session Initiation Protocol (SIP) phone, a wireless local loop (WLL) station, a personal digital assistant (PDA), a handheld device having wireless connection capability, a computing device, or other processing devices connected to a wireless modem. Moreover, various aspects are described herein in connection with a base station. A base station may be utilized for communicating with wireless terminal(s) and may also be referred to as an access point, a Node B, evolved Node B (eNB), or some other terminology.

Moreover, the term "or" is intended to mean an inclusive "or" rather than an exclusive "or." That is, unless specified otherwise, or clear from the context, the phrase "X employs A or B" is intended to mean any of the natural inclusive permutations. That is, the phrase "X employs A or B" is satisfied by any of the following instances: X employs A; X employs B; or X employs both A and B. In addition, the articles "a" and "an" as used in this application and the appended claims should generally be construed to mean "one or more" unless specified otherwise or clear from the context to be directed to a singular form.

The techniques described herein may be used for various wireless communication systems such as CDMA, TDMA, FDMA, OFDMA, SC-FDMA and other systems. The terms "system" and "network" are often used interchangeably. A CDMA system may implement a radio technology such as Universal Terrestrial Radio Access (UTRA), cdma2000, etc. UTRA includes Wideband-CDMA (W-CDMA) and other variants of CDMA. Further, cdma2000 covers IS-2000, IS-95 and IS-856 standards. A TDMA system may implement a radio technology such as Global System for Mobile Communications (GSM). An OFDMA system may implement a radio technology such as Evolved UTRA (E-UTRA), Ultra Mobile Broadband (UMB), IEEE 802.11 (Wi-Fi), IEEE 802.16 (WiMAX), IEEE 802.20, Flash-OFDM®, etc. UTRA and E-UTRA are part of Universal Mobile Telecommunication System (UMTS). 3GPP Long Term Evolution (LTE) is a release of UMTS that uses E-UTRA, which employs OFDMA on the downlink and SC-FDMA on the uplink. UTRA, E-UTRA, UMTS, LTE and GSM are described in documents from an organization named "3rd Generation Partnership Project" (3GPP). Additionally, cdma2000 and UMB are described in documents from an organization named "3rd Generation Partnership Project 2" (3GPP2). Further, such wireless communication systems may additionally include peer-to-peer (e.g., mobile-to-mobile) ad hoc network

systems often using unpaired unlicensed spectrums, 802.xx wireless LAN, BLUETOOTH and any other short- or long-range, wireless communication techniques.

Various aspects or features will be presented in terms of systems that may include a number of devices, components, modules, and the like. It is to be understood and appreciated that the various systems may include additional devices, components, modules, etc. and/or may not include all of the devices, components, modules etc. discussed in connection with the figures. A combination of these approaches may also be used.

Referring to FIG. **1**, illustrated is a wireless communication system **100** that facilitates routing messages of a positioning protocol among one or more network nodes. System **100** includes a positioning server **102** that provides messages of a positioning protocol to one or more base stations **104** and/or **106** (which can relate to devices served by base stations **104** and **106**, or otherwise). In addition, system **100** includes an intermediate network node **108** that can, in one example, route the messages to base stations **104** and/or **106**. System **100** can also optionally include a gateway **110** that further routes messages from intermediate network node **108** to the base stations **104** and/or **106**, in another example. Positioning server **102** can be a serving mobile location center (SMLC), evolved SMLC (eSMLC) in LTE, and/or the like. Base stations **104** and **106** can be a macrocell base station, femtocell or picocell base station (e.g., home evolved Node B (HeNB)), a mobile base station, relay node, a portion thereof, and/or the like. Intermediate network node **108** can be a mobility management entity (MME) that provides authorization and/or authentication for one or more devices communicating with base stations **104** and/or **106**, and/or a similar network node. Where base stations **104** and **106** are HeNBs, optional gateway **110** can be a HeNB gateway, for example.

According to an example, positioning server **102** can communicate messages of the positioning protocol to base stations **104** and/or **106** at least through intermediate network node **108**. In one example, the positioning protocol can be an LTE positioning protocol (LPP), LPP annex (LPPa), and/or similar positioning protocol. In addition, for example, the messages can relate to specific requests from devices communicating with base stations **104** and/or **106**, and can be received through intermediate network node **108**. Thus, the messages can include a related network area identifier, such as a tracking area identifier (TAI) in LTE, as specified by the intermediate network node **108**. Thus, for a given response message, positioning server **102** can identify an intermediate network node based at least in part on a network area identifier that positioning server **102** can associate with the response message.

In addition, in an example, positioning server **102** stores a mapping of network area identifiers (NAI) to base station identifiers (BS ID), such as mapping **112**. For example, the mapping can be of a format similar to the following:

Base Station ID	Network Area Identifier
Xxx	Yyy
Zzz	Yyy
Ppp	Ttt
...	...

where Xxx, Zzz, and Ppp represent base station identifiers, and Yyy and Ttt represent corresponding network area identifiers. It is to be appreciated that the identifiers can be substantially any value of substantially any format (e.g., a string, integer, etc.). In this regard, for example, positioning server **102** can receive or otherwise generate one or more messages of the positioning protocol intended for a base stations **104** and/or **106**, such as message **114**, which can thus be associated with an identifier of the base stations **104** and/or **106** (e.g., where the messages are not associated with a request from a device). Based at least in part on the identifier of base station **104** and/or **106**, for example, positioning server **102** can determine a network area identifier associated with messages according to the mapping, and can transmit the messages to intermediate network node **108** based at least in part on the network area identifier. Where gateway **110** is not present, for example, intermediate network node **108** can forward the messages to base stations **104** and/or **106** based at least in part on a base station identifier within the messages.

Moreover, where gateway **110** is present positioning server **102** can optionally include the network area identifier in the messages to the intermediate network node **108** even for messages associated with a particular device, as shown for message **114**. In this example, the intermediate network node **108** can similarly store a mapping of network area identifiers to gateway identifiers (GW ID), such as mapping **116**. Similarly, this mapping can have a format similar to the following, in one example:

Network Area Identifier	Gateway ID
Yyy	Qqq
Ttt	Fff
...	...

where Yyy and Ttt represent network area identifiers, and Qqq and Fff represent corresponding gateway identifiers. It is to be appreciated that the identifiers can be substantially any value of substantially any format (e.g., a string, integer, etc.). Accordingly, intermediate network node **108** can determine one or more gateways, such as gateway **110**, associated with the network area identifier, and can forward the messages to gateway **110** along with the base station identifier, such as message **118**. Gateway **110**, in this example, can receive the messages of the positioning protocol and can forward the messages to base stations **104** and/or **106** based at least in part on the base station identifier in the messages.

In this regard, for positioning messages that are not related to specific devices but are intended for a particular base station **104** and/or **106**, such as messages related to a position of a base station, base station timing, acknowledging a position update from the base station, and/or the like, as described herein, the positioning server **102** can identify the intermediate network node **108** to which base station **104** and/or **106** communicates based on the mapping and the base station identifier in the message, since it does not have a specific device identifier the corresponds to the intermediate network node **108**. In addition, where gateway **110** is present, positioning server **102** can include the network area identifier in the message, and the intermediate network node **108** can determine the gateway **110** associated therewith to determine the gateway **110** corresponding to base station **104** and/or **106**. This can be performed regardless of whether the positioning message relates to a particular device, in this example, since the intermediate network node **108** may not otherwise know to which gateway **110** the base station **104** and/or **106** communicates.

