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(54) **Title**: METHODS, SYSTEMS, AND COMPUTER READABLE MEDIA FOR PROVIDING FOREIGN ROUTING ADDRESS INFORMATION TO A TELECOMMUNICATIONS NETWORK GATEWAY

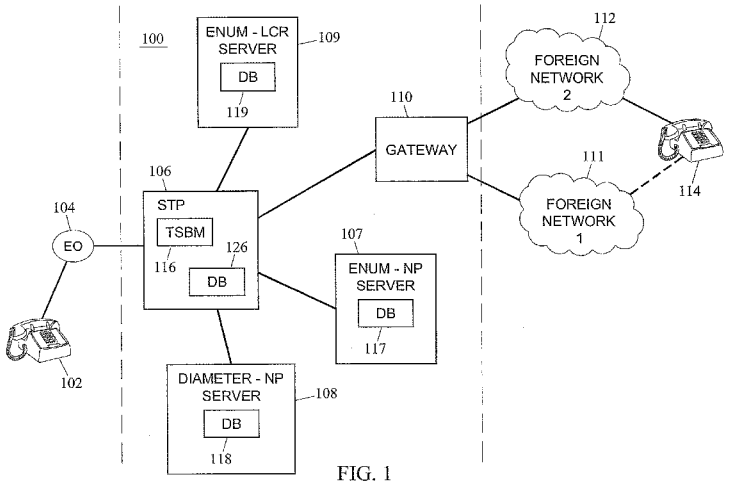

FIG. 1

(57) **Abstract**: The subject matter described herein includes methods, systems, and computer readable media for providing foreign routing address information to a telecommunications network gateway. According to one aspect, the method includes, at a call signaling message routing node in a first telecommunications network, intercepting a call setup message that includes a called party number identifier and is directed towards a network gateway connected to at least one foreign telecommunications network. The method also includes accessing a foreign routing information database using an ENUM formatted query message to obtain foreign routing address information associated with the at least one foreign telecommunications network, modifying the call setup message to include the address information, and routing the modified call setup message towards the network gateway.

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DESCRIPTION

METHODS, SYSTEMS, AND COMPUTER READABLE MEDIA FOR PROVIDING FOREIGN ROUTING ADDRESS INFORMATION TO A TELECOMMUNICATIONS NETWORK GATEWAY

PRIORITY CLAIM

This application claims the benefit of U.S. Provisional Patent Application Serial No. 61/243,014, filed September 16, 2009; the disclosure of which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

The subject matter described herein relates to network gateways and obtaining routing address information associated with a foreign telecommunications network. More particularly, the subject matter described herein relates to methods, systems, and computer readable media for providing foreign routing address information to a telecommunications network gateway.

BACKGROUND

Number portability gives telephone service subscribers the ability to change service providers without changing their directory numbers. Accordingly, service provider networks, such as carrier telecommunications networks and hub provider networks, are configured to route calls to called party devices whose telephone number has be ported to another network. The ported from network may include a network element (e.g., a gateway element) that maintains number portability data, such as a local routing numbers (LRN), that is associated with a switch device that is servicing the ported called party number in the ported to network. The number portability information is forwarded to the ported to network in order for a call session involving the called party device to be established. In many cases, however, the established call session is still trunked through the original network to the ported to network. Similarly, subsequent signaling messages associated with the established call session may also be hairpinned via the original ported from network as well. As a consequence, call setup times are increased and network resources are

being unnecessarily allocated in the original network to establish a call session with a former called party subscriber.

Accordingly, there exists a need for improved methods, systems, and computer readable media for providing foreign routing address information to a telecommunications network gateway.

SUMMARY

The subject matter described herein includes methods, systems, and computer readable media for providing foreign routing address information to a telecommunications network gateway. In one embodiment, the method includes, at a call signaling message routing node in a first telecommunications network, intercepting a call setup message that includes a called party number identifier and is directed towards a network gateway connected to at least one foreign telecommunications network. The method also includes accessing a foreign routing information database using an E.164 number mapping (ENUM) formatted query message to obtain foreign routing address information associated with the at least one foreign telecommunications network, modifying the call setup message to include the address information, and routing the modified call setup message towards the network gateway.

The subject matter described herein for providing foreign routing address information to a telecommunications network gateway may be implemented in hardware in combination with software and/or firmware. As such, the terms "function" or "module" as used herein refer to hardware in combination with software and/or firmware for implementing the feature being described. In one exemplary implementation, the subject matter described herein may be implemented using a non-transitory computer readable medium having stored thereon computer executable instructions that when executed by the processor of a computer control the computer to perform steps. Exemplary computer readable media suitable for implementing the subject matter described herein include non-transitory computer-readable media, such as disk memory devices, chip memory devices, programmable logic devices, and application specific integrated circuits. In addition, a computer readable medium that implements the subject matter described herein may be located on a single device or

computing platform or may be distributed across multiple devices or computing platforms.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the subject matter described herein will now be explained with reference to the accompanying drawings of which:

Figure 1 is a network diagram illustrating an exemplary system for providing foreign routing address information to a network gateway according to an embodiment of the subject matter described herein;

Figure 2 is a flow chart illustrating an exemplary method providing foreign routing address information to a network gateway according to an embodiment of the subject matter described herein;

Figure 3 is an exemplary call flow diagram for using an ENUM query to obtain number portability information according to an embodiment of the subject matter described herein;

Figure 4 is an exemplary call flow diagram for using a DIAMETER query to obtain number portability information according to an embodiment of the subject matter described herein;

Figure 5 is an exemplary call flow diagram for using an ENUM query to obtain least cost routing information according to an embodiment of the subject matter described herein; and

Figure 6 is an exemplary call flow diagram for using ENUM queries to obtain both number portability information and least cost routing information according to an embodiment of the subject matter described herein.

DETAILED DESCRIPTION

Figure 1 depicts an exemplary telecommunications network **100** that includes at least one call signaling message routing node (e.g., a signal transfer point (STP) or a DIAMETER signaling router (DSR) **106**) (hereinafter, "STP **106**") that is provisioned with a triggerless service broker module (TSBM) **116**. In one embodiment, network **100** may include an entire carrier network or a hub provider network. Likewise, TSBM **116** may be a software application that is executed by a processor or CPU in STP **106** that enables STP **106** to intercept

call signaling messages and request foreign routing address information associated with a called party number (CdPN) contained in an intercepted message from one or more servers (e.g., servers **107-109**) in network **100**. TSBM **116** may also be configured to modify the original call signaling message with the requested foreign routing address information and provide modified call signaling message to a network gateway **110** that is linked to one or more foreign telecommunications networks **111** and **112**. In one embodiment, gateway **110** may includes an international gateway, which may comprise a tandem switching office, a soft switch, a media gateway controller (MGC), or a gateway mobile switching center (GMSC) configured to route calls to one or more international telecommunications networks. Namely, gateway **110** may be provided with foreign routing address information that can be used to efficiently route calls originating in network **100** and destined for foreign telecommunications networks (e.g., networks, carriers, and hub providers that are distinct from telecommunications network **100**), such as a first foreign telecommunications network **111** and a second foreign telecommunications network **112**. As used herein, a foreign telecommunications network includes any telecommunications network that is distinct and separate from network **100**. For example, a foreign telecommunications network may include a telecommunications network based in a country that is different than the country in which network **100** is based. Also, a foreign telecommunications network may be based in the same country or state as network **100**, but is instead managed and/or operated by a separate and distinct carrier provider or hub provider.

