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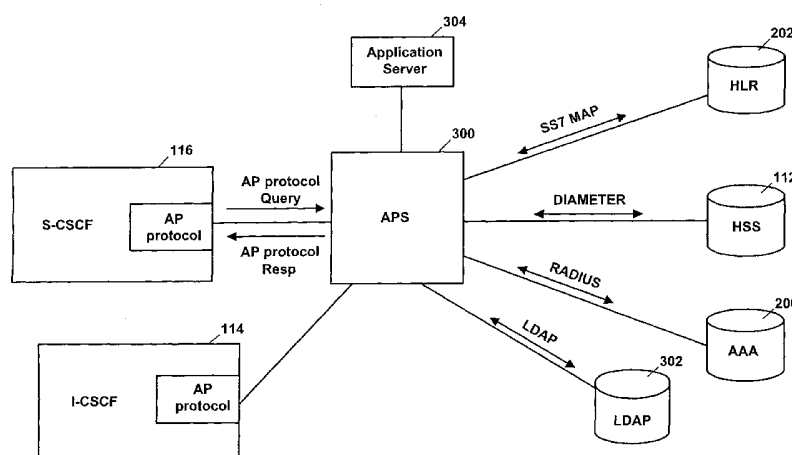
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(54) Title: METHODS, SYSTEMS, AND COMPUTER PROGRAM PRODUCTS FOR SUPPORTING DATABASE ACCESS IN AN INTERNET PROTOCOL MULTIMEDIA SUBSYSTEM (IMS) NETWORK ENVIRONMENT



(57) Abstract: Methods, systems, and computer program products for supporting database access in an Internet protocol (IP) multimedia subsystem (IMS) network environment are disclosed. At least one call state control function (CSCF) entity generates subscriber-related queries according to an abstracted profile (AP) protocol. At an abstracted profile server (APS), a CSCF-generated, subscriber-related query is received, subscriber information is gathered related to the CSCF-generated, subscriber-related query from at least one subscriber information database using a native protocol of the subscriber information database, a reply message for the CSCF-generated, subscriber-related query is generated based on the gathered subscriber information and the reply message is forwarded to a respective CSCF that generated the CSCF-generated subscriber-related query, the reply message being forwarded according to the AP protocol.

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DESCRIPTION

METHODS, SYSTEMS, AND COMPUTER PROGRAM PRODUCTS FOR
SUPPORTING DATABASE ACCESS IN AN INTERNET PROTOCOL
MULTIMEDIA SUBSYSTEM (IMS) NETWORK ENVIRONMENT

5

RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Patent Application Serial No. 60/637,426 and U.S. Provisional Patent Application Serial No. 60/637,337 both filed December 17, 2004; the disclosure of each of which is
10 incorporated herein by reference in its entirety.

TECHNICAL FIELD

The subject matter described herein relates to multimedia services and more particularly to supporting database access in an Internet protocol
15 multimedia subsystem network environment.

BACKGROUND

Internet protocol (IP) multimedia subsystem (IMS) is defined by the Third Generation Partnership Project (3GPP) as a new mobile network infrastructure
20 that enables the convergence of data, speech, and mobile network technology over an IP-based infrastructure. IMS bridges the gap between the existing traditional telecommunications technology and Internet technology, allowing network operators to offer a standardized, reusable platform with new, innovative services by enhancing real time, multimedia mobile services, such as
25 voice services, video telephony, messaging, conferencing, and push services. IMS can be used to provide services for both mobile networks and fixed networks at the same time, providing unique mixtures of services with transparency to the end-user.

IMS supports the establishment of any type of media session (e.g.,
30 voice, video, text, etc.) and provides the service creator the ability to combine services in the same session and dynamically modify sessions "on the fly" (e.g., adding a video component to an existing voice session). As a result, new and innovative user-to-user and multi-user services become available, such as enhanced voice services, video telephony, chat, push-to-talk, and multimedia

conferencing, all of which are based on the concept of a multimedia session. The underlying IMS infrastructure enables mobile IP communication services via its ability to find a user in the network and then to establish a session with the user. The key IMS components enabling mobility management are the call
5 session control function (CSCF) and home subscriber server (HSS). The CSCF is essentially a proxy, which aids in the setup and management of sessions and forwards messages between IMS networks. The HSS holds all of the key subscriber information and enables users (or servers) to find and communicate with other end users.

10 Figure 1 is a block diagram illustrating access in an IMS system. In Figure 1, a visited network **100** includes a proxy CSCF (P-CSCF) **102**. The visited network **100** may be part of or in communication with a mobile or fixed network. Accordingly, visited network **100** includes a gateway general packet radio service (GPRS) support node (GGSN) **104**, which may in turn
15 communicate with a serving GPRS support node (SGSN) **106** that is in communication with a radio access network (RAN) **108** in which an IMS subscriber is currently located. The subscriber's home network **110** includes an HSS **112** with the subscriber's profile, an interrogating CSCF (I-CSCF) **114**, and a serving CSCF (S-CSCF) **116**.

20 IMS uses session initiation protocol (SIP) for multimedia session negotiation and session management. For example, SIP REGISTER and INVITE messages are used in communication with P-CSCF **102**, I-CSCF **114**, and S-CSCF **116** in Figure 1. The IMS is essentially a mobile SIP network designed to support this functionality, providing routing, network location, and
25 addressing functionalities. The DIAMETER protocol is used between I-CSCF **114** and HSS **112** and between S-CSCF **116** and HSS **112**. DIAMETER provides an authentication, authorization and accounting (AAA) framework for applications such as network access or IP mobility in both local and roaming situations.

30 P-CSCF **102** is the first contact point within the IMS and behaves like a proxy. The P-CSCF **102** forwards the SIP REGISTER request received from the subscriber's user equipment (UE) (not shown) via GGSN **104**, SGSN **106**, and RAN **108** to I-CSCF **114**, whose identity is determined using the home

domain name, as provided by the UE. The SIP messages are forwarded to S-CSCF **116**, whose identity P-CSCF **102** received as a result of the registration procedure. P-CSCF **102** also forwards SIP requests or responses to the UE, generates call detail records (CDRs), maintains a security association between
5 itself and each UE, performs SIP message compression and decompression, and authorizes bearer resources and QoS management.

I-CSCF **114** is the contact point within the subscriber's home network **110** for all connections destined to the subscriber or for a roaming subscriber currently located within that network operator's service area. The I-CSCF **114**
10 assigns S-CSCF **116** to a user performing SIP registration, routes a SIP request received from another network towards S-CSCF **116**, obtains the address of S-CSCF **116** from HSS **112** and forwards the SIP request or response to the S-CSCF **116**.

S-CSCF **116** performs the session control services for the UE and
15 maintains session state as needed by the network operator for support of the services. S-CSCF **116** accepts registration requests, makes its information available through HSS **112**, and provides session control. S-CSCF **116** also acts as a proxy server, i.e., it accepts requests and services them internally or forwards them on, and behaves as a User Agent, i.e., it terminates and
20 independently generates SIP transactions. S-CSCF **116** is responsible for interaction with services platforms for the support of services on behalf of an originating endpoint.

HSS **112** holds the subscriber profile and keeps track of the core network node that is currently holding the subscriber. HSS **112** provides
25 mobility management, call and/or session establishment support, and supports the call and/or session establishment procedures in IMS. HSS **112** supports user security information generation, authentication procedures, user identification handling, access authorization, service authorization support service provisioning support, and provides support for application services.
30 HSS **112** may also communicate with an application server (not shown) to offer value added services. The application server and can reside either in the user's home network or in a third party location and enables different services in the IMS network like call-forwarding, call waiting, presence & instant messaging.

The application server communicates with the HSS using the DIAMETER protocol.

IMS network operators adopting an IMS infrastructure early stand to gain sizeable competitive advantages. Despite those benefits, it is still desirable to evolve network infrastructure incrementally rather than make radical changes. Accordingly, network operators must provide support for other legacy networks while implementing an IMS infrastructure. A need therefore exists for supporting database access in internet protocol multimedia subsystem network environment while supporting legacy network subscriber database access.

10

SUMMARY

In one aspect, the subject matter described herein includes a system for supporting database access in an IMS network environment. The system includes at least one CSCF entity for generating subscriber-related queries according to an abstracted profile (AP) protocol. The system also includes an abstracted profile server (APS) for receiving a CSCF-generated subscriber-related query and for gathering subscriber information related to the CSCF-generated subscriber-related query from at least one subscriber information database using a native protocol of the subscriber information database, generating a reply message for the CSCF-generated subscriber-related query based on the gathered subscriber information, and forwarding the reply message to a respective CSCF that generated the CSCF-generated subscriber-related query, the reply message being forwarded according to the AP protocol.