Turning to FIG. **2**, an example wireless communication system **200** is illustrated that facilitates routing messages of a positioning protocol based at least in part on a network area

identifier. System **200** can include a positioning server **202**, which can be similar to substantially any positioning server described herein, and can thus be an eSMLC, etc. System **200** can also include an intermediate network node **204** that can be similar to substantially any intermediate network node described herein, and can thus be an MME or similar component that facilitates communicating with one or more devices or related base stations. Moreover, for example, system **200** can optionally comprise a gateway **206** that facilitates accessing one or more base stations, such as base station **208**. Where gateway **206** is not present, for example, intermediate network node **204** can communicate directly with base station **208**. As described, base station **208** can be an HeNB, macrocell base station, mobile base station, relay node, etc., as described. Thus, for example, where base station **208** is an HeNB, gateway **206** can be an HeNB gateway.

Positioning server **202** can comprise a message component **210** that obtains or generates one or more messages of a positioning protocol (e.g., LPPa, etc.) intended for one or more base stations or related device communication with the one or more base stations, and a network area identifier determining component **212** for discerning a network area identifier associated with an identifier of the one or more base stations. Positioning server **202** can also include a message routing component **214** for delivering the one or more messages to an intermediate network node for providing to the one or more base stations based at least in part on the network area identifier, and an optional network area identifier receiving component **216** for obtaining one or more network area identifiers (e.g., and/or associations to one or more base station identifiers).

According to an example, message component **210** can receive or otherwise generate a message of a positioning protocol for transmitting to a base station, such as base station **208**. In one example, the message can be directed to a device based at least in part on a request from the device. In another example, the message can be directed to the base station and can be a message related to positioning of the base station **208**, timing, an acknowledgement of a positioning update, as described further herein, etc., for example. In either case, the message can include an identifier of the base station, and network area identifier determining component **212** can determine the identifier of the base station along with a network area identifier associated with the identifier of the base station. In one example, network area identifier determining component **212** determines such based at least in part on a mapping of network area identifiers to base station identifiers stored by network area identifier determining component **212** (e.g., in a memory or other data store, etc.). In one example, the network area identifier can be a tracking area identifier (TAI) or similar identifier. In addition, intermediate network node **204** can be an MME associated with the TAI in a core network that includes the positioning server **202**, intermediate network node **204**, etc. In this regard, message routing component **214** can determine intermediate network node **204** as associated with the determined network area identifier, and can forward the message to intermediate network node **204** for providing to base station **208**.

Moreover, for example, network area identifier receiving component **216** can obtain the mapping of network area identifier to base station identifiers from one or more components of the core network (not shown), such as an operations and management (OAM) or similar component. For example, the mapping provided can be a static or semistatic database, such that one or more components can update the mappings. In one example, base station **208** can provision updates to the mapping related to base station **208** based at least in part on detecting a configuration change, as described further herein, according to a timer, and/or the like. In another example, intermediate network node **204** can provide mappings to positioning server **202** based at least in part on the network area identifier associated with intermediate network node **204** and an identifier of one or more base stations communicating with intermediate network node **204** (e.g., this can occur periodically, for a given base station during initialization, based on another event, and/or the like). In addition, in one example, base station **208** can provide its identifier to the positioning server **202** to propagate updates at base station **208**, as described above, as part of intermediate network node **204** provisioning network area identifier mappings, and/or the like.

In another example, where gateway **206** is present, message routing component **214** can include the determined network area identifier within the message. In this regard, as described further herein, intermediate network node **204** can determine to route the message to a gateway related to the network area identifier for communicating to the base station **208**. In addition, as described further herein, intermediate network node **204** can specify to positioning server **202** whether or not to include the network area identifier in the message. In one example, intermediate network node **204** can communicate a parameter to positioning server **202** to request a network area identifier in all messages to the intermediate network node **204**, only for a specified set of base station identifiers (e.g., only HeNBs), and/or the like. In either case, network area identifier receiving component **216** can obtain the indication and/or set of base station identifiers, and message routing component **214** can accordingly indicate the network area identifier as desired in corresponding messages. In another example, positioning server **202** can include the network area identifier in messages by default unless otherwise instructed by the intermediate network node **204**.

Referring to FIG. **3**, illustrated is an example wireless communication system **300** that facilitates routing messages of a positioning protocol based at least in part on a network area identifier. System **300** can include a positioning server **302**, which can be similar to substantially any positioning server described herein, and can thus be an eSMLC, etc., as described. System **300** can also include an intermediate network node **304** that can be similar to substantially any intermediate network node described herein, and can thus be an MME or similar component that facilitates communicating with one or more devices or related base stations. Moreover, for example, system **300** can optionally comprise a gateway **306** that facilitates accessing one or more base stations, such as base station **308**, as described. Where gateway **306** is not present, for example, intermediate network node **304** can communicate directly with base station **308**. As described, base station **308** can be an HeNB, macrocell base station, mobile base station, relay node, etc., as described. Thus, for example, where base station **308** is an HeNB, gateway **306** can be an HeNB gateway.

Intermediate network node **304** can comprise a message receiving component **310** that obtains a message of a positioning protocol (e.g., LPPa, etc.) related to one or more base stations from a positioning server, and a gateway presence determining component **312** that can detect whether a gateway exists between intermediate network node **304** and the one or more base stations (e.g., and/or one or more devices communicating therewith). Intermediate network node **304** can additionally comprise a message routing component **314** that forwards the message to a gateway where present, or the one or more base stations, and an optional network area

identifier receiving component **316** that obtains network area identifiers and associated gateway identifiers.

According to an example, message receiving component **310** can obtain a message of the positioning protocol from positioning server **302** related to one or more base stations, such as base station **308** or a device communicating therewith. Gateway presence determining component **312**, in one example, discerns whether a gateway exists between intermediate network node **304** and base station **308**. In one example, this can include determining whether base station **308** is a HeNB, detecting the gateway **306** upon initialization of base station **308** with a core network, receiving an indication of gateway **306** from base station **308** or one or more other network components or devices, and/or the like. In one example, gateway presence determining component **312** can store a list of base station identifiers that correspond to base stations that communicate through a gateway. Moreover, for example, gateway presence determining component **312** can forward such identifiers to positioning server **302**, so positioning server can determine whether to provide a network area identifier in communications for the base stations, as described previously.

Additionally, in this regard, where a network area identifier is received in the message from positioning server **302**, gateway presence determining component **312** specifies that a gateway exists between intermediate network node **304** and base station **308**. In this example, message routing component **314** can determine the gateway, which is gateway **306**, based at least in part on a stored mapping between the network area identifier and an identifier of gateway **306**. As described, for example, network area identifier receiving component **316** can obtain this mapping (e.g., from an OAM), generate the mapping based at least in part on associating gateway identifiers with network area identifiers upon initialization of the gateway **306** or base station **308** with the core network, and/or the like.

Moreover, for example, message routing component **314** can include the identifier of the base station in the message or a header thereof to facilitate routing at the gateway **306**. In another example, where the message received from the positioning server **302** does not include a network area identifier, gateway presence determining component **312** can determine that there is no gateway between intermediate network node **304** and base station **308**, and message routing component **314** can forward the message directly to base station **308**.

Turning to FIG. **4**, an example wireless communication system **400** that facilitates routing messages of a positioning protocol based at least in part on a network area identifier is illustrated. System **400** can include a positioning server **402**, which can be similar to substantially any positioning server described herein, and can thus be an eSMLC, etc., as described. System **400** can also include an intermediate network node **404** that can be similar to substantially any intermediate network node described herein, and can thus be an MME or similar component that facilitates communicating with one or more devices or related base stations, as described. Moreover, as described for example, system **400** can optionally comprise a gateway **406** that facilitates accessing one or more base stations, such as base station **408**, as described. Where gateway **406** is not present, for example, intermediate network node **404** can communicate directly with base station **408**. As described, base station **408** can be an HeNB, macrocell base station, mobile base station, relay node, etc., as described. Thus, for example, where base station **408** is an HeNB, gateway **406** can be an HeNB gateway.