An exemplary method **200** in which TSBM **116** provides the foreign routing address information to gateway **110** is described by Figure 2 in conjunction with the depicted system of Figure 1. In block **202** of Figure 2, a call setup message directed toward a network gateway is intercepted. In one embodiment, STP **106** intercepts an ISUP IAM call signaling message sent from end office **104** (e.g., a service switching point (SSP) or like network element) and directed towards gateway **110**. For example, end office **104** first receives an off-hook signal from a calling device **102** that indicates (i.e., via dialed numbers) that calling device **102** is requesting a call session (e.g., an

international call) with destination device **114**. In one embodiment, calling device **102** and destination device **114** may each be a landline phone, a mobile phone, a SIP phone, or like device that can initiate or receive a call. Although Figure 1 depicts calling device **102** and end office **104** as being separate from network **100**, calling device **102** and end office **104** may be part of network **100** without departing from the scope of the present subject matter (e.g., network **100** may be a carrier network instead of a hub provider network).

Upon receiving the indication from calling device **102**, end office **104** generates a call signaling message (e.g., an ISUP IAM) that includes the called party number associated with destination device **114**. End office **104** may recognize that destination device **114** is located in a foreign network and may therefore send the call signaling message to gateway **110**. While in transit towards gateway **110**, the original call signaling message is intercepted by STP **106**.

In block **204**, a query message for requesting foreign routing address information is generated. In one embodiment, TSBM **116** in STP **106** extracts the called party number in the call signaling message and generates a query message to be sent to at least one server that contains foreign routing address information associated with the called party number in the original call signaling message. Depending on the embodiment, the query message may include a TCAP message, an E.164 number mapping standard (ENUM) message, a DIAMETER message, or the like.

In block **206**, the query message is sent to the foreign routing address server requesting foreign address information associated with the called party number in the intercepted call signaling message. Foreign routing address information may include foreign number portability information, such as an LRN of a switch device in a foreign network. The foreign routing address information may also include least cost routing (LCR) information (e.g., routing number information, switch identifier information, switch address information, carrier identification information, service profile identifier (SPID) information, etc.) pertaining to a switch device in a foreign network. In one embodiment, LCR information may include addressing data that does not include switch-related information. For example, a gateway may be configured, after a certain time

(e.g., time of day, day of week, etc.), to route all calls to a specific carrier network using a carrier identifier that is not specific to a particular switch or called party number.

In one embodiment, STP **106** is communicatively coupled to a plurality of servers located in network **100**, such as an ENUM-based NP server **107**, a DIAMETER-NP server **108**, and an ENUM-based LCR server **109**. In one embodiment, TSBM **116** sends an ENUM query message to ENUM-based NP server **107** to request an LRN of a switch in a foreign network (see Figure 3). In another embodiment, TSBM **116** sends a DIAMETER query message to DIAMETER-based NP server **108** to request an LRN of a switch in a foreign network (see Figure 4). In yet another embodiment, TSBM **116** sends an ENUM query message to an ENUM-based LCR server to request a routing number based of a switch in a foreign network in accordance with least cost routing parameters (see Figure 5). In yet another embodiment, TSBM **116** sends a TCAP query message to an LNP server to request an LRN of a switch in a foreign network. In one embodiment, the query message may be sent to a local foreign routing address information database **126** located within STP **106**. Specifically, the query message may be an internal signaling message and is not sent toward external servers **107-109**. Thus, local database **126** may contain number portability data and least cost routing data that is associated with a switch device servicing called party number associated with a foreign network (e.g., foreign networks **111-112**)

Returning to Figure 2, a response message including foreign routing address information is received in block **208**. In one embodiment, TSBM **116** receives an ENUM response message containing the LRN of the foreign switch that is serving destination device **114**. In alternative embodiments, TSBM **116** is configured to receive ENUM and DIAMETER response messages containing the requested RN or LRN of foreign switches serving destination device **114**. Notably, these response messages contain foreign routing address information that is obtained from at least one database in servers **107-109**. For example, ENUM-based NP server **107** may include a local database **117** that contains number portability information that can be accessed using an ENUM query message. For example, the ENUM-based NP database **117** may be

provisioned with number portability data (e.g., a local routing numbers (LRNs)) that are respectively associated with a plurality of E.164 called party numbers. Thus, instead of providing a URI that corresponds to an E.164 telephone number when queried, database **117** may instead supply an LRN of a foreign switch device serving destination device **114**. In an alternate embodiment, database **117** may contain both URI and number portability information that is associated with E.164 telephone numbers. In this scenario, the ENUM query message generated by TSBM **116** may need to include a flag to indicate which of the two types of information is being requested. In an alternate embodiment, ENUM-based NP server **107** may simply receive the ENUM query message from TSBM **116** and provide both a URI and LRN in an ENUM response message.

Similarly, DIAMETER-based NP server **108** may include a local database **118** that contains number portability information that can be accessed using a DIAMETER query message. In one embodiment, DIAMETER-based NP server **108** may provide the requested number portability data and/or DIAMETER data in the manner set forth above with respect to ENUM-based NP server **107**. Likewise, ENUM-based LCR server **109** may include a local database **119** that contains least cost routing information that can be accessed using an ENUM query message. In one embodiment, DIAMETER-based NP server **108** may provide the requested LCR data and/or URI data in the manner not unlike ENUM-based NP server **107**. Although Figure 1 depicts databases **117-119** being local to servers **107-109**, each of databases **117-119** may be located external to servers **107-109**, respectively.

Returning to Figure 2, the call setup message is modified in block **210**. In one embodiment, TSBM **116** extracts the foreign routing address information from the response message and modifies the ISUP IAM to include the routing address information along with the called party number.

In block **212**, the modified call setup message is routed towards the border gateway. In one embodiment, TSBM **116** sends the modified ISUP IAM message, which includes both the called party number and a RN, to gateway **110**. Notably, the ISUP IAM is sent to the same gateway that the original ISUP

IAM was initially directed towards, but is now modified with foreign routing address information to be used for more efficient routing in a foreign network.

As indicated in the description of method **200** above, there are several different types of query and response messages that can be used by TSBM **116**. Similarly, there are several different types of routing address information servers and databases that may be accessed prior to routing an ISUP IAM to a foreign network via gateway **110**. Accordingly, select exemplary embodiments of the present subject matter are depicted in call flow diagrams set forth in Figures 3-6.

For example, Figure 3 depicts an exemplary call flow diagram of an ENUM based triggerless number portability service conducted by TSBM **116**. In one embodiment of the present subject matter, end office **104** receives a call indication from calling device **102** to establish a call with destination device **114**. As shown in Figure 1, destination device **114** may be communicatively connected to and serviced by second foreign network **112**. In one embodiment, destination device **114** was formerly subscribed to network **111** (as indicated by the dashed line in Figure 1) but has since had its called party number ported from foreign network **111** to foreign network **112**.

Upon receiving the indication from user device **102**, end office (EO) **104** generates an ISDN user part (ISUP) initial address message (IAM) that includes the called party number (CdPN), or some other called party identifier. The ISUP IAM is launched from end office **104** toward network gateway **110** which is connected to the foreign network **111** (i.e., the ported from network that previously serviced destination device **114**).