According to another aspect, the subject matter described herein includes an abstracted profile server (APS) for supporting database access in an IMS network environment. The APS is configured for gathering subscriber information from at least one subscriber information database using a native protocol of the subscriber information database, wherein the native protocol is at least one of RADIUS, DIAMETER, MAP, and LDAP, generating a reply message to a subscriber-related query based on the gathered subscriber information, and forwarding the reply message to a source of the subscriber-related query, the reply message being forwarded using a protocol other than the native protocol of the subscriber information database.

30

According to yet another aspect, the subject matter described herein includes a method is disclosed for supporting database access in an IMS network environment. At least one CSCF entity generates subscriber-related queries according to an abstracted profile (AP) protocol. At an abstracted
5 profile server (APS), a CSCF-generated subscriber-related query is received, subscriber information is gathered related to the CSCF-generated subscriber-related query from at least one subscriber information database using a native protocol of the subscriber information database, a reply message for the CSCF-generated subscriber-related query is generated based on the gathered
10 subscriber information and the reply message is forwarded to a respective CSCF that generated the CSCF-generated subscriber-related query, the reply message being forwarded according to the AP protocol.

BRIEF DESCRIPTION OF THE DRAWINGS

15 Objects and advantages of the present invention will become apparent to those skilled in the art upon reading this description in conjunction with the accompanying drawings, in which like reference numerals have been used to designate like elements, and in which:

Figure 1 is a block diagram illustrating access in an IMS system;

20 Figure 2 is a block diagram illustrating an exemplary CSCF in an IMS network environment;

Figure 3 is a block diagram illustrating a system for supporting database access in an IMS network environment according to an embodiment of the subject matter described herein;

25 Figure 4 is a flow chart illustrating a method for supporting database access in an IMS network environment according to an embodiment of the subject matter described herein;

Figure 5 is a block diagram illustrating a system for supporting database access in an IMS network environment according to another embodiment of the
30 subject matter described herein;

Figure 6 is a block diagram illustrating a system for supporting database access in an IMS network environment according to another embodiment of the subject matter described herein;

Figure 7 is a block diagram illustrating a system for supporting database access in an IMS network environment according to another embodiment of the subject matter described herein;

5 Figure 8 is a block diagram illustrating a system for supporting database access in an IMS network environment according to another embodiment of the subject matter described herein;

Figure 9 is a block diagram illustrating an IMS cluster node according to another embodiment of the subject matter described herein; and

10 Figure 10 is a block diagram illustrating an IMS cluster node with HSS functionality included within the IMS cluster node according to another embodiment of the subject matter described herein

DETAILED DESCRIPTION

To facilitate an understanding of exemplary embodiments, many aspects
15 are described in terms of sequences of actions that can be performed by elements of a computer system. For example, it will be recognized that in each of the embodiments, the various actions can be performed by specialized circuits or circuitry (e.g., discrete logic gates interconnected to perform a specialized function), by program instructions being executed by one or more
20 processors, or by a combination of both.

Moreover, the sequences of actions can be embodied in any computer-readable medium for use by or in connection with an instruction execution system, apparatus, or device, such as a computer-based system, processor containing system, or other system that can fetch the instructions from a
25 computer-readable medium and execute the instructions.

As used herein, a "computer-readable medium" can be any means that can contain, store, communicate, propagate, or transport the program for use by or in connection with the instruction execution system, apparatus, or device.

The computer-readable medium can be, for example but not limited to, an
30 electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, device, or propagation medium. More specific examples (a non exhaustive list) of the computer-readable medium can include the following: an electrical connection having one or more wires, a portable computer diskette, a random access memory (RAM), a read-only memory (ROM), an

erasable programmable read-only memory (EPROM or Flash memory), an optical fiber, and a portable compact disc read-only memory (CDROM).

Thus, the subject matter described herein can be embodied in many different forms, and all such forms are contemplated to be within the scope of what is claimed. Any such form of embodiment can be referred to herein as
5 "logic configured to" perform a described action, or alternatively as "logic that" performs a described action.

Figure 2 is a block diagram illustrating an exemplary CSCF in an IMS network environment. In Figure 2, an S-CSCF **116** communicates with a number of subscriber information databases using a native protocol of each
10 subscriber information database. In the example shown, S-CSCF **116** communicates with a home subscriber server (HSS) **112** using the DIAMETER protocol to obtain a subscriber profile and IM mobility management information associated with an IMS subscriber. S-CSCF **116** may also communicate with
15 an authentication, authorization and accounting (AAA) server **200** using a protocol such as remote access dial-in user service (RADIUS) protocol, and/or with an ENUM database server (not shown) using a DNS protocol. In order to provide support for legacy networks, S-CSCF **116** may also communicate with other subscriber databases, such as a GSM or IS-41 home location register
20 (HLR) **202**. Additional databases (not shown) that may be accessed include an equipment identity register (EIR) and/or an authentication center (AuC). S-CSCF **116** communicates with HLR **202**, EIR, and AuC using protocols including signaling system 7 (SS7) signaling connection control part (SCCP), signaling user adaptation layer (SUA), transaction capabilities application part (TCAP), lightweight directory access protocol (LDAP), and mobile application
25 part (MAP).

This approach requires the simultaneous support of a multitude of native protocols by S-CSCF **116**, which is often impractical from a network operation standpoint due to the complex nature of the required multi-protocol control
30 logic. For example, in certain signaling scenarios it may be necessary to query several network entities (e.g., HSS, HLR, AAA, EIR, AuC, presence server, and the like) in a particular sequence, where the sequence is based, at least in part, on the responses obtained from the various network entities. In a single

subscriber-related transaction, AAA **200** may be queried using RADIUS protocol, and, based on the response returned by the AAA server, it may be determined that HSS **112** should be queried using the DIAMETER protocol. Based on the response provided by HSS **112**, it may then be determined that
5 HLR **202** should be queried using MAP protocol. This multi-protocol, multi-step approach is believed to consume a significant amount of available resources at S-CSCF **116**, which in turn may have a direct impact on the call control processing capabilities of S-CSCF **116**.

Figure 3 is a block diagram illustrating a system for supporting database
10 access in an IMS network environment according to an embodiment of the subject matter described herein. In Figure 3, an abstracted profile server (APS) **300** communicates with S-CSCF **116** using a universal abstracted profile protocol (AP protocol). The AP protocol may be any protocol that supports information requests and corresponding replies to the requests indicating the
15 information requested either directly or indirectly. For example, SIP may be used. APS **300** communicates with any of several subscriber information databases, such as HLR **202**, HSS **112**, AAA **200**, and LDAP server **302**, using the respective native protocol of the subscriber information database. APS **300** may also communicate with an application server **304** to access and support
20 various applications used by APS **300**. Application server **304** may be used as a platform for deploying various services in the IMS network and can provide SIP functionality, 3GPP AS call control, presence information, ENUM service and other services through the use of application programming interfaces (API).
An I-CSCF **114** also communicates with APS **300** and is the contact point
25 within the network has described above. S-CSCF **116** includes logic and protocol support for the AP protocol and need not support the several native protocols described above. APS **300** includes logic configured to determine which subscriber information databases should be queried and in what sequence they should be queried. In addition, APS **300** includes logic
30 configured to support each protocol required and to use the appropriate protocol for each query. Accordingly, CSCF protocol support and control logic requirements are greatly simplified.

In operation, when S-CSCF **116** requires subscriber information, a subscriber-related query is generated according to the AP protocol and forwarded to APS **300**. APS **300** receives the S-CSCF-generated subscriber-related query and gathers subscriber information related to the CSCF-generated subscriber-related query from at least one subscriber information database, such as HLR **202**, HSS **112**, AAA **200**, and LDAP server **302**, using a native protocol of the subscriber information database. APS **300** generates a reply message for the CSCF-generated subscriber-related query based on the gathered subscriber information and forwards the reply message to S-CSCF **116** according to the AP protocol.

Figure 4 is a flow chart illustrating a method for supporting database access in an IMS network environment according to an embodiment of the subject matter described herein. In Figure 4, at least one CSCF entity generates subscriber-related queries according to an (AP) protocol in step **400**. APS **300** receives a CSCF-generated, subscriber-related query in step **402** and gathers subscriber information related to the CSCF-generated subscriber-related query from at least one subscriber information database using a native protocol of the subscriber information database in step **404**. APS **300** generates a reply message for the CSCF-generated, subscriber-related query based on the gathered subscriber information in step **406** and forwards the reply message according to the AP protocol to a respective CSCF that generated the CSCF-generated subscriber-related query in step **408**.

