(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
3 May 2007 (03.05.2007)

PCT

(10) International Publication Number
WO 2007/050589 A2

(51) International Patent Classification:
H04M 15/00 (2006.01)

(21) International Application Number:
PCT/US2006/041449

(22) International Filing Date: 25 October 2006 (25.10.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/729,996 25 October 2005 (25.10.2005) US

(71) Applicant *(for all designated States except US)*: **TEKELEC** [US/US]; 26580 West Agoura Road, Calabasas, CA 93102 (US).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: **RUSSELL, Travis, Earl** [US/US]; 121 Pebble Drive, Clayton, NC 27520 (US).

(74) Agent: **HUNT, Gregory, A.**; Jenkins, Wilson, Taylor & Hunt, P.A., Suite 1200, University Tower, 3100 Tower Boulevard, Durham, NC 27707 (US).

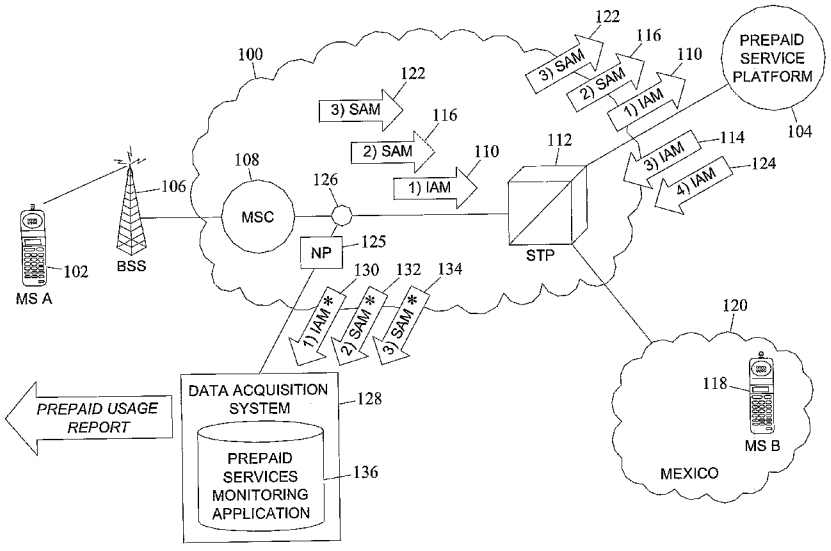
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *without international search report and to be republished upon receipt of that report*

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

(54) **Title:** METHODS, SYSTEMS, AND COMPUTER PROGRAM PRODUCTS FOR COLLECTING MESSAGES ASSOCIATED WITH PROVIDING PREPAID COMMUNICATIONS SERVICES IN A COMMUNICATIONS NETWORK



(57) **Abstract:** Methods, systems, and computer program products for collecting messages associated with providing prepaid communications services in a communications network are disclosed. According to one aspect, a method includes receiving at least a portion of messages copied from a communications network. The at least a portion of messages associated with prepaid calls to a common destination may be identified. At least one measure indicative of an absolute or relative number of prepaid calls being made to the common destination may be generated based on the identified at least a portion of messages.

WO 2007/050589 A2

DESCRIPTION

METHODS, SYSTEMS, AND COMPUTER PROGRAM PRODUCTS FOR COLLECTING MESSAGES ASSOCIATED WITH PROVIDING PREPAID COMMUNICATIONS SERVICES IN A COMMUNICATIONS NETWORK

RELATED APPLICATION

This application claims the benefit of U.S. Provisional Patent Application No. 60/729,996, filed October 25, 2005, the disclosure of which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

The subject matter disclosed herein relates generally to prepaid communications services. More particularly, the subject matter disclosed herein relates to collecting messages associated with prepaid communications services.

BACKGROUND

Subscribers to one telecommunications service provider often purchase services made available by other telecommunications service providers. One example of such services is prepaid calling card services. Utilizing prepaid calling card services, a caller may purchase a prepaid calling card for establishing a long distance call. A call using the prepaid service may originate from a communications network to which the subscriber has a subscription.

In order to initiate prepaid services, a subscriber is typically required to first dial a prepaid service provider telephone number. Next, the subscriber may be required to enter a personal identification number (PIN) to be validated by a prepaid service platform. After the PIN is validated, the subscriber may then dial a long distance telephone number for the party that the subscriber wishes to call. Next, the prepaid service platform can set up a call between the subscriber and the party corresponding to the dialed telephone number.

Prepaid service is typically provided by an operator that is different than the network operator providing network telephone service to the subscriber.

For example, the subscriber may be utilizing a mobile telephone subscribed to a mobile telephone service maintained by a network operator that is different than the prepaid services operator. It would be advantageous for the network operator to know where prepaid calls originating within its network are terminating. For example, if the network operator was able to determine that a significant number of prepaid calls originating in the network were terminating in a particular geographic location, such as Mexico, the network operator may offer reduced calling rate plans to that particular geographic location. In this way, the network operator may be able to gain back customers being serviced by the prepaid service operator. It may also be advantageous for the network operator to know the identity of the prepaid service operator providing prepaid services in its network.

Accordingly, there exists a need for methods, systems, and computer program products for collecting messages associated with providing prepaid communications services in a communications network.

SUMMARY

According to one aspect, the subject matter described herein comprises methods, systems, and computer program products for collecting messages associated with providing prepaid communications services in a communications network. One method includes receiving at least a portion of messages copied from a communications network. The at least a portion of messages associated with prepaid calls to a common destination may be identified. At least one measure indicative of an absolute or relative number of prepaid calls being made to the common destination may be generated based on the identified at least a portion of messages.

The subject matter described herein providing collecting messages associated with a prepaid communications service may be implemented using a computer program product comprising computer executable instructions embodied in a computer readable medium. Exemplary computer readable media suitable for implementing the subject matter described herein includes disk memory devices, programmable logic devices, application specific integrated circuits, and downloadable electrical signals. In addition, a computer

readable medium that implements the subject matter described herein may be distributed across multiple physical devices and/or computing platforms.

BRIEF DESCRIPTION OF THE DRAWINGS

Exemplary embodiments of the subject matter will now be explained with reference to the accompanying drawings, of which:

Figure 1 is a block diagram of an exemplary communications network in which prepaid service messages between a mobile terminal and a prepaid service platform are collected according to an embodiment of the subject matter described herein;

Figure 2 is a flow chart illustrating an exemplary process for collecting messages associated with providing prepaid communications services in the communications network shown in Figure 1 according to the subject matter described herein;

Figure 3 is an exemplary IP network in which prepaid communications service messages between a personal computer and a voice over IP (VoIP) calling service platform are collected according to an embodiment of the subject matter described herein;

Figure 4 is a block diagram of an exemplary prepaid communications services monitoring system architecture according to an embodiment of the subject matter described herein;

Figure 5 is a block diagram of a monitoring system architecture that collects signaling information from either discrete communication link probes or from an integrated signal transfer point/signaling gateway message copying interface according to an embodiment of the subject matter described herein; and

Figure 6 is a block diagram of an exemplary system architecture for collecting messages associated with providing prepaid communications services in a communications network according to an embodiment of the subject matter described herein.

DETAILED DESCRIPTION

The subject matter described herein includes methods, systems, and computer program products for collecting messages associated with providing prepaid communications services in a communications network. According to one embodiment, the subject matter described herein can be utilized for collecting messages associated with prepaid calling services in a communications network. Collected messages may include identification of the called party and identification of a prepaid service provider in a prepaid calling transaction. Collected information may be organized in a report and forwarded to a monitoring entity. The monitoring entity may be the operator of the network in which the prepaid calling service transaction originated. In this way, the network operator may be able to use the information to strategize ways for gaining back customers being serviced by the prepaid service provider. Further, the information may identify the prepaid service operator providing the prepaid services. The information may also be used to generate measures of prepaid calls being made to a common destination.