Instead of routing the ISUP IAM to gateway **110** with the called party number, STP **106** may be configured to modify the ISUP IAM so that gateway **110** can forward the ISUP IAM to the proper ported to network (e.g., network **112**) while avoiding the ported from network (e.g., network **111**). In order to obtain the number portability information needed by gateway **110**, STP **106** may send a query message to access an appropriate number portability database. In one embodiment, TSBM **116** in STP **106** generates and sends an ENUM query message containing the CdPN to ENUM server **107**. The ENUM query message may be used by TSBM **116** to request number portability

information associated with the CdPN contained in the original ISUP IAM. In one embodiment, ENUM-BASED NP server **107** may include an international ENUM-BASED NP server is configured to receive ENUM query messages and contains number portability information that is associated with one or more foreign gateways.

Upon receiving the ENUM NP query message, ENUM-BASED NP server **107** uses the CdPN identifier to search ENUM-based NP database **117** in order to retrieve a local routing number (LRN) corresponding to a telephone switch (not shown) that is responsible for routing calls to the ported CdPN of destination device **114**. After obtaining the LRN number from ENUM-based NP database **117**, ENUM-based NP server **107** sends an ENUM response message containing the LRN to TSBM **116**.

Upon receiving the ENUM response message, TSBM **116** modifies the ISUP IAM to include the acquired LRN information. In one embodiment, the digits that TSBM **116** inserts in the modified ISUP IAM may be steering or override type of data, and need not just be an LRN. TSBM **116** then routes the modified ISUP IAM to network gateway **110**. After receiving the modified ISUP IAM, network gateway **110** extracts the LRN and uses the LRN information to route the call. Namely, gateway **110** uses the extracted information to determine that the modified ISUP IAM is to be routed to network **112**. For example, the modified ISUP IAM may contain an LRN associated with a telephone switch located in network **112**. Notably, the present subject matter enables the modified ISUP IAM to be directed to the destination device **114** in network **112** while completely avoiding the ported from network **111**. Thus, network **111** is bypassed and does not need to allocate network resources to process the call intended for ported destination device **114**.

In one embodiment, TSBM **116** is configured to perform a uniform resource identifier (URI)-to-valid routing number / steering digit format translation. Namely, additional logic can be provided by the STP/TSBM to enhance the capability based on the return result of the ENUM dip. For example, TSBM **116** may formulate an ENUM query for requesting NP information associated with destination device **114**. TSBM **116** may then receive a response message to the ENUM query that includes NP information

(e.g., data other than an LRN) associated with destination device **114**. TSBM **116** is configured to extract the NP information from the ENUM response message and to re-format the NP information (e.g., routing number, etc.) as necessary so that at least some of the NP information may be included in the modified ISUP IAM. For example, ENUM server **107** may include the routing number / ported-to switch or gateway routing information in a URI format. TSBM **116** may be configured to extract the URI information from the ENUM response message and parse the URI information in order to obtain and/or derive a valid routing number or LRN. TSBM **116** then modifies the ISUP IAM to include the valid routing number or LRN. TSBM **116** subsequently routes the modified ISUP IAM to gateway **110** or tandem switching office.

Figure 4 depicts an exemplary call flow diagram of a DIAMETER based triggerless number portability service conducted by TSBM **116**. In one embodiment of the present subject matter, end office **104** receives a call indication from calling device **102** to establish a call with destination device **114**. Upon receiving the indication from calling device **102**, end office **104** generates an ISUP IAM that includes the called party number, or some other called party identifier. The ISUP IAM is launched from end office **104** toward network gateway **110** which is connected to the foreign network **111** (i.e., the ported from network that previously serviced destination device **114**).

Instead of routing the ISUP IAM to gateway **110** with the called party number, STP **106** may be configured to modify the ISUP IAM so that gateway **110** can forward the ISUP IAM to the proper ported to network (e.g., network **112**) while avoiding the ported from network (e.g., network **111**). In order to obtain the number portability information needed by gateway **110**, STP **106** may send a query message to access an appropriate number portability database. In one embodiment, TSBM **116** in STP **106** generates and sends a DIAMETER-based query message containing the CdPN to DIAMETER-based NP server **108**. Although Figure 4 depicts using a DIAMETER Location-Information-Request (LIR) query message, any other DIAMETER query message may be used to request number portability information.

The DIAMETER LIR query message may be used by TSBM **116** to request number portability information associated with the CdPN contained in

the original ISUP IAM. In one embodiment, DIAMETER-based NP server **108** may include an international DIAMETER-based NP server is configured to receive DIAMETER query messages and contains number portability information that is associated with one or more foreign gateways.

Upon receiving the DIAMETER LIR query message, DIAMETER-based NP server **108** uses the CdPN identifier to search DIAMETER-NP database **118** in order to retrieve a LRN corresponding to a telephone switch (not shown) that is responsible for routing calls to the ported CdPN of destination device **114**. After obtaining the LRN number from DIAMETER-based NP database **118**, DIAMETER-based NP server **108** sends a DIAMETER-based response message containing the LRN to TSBM **116**. Although Figure 4 depicts using a DIAMETER Location-Information-Answer (LIA) response message, any other DIAMETER response message may be used to provide number portability information to STP **106**.

Upon receiving the DIAMETER LIA response message, TSBM **116** modifies the ISUP IAM to include the acquired LRN information. TSBM **116** then routes the modified ISUP IAM to network gateway **110**. After receiving the modified ISUP IAM, network gateway **110** extracts the LRN and uses the LRN information to route the call. Namely, gateway **110** uses the extracted information to determine that the modified ISUP IAM is to be routed to network **112**. For example, the modified ISUP IAM may contain an LRN associated with a telephone switch located in network **112**.

In one embodiment, TSBM **116** is configured to perform a uniform resource identifier (URI)-to-valid routing number / steering digit format translation as explained above. In one embodiment, additional logic can be provided by the STP/TSBM to enhance the capability based on the return result of the DIAMETER server/database dip. For example, TSBM **116** may formulate a DIAMETER query message to request NP information (e.g., URI information) associated with destination device **114**. Upon receiving the DIAMETER response message, TSBM **116** may be configured to extract the URI information and parse the URI information to obtain and/or derive a valid routing number or LRN. TSBM **116** then modifies the ISUP IAM to include the valid

routing number or LRN. TSBM **116** subsequently routes the modified ISUP IAM to gateway **110**.

Figure 5 depicts an exemplary call flow diagram of an ENUM based triggerless least cost routing (LCR) service conducted by TSBM **116**. In one embodiment of the present subject matter, end office **104** receives a call indication from calling device **102** to establish a call with destination device **114**. Upon receiving the indication from calling device **102**, end office **104** generates an ISUP IAM that includes the called party number, or some other called party identifier. The ISUP IAM is launched from end office **104** toward network gateway **110** which is connected to the foreign network **111** (i.e., a network that includes an inefficient or costly route to destination device **114**).

