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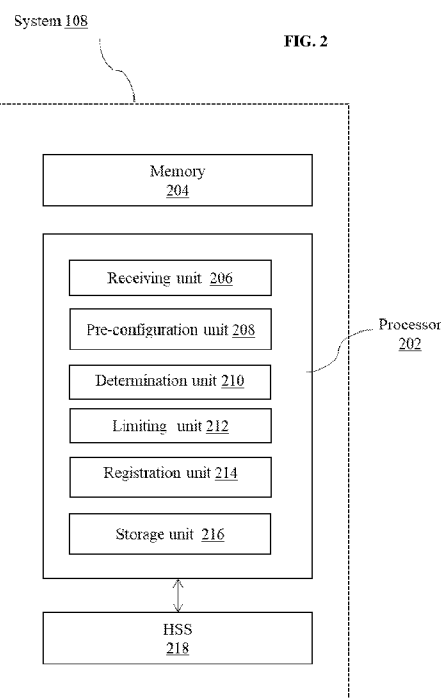
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(54) Title: METHOD AND SYSTEM FOR MANAGING A DATA REPOSITORY



(57) Abstract: The present invention relates to a system (108) and a method (500) for managing a data repository. The method (500) includes the step of receiving one or more service indications from one or more Application Server (AS) units (110) via a network (106). The method (500) further includes the step of pre-configuring the one or more service indications associated with the one or more AS units (110). The method (500) further includes the step of determining a type of the one or more AS units (110), where the type of the one or more AS units (110) is one of a trusted domain type and a non-trusted domain type. The method (500) further includes the step of limiting the one or more service indications based on determining the type of the one or more AS units (110).

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## METHOD AND SYSTEM FOR MANAGING DATA REPOSITORY

### FIELD OF THE INVENTION

**[0001]** The present invention relates to the field of wireless communication system, more particularly relates to a method and system for managing a data repository.

### BACKGROUND OF THE INVENTION

**[0002]** The present invention relates to the field of telecommunications, and more specifically to the management and storage of subscriber data in a Home Subscriber Server (HSS) within an IP Multimedia Subsystem (IMS) network. In modern telecommunications networks, a subscriber can have multiple services, each associated with different profiles. During the registration of a subscriber, information about the services subscribed to by the user is shared. This information is stored in the HSS, which serves as a centralized database for subscriber data.

**[0003]** The HSS communicates with various application servers, each responsible for different services. These application servers register with the HSS, storing data related to their respective services. In particular, the HSS stores the application/service data of the application servers as a transparent data against service indications, meaning the HSS does not process or interpret the data, it merely stores whatever data is sent by the application servers. The HSS supports network entities that handle calls and sessions, such as application servers and Call State Control Function servers (CSCF). The HSS stores user profiles, performs authentication and authorization of users and application servers, and can provide information about the physical location/PLMN, status of users.

**[0004]** Application servers in the network can host and execute services, and they can communicate with the HSS to read or update user data. This communication is facilitated by a DIAMETER protocol over the Interface. The DIAMETER protocol

performs authentication, authorization, and accounting (AAA) functions in the IMS and Next Generation Networks.

[0005] The HSS stores data related to different services of application servers as transparent data, meaning the HSS does not process or interpret this data. It merely stores the data as received and provides it when requested. This data can include service indications, which are proprietary and not standard defined. An application server can send any number of service indications to the HSS for storage.

[0006] The HSS also supports the ability for different application servers to change their data. For example, data related to call forwarding for a subscriber can be maintained and updated by a specific application server. If this data changes, it is reflected in the HSS database.

[0007] Furthermore, the HSS can notify other application servers of changes to this data if they have subscribed to such notifications. This is particularly useful when multiple application servers need to be aware of changes to a particular service.

[0008] However, managing access to the data stored in the HSS is a critical aspect. There are two types of authorizations, one for determining which application servers can access the data, and another for managing trusted and untrusted domains. Trusted domains can include internal network entities, while untrusted domains can include regulatory servers that may need access to the data.

[0009] A challenge arises when application servers send a large number of service indications, consuming significant storage in the HSS, which is also used for subscriber management.

[0010] This invention seeks to address the problem of storing untrusted or containing potential threat service data. There is a need for a solution that can check and regulate the type of data being stored at the HSS, contributing to the security and effective operation of the HSS.

## SUMMARY OF THE INVENTION

[0011] One or more embodiments of the present disclosure provide a method and system for managing a data repository.

[0012] In one aspect of the present invention, the method of managing a data repository is disclosed. The method includes the step of receiving by one or more processors one or more service indications from one or more Application Server (AS) units via a network. The method further includes the step of pre-configuring by the one or more processors the one or more service indications associated with the one or more AS units. The method further includes the step of determining by the one or more processors a type of the one or more AS units, the type of the one or more AS units is one of a trusted domain type and a non-trusted domain type. The method further includes the step of limiting by the one or more processors, the one or more service indications based on determining the type of the one or more AS units.