Figure 5 is a block diagram illustrating a system for supporting database access in an IMS network environment according to another aspect of the subject matter disclosed herein. In Figure 5, APS **300** includes associated memory **500** or other data storage resources for storing subscriber information received from previous subscriber information database queries. Memory **500** may be an integral part of the APS **300** or may be a separate memory accessible to APS **300**. Subscriber information may be stored in memory **500**, e.g., cached, for some or all subscribers serviced by APS **300**. When APS **300** receives an AP protocol query from S-CSCF **116**, some or all of the requested subscriber information can be obtained from memory **500** directly without the

need to query the individual subscriber information databases for the information, thus saving time and resources.

Figure 6 is a block diagram illustrating a system for supporting database access in an IMS network environment according to another aspect of the subject matter disclosed herein. In Figure 6, APS **300** gathers subscriber information from the subscriber information databases at least in part by receiving an update notification. For example, as subscriber information is updated in a subscriber information database, such as HLR **202**, HSS **112**, AAA **200**, and LDAP server **302**, an update notification is sent from the subscriber information database to APS **300**. The update notification may include updated subscriber information from one or more subscriber information databases or may simply inform APS **300** that subscriber information has been updated. In the latter case, APS **300** may then request updated subscriber information from the subscriber information database that sent the update notification. Alternatively, update notifications may be sent to APS **300** at periodic or aperiodic intervals independent of the updating of subscriber information in the subscriber information database. The gathered subscriber information is stored in memory **500**.

Figure 7 is a block diagram illustrating a system for supporting database access in an IMS network environment according to another embodiment of the subject matter described herein. In Figure 7, APS **300** gathers subscriber information from the subscriber information databases at least in part by polling subscriber information databases to determine if updated subscriber information exists. If so, APS **300** requests the updated subscriber information from the respective subscriber information database.

Figure 8 is a block diagram illustrating a system for supporting database access in an IMS network environment according to another embodiment of the subject matter described herein. In Figure 8, multiple CSCF entities share a single APS **300**. As shown, in addition to S-CSCF **116**, S-CSCF **800** and S-CSCF **802** also access the resources of APS **300**. Accordingly, APS **300** provides the complex multi-protocol support and control logic functions for multiple S-CSCFs.

Figure 9 is a block diagram illustrating an IMS cluster node **900** according to another embodiment of the subject matter described herein. IMS cluster nodes are described further in commonly-assigned U.S. Provisional Application No. 60/637,337, filed December 17, 2004, entitled "Methods and Systems for Providing Subscriber Information to a Call State Control Function in an Internet Protocol (IP) Multimedia Subsystem (IMS)," the disclosure of which is incorporated by reference in its entirety. In Figure 9, IMS cluster node **900** includes I-CSCF modules **902** and **904**, S-CSCF modules **906** and **908**, an internal communication bus **910**, and APS **300** with an associated network interface card (NIC) **912**. Internal communication bus **910** provides a communication path between the various printed circuit cards or processor modules in IMS cluster node **900**. As such, any module may communicate with other modules in the IMS cluster node **900**, such as I-CSCF module **904** and APS **300**, via the internal communication bus **910**. I-CSCF modules **902** and **904** may also have associated NICs **914** and **916**. NICs **912**, **914**, and **916** are adapted to communicate with circuit switched and/or packet switched networks. I-CSCF modules **902** and/or **904** may include a subscription locator function (SLF) **918**. SLF **918** is adapted to receive a communication session-related registration message, such as a session initiation protocol (SIP) REGISTER message, and identify an HSS entity **112** that contains a subscriber's location and subscription information. In the implementation illustrated by Figure 9, HSS **112** is external to IMS cluster node **900** and accessed by APS **300** via NIC **912**. In an alternative implementation illustrated by Figure 10, HSS **112** functionality is included within IMS cluster node **900** as an HSS processor or module that is connected to internal communication bus **910**. Once a subscriber's HSS **112** is identified, the subscriber's HSS **112** processor may be queried to determine the identity of a S-CSCF to which a communication session-related registration message should be forwarded. S-CSCF functionality may be included within IMS cluster node **900** as an S-CSCF processor or module that is connected to the internal communication bus as shown in Figures 9 and 10.

For example, I-CSCF **904** may send an AP protocol query to APS **300** via communication bus **910**. In the implementation of Figure 9, APS **300**

generates and sends a DIAMETER protocol query to HSS 112 via NIC 912. In the implementation of Figure 10, APS 300 generates and sends a DIAMETER protocol query to HSS processor 112 via communication bus 910. In either case, a response is received according to the DIAMETER protocol at APS 300.

5 and in the protocol response is generated at APS 300 and forwarded to I-CSCF 904. Although an HSS is used by way of example in Figures 9 and 10, it will be appreciated that the above described procedure can be used with any subscriber information database using the appropriate native protocol for the subscriber information database.

10 As used herein, a subscriber information database may be a network node or a database application residing on a processor within or without an IMS cluster node, or other similar distributed processing system.

It will be understood that various details of the invention may be changed without departing from the scope of the claimed subject matter. Furthermore,
15 the foregoing description is for the purpose of illustration only, and not for the purpose of limitation, as the scope of protection sought is defined by the claims as set forth hereinafter together with any equivalents thereof entitled to.

CLAIMS

What is claimed is:

1. A system for supporting database access in Internet protocol (IP) multimedia subsystem (IMS) network environment, the system comprising:
 - (a) at least one call state control function (CSCF) entity for generating subscriber-related queries according to an abstracted profile (AP) protocol; and
 - (b) an abstracted profile server (APS) for receiving a CSCF-generated, subscriber-related query and for:
 - (a) gathering subscriber information related to the CSCF-generated, subscriber-related query from at least one subscriber information database using a native protocol of the subscriber information database;
 - (b) generating a reply message for the CSCF-generated, subscriber-related query based on the gathered subscriber information; and
 - (c) forwarding the reply message to a respective CSCF that generated the CSCF-generated, subscriber-related query, the reply message being forwarded according to the AP protocol.
2. The system of claim 1 wherein the APS is adapted to gather subscriber information related to the CSCF-generated, subscriber-related query from at least one subscriber information database using a native protocol of the subscriber information database by:
 - (a) generating, in response to a CSCF-generated, subscriber-related query, at least one corresponding query to a subscriber information database using a native protocol of the subscriber information database; and
 - (b) receiving respective replies to the at least one corresponding query.
3. The system of claim 1 wherein the APS is adapted to gather subscriber information related to the CSCF-generated, subscriber-related query

- from at least one subscriber information database using a native protocol of the subscriber information database by:
- (a) receiving the subscriber information from at least one subscriber information database as the subscriber information is updated;
 - 5 and
 - (b) storing the subscriber information at the APS.
4. The system of claim 1 wherein the APS is adapted to gather subscriber information related to the CSCF-generated, subscriber-related query from at least one subscriber information database using a native
- 10 protocol of the subscriber information database by:
- (a) polling at least one subscriber information database for the subscriber information at intervals independent of the receipt of the CSCF-generated subscriber-related query; and
 - (b) storing the subscriber information locally to the APS.
- 15 5. The system of claim 1 wherein the native protocol of the subscriber information database comprises a DIAMETER protocol.
6. The system of claim 1 wherein the native protocol of the subscriber information database comprises a RADIUS protocol.
7. The system of claim 1 wherein the native protocol of the subscriber
- 20 information database comprises a mobile application part (MAP) protocol.
8. The system of claim 1 wherein the native protocol of the subscriber information database comprises a lightweight directory access protocol (LDAP).
- 25 9. The system of claim 1 wherein the at least one CSCF and the APS are part of an IMS cluster node.
10. An abstracted profile server (APS) for supporting database access in Internet protocol (IP) multimedia subsystem (IMS) network environment, the APS being configured for:
- 30 (a) gathering subscriber information from at least one subscriber information database using a native protocol of the subscriber information database, wherein the native protocol includes at least one of RADIUS, DIAMETER, MAP, and LDAP;