Figure 1 illustrates a block diagram of an exemplary communications network **100** in which prepaid service messages between a mobile terminal **102** and a prepaid service platform **104** are collected according to an embodiment of the subject matter described herein. In this example, mobile terminal **102** is subscribed to and serviced by network **100**. Further, prepaid calling service is provided by a prepaid service provider operating platform **104**. Referring to Figure 1, an operator of mobile terminal **102** utilizes a prepaid calling card to access the prepaid calling services provided by platform **104**. The prepaid calling card may identify a toll free 800 number or a premium rate service (PRS) number for connecting to prepaid service platform **104**. The prepaid calling card may also identify a personal identification number (PIN) which may be entered and communicated to platform **104** for use in validating the card.

The prepaid calling service may be initiated when the operator of mobile terminal **102** dials the toll free 800 number identified on the prepaid calling card. The number may be used to access platform **104**. The digits of the dialed 800 number are transmitted to a base station system (BSS) **106** which routes the digits of the dialed 800 number to a mobile switching center (MSC) **108**.

MSC **108** may generate a signaling system 7 (SS7) initial address message (IAM) **110** including the dialed number and route IAM **110** to platform **104** via a signal transfer point (STP) **112**. In response to receiving IAM **110**, platform **104** transmits an SS7 IAM **114** for establishing an initial bearer/voice connection between mobile terminal **102** and platform **104**.

Once the connection is established, platform **104** may request the subscriber's PIN for validating prepaid calling services. Next, the operator of mobile terminal **102** may enter the PIN provided on the prepaid calling card. The digits of the PIN are transmitted to BSS **106** which routes the digits to MSC **108**. MSC **108** may generate an SS7 subsequent address message (SAM) **116** including the dialed PIN, and route SAM **116** to platform **104** via STP **112**. Platform **104** may receive SAM **116** containing the PIN and determine whether the prepaid calling services should be provided to the caller.

In response to determining that prepaid calling services should be provided to the caller, platform **104** requests input of a called party number with which the operator would like a connection to be established. In this example, the operator enters a called party number for establishing a connection with mobile terminal **118** operating in a network **120** located in Mexico. The operator of mobile terminal **102** may dial the called party number, and the dialed called party number is routed to MSC **108**. MSC **108** may generate and route another SAM **122** including the entered called party number to platform **104**. Once platform **104** receives SAM **122** containing the called party number, platform **104** may generate and transmit an IAM **124** for setting up bearer channels for establishing a call between mobile terminal **102** and mobile terminal **118**. Thus, this exemplary call setup is provided by the prepaid calling service associated with platform **104**.

Figure 2 is a flow chart illustrating an exemplary process for collecting messages associated with providing prepaid communications services in communications network **100** shown in Figure 1 according to the subject matter described herein. In this example, a network monitoring probe **125** is connected to communications network **100** at a point **126** for intercepting SS7 signaling messages. By connecting at point **126**, probe **125** may intercept SS7 signaling messages communicated between MSC **108** and STP **112**. Probe

125 may be implemented in an SS7 node, such as an STP or SS7 / Internet protocol (IP) router. Alternatively, a link monitor, a routing node, or other suitable network device operable to intercept signaling messages may be connected to communications network **100** at point **126** for interception of SS7 signaling messages in accordance with the subject matter described herein. Point **126** may be a connection point of an SS7 signaling link **127** between MSC **108** and STP **112**.

Referring to Figures 1 and 2, a SS7 signaling message communicated on a communication link between MSC **108** and STP **112** are received or intercepted by probe **125** at point **126** (block **200**). The signaling message may be associated with the provision of prepaid communications services in communications network **100**. For example, probe **125** may intercept IAM **110** and SAMs **116** and **122** that are communicated between MSC **108** and STP **112**. As stated above, IAM **110** and SAMs **116** and **122** are associated with the provision of prepaid communications service to mobile terminal **102** by the prepaid calling service operating prepaid service platform **104**. Mobile terminal **102** has a subscription to communications network **100**.

Next, at block **202** of Figure 2, probe **125** may determine whether the intercepted signaling message is associated with a prepaid communications service. If it is determined that the intercepted message is not associated with a prepaid communications service, the process returns to block **200** to await receipt of another signaling message. In this instance, the intercepted message not associated with a prepaid communications service is effectively ignored by probe **125** and passed along the link to the message's destination.

Otherwise, if it is determined at block **202** that the intercepted message is associated with a prepaid service transaction, a portion of the signaling message or the entire signaling message may be copied (block **204**). The message copy is communicated to a data acquisition system **128** (block **206**). For example, IAM **110** and SAM **116** may be identified as being associated with a prepaid service transaction and copied. Copies **130**, **132**, and **134** of IAM **110**, SAM **116**, and SAM **122**, respectively, may then be communicated to system **128**.

A signaling message may be identified as being associated with a prepaid communications service based on the message's content. For example, probe **125** may observe signaling message content such as a source address, destination address, a calling party number, and a called party number for determining whether the message is associated with prepaid communications service. Further, the dialed number, such as the 800 number or PRS number, for accessing the prepaid service provider can identify a message as being associated with a prepaid communications service provider. A message having an address with an SS7 point code or IP address identifying a prepaid communications service provider may be copied. For example, a probe may copy each SS7 IAM or SS7 SAM with a destination or source address to a prepaid communications service provider. For example, the 800 number contained in IAM **110** may identify the message as being associated with a prepaid communications service provided by platform **104**. Further, for example, the destination address of platform **104** in SAMs **116** and **122** may identify these messages as being associated with communications service provided by platform **104**.

Information copied from a message associated with a prepaid service transaction may include a calling party number, a called party number, an originating switching office identifier, time or date of the communication, a prepaid service provider identifier, and subsequent dialed digit information. In addition, copied information may include mobile station ISDN number (MSISDN), mobile identification number (MIN), international mobile station identifier (IMSI), a directory number, a session initiation protocol (SIP) uniform resource identifier (URI), and/or an IP address. The time or date of the communication of a signaling message may be determined by using a time / date stamping function for associating the signaling message with its time or date of receipt. The origination switching office identifier may include an end office (EO) identifier, an MSC identifier, and SIP proxy identifier. A prepaid service provider identifier may include a uniform resource locator (URL), URI, an IP address, an SS7 point code address, a toll free number, and a PRS number. This information may be used for generating a measure based on the

identified messages. The measure may be indicative of an absolute or relative number of prepaid calls being made to the common destination.

Further, for example, additional dialed digit information entered by a subscriber via interactions with a prepaid services application, such as an interactive voice response (IVR) application, may be obtained from one or more intercepted SAMs associated with the prepaid service transaction. For example, with regard to additional dialed digit information, a subscriber may dial a toll free number associated with a prepaid service provider. One or more IAMs may be employed to establish a voice/bearer path between the subscriber and an IVR application associated with the prepaid service provider. The IVR may prompt the subscriber to enter the telephone number of the party with which the subscriber wishes to call. As the subscriber enters the called party number into a terminal, the entered digits are communicated via one or more SAMs to the prepaid service provider's IVR application. The prepaid service provider's IVR application can use this information to complete the subscriber's call to the desired called party. This information may be copied from a signaling message and provided to the data acquisition system.