[0013] In one embodiment, upon receipt of the one or more service indications, the method further comprises the step of registering by the one or more processors the one or more AS units and the one or more received service indications received from the one or more AS units at a Home Subscriber Server (HSS).

[0014] In another embodiment, upon registration, the method further comprises the step of serving a User Data Request (UDR) and a notification- request for the one or more service indications that are associated with the one or more AS units.

[0015] In yet another embodiment, the method further comprises the step of storing by the one or more processors data corresponding to one or more service indications corresponding to multiple services provided by each of the one or more AS units.

[0016] In yet another embodiment, the trusted domain type pertains to domains maintained by a service provider and non-trusted domain type is one of a regulatory application and a third-party application.

[0017] In yet another embodiment, the step of limiting the one or more service indication comprises providing by the one or more processors limited access of the HSS to the non-trusted domain type or send error code to the non-trusted domain type, the limited access is based on a data limit check between the HSS and the one or more AS units.

[0018] In another aspect of the present invention, the system for managing a data repository is disclosed. The system includes a receiving unit configured to receive one or more service indications from one or more Application Server (AS) units via a network. The system further includes a pre-configuration unit configured to pre-configure the one or more service indications associated with the one or more AS units. The system further includes a determination unit configured to determine a type of the one or more AS units, the type of the one or more AS units is one of a trusted domain type and a non-trusted domain type. The system further includes a limiting unit configured to limit the one or more service indications based on determining the type of the one or more AS units.

[0019] In another aspect of the present invention, User Equipment (UE) is disclosed. The UE includes an application module for hosting one or more applications on the UE and one or more primary processors communicatively coupled to one or more processors. The one or more primary processors coupled with a memory. The memory stores instructions which when executed by the one or more primary processors causes the UE to generate and transmit a request to a one or more Application Server (AS) units. Further, the one or more processors are configured to perform the method for managing a data repository.

[0020] In yet another aspect of the present invention, a non-transitory computer-readable medium having stored thereon computer-readable instructions that, when executed by a processor is disclosed. The processor is configured to receive, one or more service indications from one or more Application Server (AS) units via a network. The processor is further configured to pre-configure the one or more service

indications associated with the one or more AS units. The processor is further configured to determine a type of the one or more AS units, the type of the one or more AS units is one of a trusted domain type and a non-trusted domain type. The processor is further configured limit the one or more service indications based on determining the type of the one or more AS units.

[0021] Other features and aspects of this invention will be apparent from the following description and the accompanying drawings. The features and advantages described in this summary and in the following detailed description are not all-inclusive, and particularly, many additional features and advantages will be apparent to one of ordinary skill in the relevant art, in view of the drawings, specification, and claims hereof. Moreover, it should be noted that the language used in the specification has been principally selected for readability and instructional purposes and may not have been selected to delineate or circumscribe the inventive subject matter, resort to the claims being necessary to determine such inventive subject matter.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0022] The accompanying drawings, which are incorporated herein, and constitute a part of this disclosure, illustrate exemplary embodiments of the disclosed methods and systems in which like reference numerals refer to the same parts throughout the different drawings. Components in the drawings are not necessarily to scale, emphasis instead being placed upon clearly illustrating the principles of the present disclosure. Some drawings may indicate the components using block diagrams and may not represent the internal circuitry of each component. It will be appreciated by those skilled in the art that disclosure of such drawings includes disclosure of electrical components, electronic components or circuitry commonly used to implement such components.

[0023] **FIG. 1** is an exemplary block diagram of a communication system for managing a data repository, according to one or more embodiments of the present invention;

[0024] **FIG. 2** is an exemplary block diagram of a system for managing a data repository, according to one or more embodiments of the present invention;

[0025] **FIG. 3** is an exemplary flow diagram of the system of **FIG. 2**, according to one or more embodiments of the present invention;

[0026] **FIG. 4** is a signal flow diagram illustrating the flow for managing a data repository, according to one or more embodiments of the present disclosure; and

[0027] **FIG. 5** is a flow diagram of a method for managing a data repository, according to one or more embodiments of the present invention.

[0028] The foregoing shall be more apparent from the following detailed description of the invention.

#### DETAILED DESCRIPTION OF THE INVENTION

[0029] Some embodiments of the present disclosure, illustrating all its features, will now be discussed in detail. It must also be noted that as used herein and in the appended claims, the singular forms "a", "an" and "the" include plural references unless the context clearly dictates otherwise.

[0030] Various modifications to the embodiment will be readily apparent to those skilled in the art and the generic principles herein may be applied to other embodiments. However, one of ordinary skill in the art will readily recognize that the present disclosure including the definitions listed here below are not intended to be limited to the embodiments illustrated but is to be accorded the widest scope consistent with the principles and features described herein.