- (b) generating a reply message to a subscriber-related query based on the gathered subscriber information; and
 - (c) forwarding the reply message to a source of the subscriber-related query, the reply message being forwarded using a protocol other than the native protocol of the subscriber information database.
- 5
11. A method for supporting database access in Internet protocol (IP) multimedia subsystem (IMS) network environment, the method comprising:
- 10
- (a) generating, from at least one call state control function (CSCF) entity, subscriber-related queries according to an abstracted profile (AP) protocol;
 - (b) at an abstracted profile server (APS):
 - (i) receiving a CSCF-generated, subscriber-related query;
 - 15 (ii) gathering subscriber information related to the CSCF-generated, subscriber-related query from at least one subscriber information database using a native protocol of the subscriber information database;
 - (iii) generating a reply message for the CSCF-generated, subscriber-related query based on the gathered subscriber information; and
 - 20 (iv) forwarding the reply message to a respective CSCF that generated the CSCF-generated, subscriber-related query, the reply message being forwarded according to the AP protocol.
- 25
12. The method of claim 11 wherein gathering subscriber information related to the CSCF-generated, subscriber-related query from at least one subscriber information database using a native protocol of the subscriber information database includes:
- 30
- (a) generating, in response to the CSCF-generated subscriber-related query, at least one corresponding query to a subscriber information database using a native protocol of the subscriber information database; and

- (b) receiving respective replies to the at least one corresponding query.
13. The method of claim 11 wherein gathering subscriber information related to the CSCF-generated subscriber-related query from at least one subscriber information database using a native protocol of the subscriber information database includes:
- 5 (a) receiving the subscriber information from at least one subscriber information database as the subscriber information is updated; and
- 10 (b) storing the subscriber information at the APS.
14. The method of claim 11 wherein gathering subscriber information related to the CSCF-generated, subscriber-related query from at least one subscriber information database using a native protocol of the subscriber information database includes:
- 15 (a) polling at least one subscriber information database for the subscriber information at intervals independent of the receipt of the CSCF-generated, subscriber-related query; and
- (b) storing the subscriber information at the APS.
15. The method of claim 11 wherein the native protocol of the subscriber information database is a DIAMETER protocol.
- 20 16. The method of claim 11 wherein the native protocol of the subscriber information database is a RADIUS protocol.
17. The method of claim 11 wherein the native protocol of the subscriber information database is a mobile application part (MAP) protocol.
- 25 18. The method of claim 11 wherein the native protocol of the subscriber information database is a lightweight directory access protocol (LDAP).
19. The method of claim 11 wherein the at least one CSCF and the APS are part of an IMS cluster node.
20. A method for supporting database access in an Internet protocol (IP) multimedia subsystem (IMS) network environment, the method comprising:
- 30 at an abstract profile server (APS):
- (a) receiving a CSCF-generated, subscriber-related query;

- (b) gathering subscriber information related to the CSCF-generated, subscriber-related query from at least one subscriber information database using a native protocol of the subscriber information database;
 - 5 (c) generating a reply message for the CSCF-generated, subscriber-related query based on the gathered subscriber information; and
 - (d) forwarding the reply message to a respective CSCF that generated the CSCF-generated, subscriber-related query, the reply message being forwarded according to the AP protocol.
- 10 21. A computer program product comprising computer-executable instructions embodied in a computer-readable medium for performing steps comprising:
- (a) gathering subscriber information from at least one subscriber information database using a native protocol of the subscriber information database, wherein the native protocol includes at least one of RADIUS, DIAMETER, MAP, and LDAP;
 - 15 (b) generating a reply message to a subscriber-related query based on the gathered subscriber information; and
 - (c) forwarding the reply message to a source of the subscriber-related query, the reply message being forwarded using a protocol other than the native protocol of the subscriber information database.
- 20 22. A computer program product comprising computer-executable instructions embodied in a computer-readable medium for performing steps comprising:
- (a) generating, from at least one call state control function (CSCF) entity, subscriber-related queries according to an abstracted profile (AP) protocol;
 - 25 (b) at an abstracted profile server (APS):
- 30 (i) receiving a CSCF-generated, subscriber-related query;
 - (ii) gathering subscriber information related to the CSCF-generated, subscriber-related query from at least one subscriber information database using a native protocol of the subscriber information database;

- (iii) generating a reply message for the CSCF-generated, subscriber-related query based on the gathered subscriber information; and
- (iv) forwarding the reply message to a respective CSCF that generated the CSCF-generated, subscriber-related query, the reply message being forwarded according to the AP protocol.
- 5
23. A computer program product comprising computer-executable instructions embodied in a computer-readable medium for performing steps comprising:
- 10 at an abstract profile server (APS):
- (a) receiving a CSCF-generated, subscriber-related query;
- (b) gathering subscriber information related to the CSCF-generated, subscriber-related query from at least one subscriber information database using a native protocol of the subscriber information database;
- 15 (c) generating a reply message for the CSCF-generated, subscriber-related query based on the gathered subscriber information; and
- (d) forwarding the reply message to a respective CSCF that generated the CSCF-generated, subscriber-related query, the reply message being forwarded according to the AP protocol.
- 20

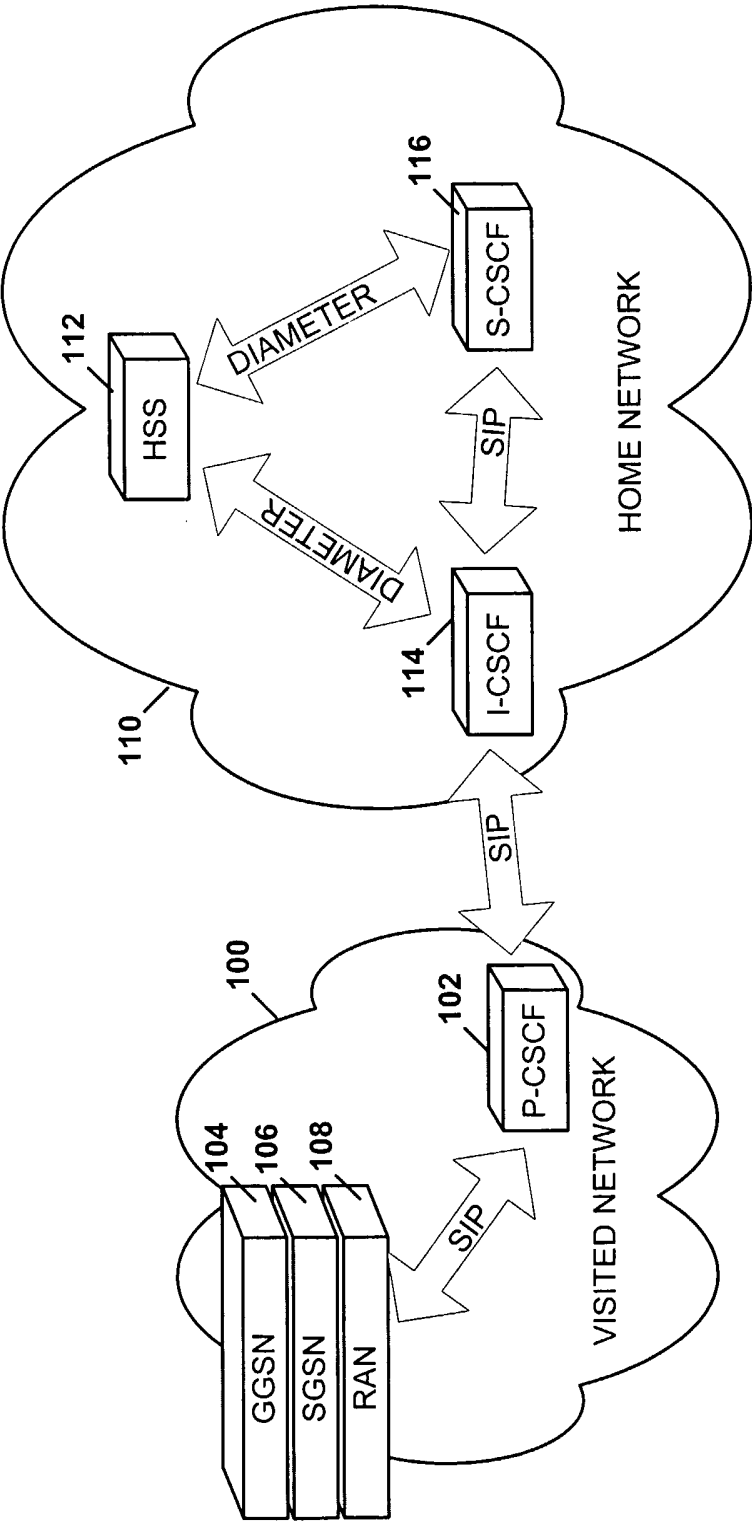


FIG. 1
(PRIOR ART)