Base station **408** can comprise a configuration modification detecting component **410** that can determine modification of one or more configuration parameters for a base station, and a positioning server communicating component **412** that can communicate the one or more configuration parameters as modified to one or more network components. According to an example, as described, positioning server **402** can communicate messages of a positioning protocol (e.g., LPPa, etc.) to base station **408** through intermediate network node **404** and/or gateway **406** (if present), which can be received at positioning server communicating component **412**. As described, base station **408** can be an HeNB, which can be configured by a user. Similarly, for example, the base station **408** can be moved from one location to another. In either case, this can result in a configuration update. In an example, configuration modification detecting component **410** can determine the modification of at least one or more positioning parameters, such as location, at least in part by monitoring the parameters, or otherwise being notified of modification.

In this example, positioning server communicating component **412** can transmit a message to positioning server **402** to update the parameters for base station **408**. For example, the message can be of the positioning protocol utilized by positioning server **402** to communicate with base station **408**. In one example, the parameters can relate to assistance data subsequently provided to one or more devices for determining positioning. In another example, the updated position or other parameters may change the network area identifier (and/or gateway **406**, in one example) associated with base station **408**. Thus, the positioning server **402**, in this example, can associate the identifier of base station **408** with the new network area identifier, and/or intermediate network node **404** can associate the network area identifier with the new gateway, if not already associated, for example.

Referring to FIG. **5**, an example wireless communication system **500** is illustrated that facilitates routing messages of a positioning protocol. System **500** comprises an eSMLC **502** that communicates positioning protocol message through an MME **504** to an eNB **506**. In this example, MME **504** can be associated with TAI Y, and eNB **506** can have identifier X. As depicted, at eSMLC **502**, generation of a non-UE associated LPPa message for eNB X can be triggered **508**. This can include, for example, messages for requesting a position, updating timing, acknowledging positioning updates, and/or the like. eSMLC can lookup a TAI for eNB X **510**. As described, this can include analyzing a mapping of TAIs to eNB identifiers, which can be received or otherwise generated/updated by eSMLC **502**. eSMLC **502** can determine that TAI Y is associated with eNB X **512**. Thus, eSMLC **502** can transmit a container message that specifies eNB ID=X **514** to MME **504**, based at least in part on MME **504** being associated with TAI Y. For example, the container message **514** can be a location service (LCS) message in LTE. MME **504** can subsequently forward container message **516**, which can have different headers than container message **514**, to eNB **506** based at least in part on the eNB ID received in container message **514**.

Referring to FIG. **6**, an example wireless communication system **600** is illustrated that facilitates routing messages of a positioning protocol. System **600** comprises an eSMLC **602** that communicates positioning protocol message through an MME **604** and a HeNB gateway **606** to an HeNB **608**. In this example, MME **604** can be associated with TAI Y, and HeNB **608** can have identifier X. As depicted, at eSMLC **602**, generation of a non-UE associated LPPa message for eNB X can be triggered **610**. This can include, for example, messages for requesting a position, updating timing, and/or the like. eSMLC can lookup a TAI for eNB X **612**. As described, this

can include analyzing a mapping of TAIs to eNB identifiers, which can be received or otherwise generated/updated by eSMLC **602**. eSMLC **602** can determine that TAI Y is associated with eNB X **614**. Thus, eSMLC **502** can transmit a container message that specifies eNB ID=X and TAI=Y **616** to MME **604**, based at least in part on MME **604** being associated with TAI Y.

As described, for example, eSMLC **602** can include TAI Y in container message **616** based at least in part on a request from MME **604** to include TAI in all container messages, container messages for eNB X, and/or the like, a determination to include TAI in container messages, eSMLC **602** or MME **604** detecting presence of HeNB gateway **606**, and/or the like. MME **604** can receive the container message **616** and can lookup a HeNB gateway for TAI Y **618**. MME **604** can identify the HeNB gateway **620** related to TAI Y and can transmit container message **622** to HeNB gateway **606** for forwarding to HeNB **608**. For example, MME **604** can include eNB ID=X in the container message **622** (e.g., or a header thereof) to allow HeNB gateway **606** to determine the container message **622** is for HeNB **608**.

Referring to FIGS. **7-9**, example methodologies relating to routing messages of a positioning protocol are illustrated. While, for purposes of simplicity of explanation, the methodologies are shown and described as a series of acts, it is to be understood and appreciated that the methodologies are not limited by the order of acts, as some acts may, in accordance with one or more embodiments, occur in different orders and/or concurrently with other acts from that shown and described herein. For example, it is to be appreciated that a methodology could alternatively be represented as a series of interrelated states or events, such as in a state diagram. Moreover, not all illustrated acts may be required to implement a methodology in accordance with one or more embodiments.

Referring to FIG. **7**, an example methodology **700** is displayed that facilitates routing messages of a positioning protocol. At **701**, a mapping between a plurality of base stations identifiers and network area identifiers can be stored. At **702**, a message of a positioning protocol associated with a base station can be generated. For example, as described, the positioning protocol can be LPPa, etc., and the message can relate to a position, timing, acknowledgement of a positioning information update, and/or one or more similar parameters. In another example, the message can relate to a device served by the base station. At **703**, an identifier of the base station can be obtained. At **704**, a network area identifier associated with the base station can be determined. As described, for example, this can be determined based at least in part on locating the network area identifier in the stored mapping of network area identifiers to base station identifiers. At **706**, the message can be delivered to an intermediate network node based at least in part on the network area identifier. As described, for example, the intermediate network node can be an MME, the network area identifier can be a TAI, etc.

Turning to FIG. **8**, an example methodology **800** is displayed that facilitates routing messages of a positioning protocol. At **802**, a network area identifier related to a base station can be received in a message of a positioning protocol. At **804**, it can be determined whether a gateway is present (e.g., whether the base station is served by the gateway). For example, this can be based at least in part on analyzing a mapping of network area identifiers to gateway identifiers to determine whether the received network area identifier is associated with a gateway. If so, at **806**, an eNB identifier can be included in the message, and at **808**, the message can be delivered to the gateway. If the gateway is not present, at **810**, the message can be delivered to the base station.

Referring to FIG. **9**, illustrated is an example methodology **900** for updating positioning information. At **902**, one or more messages can be received from a positioning server, as described above. At **904**, modification of one or more parameters related to a position can be detected. For example, this can include detecting a change in location (e.g., based at least in part on monitored coordinates). At **906**, a message including the one or more parameters as modified can be communicated to the positioning server. For example, the message can be of the positioning protocol of the one or more messages received from the positioning server, as described.

It will be appreciated that, in accordance with one or more aspects described herein, inferences can be made regarding associating network area identifiers with base station identifiers or HeNB gateway identifiers, determining an intermediate network node or HeNB gateway based at least in part upon the network area identifiers, and/or the like, as described. As used herein, the term to "infer" or "inference" refers generally to the process of reasoning about or inferring states of the system, environment, and/or user from a set of observations as captured via events and/or data. Inference can be employed to identify a specific context or action, or can generate a probability distribution over states, for example. The inference can be probabilistic—that is, the computation of a probability distribution over states of interest based on a consideration of data and events. Inference can also refer to techniques employed for composing higher-level events from a set of events and/or data. Such inference results in the construction of new events or actions from a set of observed events and/or stored event data, whether or not the events are correlated in close temporal proximity, and whether the events and data come from one or several event and data sources.