At block **208**, data acquisition system **128** may receive the message copy. A prepaid service monitoring application **136** of system **128** may be applied to the data contained in copies **130** and **132** for analyzing and reporting prepaid communications services to a monitoring entity, such as the operator of network **100**. In particular, application **136** may identify copied messages that are associated with prepaid calls to a common destination (block **210**). For example, called party numbers contained in copied messages may indicate that calls associated with prepaid communications services are being made to a common destination, such as within network **120** in Mexico. An area code portion of a called party number may indicate the destination of a call. Further, application **136** may generate at least one measure based on the identified messages indicative of an absolute or relative number of prepaid calls being made to the common destination (block **212**).

Further, the prepaid communications service information may be used to generate individual transaction detail records (TDRs) for each call associated with a prepaid service provider. Exemplary TDR information may include date,

time, calling party ID, prepaid service provider ID, any additional collected/dialed digits, and an originating switching office ID.

Data in the message copies may also be used to determine whether a calling party is a subscriber that is "owned" or "serviced by" the operator of the network being monitored. Subscriber information may be useful, for example, in a wireless network environment. The network operator may be interested in knowing the prepaid calling service behavior of only the mobile subscribers operating in the network operator's network. Prepaid calling service behavior of mobile subscribers that are roaming in the network operator's network may be of no interest. The obtained information may also be applied to wireless network environments.

Data relating to prepaid service transaction may be useful to an operator of network **100**, for example, for analyzing marketing trends. The information may be reported in a manner that a network operator may be able to determine prepaid calling usage patterns, tendencies, and preferences among its subscribers. For example, if the network operator was able to determine that 40% of all prepaid calls originating from network **100** were terminating in Mexico, the network operator may decide to offer reduced calling rate plans to Mexican destinations in order to gain customers from the prepaid service provider.

Figure 3 illustrates an exemplary IP network **300** in which prepaid communications service messages between a personal computer (PC) **302** and a VoIP calling service platform **304** are collected according to an embodiment of the subject matter described herein. In this example, PC **302** is provided Internet services by an operator of IP network **300**. Further, PC **302** is provided calling services by an operator of VoIP service platform **304**. PC **302** is provided connection to IP network **300** via a digital subscriber line access multiplexer (DSLAM) **306**.

Referring to Figure 3, when a call is initiated from PC **302**, a SIP message, such as a SIP INVITE message or a SIP INFO message, may be generated and communicated to VoIP service platform **304** for establishing a call with a called party, such as a SIP telephone **308**. The message may be transmitted over IP network **300** using any suitable protocol such as

transmission control protocol (TCP), user datagram protocol (UDP), and stream control transmission protocol (SCTP). The message may include identification information of the PC initiating the call, identification information of the VoIP service platform establishing the call, or user-input dialed digit information. Identification information includes a SIP URI, an IP address, a URL, and a URI. For example, an IP address and URL may identify PC **302** and VoIP service platform **304**, respectively.

Messages communicated between PC **302** and VoIP service platform **304** may be routed by a routing node **310**. Routing node **310** can include message copy functionality for identifying a message as being associated with a communications service transaction between PC **302** and VoIP service platform **304**. If it is determined that the intercepted message is not associated with a communications service transaction, the message is routed to its destination. Otherwise, if it is determined that the intercepted message is associated with a communications service transaction, a portion of the message or the entire message may be copied and the copy forwarded to data acquisition system **128**. For example, an IP address and URL identifying PC **302** and VoIP service platform **304**, respectively, may be communicated to system **128**.

Prepaid service monitoring application **136** may be applied to the data contained in the message copies for analyzing and reporting communications service transactions to a monitoring entity, such as the operator of IP network **300**. For example, the communications service transaction information may be used to generate individual transaction detail records (TDRs) for each call associated with a prepaid service provider. Exemplary TDR information may include date, time, calling party ID, prepaid service provider ID, any additional collected/dialed digits, and an originating switching office ID.

It will be appreciated that, in the case of SIP signaling, a prepaid communications service provider may request a SIP URI for input by the subscriber into a PC. This information may be intercepted by routing node **310** for analysis. A prepaid services usage analysis application may analyze such information and provide reports to a service provider of the subscriber.

Figure 4 illustrates an exemplary prepaid communications services monitoring system architecture that is based on the INTEGRATED APPLICATIONS SERVICE™ platform available from Tekelec of Morrisville, North Carolina. Referring to Figure 4, routing node **300** is an STP with a plurality of link interface modules (LIMs) **400**, a data communications module **402**, and a network monitoring transport card **404**. Routing node **300** may be located in an SS7 communication link carrying SS7 signaling messages associated with a prepaid communications services. Each module of routing node **300** may include a printed circuit board with an application processor and a communications processor mounted thereon. Modules **400**, **402**, and **404** are connected to each other via a counter rotating dual ring bus **406**. LIMs **400** send and receive SS7 signaling messages over SS7 signaling links and perform MTP3 routing functions.

LIMs **400** may also include message copy functions **408** for copying SS7 signaling messages received over SS7 signaling links and associated with a prepaid service transaction. As stated above, the signaling messages associated with prepaid communications services may be identified by the message's content such as a source address, destination address, a calling party number, and a called party number. A message having an address with an SS7 point code identifying a prepaid communications service provider may be copied. For example, function **408** may copy SS7 IAMs or SS7 SAMs addressed to a prepaid communications service provider. Information for identifying whether a signaling message is associated with a prepaid service transaction may be received from a SENTINEL™ server **410**.

DCM **402** sends and receives signaling messages over IP signaling links. Prepaid service functions similar to those described above with respect to function **408** may be incorporated in a message copy function **412** on DCM **402**. DCM **402** may include a message copy function **412** for copying signaling messages received over IP signaling links and associated with a prepaid communications service. For example, message copy function **412** may copy SS7 signaling messages sent over IP signaling links or IP telephony signaling messages sent over IP signaling links for network monitoring purposes. A message having an IP address identifying a prepaid service provider may be

copied. DCM **402** may receive and internally distribute SIP-based messages related to prepaid communications service in a manner similar to that described above with respect to an SS7 LIM module. For example, DCM **402** may receive SIP INVITE, SIP INFO, and other suitable SIP messages that may be used to facilitate the initial call setup between a calling subscriber and a prepaid communications service provider. Subsequent dialed digit information may be communicated between the calling subscriber and the prepaid service provider using one or more suitable SIP messages.

It will be appreciated that a similar message interception/surveillance scheme can be employed with regard to other types of messaging services, such as multimedia messaging service (MMS) and instant message (IM) service. Depending upon the particular type of messaging service that is to be monitored and the network configuration, the communications service message interception function may be strategically placed at one or more nodes in the network. For example, in a SIP-based network, the subject matter described herein may be implemented on a SIP router, a SIP proxy server, a SIP messaging server, or an IP multimedia subsystem (IMS) network element.

Network monitoring transport card **404** communicates messages or portions of copied messages from signaling links to network monitoring processors (NMPs) **414**. When a message copy function **408** or **412** copies signaling messages from a signaling link, the message copy function broadcasts a service request to network monitoring processors **414** via network monitoring transport card **404**. In response to the service request, the network monitoring processor provisioned to service the particular copy function establishes a TCP/IP connection with the message copy function via network monitoring transport card **404**. The message copy function then sends copied messages to the network monitoring processor over the TCP/IP connection. Network monitoring processors **414** store signaling message copies and forward the copies to a site collector **416**. Site collector **416** filters the messages and transmits the messages to a data gateway server **418** via an IP network **420**. Data gateway server **418** receives message data from site collector **416**. Monitoring application **136** may analyze the collected data and generate call detail records (CDRs) based on the analyzed data. A CDR is a

data record containing information related to a communication, such as the origination and destination addresses of the call, the time the call started and ended, and the duration of the call. Server **418** may store or buffer the CDRs.