[0031] A person of ordinary skill in the art will readily ascertain that the illustrated steps detailed in the figures and here below are set out to explain the exemplary embodiments shown, and it should be anticipated that ongoing technological development will change the manner in which particular functions are performed. These examples are presented herein for purposes of illustration, and not limitation. Further, the boundaries of the functional building blocks have been arbitrarily defined herein for the convenience of the description. Alternative boundaries can be defined so long as the specified functions and relationships thereof are appropriately performed. Alternatives (including equivalents, extensions, variations, deviations, etc., of those described herein) will be apparent to persons skilled in the relevant art(s) based on the teachings contained herein. Such alternatives fall within the scope and spirit of the disclosed embodiments.

[0032] The present invention provides a system and method for managing a data repository. The invention introduces an additional level of authorization to manage the storage of service indications data in a repository such as a Home Subscriber Server (HSS), which is achieved by limiting the service indication data based on a mutual agreement between the repository and one or more Application Server (AS) units. This agreement specifies types of service indications that the one or more AS transmits to store in the repository, thereby preventing the repository storage from being overwhelmed.

[0033] Referring to **FIG. 1**, **FIG. 1** illustrates an exemplary block diagram of a communication system **100** for managing a data repository, according to one or more embodiments of the present invention. The communication system **100** includes, a User Equipment (UE) **102**, a server **104**, a system **108**, and one or more Application Server (AS) units **110**.

[0034] As per the illustrated embodiment and for the purpose of description and explanation, the description will be explained with respect to the user equipment's (UEs) **102**, or to be more specific will be explained with respect to a first UE **102a**, a

second UE **102b**, and a third UE **102c** of the first set of UEs **102**, and should nowhere be construed as limiting the scope of the present disclosure. Each of the at least one UE **102** namely the first UE **102a**, the second UE **102b**, and the third UE **102c** is configured to connect to the server **104** via a network **106**. Further, at least one of the UE **102** is connected to the one or more AS units **110** via the network **106**.

[0035] In an embodiment, each of the UE **102** is one of, but not limited to, any electrical, electronic, electro-mechanical or an equipment and a combination of one or more of the above devices such as virtual reality (VR) devices, augmented reality (AR) devices, laptop, a general-purpose computer, desktop, personal digital assistant, tablet computer, mainframe computer, or any other computing device.

[0036] The network **106** includes, by way of example but not limitation, one or more of a wireless network, a wired network, an internet, an intranet, a public network, a private network, a packet-switched network, a circuit-switched network, an ad hoc network, an infrastructure network, a Public-Switched Telephone Network (PSTN), a cable network, a cellular network, a satellite network, a fiber optic network, or some combination thereof. The network **106** may include, but is not limited to, a Third Generation (3G), a Fourth Generation (4G), a Fifth Generation (5G), a Sixth Generation (6G), a New Radio (NR), a Narrow Band Internet of Things (NB-IoT), an Open Radio Access Network (O-RAN), and the like.

[0037] The network **106** may also include, by way of example but not limitation, at least a portion of one or more networks having one or more nodes that transmit, receive, forward, generate, buffer, store, route, switch, process, or a combination thereof, etc. one or more messages, packets, signals, waves, voltage or current levels, some combination thereof, or so forth. The network **106** may also include, by way of example but not limitation, one or more of a wireless network, a wired network, an internet, an intranet, a public network, a private network, a packet-switched network, a circuit-switched network, an ad hoc network, an infrastructure network, a Public-

Switched Telephone Network (PSTN), a cable network, a cellular network, a satellite network, a fiber optic network, a VOIP or some combination thereof.

[0038] The communication system **100** includes the server **104** accessible via the network **106**. The server **104** may include by way of example but not limitation, one or more of a standalone server, a server blade, a server rack, a bank of servers, a server farm, hardware supporting a part of a cloud service or system, a home server, hardware running a virtualized server, a processor executing code to function as a server, one or more machines performing server-side functionality as described herein, at least a portion of any of the above, some combination thereof. In an embodiment, the entity may include, but is not limited to, a vendor, a network operator, a company, an organization, a university, a lab facility, a business enterprise side, a defense facility side, or any other facility that provides service.

[0039] The communication system **100** further includes the one or more Application Server (AS) units **110**. The one or more AS units **110** in the embodiments of this application is a carrier that can provide a corresponding service. For example, one or more messaging AS units **110** may be a carrier that can provide a messaging service. The carrier in the embodiments of this application may be a virtual device, or maybe a physical device. This is not specifically limited in the embodiments of this application. The virtual device herein may be, for example, a virtual machine or a container. This is not specifically limited in the embodiments of this application. The one or more AS units **110** are a server program in a computer in a distributed network that provides the business logic for an application program. It plays a crucial role in modern applications built on the latest microservices architecture. The one or more AS units **110** are typically used for complex transaction-oriented applications.

[0040] Different implementations of the one or more AS units **110** can be seen in various programming environments. For example, in the Java environment, the one or more AS units **110** are like Apache Tomcat, JBoss, and GlassFish. In the .NET

environment, there is an Internet Information Services (IIS) as the primary one or more AS units **110**.