FIG. **10** is an illustration of a system **1000** that facilitates updating positioning configuration. System **1000** comprises a base station **1002**, which can be substantially any base station (e.g., a small base station, such as a femtocell, picocell, etc., relay node, mobile base station . . .) having a receiver **1010** that receives signal(s) from one or more mobile devices **1004** through a plurality of receive antennas **1006** (e.g., which can be of multiple network technologies, as described), and a transmitter **1024** that transmits to the one or more mobile devices **1004** through a plurality of transmit antennas **1008** (e.g., which can be of multiple network technologies, as described). In addition, in one example, transmitter **1024** can transmit to the mobile devices **1004** over a wired front link. Receiver **1010** can receive information from one or more receive antennas **1006** and is operatively associated with a demodulator **1012** that demodulates received information. In addition, in an example, receiver **1010** can receive from a wired backhaul link. Demodulated symbols are analyzed by a processor **1014** that can be similar to processors described herein, and which is coupled to a memory **1016** that can store information related to estimating a signal (e.g., pilot) strength and/or interference strength, data to be transmitted to or received from mobile device(s) **1004** (or a disparate base station (not shown)), and/or any other suitable information related to performing the various actions and functions set forth herein.

Memory **1016** can additionally store protocols and/or algorithms associated with estimating and/or utilizing a channel (e.g., performance based, capacity based, etc.), updating positioning information, or substantially any other aspect described herein. It will be appreciated that memory **1016** can be either volatile memory or nonvolatile memory, or can include both volatile and nonvolatile memory. By way of illustration, and not limitation, nonvolatile memory can

include read only memory (ROM), programmable ROM (PROM), electrically programmable ROM (EPROM), electrically erasable PROM (EEPROM), or flash memory. Volatile memory can include random access memory (RAM), which acts as external cache memory. By way of illustration and not limitation, RAM is available in many forms such as synchronous RAM (SRAM), dynamic RAM (DRAM), synchronous DRAM (SDRAM), double data rate SDRAM (DDR SDRAM), enhanced SDRAM (ESDRAM), Synchlink DRAM (SLDRAM), and direct Rambus RAM (DRRAM). The memory **1016** of the subject systems and methods is intended to comprise, without being limited to, these and any other suitable types of memory, and can generally be a data store, as described herein.

Processor **1014** is further optionally coupled to a configuration modification detecting component **1018**, which can be similar to a configuration modification detecting component **410**, and a positioning server communicating component **1020**, which can be similar to a positioning server communicating component **412**. In this regard, the configuration modification detecting component **1018** and positioning server communicating component **1020** can utilize processor **1014** to execute one or more functions described herein, memory **1016** to store such instructions or parameters related thereto, and/or the like.

Moreover, for example, processor **1014** can modulate signals to be transmitted using modulator **1022**, and transmit modulated signals using transmitter **1024**. Transmitter **1024** can transmit signals to mobile devices **1004** over Tx antennas **1008**. Furthermore, although depicted as being separate from the processor **1014**, it is to be appreciated that configuration modification detecting component **1018**, positioning server communicating component **1020**, demodulator **1012**, and/or modulator **1022** can be part of the processor **1014** or multiple processors (not shown).

Referring to FIG. **11**, in one aspect, any of network nodes **102**, **108**, **202**, **204**, **302**, **304**, **402**, **404**, **502**, **504**, **602**, or **604**, etc. (e.g., FIGS. **1-6**) may be represented by computer device **1100**. Computer device **1100** includes a processor **1102** for carrying out processing functions associated with one or more of components and functions described herein. Processor **1102** can include a single or multiple set of processors or multi-core processors. Moreover, processor **1102** can be implemented as an integrated processing system and/or a distributed processing system.

Computer device **1100** further includes a memory **1104**, such as for storing local versions of applications being executed by processor **1102**. Memory **1104** can include substantially any type of memory usable by a computer, such as random access memory (RAM), read only memory (ROM), tapes, magnetic discs, optical discs, volatile memory, non-volatile memory, and any combination thereof.

Further, computer device **1100** includes a communications component **1106** that provides for establishing and maintaining communications with one or more parties utilizing hardware, software, and services as described herein. Communications component **1106** may carry communications between components on computer device **1100**, as well as between computer device **1100** and external devices, such as devices located across a communications network and/or devices serially or locally connected to computer device **1100**. For example, communications component **1106** may include one or more buses, and may further include transmit chain components and receive chain components associated with a transmitter and receiver, respectively, operable for interfacing with external devices.

Additionally, computer device **1100** may further include a data store **1108**, which can be any suitable combination of hardware and/or software, that provides for mass storage of information, databases, and programs employed in connection with aspects described herein. For example, data store **1108** may be a data repository for applications not currently being executed by processor **1102**.

Computer device **1100** may optionally include a interface component **1110** operable to receive inputs from a user of computer device **1100**, and further operable to generate outputs for presentation to the user. Interface component **1110** may include one or more input devices, including but not limited to a keyboard, a number pad, a mouse, a touch-sensitive display, a navigation key, a function key, a microphone, a voice recognition component, any other mechanism capable of receiving an input from a user, or any combination thereof. Further, interface component **1110** may include one or more output devices, including but not limited to a display, a speaker, a haptic feedback mechanism, a printer, any other mechanism capable of presenting an output to a user, or any combination thereof. In another example, interface component **1110** can be an application programming interface (API) that can be accessed by one or more devices to perform functions on computer device **1100**.

In addition, in the depicted example, computer device **1100** can optionally include one or more of a message component **1112**, network area identifier determining component **1114**, message routing component **1116**, message receiving component **1118**, or gateway presence determining component **1120**. Thus, these components **1112**, **1114**, **1116**, **1118**, and/or **1120**, which can be similar to other components described herein, can utilize processor **1102** to execute instructions associated therewith, memory **1104** to store information associated therewith, communications component **1106** to carry out communications, and/or the like, as described. In addition, it is to be appreciated that computer device **1100** can include additional or alternative components described herein.

With reference to FIG. **12**, illustrated is a system **1200** that routes messages of a positioning protocol. For example, system **1200** can reside at least partially within an eSMLC, or other core network component, etc. It is to be appreciated that system **1200** is represented as including functional blocks, which can be functional blocks that represent functions implemented by a processor, software, or combination thereof (e.g., firmware). System **1200** includes a logical grouping **1202** of electrical components that can act in conjunction. For instance, logical grouping **1202** can include an electrical component for generating a message of a positioning protocol associated with a base station **1204**. As described, the message can include one or more parameters related to positioning, timing, acknowledging a positioning update, and/or the like. Further, logical grouping **1202** can comprise an electrical component for determining a network area identifier associated with the base station **1206**.

As described, for example, electrical component **1206** can store mappings of network area identifiers to base station identifiers (e.g., in memory **1210** or otherwise) for subsequently determining the network area identifier associated with an identifier of the base station. Moreover, logical grouping **1202** can include an electrical component for delivering the message to an intermediate network node based at least in part on the network area identifier **1208**. For example, electrical component **1204** can include a message component **210**, as described above. In addition, for example, electrical component **1206**, in an aspect, can include a network area identifier determining component **212**, as described above.