Figure 5 illustrates a monitoring system architecture that collects signaling information from either discrete communication link probes or from an integrated signal transfer point/signaling gateway message copying interface. Referring to Figure 5, a pair of site collectors **416** collects and temporarily buffers monitored signaling messages. Site collectors **416** may be connected to external signaling link probes that passively copy signaling messages from SS7 signaling links or to network monitoring processors that receive and store signaling messages copied from signaling links within a routing node, such as an STP.

Each site collector **416** may be a general purpose computing platform including a microprocessor and one or more applications executing thereon. In the illustrated example, each site collector **416** includes a filter application **500**, a data capture application **502**, and a message database **504**. Filter application **500** filters received signaling messages based on filter criteria received from SENTINEL™ server **410**. The filter criteria may be structured such that the data captured by site collectors **416** is the superset of data required by prepaid services monitoring application **136** and other network service applications that may be resident on data gateway server **418**, or located elsewhere in the network. Received signaling messages may be filtered based on whether they are associated with a prepaid communications services. As stated above, the signaling messages associated with prepaid communications services may be identified by the message's content such as a source address, destination address, a calling party number, and a called party number. A message having an address with an SS7 point code or IP address identifying a prepaid communications service provider may be copied.

Data capture applications **502** capture raw message data copied by the link monitors or NMPs. Message databases **504** store messages captured by data capture applications **502** and filtered by filter applications **500**.

Data gateway server **418** receives message data from the site collectors, generates CDRs and TDRs based on the message data, and stores or buffers

the CDRs and TDRs. Exemplary reporting information may include date, time, calling party ID, prepaid service provider ID, any additional collected/dialed digits, and an originating switching office ID.

Figure 6 illustrates a block diagram of an exemplary system architecture for collecting messages associated with providing prepaid communications services in a communications network according to an embodiment of the subject matter described herein. Referring to Figure 6, the system architecture includes a probe message feeder (PMF) **600** and an integrated message feeder (IMF) **602**. PMF **600** may be a probe that is operable to receive signaling message from a signaling link in a communications network. IMF **602** may be STP including functions for receiving signaling message from a signaling link in the communications network. PMF **600** and IMF **602** may copy received signaling messages and forward the copied signaling messages to an integrated CDR platform (ICP) **604**. The system architecture may include other probes suitable for copying messages associated with prepaid communications services.

ICP **604** may be operable to receive signaling message copies from multiple PMFs and IMFs. Further, ICP **604** may generate different types of detail records (xDRs) based on the received message copies. For example, ICP **604** may generate a CDR based on ISUP related messages. In another example, ICP **604** may generate an Internet protocol detail record (IPDR) based on IP-related messages, such as SIP-related messages. In yet another example, ICP **604** may generate a signal unit detail record (SUDR) based on signal units. In another example, ICP **604** may generate a TDR based on a transaction protocol. The records may be generated by copying predetermined protocol fields in received messages into a flat file.

The xDRs generated by ICP **604** may be sent to one or more data servers **606** for processing the data contained in the xDRs. For example, ICP **604** may generate information about calls in the communications network, such as Key Performance Indicators (KPIs), Key Quality Indicators (KQIs), alarm data, and statistics.

NSP **608** may receive xDRs, statistics, and alarms from data server **606**. NSP **608** may include one or more processors and memory. NSP **608** may

include a prepaid communications services message identifier function **110** and a prepaid services report generator **612**. Function **610** is operable to receive messages copied from a signaling link in a communication network and identify the messages associated with prepaid calls to a common destination, such as a common geographic region. Generator **612** is operable to generate statistics indicative of the amount of prepaid calls being made to the common destination. For example, generator **612** may be operable to generate a report indicating the amount of calls to a particular destination, the prepaid service provider servicing the calls, and the call duration. The prepaid service provider may be determined by examining the dialed digits contained in the received signaling messages.

It will be understood that various details of the subject matter disclosed herein may be changed without departing from the scope of the disclosed subject matter. Furthermore, the foregoing description is for the purpose of illustration only, and not for the purpose of limitation, as the subject matter disclosed herein is defined by the claims as set forth hereinafter.

CLAIMS

What is claimed is:

1. A method for collecting messages associated with providing prepaid communications services in a communications network, the method comprising:
   (a) receiving at least a portion of messages copied from a communications network;
   (b) identifying the at least a portion of messages as being associated with prepaid calls to a common destination; and
   (c) generating at least one measure indicative of an absolute or relative number of prepaid calls being made to the common destination and based on the identified at least a portion of messages.

2. The method of claim 1 wherein identifying the at least a portion of messages as being associated with prepaid calls includes identifying session initiation protocol (SIP) signaling messages associated with prepaid calls to a common destination.

3. The method of claim 1 wherein identifying the at least a portion of messages as being associated with prepaid calls includes identifying signaling system 7 (SS7) signaling messages associated with prepaid calls to the common destination.

4. The method of claim 1 wherein identifying the at least a portion of messages as being associated with prepaid calls includes identifying messages including an identifier associated with a prepaid communications service provider.

5. The method of claim 4 wherein identifying messages including an identifier associated with a prepaid communications service provider includes identifying an identifier selected from the group consisting of a toll free 800 number of a prepaid communications service provider, a premium rate service (PRS) number of a prepaid communications service provider, an SS7 point code of a prepaid communications service provider, an IP address of a prepaid communications service provider, a source address of a prepaid communications service

provider, and a destination address of a prepaid communications service provider.

6. The method of claim 1 wherein generating at least one measure includes generating the at least one measure based on contents of the identified at least a portion of messages that identify a common destination.

7. The method of claim 6 wherein generating at least one measure based on contents of the identified at least a portion of messages includes generating the at least one measure based on contents selected from the group consisting of a calling party number, a called party number, an originating switching office identifier, a prepaid service provider identifier, subsequent dialed digit information, a mobile station ISDN number (MSISDN), a mobile identification number (MIN), an international mobile station identifier (IMSI), a directory number, a uniform resource identifier (URI), an IP address, an end office (EO) identifier, an mobile switching center (MSC) identifier, a SIP proxy identifier, a uniform resource locator (URL), an IP address, an SS7 point code address, a toll free number, and a PRS number.

8. The method of claim 6 wherein generating at least one measure based on contents of the identified at least a portion of messages includes generating the at least one measure based on time or date of a communication of the identified at least a portion of messages.

9. A system for collecting messages associated with providing prepaid communications services in a communications network, the system comprising:

(a) a prepaid communications services message identifier configured to receive copies of at least a portion of messages and configured to identify the at least a portion of the messages as being associated with prepaid calls to a common destination; and

(b) a prepaid services report generator configured to generate at least one measure indicative of an absolute or relative number of prepaid calls being made to the common destination and based on the identified at least a portion of messages.

10. The system of claim 9 wherein the prepaid communications services message identifier is configured to identify session initiation protocol (SIP) signaling messages associated with prepaid calls to a common destination.

11. The system of claim 9 wherein the prepaid communications services message identifier is configured to identify signaling system 7 (SS7) signaling messages associated with prepaid calls to the common destination.

12. The system of claim 9 wherein the prepaid communications services message identifier is configured to identify messages including an identifier associated with a prepaid communications service provider.