[0041] The communication system **100** further includes the system **108** communicably coupled to the server **104**, the one or more AS units **110**, and the UE **102**, via the network **106**. In one or more embodiments, the system **108** is adapted to be embedded within the server **104** or is embedded as an individual entity. However, for the purpose of description, the system **108** is illustrated as remotely coupled with the server **104**, without deviating from the scope of the present disclosure.

[0042] Operational and construction features of the system **108** will be explained in detail with respect to the following figures.

[0043] **FIG. 2** is an exemplary block diagram of the system **108** for managing the data repository, according to one or more embodiments of the present invention.

[0044] As per the illustrated and preferred embodiment, the system **108** includes one or more processors **202**, a memory **204**, and a Home Subscriber Server (HSS) **218**. However, for the purpose of description, the system **108** illustrated is adapted to be part of the HSS **218** or HSS **218** front end. In an alternate embodiment, the system **108** illustrated is embedded as an individual entity. The one or more processors **202** includes a receiving unit **206**, a pre-configuration unit **208**, a determination unit **210**, a limiting unit **212**, a registration unit **214** and a storage unit **216**. The one or more processors **202**, hereinafter referred to as the processor **202**, may be implemented as one or more microprocessors, microcomputers, microcontrollers, digital signal processors, central processing units, state machines, logic circuitries, single board computers, and/or any devices that manipulate signals based on operational instructions. However, it is to be noted that the system **108** may include multiple processors as per the requirement and without deviating from the scope of the present disclosure. Among other capabilities, the processor **202** is configured to fetch and execute computer-readable instructions stored in the memory **204**.

[0045] As per the illustrated embodiment, the processor **202** is configured to fetch and execute computer-readable instructions stored in the memory **204** as the memory **204** is communicably connected to the processor **202**. The memory **204** is configured to store one or more computer-readable instructions or routines in a non-transitory computer-readable storage medium, which may be fetched and executed to managing the data repository. The memory **204** may include any non-transitory storage device including, for example, volatile memory such as RAM, or non-volatile memory such as disk memory, EPROMs, FLASH memory, unalterable memory, and the like.

[0046] As per the illustrated and preferred embodiment, the processor **202** is communicably coupled to the HSS **218** which serves as the repository or primary database of subscriber information within a Long Term Evolution (LTE)/ Evolved Packet Core (EPC) or IP Multimedia Subsystem (IMS) network core. Further, the HSS **218** is a carrier grade, high capacity, fault tolerant and scalable cluster solution designed to serve millions of network elements in at least one of, the network **106**. The HSS **218** is a converged solution to serve 2G/3G/4G and 5G subscribers. The HSS **218** supports a Home Location Register (HLR) and Equipment Identification Register (EIR) functionality compliant to 3GPP specifications. Further, the HSS **218** supports diameter interfaces and is capable to integrate with any 3GPP compliant Mobility Management Entity (MME) unit, Service Capability Exposure Function (SCEF), Short Message Service Center (SMSC), Call Session Control Function (CSCF), one or more Application Server (AS) units **110** and Gateway Mobile Location Centre (GMLC).

[0047] The HSS **218** stores data related to different services of one or more AS units **110** as transparent data. In particular, the HSS **218** does not process or interpret the data related to different services. The HSS **218** merely stores the data as received from the one or more AS units **110** via the processor **202** and further provides the data when requested by the network elements of the network **106**. The transparent data can include service indications, which are proprietary and not standard defined. The one or more AS units **110** transmits any number of service indications to the HSS **218** for storage.

[0048] For example, the different services provided by the one or more AS units **110** includes at least one of, but not limited to, a call forwarding service, a missed call alert service, a true caller service.

[0049] In an embodiment, the HSS **218** allows the one or more AS units **110** to download and update a service profile of the subscriber. An interface such as at least one of, but not limited to, an Sh interface allows the one or more AS units **110** to communicate with the HSS **218** to extract the necessary data. Further, the Sh interface is used to subscribe for any change in the subscriber profiles.

[0050] In an embodiment, the HSS **218** supports service data handling procedures in order to facilitate downloading and updating data pertaining to at least one of, but not limited to, the service profile of the subscriber to/from the one or more AS units **110**. The HSS **218** stores the data read and update permissions assigned to one or more AS units **110** in the network **106**. The HSS **218** stores and provides repository data specific to services offered to subscriber by the one or more AS units **110**. The HSS **218** stores and provides the one or more AS units **110** at least one of, but not limited to, an IP Multimedia Subsystem (IMS) public identity, an IMS user state, a Serving-Call Session Control Function (S-CSCF) name, Short Message Service (SMS) registration information, location information, a CS Domain Routing Number (CSRN), a Mobile Station International Subscriber Directory Number (MSISDN) and an International Mobile Subscriber Identity (IMSI). The HSS **218** supports Notif-Eff and Update-Eff features for optimal operations on the Sh interface.

[0051] In an embodiment, the service data updates procedures that allows the one or more AS units **110** to update transparent (repository) data stored at the HSS **218** for each IMS public user identity. Further, the service data update procedures allows the one or more AS units **110** (IP Short Message Gateway IPSM) to update the SMS registration information stored at the HSS **218**.