Instead of routing the ISUP IAM to gateway **110** with the called party number, STP **106** may be configured to modify the ISUP IAM so that gateway **110** can forward the ISUP IAM to the efficient network (e.g., network **112**) while avoiding the inefficient network (e.g., network **111**). In order to obtain the LCR information needed by gateway **110**, STP **106** may send a query message to access an appropriate LCR database. In one embodiment, TSBM **116** in STP **106** generates and sends an ENUM-based query message containing the CdPN to ENUM server **108**.

The ENUM query message may be used by TSBM **116** to request LCR information associated with the CdPN contained in the original ISUP IAM. In one embodiment, ENUM-based NP server **108** may include an ENUM-BASED LCR server is configured to receive ENUM query messages and contains LCR information that is associated with one or more foreign gateways.

Upon receiving the ENUM query message, ENUM-based NP server **108** uses the CdPN identifier to search ENUM-based LCR database **118** in order to retrieve a RN corresponding to a telephone switch (not shown) that is responsible for routing calls to the CdPN of destination device **114**. After obtaining the RN from ENUM-based LCR database **118**, ENUM-based LCR server **108** sends an ENUM-based response message containing an RN associated with the called party number to TSBM **116**.

Upon receiving the ENUM response message, TSBM **116** modifies the ISUP IAM to include the acquired routing number information. TSBM **116** then routes the modified ISUP IAM to network gateway **110**. After receiving the modified ISUP IAM, network gateway **110** extracts the RN information and uses the RN information to route the call. Namely, gateway **110** determines that the modified ISUP IAM is to be routed to network **112**. For example, the modified ISUP IAM may contain an RN associated with a telephone switch located in network **112**.

In one embodiment, TSBM **116** is configured to perform a uniform resource identifier (URI)-to-valid routing number / steering digit format translation. Namely, additional logic can be provided by the STP/TSBM to enhance the capability based on the return result of the ENUM dip. For example, TSBM **116** may formulate an ENUM query for requesting LCR information associated with destination device **114**. TSBM **116** may then receive a response message to the ENUM query that includes LCR information (e.g., data indicating an optimal route or link) associated with destination device **114**. TSBM **116** is configured to extract the LCR information from the ENUM response message and to re-format the LCR information (e.g., routing number, etc.) as necessary so that at least some of the LCR information may be included in the modified ISUP IAM. For example, ENUM server **107** may include a routing number or gateway routing information in a URI format. TSBM **116** may be configured to extract the URI information from the ENUM response message and parse the URI information in order to obtain and/or derive a valid routing number. TSBM **116** then modifies the ISUP IAM to include the valid routing number. TSBM **116** subsequently routes the modified ISUP IAM to gateway **110** or tandem switching office.

Figure 6 depicts an exemplary call flow diagram of an ENUM based triggerless number portability service combined with LCR service conducted by TSBM **116**. In one embodiment, end office **104** receives a call indication from calling device **102** to establish a call with destination device **114**. Upon receiving the indication from user device **102**, end office (EO) **104** generates an ISDN user part (ISUP) initial address message (IAM) that includes the called party number (CdPN), or some other called party identifier. The ISUP IAM is

launched from end office **104** toward network gateway **110**, which is connected to the foreign network **111** (i.e., the ported from network that previously serviced destination device **114**), and intercepted by STP **106**. Instead of routing the ISUP IAM to gateway **110** with the called party number, STP **106** may be configured to modify the ISUP IAM to include both number portability information and LCR information. For example, TSBM **116** may generate and send a first ENUM query message containing the CdPN to ENUM server **107** and a second ENUM query message containing the CdPN to ENUM-based LCR server **109**. In the manner explained above with regard to Figures 3 and 5, TSBM **106** may receive an a first ENUM response message containing an LRN from ENUM-based NP server **107** and a second ENUM response message containing a RN from ENUM-based LCR server **109**.

Upon receiving the ENUM response messages, TSBM **116** modifies the ISUP IAM to include both the acquired LRN information and LCR information (e.g., a RN). In one embodiment, the digits that TSBM **116** inserts in the modified ISUP IAM may be steering or override type of data, and need not just be an LRN. TSBM **116** then routes the modified ISUP IAM to network gateway **110**. After receiving the modified ISUP IAM, network gateway **110** extracts the LRN and RN and uses the extracted information to route the call.

In one embodiment, TSBM **116** is configured to perform a uniform resource identifier (URI)-to-valid routing number / steering digit format translation. Namely, additional logic can be provided by the STP/TSBM to enhance the capability based on the return result of the ENUM dips.

It will be understood that various details of the subject matter described herein may be changed without departing from the scope of the subject matter described herein. Furthermore, the foregoing description is for the purpose of illustration only, and not for the purpose of limitation.

CLAIMS

What is claimed is:

1. A method for providing switch address information to a foreign telecommunications network, the method comprising:

at a call signaling message routing node in a first telecommunications network:

intercepting a call setup message that includes a called party number identifier and is directed towards a network gateway connected to at least one foreign telecommunications network;

accessing a foreign routing information database using an ENUM formatted query message to obtain foreign routing address information associated with the at least one foreign telecommunications network;

modifying the call setup message to include the address information; and

routing the modified call setup message towards the network gateway.

2. The method of claim 1 wherein the foreign routing address information is associated with the called party number and a switch device in the at least one foreign telecommunications network.

3. The method of claim 2 wherein accessing the foreign routing information database includes generating the ENUM formatted query message to request address information associated with the called party number and a switch device in the at least one foreign telecommunications network, transmitting the ENUM formatted query message to a server in the first telecommunications network that contains the address information and receiving, from the server, an ENUM formatted response message that includes the address information.

4. The method of claim 1 wherein the foreign routing information database is located within the call signaling message routing node.

5. The method of claim 1 wherein the foreign routing address information includes at least one of number portability information and least cost routing information.

6. The method of claim 1 wherein the gateway includes an international gateway providing a connection to at least one international telecommunications network.

7. The method of claim 2 wherein the foreign routing address information includes at least one of a routing number and a local routing number (LRN) associated with a switch device in the at least one foreign telecommunications network.

8. The method of claim 1 wherein the foreign routing address information includes a uniform resource identifier (URI) that is translated to generate at least one of a routing number and a local routing number.

9. The method of claim 1 wherein the call setup message includes an ISDN user part (ISUP) initial address message (IAM).

10. The method of claim 1 wherein the call signaling message routing node includes a signal transfer point (STP) or a DIAMETER signaling router (DSR).

11. The method of claim 1 wherein the foreign routing address information includes at least one of switch identifier information, switch address information, carrier identification information, service profile identifier (SPID) information associated with the at least one foreign telecommunications network.

12. A method for providing switch address information to a foreign telecommunications network, the method comprising:

at a call signaling message routing node in a first telecommunications network:

intercepting a call setup message that includes a called party number identifier and is directed towards a network gateway connected to at least one foreign telecommunications network;

accessing a foreign routing information database using an DIAMETER formatted query message to obtain foreign routing address information associated with the at least one foreign telecommunications network;

modifying the call setup message to include the address information; and

routing the modified call setup message towards the network gateway.

13. The method of claim 12 wherein the foreign routing address information is associated with the called party number and a switch device in the at least one foreign telecommunications network.

14. The method of claim 13 wherein accessing the foreign routing information database includes generating the DIAMETER formatted query message to request address information associated with the called party number and a switch device in the at least one foreign telecommunications network, transmitting the DIAMETER formatted query message to a server in the first telecommunications network that contains the address information, and receiving, from the server, a DIAMETER formatted response message that includes the address information.