Furthermore, electrical component **1208**, in an aspect, can include a message routing component **214**, as described. Additionally, system **1200** can include a memory **1210** that retains instructions for executing functions associated with the electrical components **1204**, **1206**, and **1208**. While shown as being external to memory **1210**, it is to be understood that one or more of the electrical components **1204**, **1206**, and **1208** can exist within memory **1210**.

In one example, electrical components **1204**, **1206**, and **1208** can comprise at least one processor, or each electrical component **1204**, **1206**, and **1208** can be a corresponding module of at least one processor. Moreover, in an additional or alternative example, electrical components **1204**, **1206**, and **1208** can be a computer program product comprising a computer readable medium, where each electrical component **1204**, **1206**, and **1208** can be corresponding code.

With reference to FIG. **13**, illustrated is a system **1300** that routes messages of a positioning protocol. For example, system **1300** can reside at least partially within an MME, or other core network component, etc. It is to be appreciated that system **1300** is represented as including functional blocks, which can be functional blocks that represent functions implemented by a processor, software, or combination thereof (e.g., firmware). System **1300** includes a logical grouping **1302** of electrical components that can act in conjunction. For instance, logical grouping **1302** can include an electrical component for receiving a network area identifier related to a base station in a message of a positioning protocol **1304**. Further, logical grouping **1302** can comprise an electrical component for determining whether a gateway is present based at least in part on the network area identifier **1306**. As described, for example, electrical component **1306** can store mappings of network area identifiers to identifiers of gateways, and can determine presence of the gateway based at least in part on locating the network area identifier in the mappings.

Moreover, logical grouping **1302** can include an electrical component for delivering the message to a network node based at least in part on whether the gateway is present **1308**. As described, where the gateway is present, electrical component **1308** can deliver the message to the gateway and can include an identifier of the base station in the message. Where the gateway is not present, for example, electrical component **1308** can deliver the message to the base station. For example, electrical component **1304** can include a message receiving component **310**, as described above. In addition, for example, electrical component **1306**, in an aspect, can include a gateway presence determining component **312**, as described above. Furthermore, electrical component **1308**, in an aspect, can include a message routing component **314**, as described. Additionally, system **1300** can include a memory **1310** that retains instructions for executing functions associated with the electrical components **1304**, **1306**, and **1308**. While shown as being external to memory **1310**, it is to be understood that one or more of the electrical components **1304**, **1306**, and **1308** can exist within memory **1310**.

In one example, electrical components **1304**, **1306**, and **1308** can comprise at least one processor, or each electrical component **1304**, **1306**, and **1308** can be a corresponding module of at least one processor. Moreover, in an additional or alternative example, electrical components **1304**, **1306**, and **1308** can be a computer program product comprising a computer readable medium, where each electrical component **1304**, **1306**, and **1308** can be corresponding code.

With reference to FIG. **14**, illustrated is a system **1400** that updates positioning information. For example, system **1400** can reside at least partially within a base station, mobile device, etc. It is to be appreciated that system **1400** is represented as including functional blocks, which can be functional blocks that represent functions implemented by a processor, software, or combination thereof (e.g., firmware). System **1400** includes a logical grouping **1402** of electrical components that can act in conjunction. For instance, logical grouping **1402** can include an electrical component for detecting modification of one or more parameters related to a position **1404**. As described, electrical component **1404** can monitor parameters such as a location (e.g., GPS location), and/or the like.

Further, logical grouping **1402** can comprise an electrical component for communicating a message to the positioning server including the one or more parameters as modified **1406**. As described, for example, electrical component **1406** can utilize one or more messages available in the positioning protocol for communicating the message. For example, in an aspect, electrical component **1404** can include configuration modification detecting component **410**, as described above. In addition, for example, electrical component **1406**, in an aspect, can include positioning server communicating component **412**, as described above. Additionally, system **1400** can include a memory **1408** that retains instructions for executing functions associated with the electrical components **1404** and **1406**. While shown as being external to memory **1408**, it is to be understood that one or more of the electrical components **1404** and **1406** can exist within memory **1408**.

In one example, electrical components **1404** and **1406** can comprise at least one processor, or each electrical component **1404** and **1406** can be a corresponding module of at least one processor. Moreover, in an additional or alternative example, electrical components **1404** and **1406** can be a computer program product comprising a computer readable medium, where each electrical component **1404** and **1406** can be corresponding code.

Referring now to FIG. **15**, a wireless communication system **1500** is illustrated in accordance with various embodiments presented herein. System **1500** comprises a base station **1502** that can include multiple antenna groups. For example, one antenna group can include antennas **1504** and **1506**, another group can comprise antennas **1508** and **1510**, and an additional group can include antennas **1512** and **1514**. Two antennas are illustrated for each antenna group; however, more or fewer antennas can be utilized for each group. Base station **1502** can additionally include a transmitter chain and a receiver chain, each of which can in turn comprise a plurality of components associated with signal transmission and reception (e.g., processors, modulators, multiplexers, demodulators, demultiplexers, antennas, etc.), as is appreciated.

Base station **1502** can communicate with one or more mobile devices such as mobile device **1516** and mobile device **1522**; however, it is to be appreciated that base station **1502** can communicate with substantially any number of mobile devices similar to mobile devices **1516** and **1522**. Mobile devices **1516** and **1522** can be, for example, cellular phones, smart phones, laptops, handheld communication devices, handheld computing devices, satellite radios, global positioning systems, PDAs, and/or any other suitable device for communicating over wireless communication system **1500**. As depicted, mobile device **1516** is in communication with antennas **1512** and **1514**, where antennas **1512** and **1514** transmit information to mobile device **1516** over a forward link **1518** and receive information from mobile device **1516** over a reverse link **1520**. Moreover, mobile device **1522** is in communication with antennas **1504** and **1506**, where anten-

nas **1504** and **1506** transmit information to mobile device **1522** over a forward link **1524** and receive information from mobile device **1522** over a reverse link **1526**. In a frequency division duplex (FDD) system, forward link **1518** can utilize a different frequency band than that used by reverse link **1520**, and forward link **1524** can employ a different frequency band than that employed by reverse link **1526**, for example. Further, in a time division duplex (TDD) system, forward link **1518** and reverse link **1520** can utilize a common frequency band and forward link **1524** and reverse link **1526** can utilize a common frequency band.

Each group of antennas and/or the area in which they are designated to communicate can be referred to as a sector of base station **1502**. For example, antenna groups can be designed to communicate to mobile devices in a sector of the areas covered by base station **1502**. In communication over forward links **1518** and **1524**, the transmitting antennas of base station **1502** can utilize beamforming to improve signal-to-noise ratio of forward links **1518** and **1524** for mobile devices **1516** and **1522**. Also, while base station **1502** utilizes beamforming to transmit to mobile devices **1516** and **1522** scattered randomly through an associated coverage, mobile devices in neighboring cells can be subject to less interference as compared to a base station transmitting through a single antenna to all its mobile devices. Moreover, mobile devices **1516** and **1522** can communicate directly with one another using a peer-to-peer or ad hoc technology as depicted. According to an example, system **1500** can be a multiple-input multiple-output (MIMO) communication system.

FIG. **16** shows an example wireless communication system **1600**. The wireless communication system **1600** depicts one base station **1610** and one mobile device **1650** for sake of brevity. However, it is to be appreciated that system **1600** can include more than one base station and/or more than one mobile device, wherein additional base stations and/or mobile devices can be substantially similar or different from example base station **1610** and mobile device **1650** described below. In addition, it is to be appreciated that base station **1610** and/or mobile device **1650** can employ the systems (FIGS. **1-6**, **10**, and **12-15**), computer devices, (FIG. **11**), and/or methods (FIGS. **7-9**) described herein to facilitate wireless communication there between. For example, components or functions of the systems and/or methods described herein can be part of a memory **1632** and/or **1672** or processors **1630** and/or **1670** described below, and/or can be executed by processors **1630** and/or **1670** to perform the disclosed functions.