[0052] In an embodiment, the HSS **218** supports subscription and notification procedures. The HSS **218** stores the subscription data of the one or more AS units **110** for changes in at least one of, the user profile, the service data and the user state information. The HSS **218** supports providing the one or more AS units **110** the subscribed data in the response to the subscription transaction which notifies the one or more AS units **110** that has subscribed for notification related to any change occurred in the stored subscription data. The HSS **218** also supports unsubscribing for any subscribed events as well as subscription expiry.

[0053] In an embodiment, the receiving unit **206** of the processor **202** is configured to receive the one or more service indications from the one or more AS units **110** based on a request received from the UE **102**. Upon receipt of the one or more service indications, the registration unit **214** of the processor **202** is configured to register the one or more AS units **110** and the one or more service indications received from the one or more AS units **110** at the HSS **218** of the system **108**. Further, the registration unit **206** is configured to serve the User Data Request (UDR) and an Sh notification request for the one or more service indications that are associated with the one or more AS units **110**.

[0054] In another embodiment, the one or more AS units **110** uses a command such as a User Data Request (UDR) in order to request data from the HSS **218** and to register the one or more AS units **110** at the HSS **218**. The one or more AS units **110** communicates with the HSS **218** using the DIAMETER Protocol over a Sh interface. The Sh interface allows the one or more AS units **110** to communicate with the HSS **218** so that the one or more AS units **110** can receive the necessary data from the HSS **218** to provide the service to a user.

[0055] In another embodiment, the Sh notification request is invoked by the HSS **218** to inform the one or more AS units **110** regarding the changes in the transparent data and/or non-transparent data to which the one or more AS units **110** has previously subscribed to receive notifications.

[0056] In an embodiment, the pre-configuration unit **208** of the processor **202** is configured to pre-configure the one or more service indications associated with the one or more AS units **110**. In particular, one or more lists of the one or more service indications associated with the one or more AS units **110** and the one or more rules are pre-configured by the pre-configuration unit **208**. The one or more pre-configured lists and the one or more pre-configured rules are utilized by the processor **202** in order to manage the accessing of the HSS **218** by the one or more AS units **110**.

[0057] In an embodiment, the one or more lists includes the list of at least one of, but not limited to, the one or more service indications for each of the one or more AS units **110** associated within the network of the service provider and the one or more service indications for each of the one or more AS units **110** associated with the network of the third-party.

[0058] In an embodiment, the one or more pre-configured rules includes at least one of, but not limited to, allowing accessing of the HSS **218** to the one or more AS units **110** for a pre-defined time period, and restriction for accessing of the HSS **218** to the one or more AS units **110**.

[0059] In an embodiment, the determination unit **210** of the processor **202** is configured to determine a type of the one or more AS units **110**. In particular, the type of the one or more AS units **110** is one of, a trusted domain type and a non-trusted domain type. In particular, the trusted domain type pertains to domains maintained by a service provider and non-trusted domain type pertains to domains maintained by a third-party entity.

[0060] In an embodiment, the limiting unit **212** of the processor **202** is configured to limit the one or more service indications based on determining the type of the one or more AS **110**. The limiting unit **212** is configured to provide limited access of the HSS **218** to the non-trusted domain type or send error code to the non-trusted domain

type. In particular, the limited access is based on a data limit check between the HSS **218** and the one or more AS **110**.

[0061] In an embodiment, the storage unit **216** of the processor **202** is configured to store data corresponding to the one or more service indications corresponding to multiple services provided by each of the one or more AS units **110**. In particular, the one or more service indications are syntactically deciphered by the HSS **218**. Further, the storage unit **216** is configured to store data syntactically and semantically which are not deciphered by the HSS **218**.

[0062] For example, the multiple services provided by the one or more AS units **110** includes at least one of, but not limited to, a call forwarding service, a miss call alert service, and a true caller service.

[0063] As per the illustrated embodiment, the storage unit **216** is a master database configured to store the data provided by the one or more AS units **110**. The storage unit **216** is one of, but not limited to, a centralized database, a cloud-based database, a commercial database, an open-source database, a distributed database, an end-user database, a graphical database, a No-Structured Query Language (NoSQL) database, an object-oriented database, a personal database, an in-memory database, a document-based database, a time series database, a wide column database, a key value database, a search database, a cache databases, and so forth. The foregoing examples of storage unit types are non-limiting and may not be mutually exclusive e.g., a database can be both commercial and cloud-based, or both relational and open-source, etc.

[0064] The receiving unit **206**, the pre-configured unit **208**, the determination unit **210**, the limiting unit **212**, the registration unit **214**, and the storage unit **216** in an exemplary embodiment, are implemented as a combination of hardware and programming (for example, programmable instructions) to implement one or more functionalities of the processor **202**. In the examples described herein, such combinations of hardware and programming may be implemented in several different

ways. For example, the programming for the processor **202** may be processor-executable instructions stored on a non-transitory machine-readable storage medium and the hardware for the processor may comprise a processing resource (for example, one or more processors), to execute such instructions. In the present examples, the memory **204** may store instructions that, when executed by the processing resource, implement the processor **202**. In such examples, the system **108** may comprise the memory **204** storing the instructions and the processing resource to execute the instructions, or the memory **204** may be separate but accessible to the system **108** and the processing resource. In other examples, the processor **202** may be implemented by electronic circuitry.