13. The system of claim 12 wherein prepaid communications services message identifier is configured to identify an identifier selected from the group consisting of a toll free 800 number of a prepaid communications service provider, a premium rate service (PRS) number of a prepaid communications service provider, an SS7 point code of a prepaid communications service provider, an IP address of a prepaid communications service provider, a source address of a prepaid communications service provider, and a destination address of a prepaid communications service provider.

14. The system of claim 12 wherein the prepaid services report generator is configured to generate the at least one measure based on contents of the identified at least a portion of messages that identify a common destination.

15. The system of claim 14 wherein the prepaid services report generator is configured to generate the at least one measure based on contents selected from the group consisting of a calling party number, a called party number, an originating switching office identifier, a prepaid service provider identifier, subsequent dialed digit information, a mobile station ISDN number (MSISDN), a mobile identification number (MIN), an international mobile station identifier (IMSI), a directory number, a uniform resource identifier (URI), an IP address, an end office (EO) identifier, an mobile switching center (MSC) identifier, a SIP proxy

identifier, a uniform resource locator (URL), an IP address, an SS7 point code address, a toll free number, and a PRS number.

16. The system of claim 14 wherein the prepaid services report generator is configured to generate the at least one measure based on time or date of a communication of the identified at least a portion of messages.

17. The system of claim 14 wherein the prepaid communications services message identifier and the prepaid services report generator are components of a device selected from the group consisting of signaling transfer point (STP), an SS7 node, an SS7 / Internet protocol (IP) router, a SIP router, a SIP proxy server, a SIP messaging server, and an IP multimedia subsystem (IMS) network element.

18. A computer program product comprising computer executable instructions embodied in a computer readable medium for performing steps comprising:

(a) receiving at least a portion of messages copied from a communications network;

(b) identifying the at least a portion of messages as being associated with prepaid calls to a common destination; and

(c) generating at least one measure indicative of an absolute or relative number of prepaid calls being made to the common destination and based on the identified at least a portion of messages.

19. The computer program product of claim 18 wherein identifying the at least a portion of messages as being associated with prepaid calls includes identifying session initiation protocol (SIP) signaling messages associated with prepaid calls to a common destination.

20. The computer program product of claim 18 wherein identifying the at least a portion of messages as being associated with prepaid calls includes identifying signaling system 7 (SS7) signaling messages associated with prepaid calls to the common destination.

21. The computer program product of claim 18 wherein identifying the at least a portion of messages as being associated with prepaid calls

includes identifying messages including an identifier associated with a prepaid communications service provider.

22. The computer program product of claim 21 wherein identifying messages including an identifier associated with a prepaid communications service provider includes identifying an identifier selected from the group consisting of a toll free 800 number of a prepaid communications service provider, a premium rate service (PRS) number of a prepaid communications service provider, an SS7 point code of a prepaid communications service provider, an IP address of a prepaid communications service provider, a source address of a prepaid communications service provider, and a destination address of a prepaid communications service provider.

23. The computer program product of claim 18 wherein generating at least one measure includes generating the at least one measure based on contents of the identified at least a portion of messages that identify a common destination.

24. The computer program product of claim 23 wherein generating at least one measure based on contents of the identified at least a portion of messages includes generating the at least one measure based on contents selected from the group consisting of a calling party number, a called party number, an originating switching office identifier, a prepaid service provider identifier, subsequent dialed digit information, a mobile station ISDN number (MSISDN), a mobile identification number (MIN), an international mobile station identifier (IMSI), a directory number, a uniform resource identifier (URI), an IP address, an end office (EO) identifier, an mobile switching center (MSC) identifier, a SIP proxy identifier, a uniform resource locator (URL), an IP address, an SS7 point code address, a toll free number, and a PRS number.

25. The computer program product of claim 23 wherein generating at least one measure based on contents of the identified at least a portion of messages includes generating the at least one measure based on time or date of a communication of the identified at least a portion of messages.

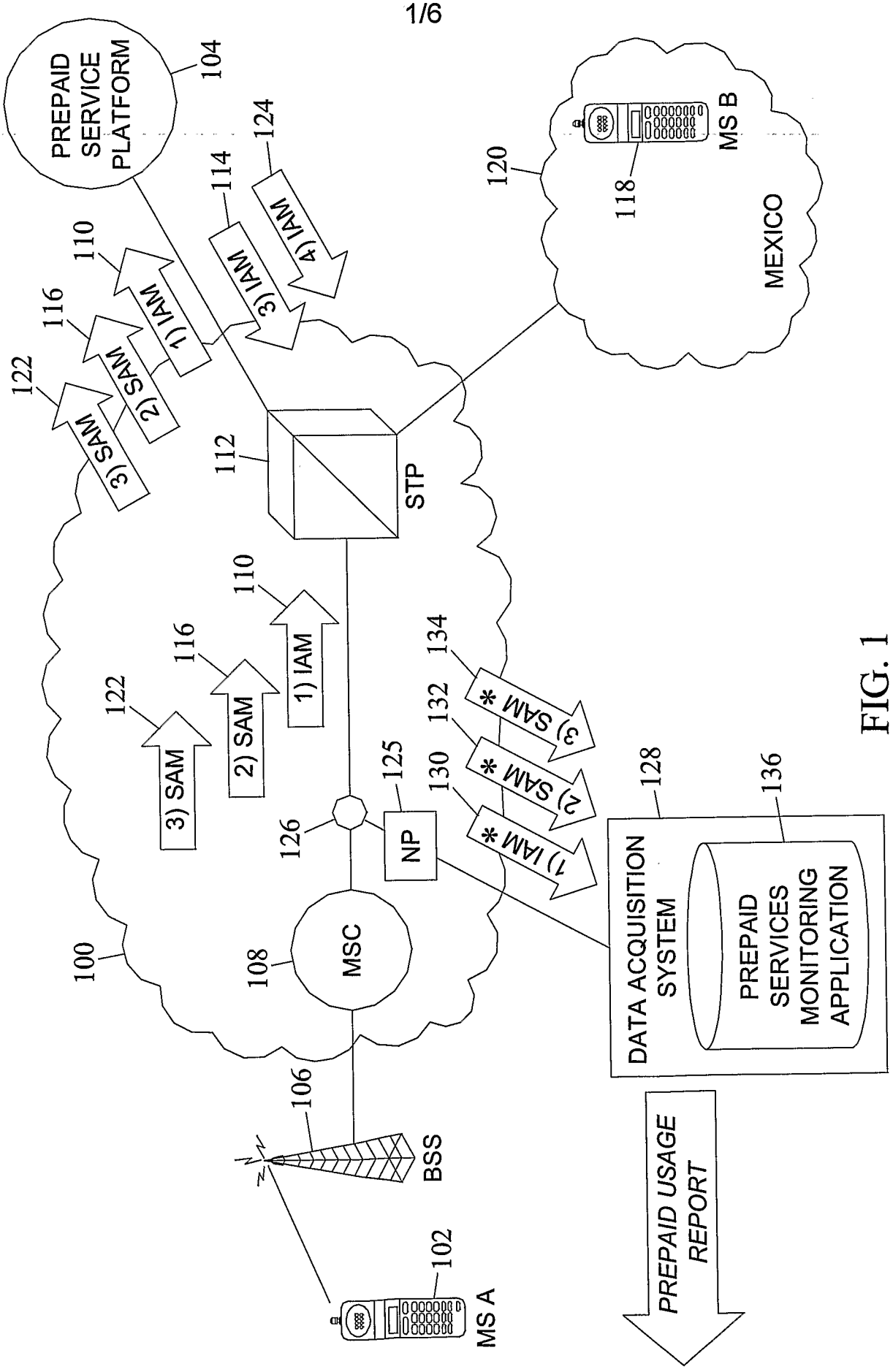

PREPAID SERVICE PLATFORM
104
114
124
4) IAM
3) IAM
1) IAM
110
116
2) SAM
3) SAM
122
112
STP
120
MS B
118
MEXICO
110
1) IAM
116
2) SAM
122
3) SAM
134
* 3) SAM
132
* 2) SAM
130
* 1) IAM
125
NP
126
MSC
108
100
106
BSS
102
MS A
128
DATA ACQUISITION SYSTEM
136
PREPAID SERVICES MONITORING APPLICATION
PREPAID USAGE REPORT