At base station **1610**, traffic data for a number of data streams is provided from a data source **1612** to a transmit (TX) data processor **1614**. According to an example, each data stream can be transmitted over a respective antenna. TX data processor **1614** formats, codes, and interleaves the traffic data stream based on a particular coding scheme selected for that data stream to provide coded data.

The coded data for each data stream can be multiplexed with pilot data using orthogonal frequency division multiplexing (OFDM) techniques. Additionally or alternatively, the pilot symbols can be frequency division multiplexed (FDM), time division multiplexed (TDM), or code division multiplexed (CDM). The pilot data is typically a known data pattern that is processed in a known manner and can be used at mobile device **1650** to estimate channel response. The multiplexed pilot and coded data for each data stream can be modulated (e.g., symbol mapped) based on a particular modulation scheme (e.g., binary phase-shift keying (BPSK), quadrature phase-shift keying (QPSK), M-phase-shift keying (M-PSK), M-quadrature amplitude modulation (M-QAM), etc.) selected for that data stream to provide modulation symbols. The data rate, coding, and modulation for each data stream can be determined by instructions performed or provided by processor **1630**.

The modulation symbols for the data streams can be provided to a TX MIMO processor **1620**, which can further process the modulation symbols (e.g., for OFDM). TX MIMO processor **1620** then provides NT modulation symbol streams to NT transmitters (TMTR) **1622***a* through **1622***t*. In various embodiments, TX MIMO processor **1620** applies beamforming weights to the symbols of the data streams and to the antenna from which the symbol is being transmitted.

Each transmitter **1622** receives and processes a respective symbol stream to provide one or more analog signals, and further conditions (e.g., amplifies, filters, and upconverts) the analog signals to provide a modulated signal suitable for transmission over the MIMO channel. Further, NT modulated signals from transmitters **1622***a* through **1622***t* are transmitted from NT antennas **1624***a* through **1624***t*, respectively.

At mobile device **1650**, the transmitted modulated signals are received by NR antennas **1652***a* through **1652***r* and the received signal from each antenna **1652** is provided to a respective receiver (RCVR) **1654***a* through **1654***r*. Each receiver **1654** conditions (e.g., filters, amplifies, and down-converts) a respective signal, digitizes the conditioned signal to provide samples, and further processes the samples to provide a corresponding "received" symbol stream.

An RX data processor **1660** can receive and process the NR received symbol streams from NR receivers **1654** based on a particular receiver processing technique to provide NT "detected" symbol streams. RX data processor **1660** can demodulate, deinterleave, and decode each detected symbol stream to recover the traffic data for the data stream. The processing by RX data processor **1660** is complementary to that performed by TX MIMO processor **1620** and TX data processor **1614** at base station **1610**.

The reverse link message can comprise various types of information regarding the communication link and/or the received data stream. The reverse link message can be processed by a TX data processor **1638**, which also receives traffic data for a number of data streams from a data source **1636**, modulated by a modulator **1680**, conditioned by transmitters **1654***a* through **1654***r*, and transmitted back to base station **1610**.

At base station **1610**, the modulated signals from mobile device **1650** are received by antennas **1624**, conditioned by receivers **1622**, demodulated by a demodulator **1640**, and processed by a RX data processor **1642** to extract the reverse link message transmitted by mobile device **1650**. Further, processor **1630** can process the extracted message to determine which precoding matrix to use for determining the beamforming weights.

Processors **1630** and **1670** can direct (e.g., control, coordinate, manage, etc.) operation at base station **1610** and mobile device **1650**, respectively. Respective processors **1630** and **1670** can be associated with memory **1632** and **1672** that store program codes and data. Processors **1630** and **1670** can also perform computations to derive frequency and impulse response estimates for the uplink and downlink, respectively.

FIG. **17** illustrates a wireless communication system **1700**, configured to support a number of users, in which the teachings herein may be implemented. The system **1700** provides communication for multiple cells **1702**, such as, for example, macro cells **1702**A-**1702**G, with each cell being serviced by a corresponding access node **1704** (e.g., access nodes **1704**A-**1704**G). As shown in FIG. **17**, access terminals **1706** (e.g., access terminals **1706**A-**1706**L) can be dispersed at various

locations throughout the system over time. Each access terminal **1706** can communicate with one or more access nodes **1704** on a forward link (FL) and/or a reverse link (RL) at a given moment, depending upon whether the access terminal **1706** is active and whether it is in soft handoff, for example. The wireless communication system **1700** can provide service over a large geographic region.

FIG. **18** illustrates an exemplary communication system **1800** where one or more femto nodes are deployed within a network environment. Specifically, the system **1800** includes multiple femto nodes **1810**A and **1810**B (e.g., femtocell nodes or HeNB) installed in a relatively small scale network environment (e.g., in one or more user residences **1830**). Each femto node **1810** can be coupled to a wide area network **1840** (e.g., the Internet) and a mobile operator core network **1850** via a digital subscriber line (DSL) router, a cable modem, a wireless link, or other connectivity means (not shown). As will be discussed below, each femto node **1810** can be configured to serve associated access terminals **1820** (e.g., access terminal **1820**A) and, optionally, alien access terminals **1820** (e.g., access terminal **1820**B). In other words, access to femto nodes **1810** can be restricted such that a given access terminal **1820** can be served by a set of designated (e.g., home) femto node(s) **1810** but may not be served by any non-designated femto nodes **1810** (e.g., a neighbor's femto node).

FIG. **19** illustrates an example of a coverage map **1900** where several tracking areas **1902** (or routing areas or location areas) are defined, each of which includes several macro coverage areas **1904**. Here, areas of coverage associated with tracking areas **1902**A, **1902**B, and **1902**C are delineated by the wide lines and the macro coverage areas **1904** are represented by the hexagons. The tracking areas **1902** also include femto coverage areas **1906**. In this example, each of the femto coverage areas **1906** (e.g., femto coverage area **1906**C) is depicted within a macro coverage area **1904** (e.g., macro coverage area **1904**B). It should be appreciated, however, that a femto coverage area **1906** may not lie entirely within a macro coverage area **1904**. In practice, a large number of femto coverage areas **1906** can be defined with a given tracking area **1902** or macro coverage area **1904**. Also, one or more pico coverage areas (not shown) can be defined within a given tracking area **1902** or macro coverage area **1904**.

Referring again to FIG. **18**, the owner of a femto node **1810** can subscribe to mobile service, such as, for example, 3G mobile service, offered through the mobile operator core network **1850**. In addition, an access terminal **1820** can be capable of operating both in macro environments and in smaller scale (e.g., residential) network environments. Thus, for example, depending on the current location of the access terminal **1820**, the access terminal **1820** can be served by an access node **1860** or by any one of a set of femto nodes **1810** (e.g., the femto nodes **1810**A and **1810**B that reside within a corresponding user residence **1830**). For example, when a subscriber is outside his home, he is served by a standard macro cell access node (e.g., node **1860**) and when the subscriber is at home, he is served by a femto node (e.g., node **1810**A). Here, it should be appreciated that a femto node **1810** can be backward compatible with existing access terminals **1820**.