[0065] **FIG. 3** illustrates an exemplary block diagram of an architecture for the system **108** of **FIG. 2**, according to one or more embodiments of the present invention. More specifically, **FIG. 3** illustrates the system **108** configured for managing the data repository. It is to be noted that the embodiment with respect to **FIG. 3** will be explained with respect to the UE **102** for the purpose of description and illustration and should nowhere be construed as limited to the scope of the present disclosure.

[0066] **FIG. 3** shows communication between the UE **102** and the system **108** via at least one of but not limited to, a Radio Access Network (RAN), one or more network elements such as a Mobility Management Entity (MME). For the purpose of description of the exemplary embodiment as illustrated in **FIG. 3**, the UE **102** uses network protocol connection to communicate with the system **108**. In an embodiment, the network protocol connection is the establishment and management of communication between the UE **102** and the system **108** over the network **106** using a specific protocol or set of protocols. The network protocol connection includes, but not limited to, Session Initiation Protocol (SIP), System Information Block (SIB) protocol, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), File Transfer Protocol (FTP), Hypertext Transfer Protocol (HTTP), Simple Network Management Protocol (SNMP), Internet Control Message Protocol (ICMP), Hypertext Transfer Protocol Secure (HTTPS) and Terminal Network (TELNET).

[0067] In an embodiment, the UE **102** includes a primary processor **302**, a memory **304**, and an application module **306**. In alternate embodiments, the UE **102** may include more than one primary processor **302** as per the requirement of the first network **106**. The primary processor **302**, may be implemented as one or more microprocessors, microcomputers, microcontrollers, digital signal processors, central processing units, state machines, logic circuitries, single board computers, and/or any devices that manipulate signals based on operational instructions.

[0068] In an embodiment, the primary processor **302** is configured to fetch and execute computer-readable instructions stored in the memory **304**. The memory **304** may be configured to store one or more computer-readable instructions or routines in a non-transitory computer-readable storage medium, which may be fetched and executed to manage the data repository. The memory **304** may include any non-transitory storage device including, for example, volatile memory such as RAM, or non-volatile memory such as disk memory, EPROMs, FLASH memory, unalterable memory, and the like.

[0069] In an embodiment, the application module **306** is configured to host one or more applications on the UE **102**. Further, the UE **102** generates and transmit the request to the one or more AS units **110** via the RAN. The request transmitted by UE **102** pertains to get services from the one or more AS units **110**. Further, the one or more AS units **110** transmits one or more service indications to the processor **202** of the system **108** via the network **106** based on the request received from the UE **102**. Thereafter, the processor **202** registers the one or more AS units **110** and the one or more service indications at the HSS **218** by transmitting a registration request to the HSS **218**.

[0070] In an alternate embodiment, along with the one or more service indications, the one or more AS units **110** transmits the registration request to the processor **202** of the system **108** in order to register the one or more AS units **110** at the HSS **218**. Subsequent to the registration of the one or more AS units **110** and the service

indications at the HSS **218**, the processor **202** transmits the registration request such as a User Data Request (UDR) to update or retrieve data from the HSS **218**. The processor is configured to serve the UDR and the Sh notification request.

[0071] Further, upon registration of the one or more AS units **110** at the HSS **218** and serving the UDR request, the determination unit **210** of the processor **202** determines the type of the one or more AS units **110**. The type of the one or more AS units **110** is at least one of, but not limited to, the trusted domain type and the non-trusted domain type. For example, if the one or more AS units **110** is associated within the network of the service provider, then these one or more AS units **110** are inferred by the determination unit **210** as the trusted domain type. Alternatively, if the one or more AS units **110** are associated with the network of the third-party, then these one or more AS units **110** are inferred by the determination unit **210** as the non-trusted domain type.

[0072] If the one or more AS units **110** are determined as the trusted domain type, then the data received from the trusted one or more AS units **110** corresponding to one or more service indications which are related to multiple services provided by the one or more AS units **110** are stored and maintained in the HSS **218** based on the one or more pre-configured lists and the one or more pre-configured rules. The one or more pre-configured lists includes the list of the one or more service indications which are allowed to be stored and maintained in the HSS **218** for the trusted one or more AS units **110**. In particular, to one or more service indications are stored in the HSS **218** based on a mutual agreement between the trusted one or more AS units **110** and the HSS **218**.