FIG. 1

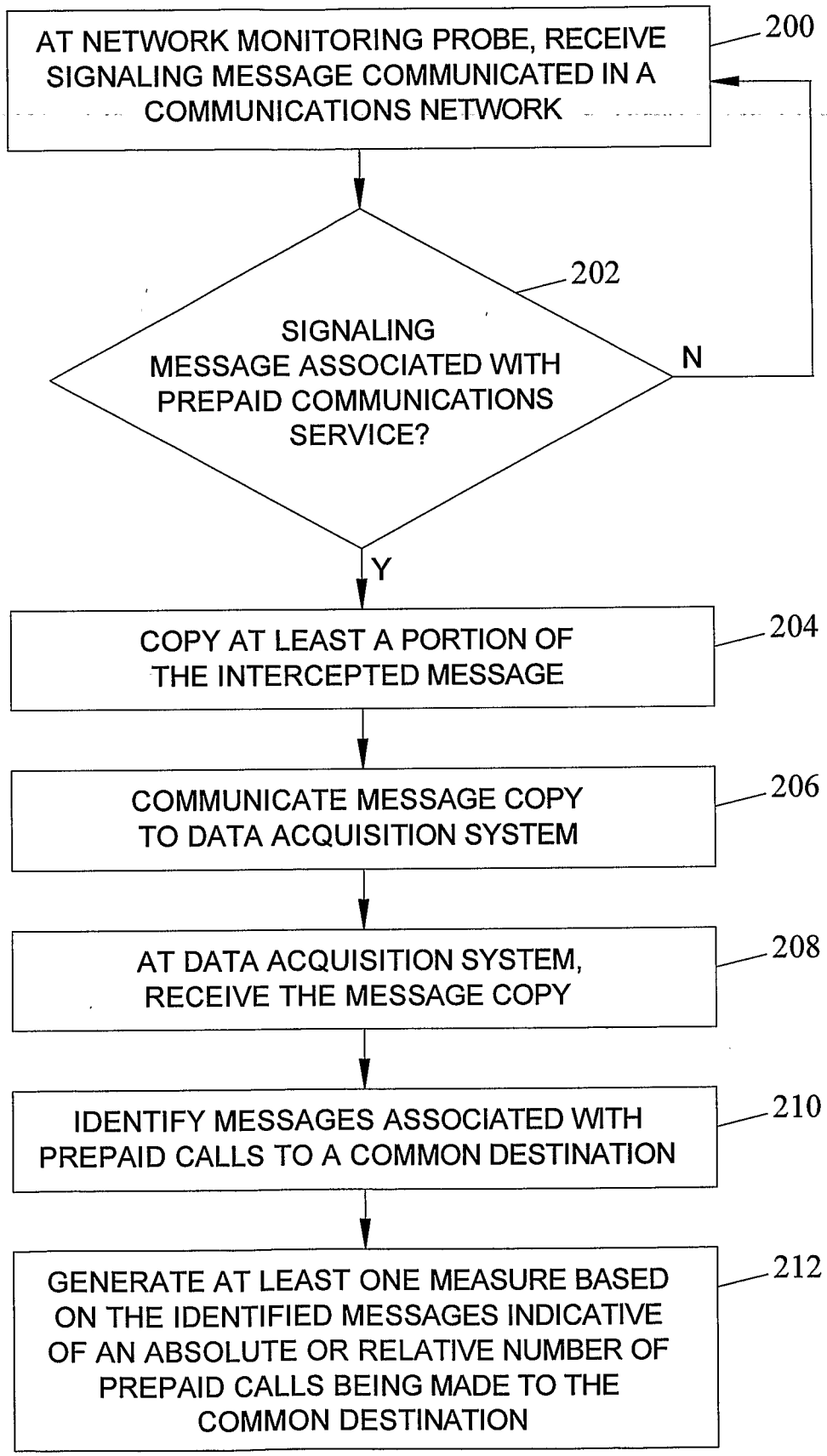

AT NETWORK MONITORING PROBE, RECEIVE SIGNALING MESSAGE COMMUNICATED IN A COMMUNICATIONS NETWORK
200
SIGNALING MESSAGE ASSOCIATED WITH PREPAID COMMUNICATIONS SERVICE?
202
N
Y
COPY AT LEAST A PORTION OF THE INTERCEPTED MESSAGE
204
COMMUNICATE MESSAGE COPY TO DATA ACQUISITION SYSTEM
206
AT DATA ACQUISITION SYSTEM, RECEIVE THE MESSAGE COPY
208
IDENTIFY MESSAGES ASSOCIATED WITH PREPAID CALLS TO A COMMON DESTINATION
210
GENERATE AT LEAST ONE MEASURE BASED ON THE IDENTIFIED MESSAGES INDICATIVE OF AN ABSOLUTE OR RELATIVE NUMBER OF PREPAID CALLS BEING MADE TO THE COMMON DESTINATION
212