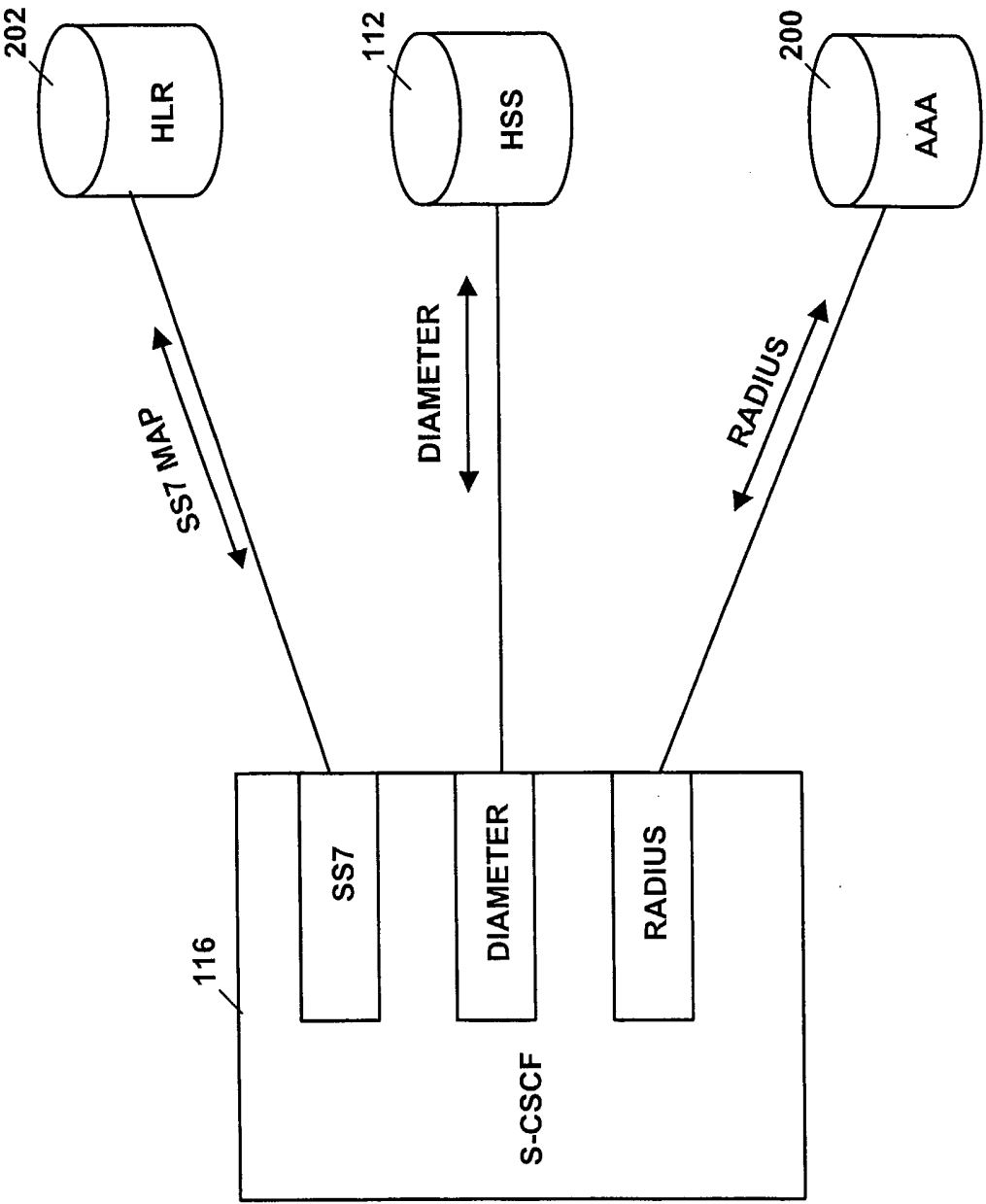


FIG. 2

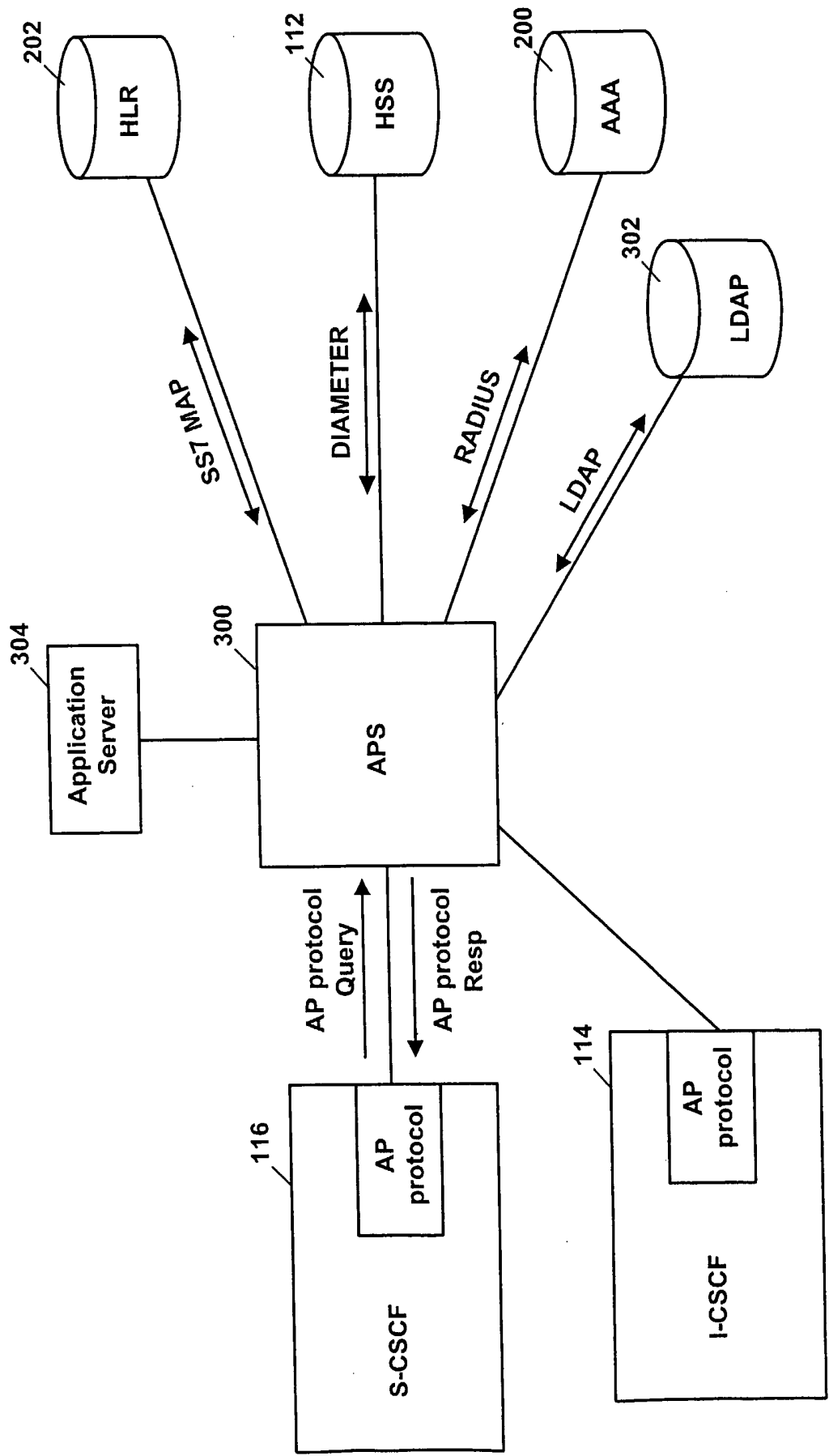
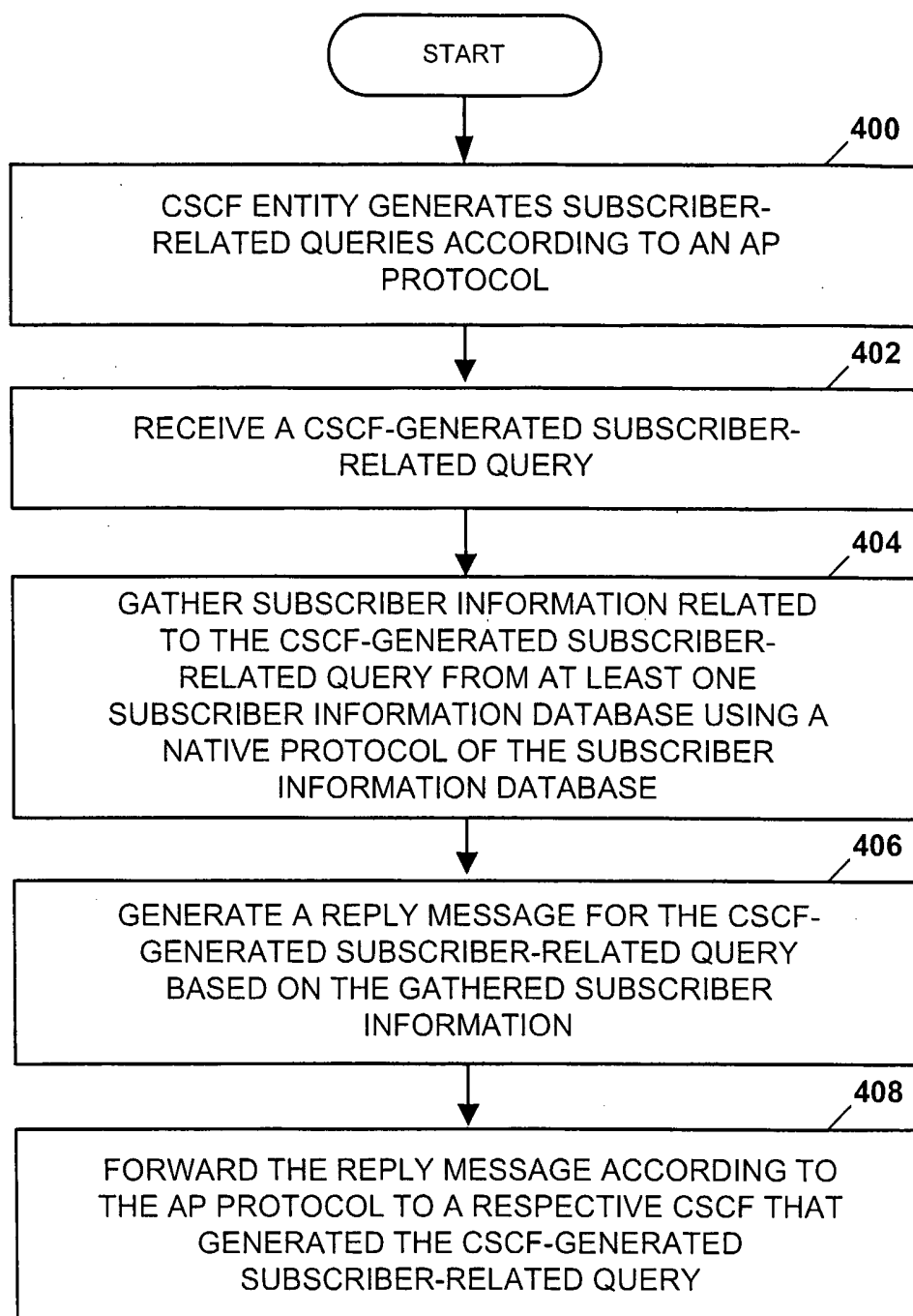