[0073] If the one or more AS units **110** are determined as the non-trusted domain type, then the limiting unit **212** of the processor **202** limits storage of the data received from the trusted one or more AS units **110** corresponding to one or more service indications in the HSS **218** based on the one or more pre-configured lists and the one or more pre-configured rules. The pre-configured list includes the list of the one or

more service indications which are allowed to be stored and maintained in the HSS **218** for the non-trusted one or more AS units **110**. In particular, the limiting unit **212** provides limited access to the HSS **218** for the non-trusted one or more AS units **110**. Alternatively, the limiting unit **212** of the processor **202** restricts the access to the HSS **218** for the non-trusted one or more AS units **110** based on the one or more pre-configured lists and the one or more pre-configured rules.

[0074] In another embodiment, let's us assume that the determination unit **210** identifies non-trusted one or more AS units **110** including a third party application such as a true caller application. The true caller application provides service such as translating a phone number into name for incoming calls received by the UE **102**. Based on the determination, the limiting unit **212** allows access to the data from the HSS **218** which is required by the true caller application in order to translate the phone number into name for incoming call and further limits the access to the data related to the other services such as call forwarding or missed call alert services which are not provided by the true caller application. Advantageously, the third-party applications can only access and operate the data from the HSS **218** for which the third-party applications are authorized, thereby high level of the security related to the data stored in the HSS **218** is ensured by the processor **202** when integrated with the third party application.

[0075] FIG. 4 is a signal flow diagram illustrating the flow for managing the data repository, according to one or more embodiments of the present disclosure.

[0076] At step **402**, the UE **102** transmits the request to the one or more AS units **110** via the Radio Access Network (RAN).

[0077] At step **404**, the one or more AS units **110** receives the request from the UE **102**, based on which the one or more service indications are transmitted from the one or more AS units **110** to the system **108**.

[0078] At step 406, upon receipt of the one or more services by the system 108, the processor 202 of the system 108 transmits the registration request at the HSS 218 in order to register the one or more service indications and the one or more AS units 110 at the HSS 218. Subsequent to the registration of the one or more service indications and the one or more AS units 110 at the HSS 218, the processor 202 further transmits another registration request which includes at least one of, the User Data Request (UDR) to update/retrieve data from the HSS 218 and an Sh-notification request. The processor 202 serves at least one of, the UDR and the Sh-notification request for the one or more service indications that are associated with the one or more AS units 110.

[0079] At step 408, the HSS 218 transmits a User-Data-Answer (UDA) to the processor 202 subsequent to the serving the registration request of the one or more AS units 110 and the one or more service indications.

[0080] At step 410, upon reception of the UDA at the processor 202 from the HSS 218, the processor 202 determines the type of the one or more AS units 110. Thereafter, based on the type of the one or more AS units 110, the processor 202 transmits at least one of, a limited access signal in order to limit the access of the HSS 218 and an error signal in order to restrict access of the HSS 218 to one or more AS units 110.

[0081] FIG. 5 is a flow diagram of a method 500 for managing the data repository, according to one or more embodiments of the present invention. For the purpose of description, the method 500 is described with the embodiments as illustrated in FIG. 2 and should nowhere be construed as limiting the scope of the present disclosure.

[0082] At step 502, the method 500 includes the step of receiving one or more service indications from one or more Application Server (AS) units 110 via a network 106. In one embodiment, the receiving unit 206 of the processor 202 is configured to receive the one or more service indications from the one or more AS units 110 to access the HSS 218. Based on the one or more service indications received at the

receiving unit **206**, the registration unit **214** is configured to at least one of, register the one or more AS units **110** and the one or more service indications at the HSS **218**, and update or retrieve data from the HSS **218**.

[0083] At step **504**, the method **500** includes the step of pre-configuring the one or more service indications associated with the one or more AS units **110**. In one embodiment, the pre-configuration unit **208** of the processor **202** is configured to pre-configure the one or more service indications associated with the one or more AS units **110**. The pre-configuration unit **208** includes one or more pre-configured lists of the one or more service indications for the various types of the one or more AS units **110**. In an alternate embodiment, the pre-configuration unit **208** includes one or more pre-configured rules for the various types of the one or more AS units **110**. The one or more pre-configured lists and the one or more pre-configured rules are utilized by the processor **202** in order to manage the accessing of the HSS **218** by the one or more AS units **110**.

[0084] At step **506**, the method **500** includes the step of determining a type of the one or more AS units **110**, wherein the type of the one or more AS units **110** is one of a trusted domain type and a non-trusted domain type. In one embodiment, the determination unit **210** of the processor **202** determines the type of the one or more AS units **110** subsequent to the registration of the one or more AS units **110** at the HSS **218**. In order to determine the type of the one or more AS units **110**, the determination unit **210** checks whether the registered one or more AS units **110** are associated with network of the service provider or associated with the network of the third-party. For example, if the determination unit **210** identifies that registered one or more AS units **110** are maintained by the service provider then the determination unit **210** infers the registered one or more AS units **110** as the trusted domain type and if the determination unit **210** identifies that registered one or more AS units **110** are maintained by the third-party then the determination unit **210** infers the registered one or more AS units **110** as the non-trusted domain type.