FIG. 2

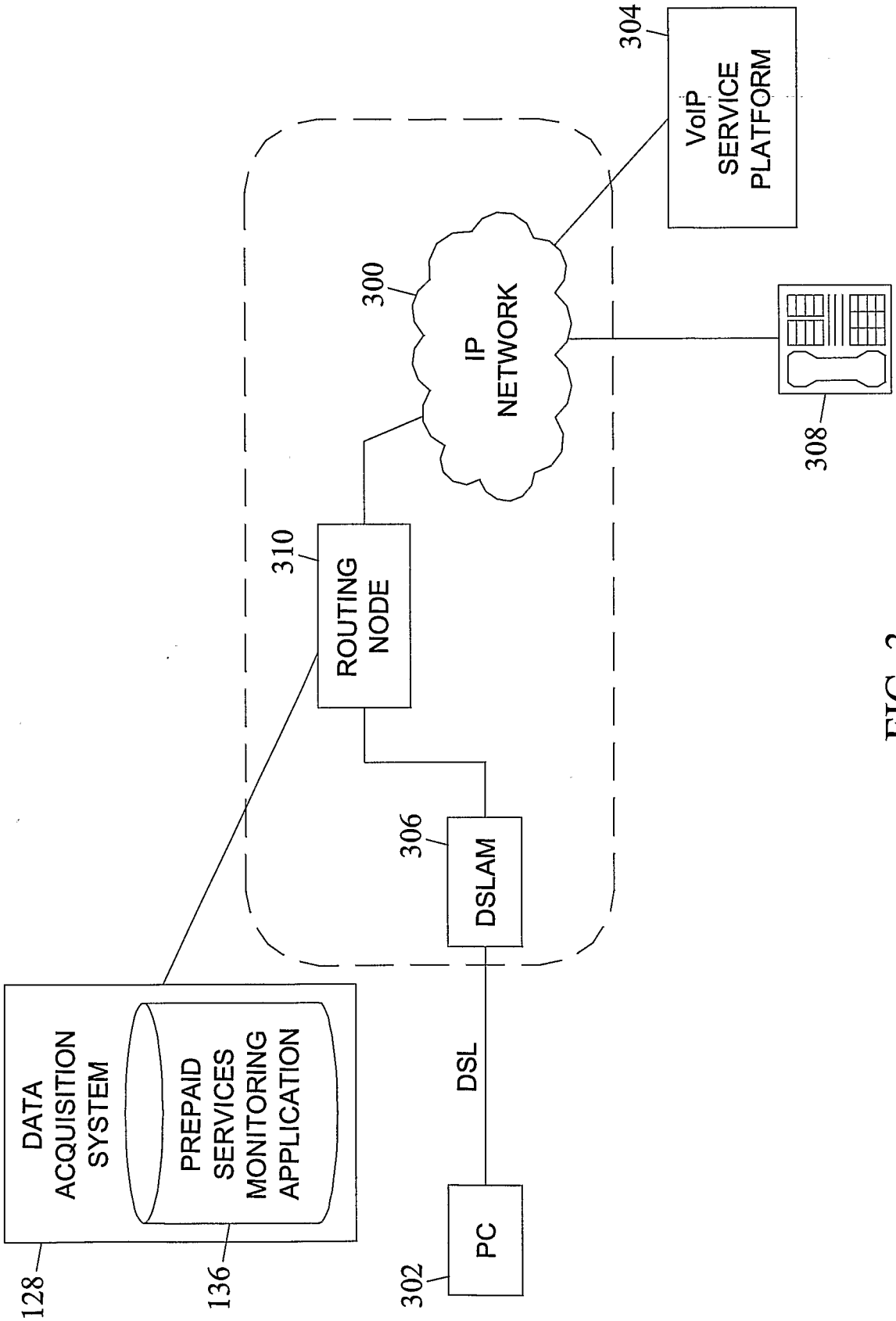

304
VoIP SERVICE PLATFORM
300
IP NETWORK
308
310
ROUTING NODE
306
DSLAM
DSL
DATA ACQUISITION SYSTEM
PREPAID SERVICES MONITORING APPLICATION
128
136
302
PC

FIG. 3

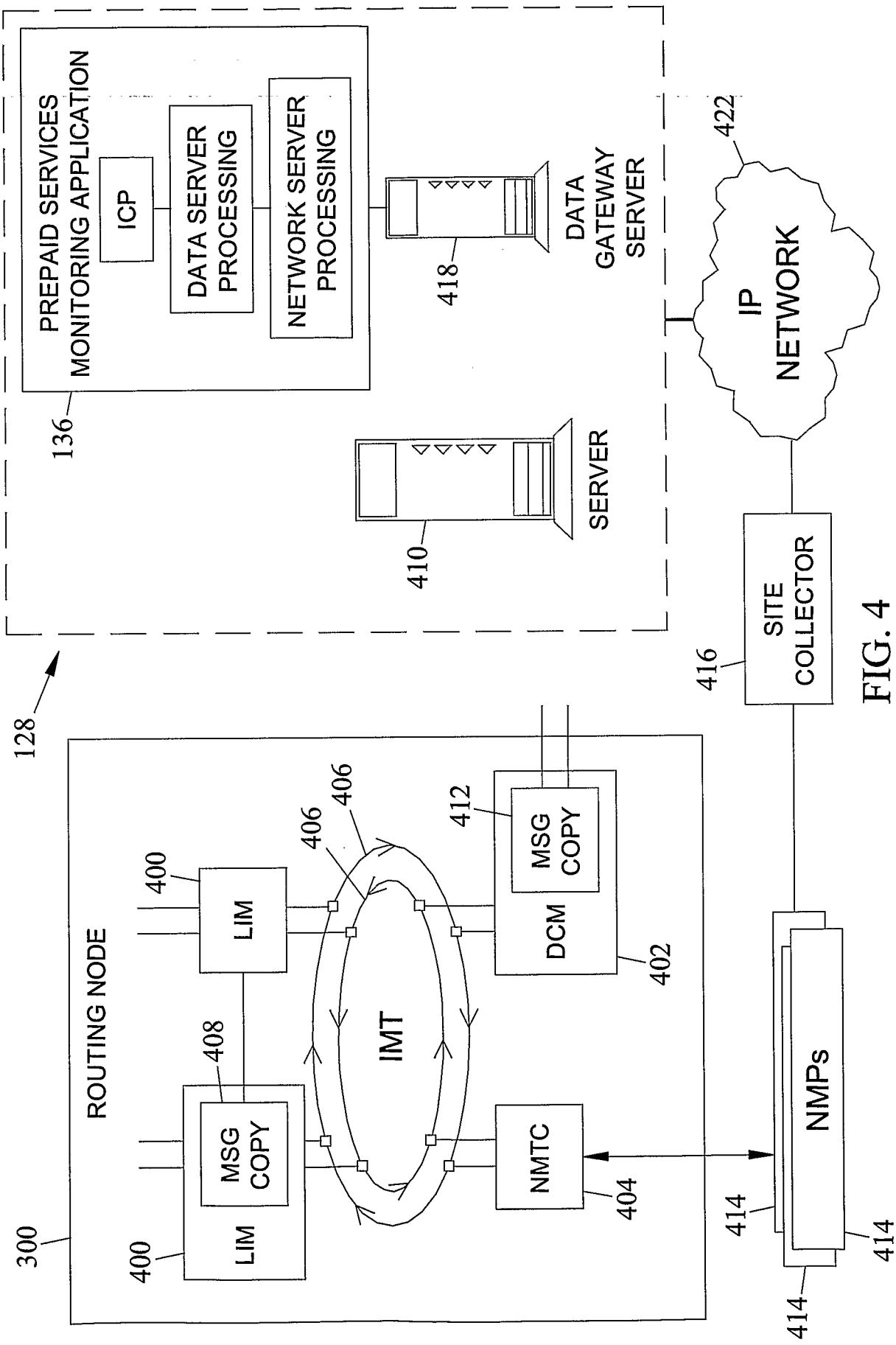

PREPAID SERVICES MONITORING APPLICATION
ICP
DATA SERVER PROCESSING
NETWORK SERVER PROCESSING
136
418
DATA GATEWAY SERVER
422
IP NETWORK
410
SERVER
128
416
SITE COLLECTOR
ROUTING NODE
300
400
LIM
406
406
412
MSG COPY
DCM
402
408
MSG COPY
LIM
400
IMT
NMTC
404
414
NMPs
414
414