A femto node **1810** can be deployed on a single frequency or, in the alternative, on multiple frequencies. Depending on the particular configuration, the single frequency or one or more of the multiple frequencies can overlap with one or more frequencies used by a macro cell access node (e.g., node **1860**). In some aspects, an access terminal **1820** can be configured to connect to a preferred femto node (e.g., the home femto node of the access terminal **1820**) whenever such connectivity is possible. For example, whenever the access terminal **1820** is within the user's residence **1830**, it can communicate with the home femto node **1810**.

In some aspects, if the access terminal **1820** operates within the mobile operator core network **1850** but is not residing on its most preferred network (e.g., as defined in a preferred roaming list), the access terminal **1820** can continue to search for the most preferred network (e.g., femto node **1810**) using a Better System Reselection (BSR), which can involve a periodic scanning of available systems to determine whether better systems are currently available, and subsequent efforts to associate with such preferred systems. Using an acquisition table entry (e.g., in a preferred roaming list), in one example, the access terminal **1820** can limit the search for specific band and channel. For example, the search for the most preferred system can be repeated periodically. Upon discovery of a preferred femto node, such as femto node **1810**, the access terminal **1820** selects the femto node **1810** for camping within its coverage area.

A femto node can be restricted in some aspects. For example, a given femto node can only provide certain services to certain access terminals. In deployments with so-called restricted (or closed) association, a given access terminal can only be served by the macro cell mobile network and a defined set of femto nodes (e.g., the femto nodes **1810** that reside within the corresponding user residence **1830**). In some implementations, a femto node can be restricted to not provide, for at least one access terminal, at least one of: signaling, data access, registration, paging, or service.

In some aspects, a restricted femto node (which can also be referred to as a Closed Subscriber Group HeNB) is one that provides service to a restricted provisioned set of access terminals. This set can be temporarily or permanently extended as necessary. In some aspects, a Closed Subscriber Group (CSG) can be defined as the set of access nodes (e.g., femto nodes) that share a common access control list of access terminals. A channel on which all femto nodes (or all restricted femto nodes) in a region operate can be referred to as a femto channel.

Various relationships can thus exist between a given femto node and a given access terminal. For example, from the perspective of an access terminal, an open femto node can refer to a femto node with no restricted association. A restricted femto node can refer to a femto node that is restricted in some manner (e.g., restricted for association and/or registration). A home femto node can refer to a femto node on which the access terminal is authorized to access and operate on. A guest femto node can refer to a femto node on which an access terminal is temporarily authorized to access or operate on. An alien femto node can refer to a femto node on which the access terminal is not authorized to access or operate on, except for perhaps emergency situations (e.g., 911 calls).

From a restricted femto node perspective, a home access terminal can refer to an access terminal that authorized to access the restricted femto node. A guest access terminal can refer to an access terminal with temporary access to the restricted femto node. An alien access terminal can refer to an access terminal that does not have permission to access the restricted femto node, except for perhaps emergency situations, for example, 911 calls (e.g., an access terminal that does not have the credentials or permission to register with the restricted femto node).

For convenience, the disclosure herein describes various functionality in the context of a femto node. It should be appreciated, however, that a pico node can provide the same or similar functionality as a femto node, but for a larger

coverage area. For example, a pico node can be restricted, a home pico node can be defined for a given access terminal, and so on.

A wireless multiple-access communication system can simultaneously support communication for multiple wireless access terminals. As mentioned above, each terminal can communicate with one or more base stations via transmissions on the forward and reverse links. The forward link (or downlink) refers to the communication link from the base stations to the terminals, and the reverse link (or uplink) refers to the communication link from the terminals to the base stations. This communication link can be established via a single-in-single-out system, a MIMO system, or some other type of system.

The various illustrative logics, logical blocks, modules, components, and circuits described in connection with the embodiments disclosed herein may be implemented or performed with a general purpose processor, a digital signal processor (DSP), an application specific integrated circuit (ASIC), a field programmable gate array (FPGA) or other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described herein. A general-purpose processor may be a microprocessor, but, in the alternative, the processor may be any conventional processor, controller, microcontroller, or state machine. A processor may also be implemented as a combination of computing devices, e.g., a combination of a DSP and a microprocessor, a plurality of microprocessors, one or more microprocessors in conjunction with a DSP core, or any other such configuration. Additionally, at least one processor may comprise one or more modules operable to perform one or more of the steps and/or actions described above. An exemplary storage medium may be coupled to the processor, such that the processor can read information from, and write information to, the storage medium. In the alternative, the storage medium may be integral to the processor. Further, in some aspects, the processor and the storage medium may reside in an ASIC. Additionally, the ASIC may reside in a user terminal. In the alternative, the processor and the storage medium may reside as discrete components in a user terminal.

In one or more aspects, the functions, methods, or algorithms described may be implemented in hardware, software, firmware, or any combination thereof. If implemented in software, the functions may be stored or transmitted as one or more instructions or code on a computer-readable medium, which may be incorporated into a computer program product. Computer-readable media includes both computer storage media and communication media including any medium that facilitates transfer of a computer program from one place to another. A storage medium may be any available media that can be accessed by a computer. By way of example, and not limitation, such computer-readable media can comprise RAM, ROM, EEPROM, CD-ROM or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other medium that can be used to carry or store desired program code in the form of instructions or data structures and that can be accessed by a computer. Also, substantially any connection may be termed a computer-readable medium. For example, if software is transmitted from a website, server, or other remote source using a coaxial cable, fiber optic cable, twisted pair, digital subscriber line (DSL), or wireless technologies such as infrared, radio, and microwave, then the coaxial cable, fiber optic cable, twisted pair, DSL, or wireless technologies such as infrared, radio, and microwave are included in the definition of medium. Disk and disc, as used herein, includes compact disc (CD), laser disc, optical disc, digital versatile disc (DVD), floppy disk and blu-ray disc where disks usually reproduce data magnetically, while discs usually reproduce data optically with lasers. Combinations of the above should also be included within the scope of computer-readable media.

While the foregoing disclosure discusses illustrative aspects and/or embodiments, it should be noted that various changes and modifications could be made herein without departing from the scope of the described aspects and/or embodiments as defined by the appended claims. Furthermore, although elements of the described aspects and/or embodiments may be described or claimed in the singular, the plural is contemplated unless limitation to the singular is explicitly stated. Additionally, all or a portion of any aspect and/or embodiment may be utilized with all or a portion of any other aspect and/or embodiment, unless stated otherwise.

What is claimed is:

1. A method, executable by a positioning server, of communicating a message of a positioning protocol in a wireless network, comprising:

storing, by the positioning server, a mapping between a plurality of base stations identifiers and network area identifiers;

generating, by the positioning server, a message of a positioning protocol associated with a base station;

obtaining an identifier of the base station;

determining a network area identifier associated with the base station based on the identifier of the base station in accordance with the mapping; and

delivering the message to an intermediate network node based at least in part on the determined network area identifier.

2. The method of claim **1**, wherein the obtaining of the identifier of the base station comprises receiving the identifier of the base station from the base station.

3. The method of claim **1**, wherein the delivering the message to the intermediate network node further comprises including the network area identifier with the message.

4. The method of claim **1**, wherein the intermediate network node is a mobility management entity, and the positioning protocol is long term evolution positioning protocol annex.

5. An apparatus of a positioning server for routing messages of a positioning protocol in a wireless network, comprising:

a plurality of components;

at least one processor, at the positioning server, configured to process functions associated with the plurality of components to:

store a mapping between a plurality of base stations identifiers and network area identifiers;

generate a message of a positioning protocol associated with a base station;

obtain an identifier of the base station;

determine a network area identifier associated with the base station based on the identifier of the base station in accordance with the mapping; and

provide the message to an intermediate network node based at least in part on the determined network area identifier; and

a memory coupled to the at least one processor.