15. The method of claim 12 wherein the foreign routing information database is located within the call signaling message routing node.

16. The method of claim 12 wherein the foreign routing address information includes at least one of number portability information and least cost routing information.

17. The method of claim 12 wherein the DIAMETER formatted query message includes a DIAMETER location information request (LIR) query message.

18. The method of claim 14 wherein the DIAMETER response message includes a DIAMETER location information answer (LIA) response message.

19. The method of claim 12 wherein the gateway includes an international gateway providing a connection to at least one foreign telecommunications network.

20. The method of claim 13 wherein the foreign routing address information includes at least one of a routing number and a local routing number (LRN) associated with a switch device in the at least one foreign telecommunications network.

21. The method of claim 12 wherein the foreign routing address information includes a uniform resource identifier (URI) that is translated to generate at least one of a routing number and a local routing number.

22. The method of claim 12 wherein the call setup message includes an ISDN user part (ISUP) initial address message (IAM).

23. The method of claim 12 wherein the call signaling message routing node includes a signal transfer point (STP) or a DIAMETER signaling router (DSR).

24. The method of claim 12 wherein the foreign routing address information includes at least one of switch identifier information, switch address information, carrier identification information, service profile identifier (SPID) information associated with the at least one foreign telecommunications network.

25. A system for providing switch address information to a foreign telecommunications network, the system comprising:

in a first telecommunications network:

a network gateway for receiving a modified call signaling message and routing the modified call signaling message to a foreign network; and

a call signaling message routing node configured for intercepting a call setup message that includes a called party number identifier and is directed towards a network gateway connected to at least one foreign telecommunications network, for accessing a foreign routing information database using an ENUM formatted query message to obtain foreign routing address information associated with the at least one foreign telecommunications network, and for modifying the call setup message to include the address information.

26. The system of claim 25 wherein the foreign routing address information is associated with the called party number and a switch device in the at least one foreign telecommunications network.

27. The system of claim 26 wherein the call signaling message routing node is configured for generating an ENUM formatted query message to request address information associated with the called party number and

a switch device in the at least one foreign telecommunications network, transmitting the ENUM formatted query message to a server in the first telecommunications network that contains the address information, and receiving, from the server, an ENUM formatted response message that includes the address information.

28. The system of claim 25 wherein the foreign routing information database is located within the call signaling message routing node.

29. The system of claim 25 wherein the foreign routing address information includes at least one of number portability information and least cost routing information.

30. The system of claim 25 wherein the gateway includes an international gateway providing a connection to at least one foreign telecommunications network.

31. The system of claim 26 wherein the foreign routing address information includes at least one of a routing number and a local routing number (LRN) associated with a switch device in the at least one foreign telecommunications network.

32. The system of claim 25 wherein the foreign routing address information includes a uniform resource identifier (URI) that is translated to generate at least one of a routing number and a local routing number.

33. The system of claim 25 wherein the call setup message includes an ISDN user part (ISUP) initial address message (IAM).

34. The system of claim 25 wherein the call signaling message routing node includes a signal transfer point (STP) or a DIAMETER signaling router (DSR).

35. The system of claim 25 wherein the foreign routing address information includes at least one of switch identifier information, switch address information, carrier identification information, service profile identifier (SPID) information associated with the at least one foreign telecommunications network.

36. A non-transitory computer readable medium having stored thereon executable instructions that when executed by the processor of a computer control the computer to perform steps comprising:

at a call signaling message routing node in a first telecommunications network:

intercepting a call setup message that includes a called party number identifier and is directed towards a network gateway connected to at least one foreign telecommunications network;

accessing a foreign routing information database using an ENUM formatted query message to obtain foreign routing address information associated with the at least one foreign telecommunications network;

modifying the call setup message to include the address information; and

routing the modified call setup message towards the network gateway.

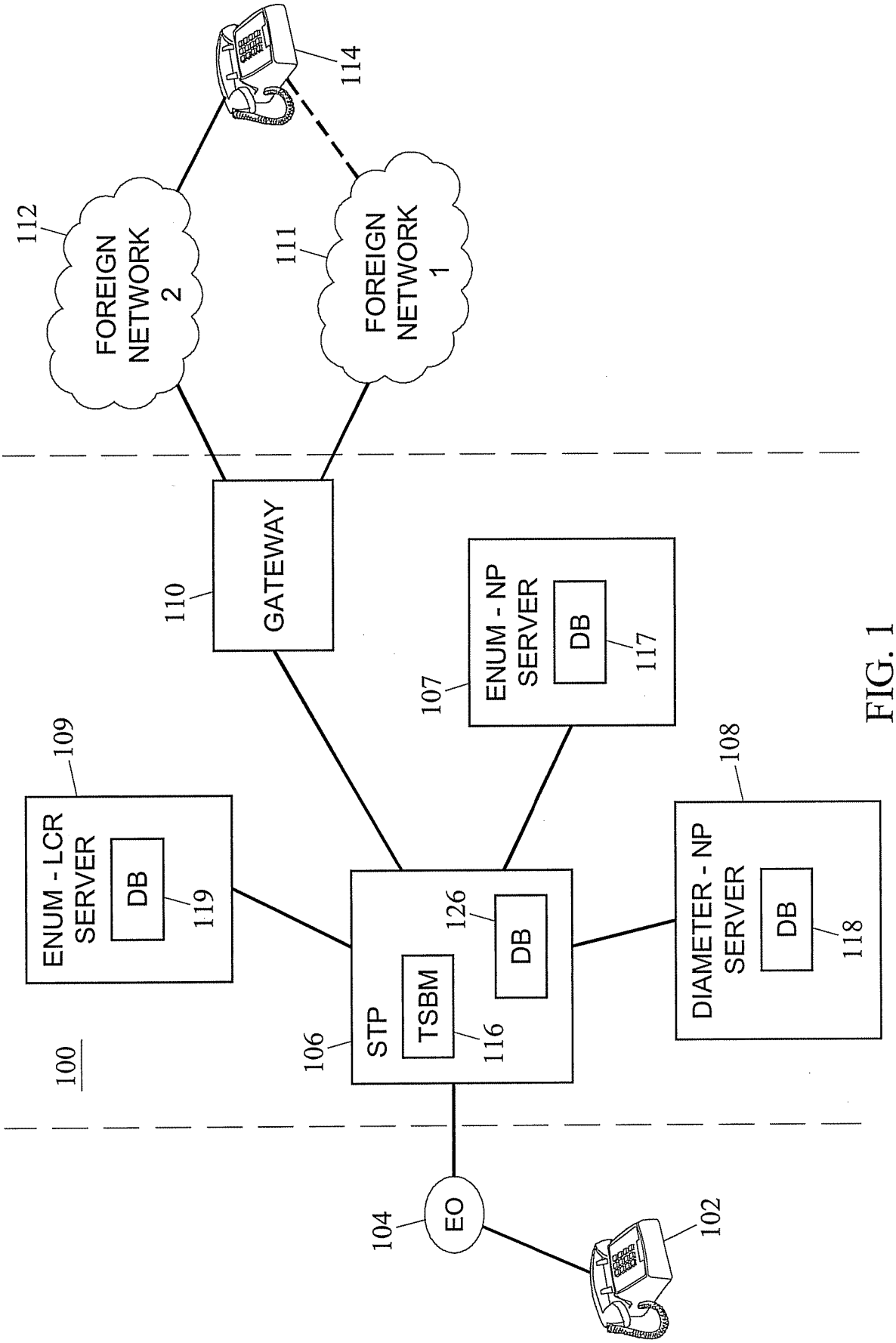
114
112
FOREIGN NETWORK 2
111
FOREIGN NETWORK 1
110
GATEWAY
107
ENUM - NP SERVER
DB
117
109
ENUM - LCR SERVER
DB
119
108
DIAMETER - NP SERVER
DB
118
126
DB
106
STP
TSBM
116
100
104
EO
102