FIG. 4

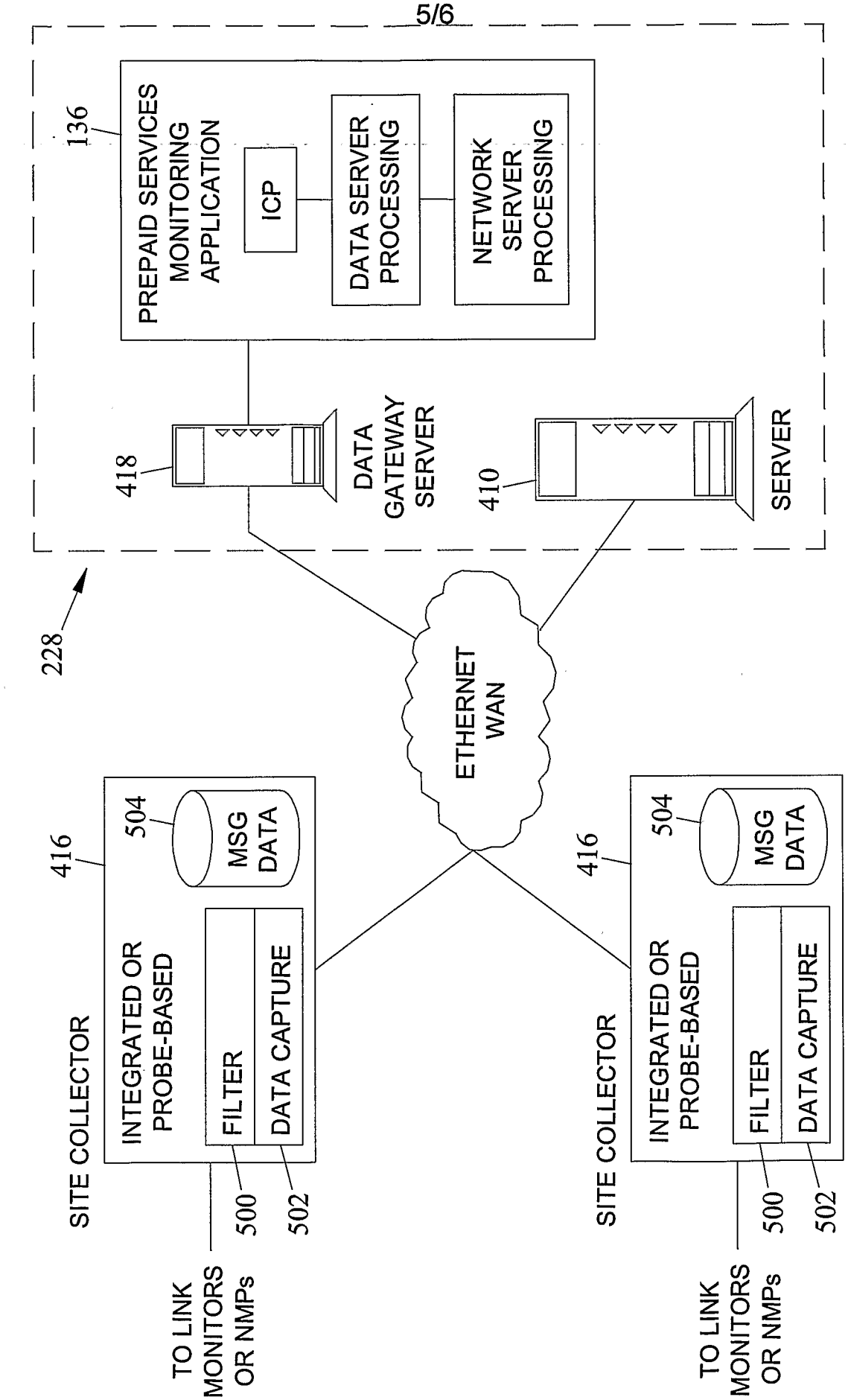

228
136
PREPAID SERVICES MONITORING APPLICATION
ICP
DATA SERVER PROCESSING
NETWORK SERVER PROCESSING
418
DATA GATEWAY SERVER
410
SERVER
ETHERNET WAN
416
SITE COLLECTOR
INTEGRATED OR PROBE-BASED
FILTER
DATA CAPTURE
504
MSG DATA
500
502
TO LINK MONITORS OR NMPs

FIG. 5

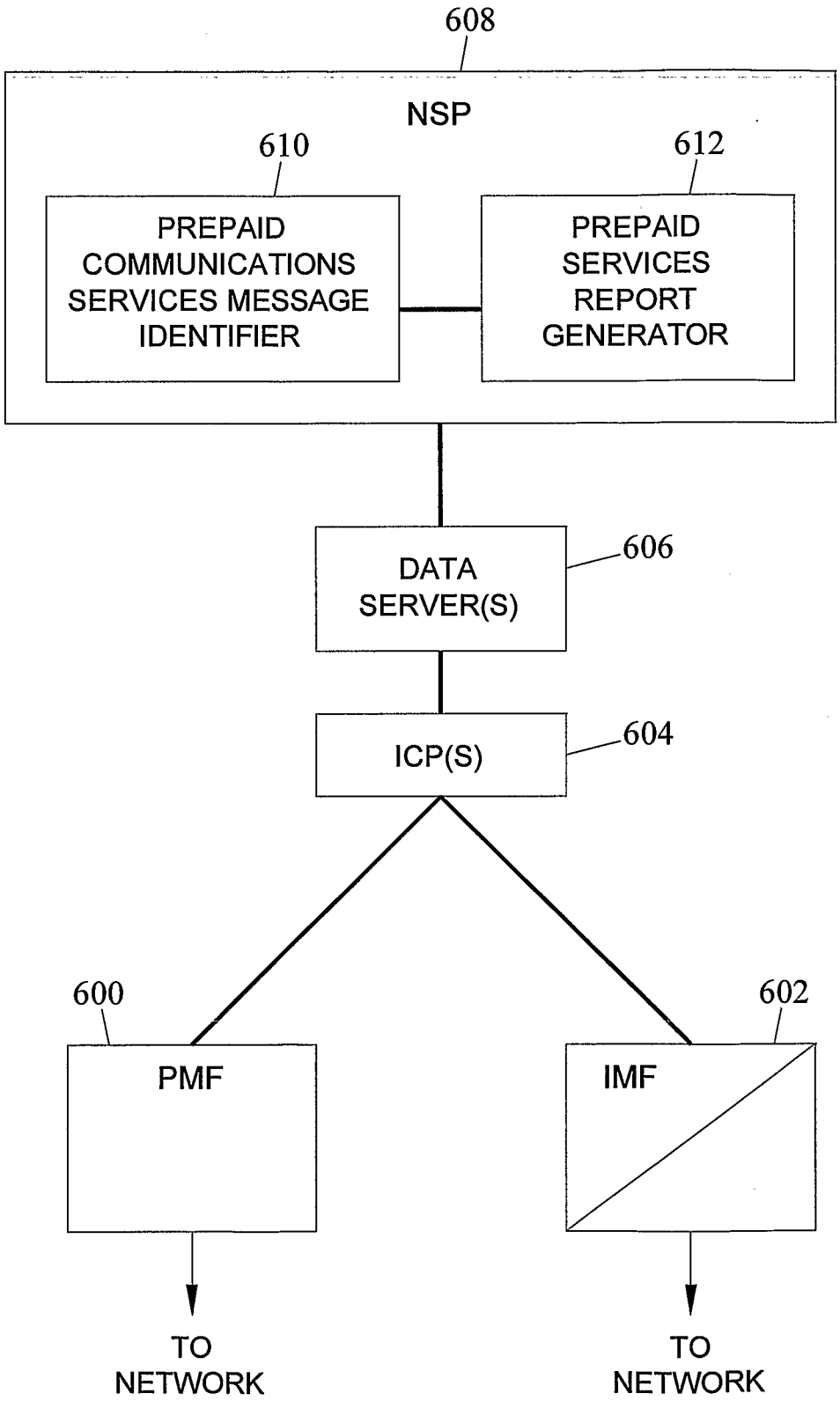

608
NSP
610
612
PREPAID COMMUNICATIONS SERVICES MESSAGE IDENTIFIER
PREPAID SERVICES REPORT GENERATOR
DATA SERVER(S)
606
ICP(S)
604
600
602
PMF
IMF
TO NETWORK
TO NETWORK

FIG. 6