FIG. 3

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**FIG. 4**

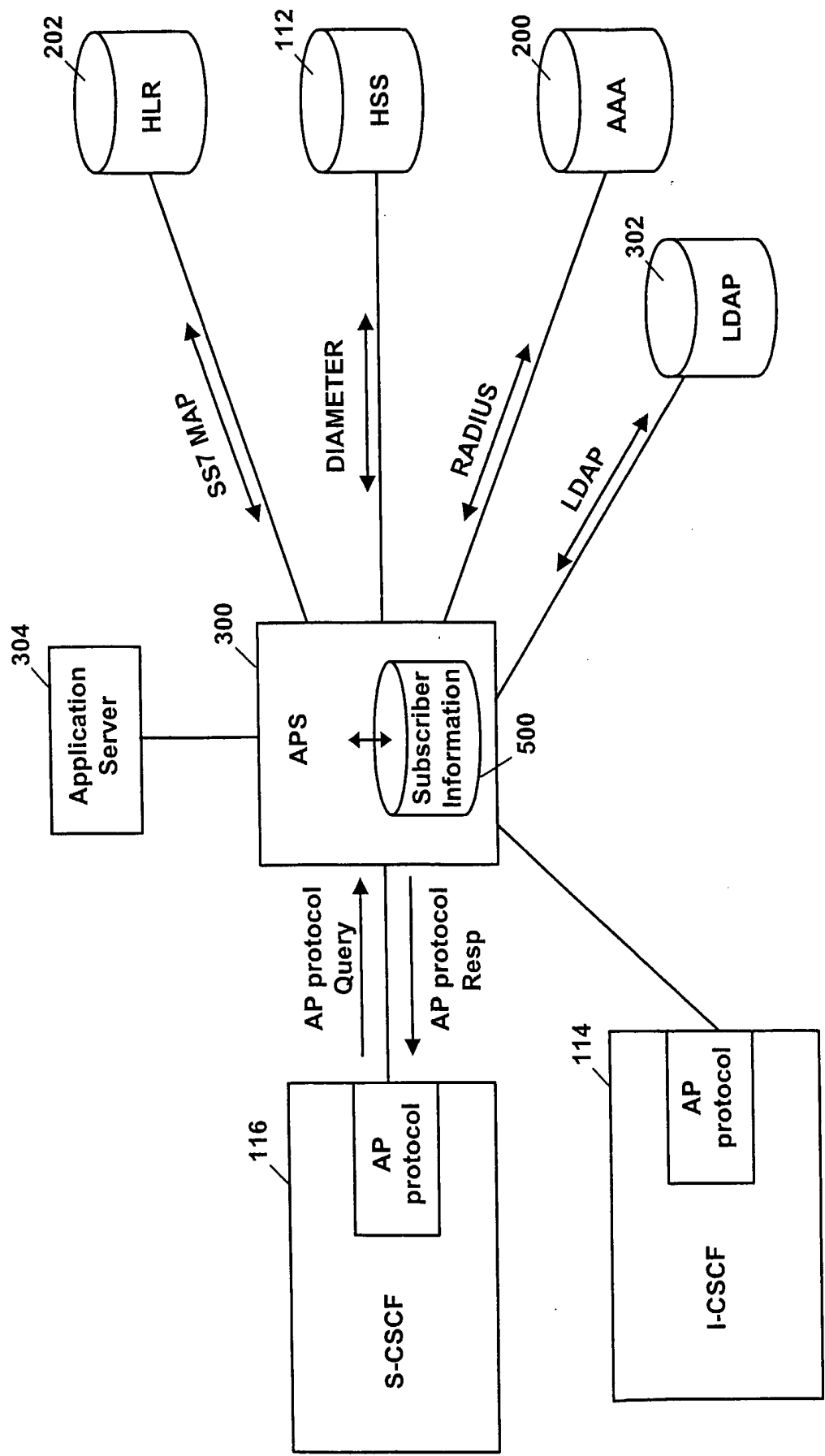


FIG. 5