FIG. 1

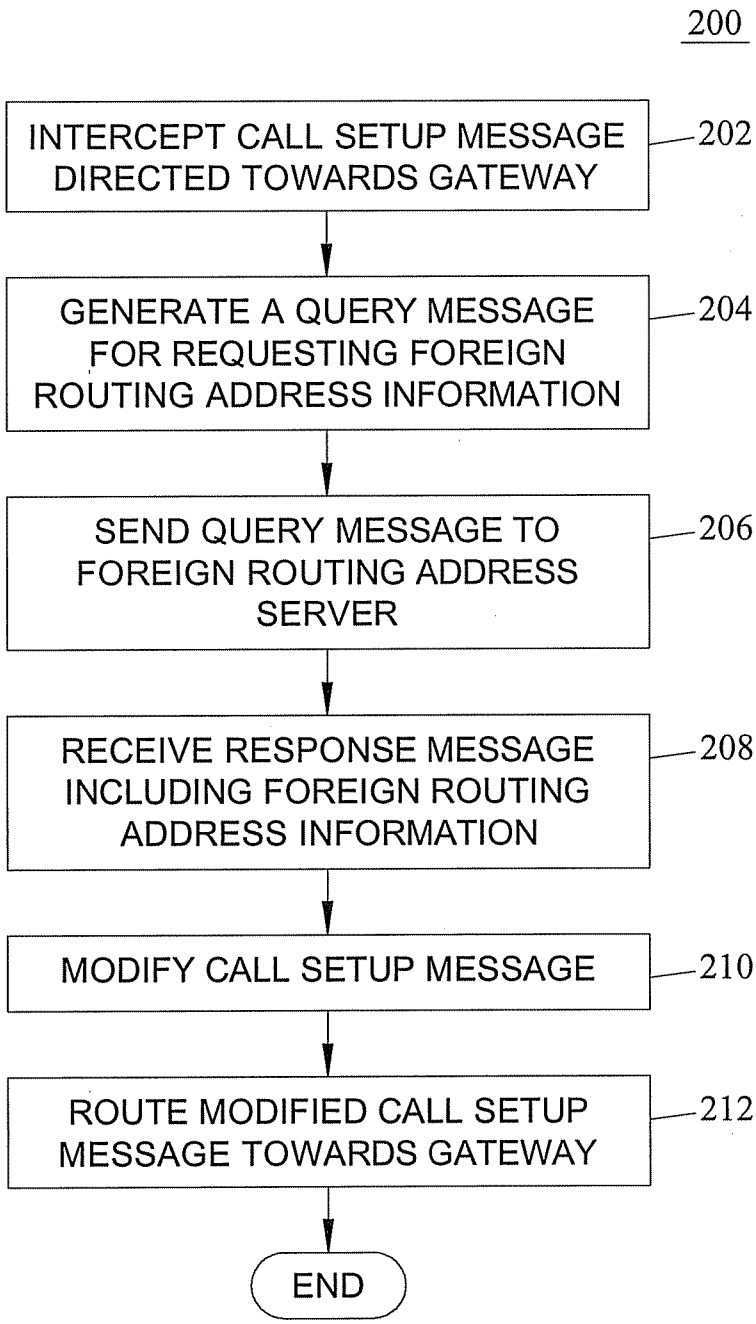
200
INTERCEPT CALL SETUP MESSAGE DIRECTED TOWARDS GATEWAY
202
GENERATE A QUERY MESSAGE FOR REQUESTING FOREIGN ROUTING ADDRESS INFORMATION
204
SEND QUERY MESSAGE TO FOREIGN ROUTING ADDRESS SERVER
206
RECEIVE RESPONSE MESSAGE INCLUDING FOREIGN ROUTING ADDRESS INFORMATION
208
MODIFY CALL SETUP MESSAGE
210
ROUTE MODIFIED CALL SETUP MESSAGE TOWARDS GATEWAY
212
END

FIG.2

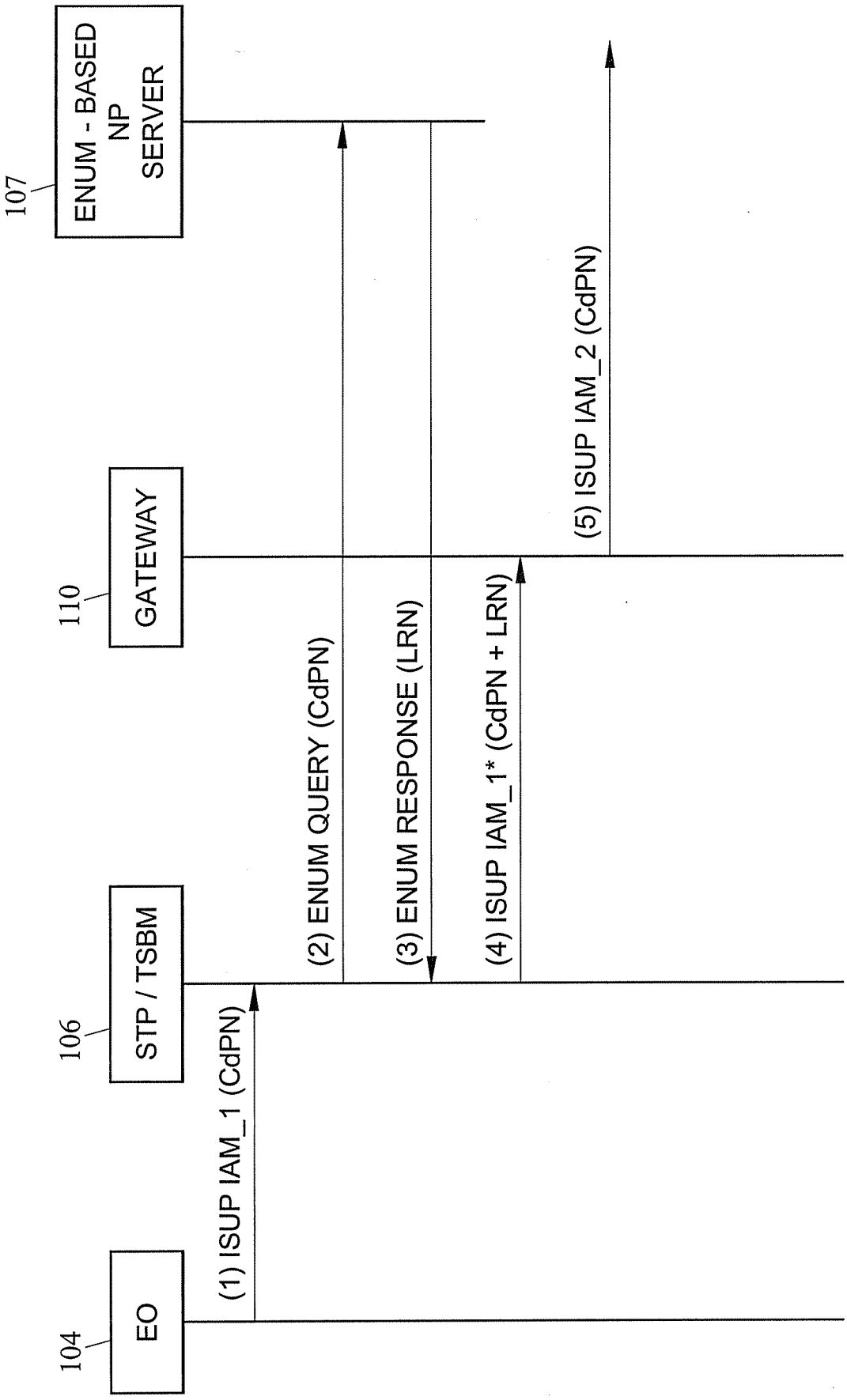
104
EO
106
STP / TSBM
110
GATEWAY
107
ENUM - BASED NP SERVER
(1) ISUP IAM_1 (CdPN)
(2) ENUM QUERY (CdPN)
(3) ENUM RESPONSE (LRN)
(4) ISUP IAM_1* (CdPN + LRN)
(5) ISUP IAM_2 (CdPN)