6. The apparatus of claim **5**, wherein the at least one processor is further configured to process functions associated with the plurality of components to receive the identifier of the base station from the base station.

7. The apparatus of claim 5, wherein the at least one processor is further configured to process functions associated with the plurality of components to include the network area identifier in the message.

8. The apparatus of claim 5, wherein the intermediate network node is a mobility management entity, and the positioning protocol is long term evolution positioning protocol annex.

9. An apparatus of a positioning server for routing messages of a positioning protocol in a wireless network, comprising:

means for storing a mapping between a plurality of base stations identifiers and network area identifiers;

means for generating a message of a positioning protocol associated with a base station;

means for obtaining an identifier of the base station;

means for determining a network area identifier associated with the base station based on the identifier of the base station in accordance with the mapping; and

means for delivering the message to an intermediate network node based at least in part on the determined network area identifier.

10. The apparatus of claim 9, wherein the means for obtaining comprises means for receiving the identifier of the base station from the base station.

11. The apparatus of claim 9, wherein the means for delivering further comprises means for including the network area identifier with the message.

12. The apparatus of claim 9, wherein the intermediate network node is a mobility management entity, and the positioning protocol is long term evolution positioning protocol annex.

13. A computer program product, executable by a positioning server, for routing messages of a positioning protocol in a wireless network, comprising:

a non-transitory computer-readable medium, comprising:

code for causing at least one computer to store a mapping between a plurality of base stations identifiers and network area identifiers;

code for causing the at least one computer to generate a message of a positioning protocol associated with a base station;

code for causing the at least one computer to obtain an identifier of the base station;

code for causing the at least one computer to determine a network area identifier associated with the base station based on the identifier of the base station in accordance with the mapping; and

code for causing the at least one computer to provide the message to an intermediate network node based at least in part on the determined network area identifier.

14. The computer program product of claim 13, wherein the obtaining of the identifier of the base station comprises receiving the identifier of the base station from the base station.

15. The computer program product of claim 13, wherein the computer-readable medium further comprises code for causing the at least one computer to include the network area identifier in the message.

16. The computer program product of claim 13, wherein the intermediate network node is a mobility management entity, and the positioning protocol is long term evolution positioning protocol annex.

17. An apparatus of a positioning server for routing messages of a positioning protocol in a wireless network, comprising:

a message component for generating, executable by the positioning server, a message of a positioning protocol associated with a base station;

a network area identifier receiving component for obtaining an identifier of the base station from the base station;

a network area identifier determining component, comprising hardware, for:

storing a mapping between a plurality of base stations identifiers and network area identifiers, and

determining a network area identifier associated with the base station based on the identifier of the base station in accordance with the mapping; and

a message routing component for delivering the message to an intermediate network node based at least in part on the determined network area identifier.

18. The apparatus of claim 17, wherein the network area identifier receiving component obtains the identifier of the base station from the base station.

19. The apparatus of claim 17, wherein the message routing component further includes the network area identifier with the message.

20. The apparatus of claim 17, wherein the intermediate network node is a mobility management entity, and the positioning protocol is long term evolution positioning protocol annex.

21. A method, executable by an intermediate network node, for routing messages of a positioning protocol in a wireless network, comprising:

determining and storing, by the intermediate network node, a mapping between a plurality of network area identifiers and gateway identifiers;

receiving a network area identifier related to a base station in a message of a positioning protocol from a positioning server;

determining whether a gateway is present based at least in part on the network area identifier in accordance with the mapping; and

delivering the message to a network node based at least in part on whether the gateway is present.

22. The method of claim 21, wherein the determining includes determining that the gateway is present, and the delivering includes delivering the message to the gateway along with an identifier of the base station.

23. The method of claim 21, wherein the determining includes determining that the gateway is not present, and the delivering includes delivering the message to the base station.

24. The method of claim 21, wherein the positioning protocol is long term evolution positioning protocol annex.

25. An apparatus of an intermediate network node for routing messages of a positioning protocol in a wireless network, comprising:

a plurality of components;

at least one processor configured to process functions associated with the plurality of components to:

determine and store a mapping between a plurality of network area identifiers and gateway identifiers;

receive a network area identifier related to a base station in a message of a positioning protocol from a positioning server;

determine whether a gateway is present based at least in part on the network area identifier in accordance with the mapping; and

provide the message to a network node based at least in part on whether the gateway is present; and

a memory coupled to the at least one processor.

26. The apparatus of claim 25, wherein the at least one processor determines that the gateway is present, the network

node is the gateway, and the at least one processor provides the message to the gateway along with an identifier of the base station.

27. The apparatus of claim **25**, wherein the at least one processor determines that the gateway is not present, and the network node is the base station.

28. The apparatus of claim **25**, wherein the positioning protocol is long term evolution positioning protocol annex.

29. An apparatus of an intermediate network node for routing messages of a positioning protocol in a wireless network, comprising:

means for determining and storing a mapping between a plurality of network area identifiers and gateway identifiers;

means for receiving a network area identifier related to a base station in a message of a positioning protocol from a positioning server;

means for determining whether a gateway is present based at least in part on the network area identifier in accordance with the mapping; and

means for delivering the message to a network node based at least in part on whether the gateway is present.

30. The apparatus of claim **29**, wherein the means for determining determines that the gateway is present, the network node is the gateway, and the means for delivering includes an identifier of the base station in the message.

31. The apparatus of claim **29**, wherein the means for determining determines that the gateway is not present, and the network node is the base station.

32. The apparatus of claim **29**, wherein the positioning protocol is long term evolution positioning protocol annex.

33. A computer program product, executable by of an intermediate network node, for routing messages of a positioning protocol in a wireless network, comprising:

a non-transitory computer-readable medium, comprising:

code for causing at least one computer to determine and store a mapping between a plurality of network area identifiers and gateway identifiers;

code for causing the at least one computer to receive a network area identifier related to a base station in a message of a positioning protocol from a positioning server;

code for causing the at least one computer to determine whether a gateway is present based at least in part on the network area identifier in accordance with the mapping; and

code for causing the at least one computer to provide the message to a network node based at least in part on whether the gateway is present.

34. The computer program product of claim **33**, wherein the code for causing the at least one computer to determine determines that the gateway is present, the network node is the gateway, and the code for causing the at least one computer to provide provides the message to the gateway along with an identifier of the base station.

35. The computer program product of claim **33**, wherein the code for causing the at least one computer to determine determines that the gateway is not present, and the network node is the base station.

36. The computer program product of claim **33**, wherein the positioning protocol is long term evolution positioning protocol annex.

37. An apparatus of an intermediate network node for routing messages of a positioning protocol in a wireless network, comprising:

a network area identifier receiving component for determining and storing a mapping between a plurality of network area identifiers and gateway identifiers;

a message receiving component for obtaining a network area identifier related to a base station in a message of a positioning protocol;

a gateway presence determining component, comprising hardware, for determining whether a gateway is present based at least in part on the network area identifier in accordance with the mapping; and

a message routing component for delivering the message to a network node based at least in part on whether the gateway is present.

38. The apparatus of claim **37**, wherein the gateway presence determining component discerns that the gateway is present, the network node is the gateway, and the means for delivering includes an identifier of the base station in the message.

39. The apparatus of claim **37**, wherein the gateway presence determining component discerns that the gateway is not present, and the network node is the base station.

40. The apparatus of claim **37**, wherein the positioning protocol is long term evolution positioning protocol annex.

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