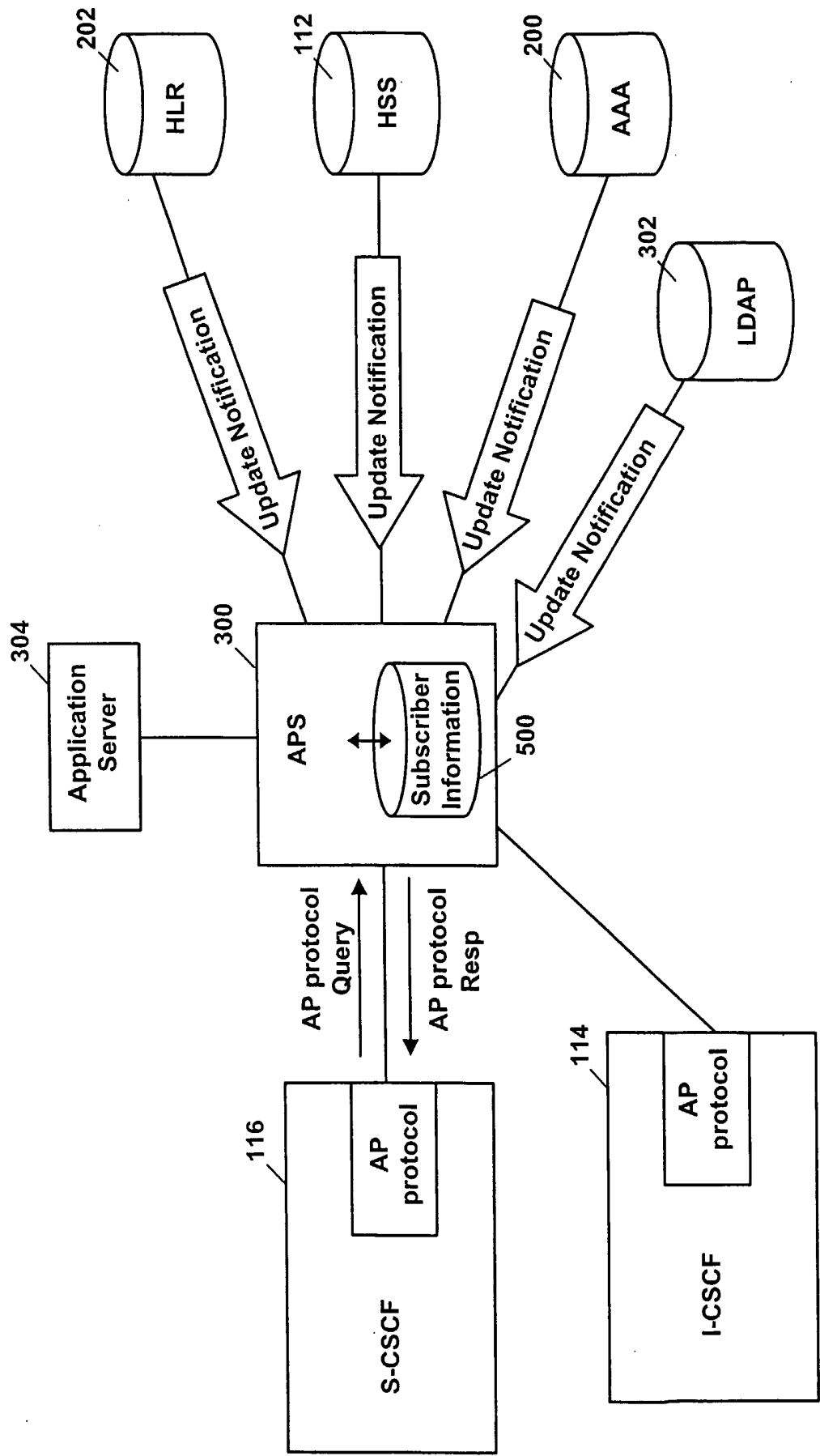


FIG. 6

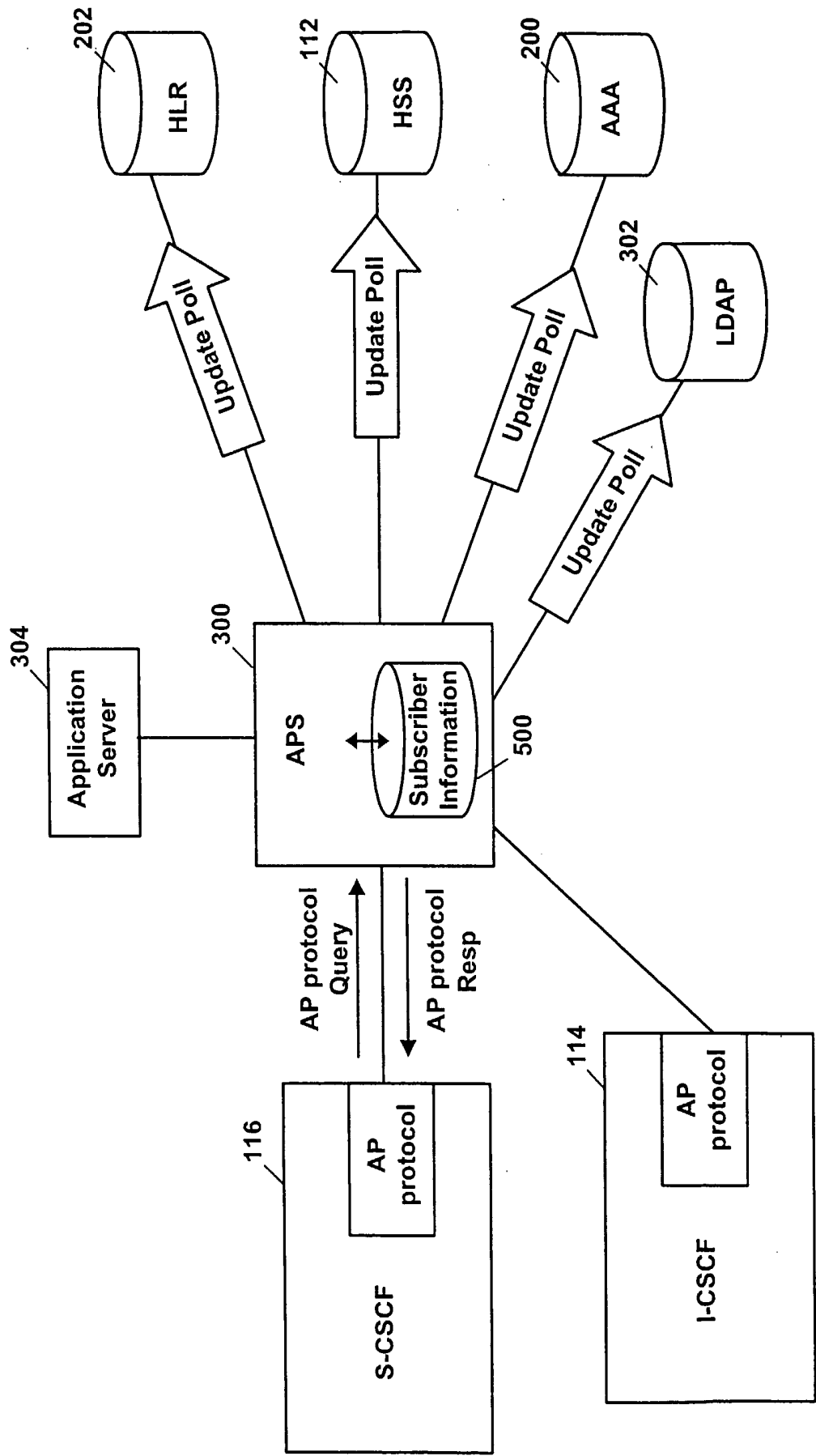


FIG. 7

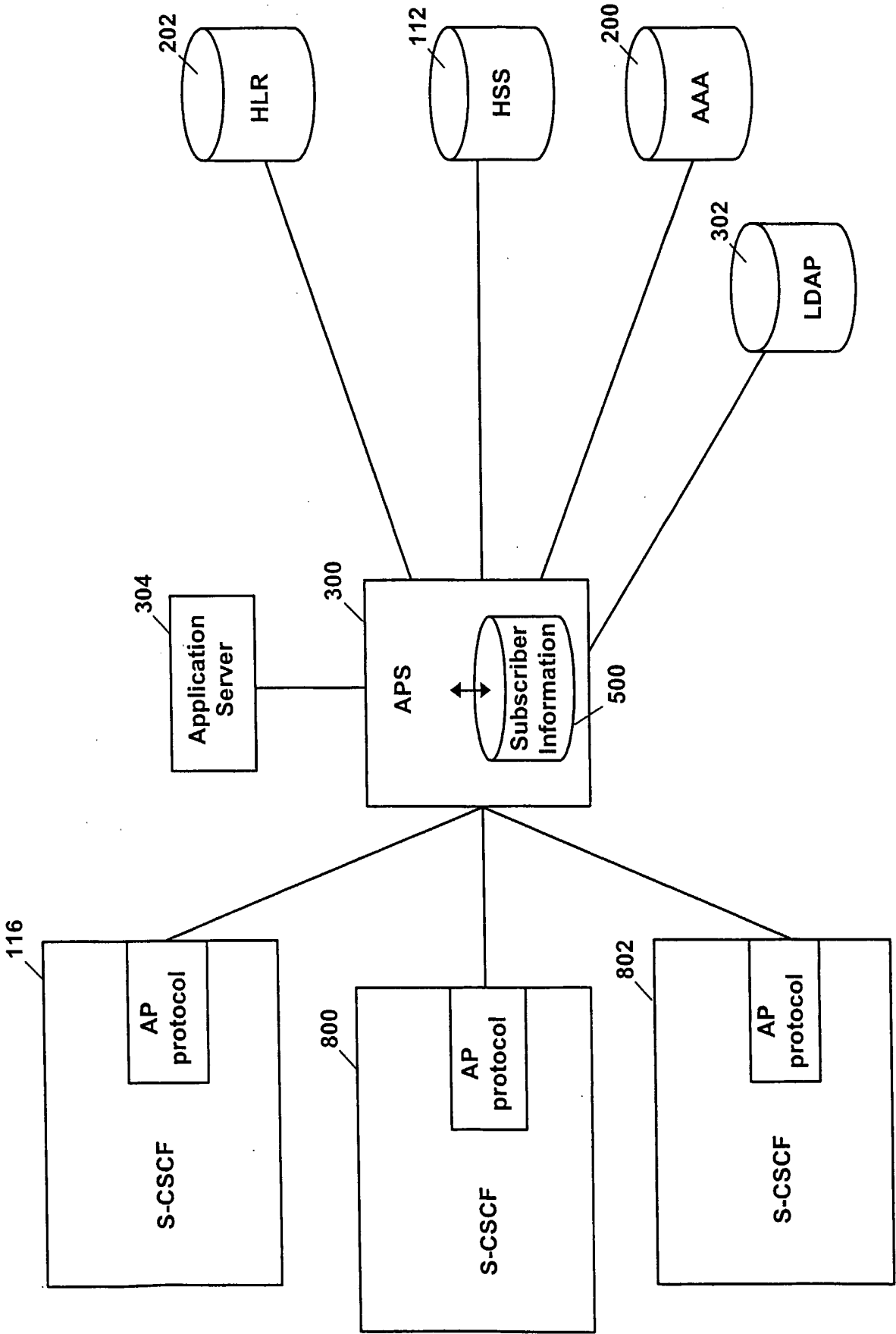