FIG. 3

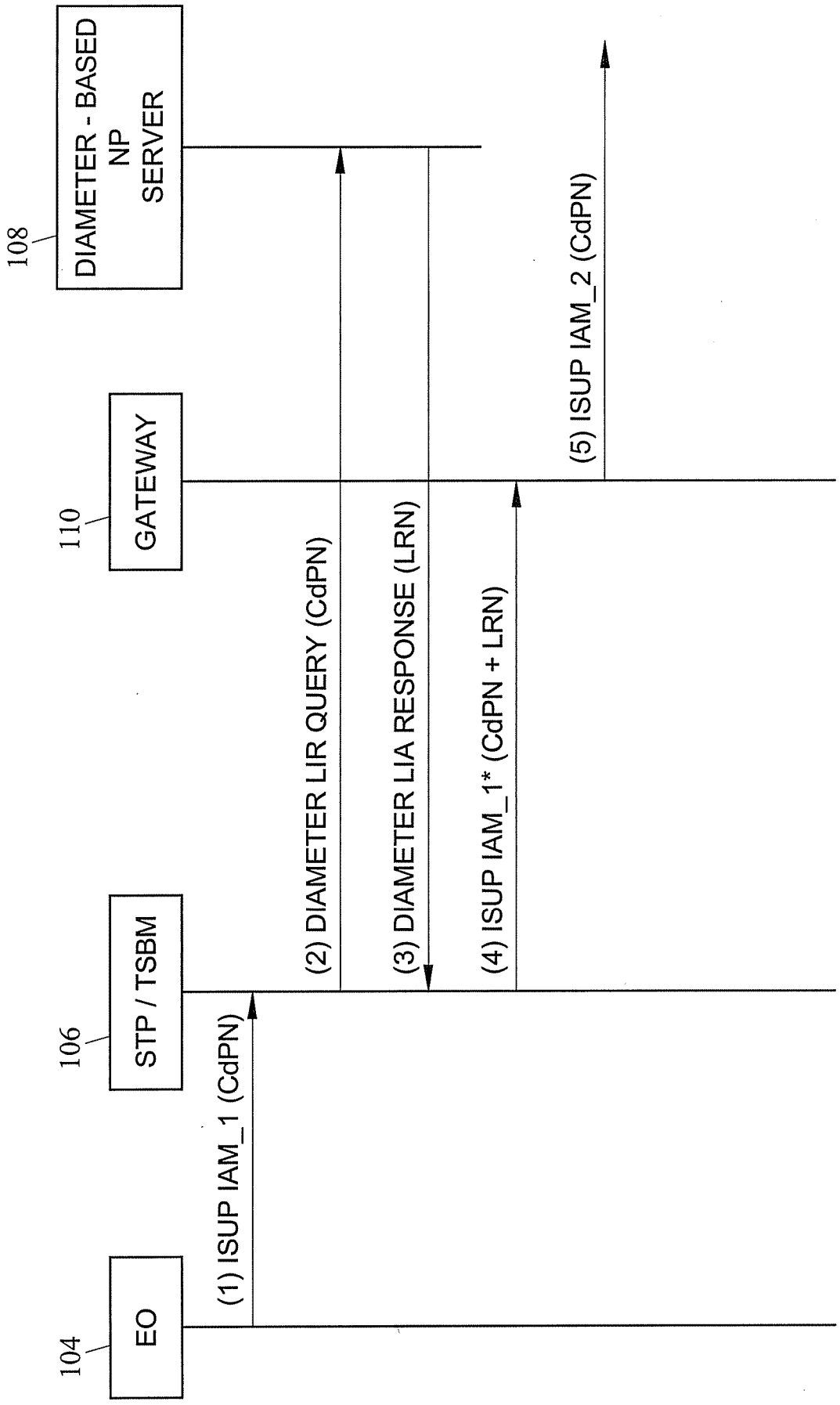
104
EO
106
STP / TSBM
110
GATEWAY
108
DIAMETER - BASED NP SERVER
(1) ISUP IAM_1 (CdPN)
(2) DIAMETER LIR QUERY (CdPN)
(3) DIAMETER LIA RESPONSE (LRN)
(4) ISUP IAM_1* (CdPN + LRN)
(5) ISUP IAM_2 (CdPN)