FIG. 8

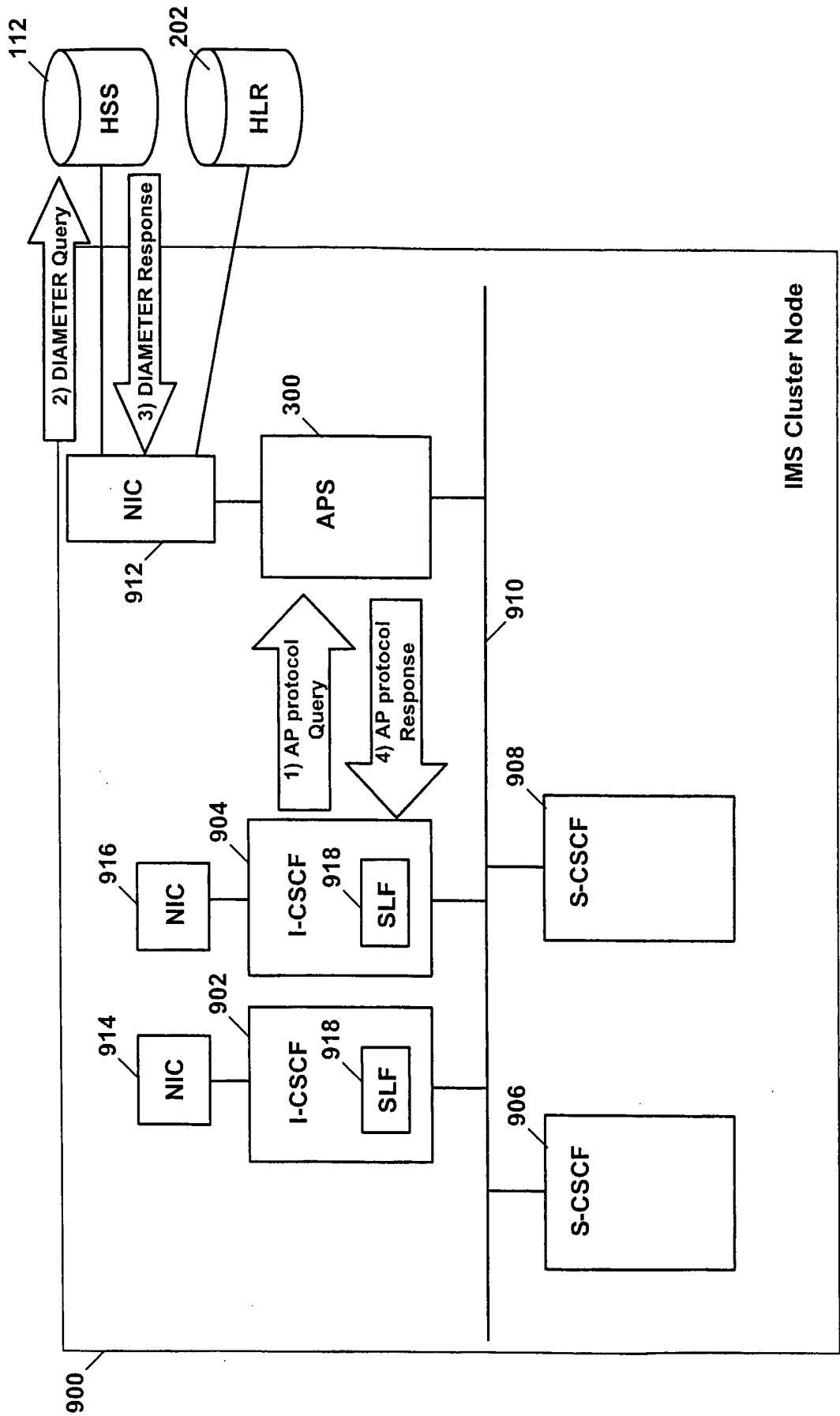


FIG. 9

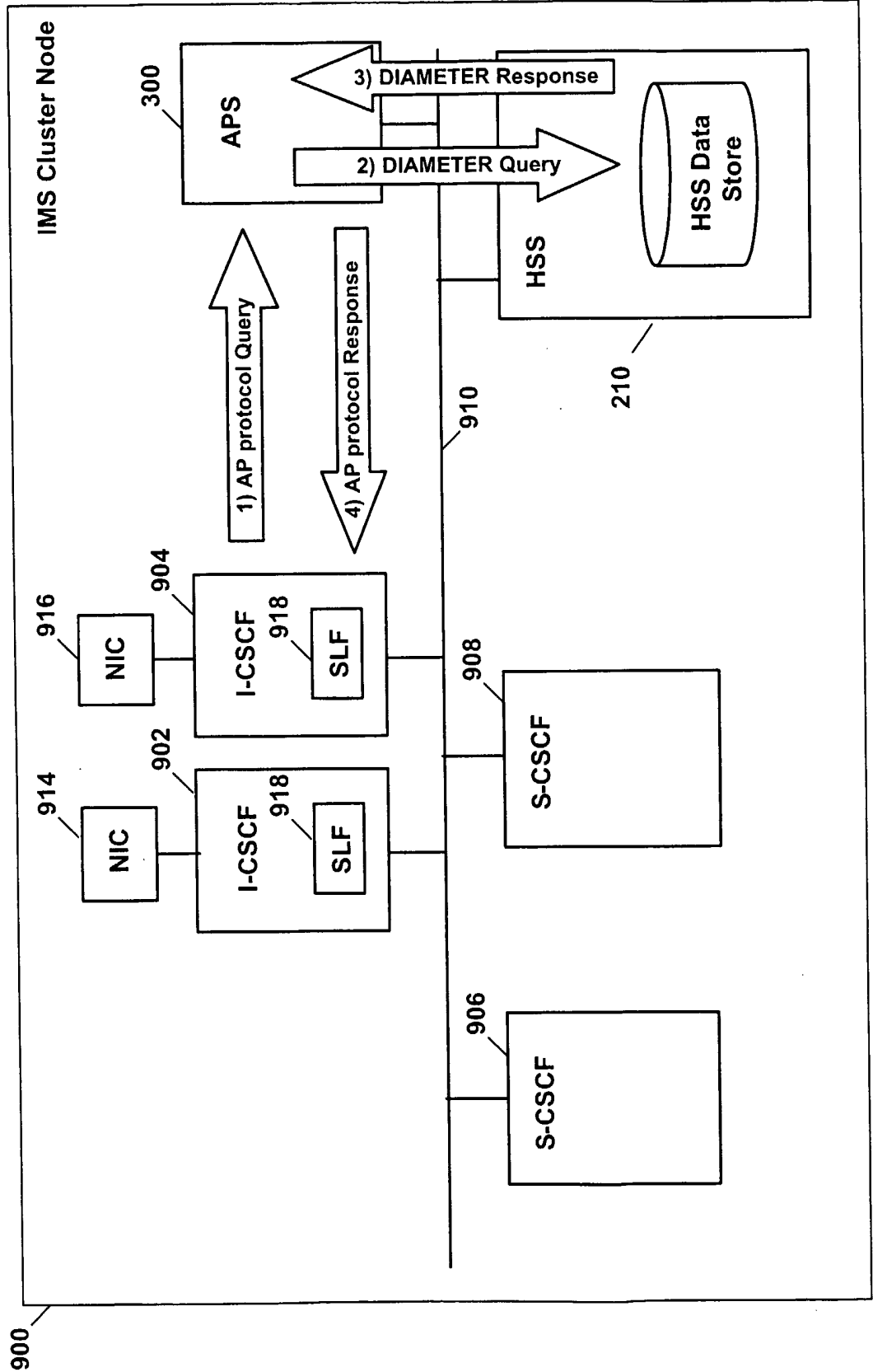


FIG. 10