FIG. 4

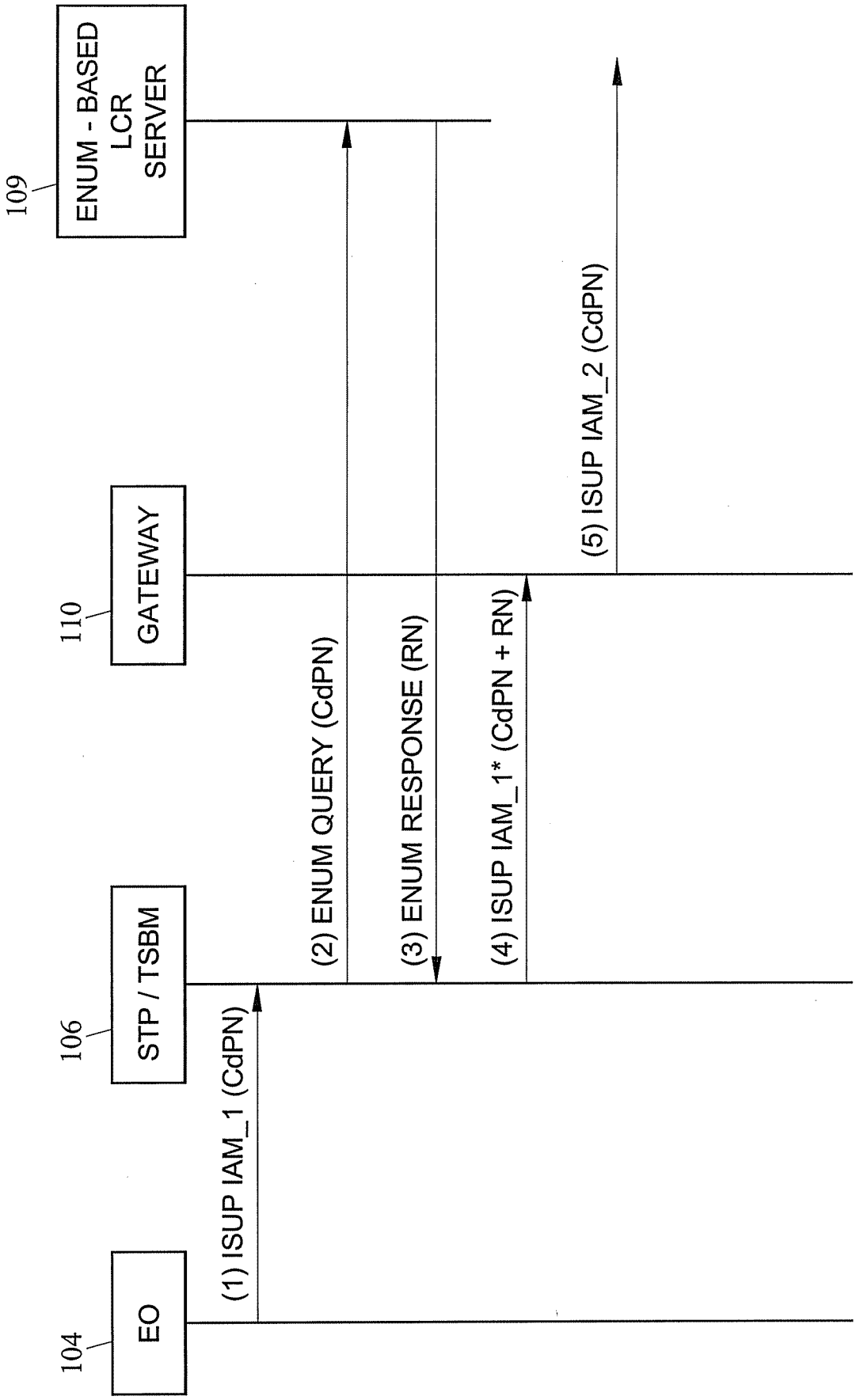
ENUM - BASED LCR SERVER
109
GATEWAY
110
STP / TSBM
106
EO
104
(1) ISUP IAM_1 (CdPN)
(2) ENUM QUERY (CdPN)
(3) ENUM RESPONSE (RN)
(4) ISUP IAM_1* (CdPN + RN)
(5) ISUP IAM_2 (CdPN)

FIG. 5

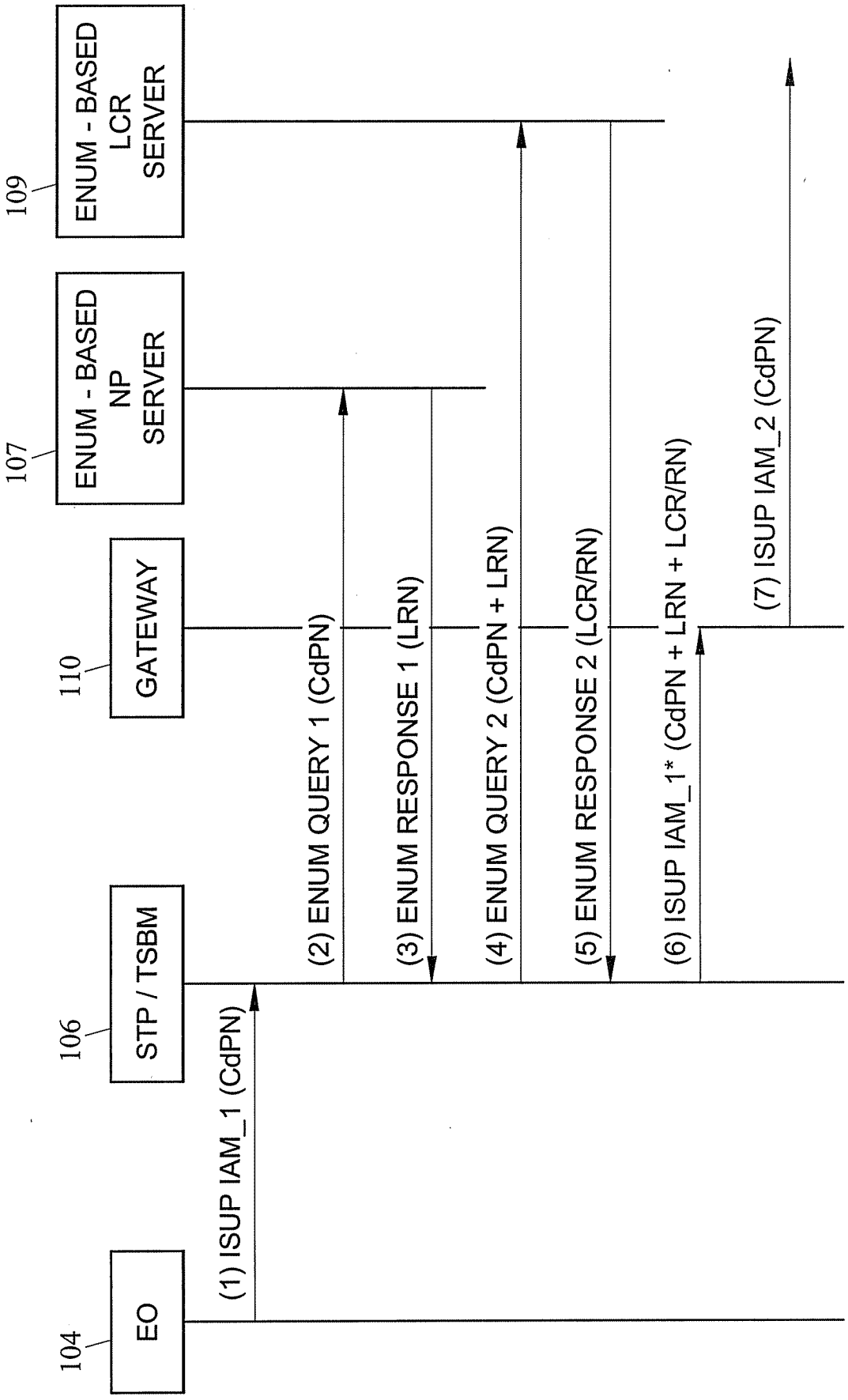
104
EO
106
STP / TSBM
110
GATEWAY
107
ENUM - BASED NP SERVER
109
ENUM - BASED LCR SERVER
(1) ISUP IAM_1 (CdPN)
(2) ENUM QUERY 1 (CdPN)
(3) ENUM RESPONSE 1 (LRN)
(4) ENUM QUERY 2 (CdPN + LRN)
(5) ENUM RESPONSE 2 (LCR/RN)
(6) ISUP IAM_1* (CdPN + LRN + LCR/RN)
(7) ISUP IAM_2 (CdPN)

FIG. 6