[0085] At step 508, the method 500 includes the step of limiting, the one or more service indications based on determining the type of the one or more AS units 110. In one embodiment, the limiting unit 212 of the processor 202 is configured to limit the one or more service indications based on the determination of the type of the one or more AS units 110. In particular, if the determination unit 210 determines that the one or more AS units 110 is the non-trusted domain type, then the limiting unit 212 limits the one or more service indications of the non-trusted one or more AS units 110 based on the pre-configured lists and pre-configured rules.

[0086] In one embodiment, the limiting unit 212 limits the access of the HSS 218 to the non-trusted one or more AS units 110 based on the pre-configured lists and the pre-configured rules by allowing the limited number of the one or more service indications of the non-trusted one or more AS units 110 to be stored and maintained in the HSS 218.

[0087] In another embodiment, the limiting unit 212 limits the access of the HSS 218 to the non-trusted one or more AS units 110 based on the pre-configured lists and the pre-configured rules by restricting accessing of the HSS 218 for the non-trusted domain type one or more AS units 110. The limiting unit 212 transmits an error code to the non-trusted one or more AS units 110 in order to restrict the accessing of the HSS 218.

[0088] In yet another embodiment, the limiting unit 212 limits the access of the HSS 218 to the non-trusted one or more AS units 110 based on the data limit check between the HSS 218 and the one or more AS units 110.

[0089] The present invention further discloses a non-transitory computer-readable medium having stored thereon computer-readable instructions. The computer-readable instructions are executed by the processor 202. The processor 202 is configured to receive one or more service indications from one or more Application Server (AS) units 110 via a network 106. The processor 202 is further configured to

pre-configure the one or more service indications associated with the one or more AS units **110**. The processor **202** is further configured to determine a type of the one or more AS units **110**, the type of the one or more AS units **110** is one of a trusted domain type and a non-trusted domain type. The processor **202** is further configured to limit the one or more service indications based on determining the type of the one or more AS units **110**.

**[0090]** A person of ordinary skill in the art will readily ascertain that the illustrated embodiments and steps in description and drawings (FIG.1-5) are set out to explain the exemplary embodiments shown, and it should be anticipated that ongoing technological development will change the manner in which particular functions are performed. These examples are presented herein for purposes of illustration, and not limitation. Further, the boundaries of the functional building blocks have been arbitrarily defined herein for the convenience of the description. Alternative boundaries can be defined so long as the specified functions and relationships thereof are appropriately performed. Alternatives (including equivalents, extensions, variations, deviations, etc., of those described herein) will be apparent to persons skilled in the relevant art(s) based on the teachings contained herein. Such alternatives fall within the scope and spirit of the disclosed embodiments.

**[0091]** The present disclosure provides technical advancements by introducing an additional level of authorization and differentiating between trusted and untrusted domains type of the one or more AS units. The invention ensures efficient management of the HSS storage and prevents unauthorized access to data included in the HSS. The invention ensures high security of the data stored in the HSS when integrated with the third party.

**[0092]** The present invention offers multiple advantages over the prior art and the above listed are a few examples to emphasize on some of the advantageous features. The listed advantages are to be read in a non-limiting manner.

## REFERENCE NUMERALS

- [0093] Communication system - 100;
- [0094] User Equipment (UE) - 102;
- [0095] Server - 104;
- [0096] Network- 106;
- [0097] System -108;
- [0098] Application server -110;
- [0099] Processor - 202;
- [00100] Memory - 204;
- [00101] Receiving unit – 206;
- [00102] Pre-configuration unit- 208;
- [00103] Determination unit – 210;
- [00104] Limiting unit – 212;
- [00105] Registration unit – 214;
- [00106] Storage unit – 216;
- [00107] HSS – 218;
- [00108] Primary processor- 302;
- [00109] Memory- 304;
- [00110] Application module – 306.

We Claim:

1. A system (108) for managing a data repository, the system (108) comprising:
  - a receiving unit (206) configured to receive, one or more service indications from one or more Application Server (AS) units (110) via a network (106);
  - a pre-configuration unit (208) configured to pre-configure, the one or more service indications associated with the one or more AS units (110);
  - a determination unit (210) configured to determine, a type of the one or more AS units (110), wherein the type of the one or more AS units (110) is one of a trusted domain type and a non-trusted domain type; and
  - a limiting unit (212) configured to limit, the one or more service indications based on determining the type of the one or more AS units (110).
2. The system (108) as claimed in claim 1, wherein the system (108) comprises a registration unit (214) configured to register the one or more AS units (110) and the one or more service indications received from the one or more AS units (110) at a Home Subscriber Server (HSS) (218).
3. The system (108) as claimed in claim 2, wherein the registration unit (214) is configured to serve a User Data Request (UDR) and a notification request for the one or more service indications that are associated with the one or more AS units (110).
4. The system (108) as claimed in claim 1, wherein the system (108) comprises a storage unit (216) configured to store, data corresponding to the one or more service indications corresponding to multiple services provided by each of the one or more AS units (110), wherein the one or more service indications are syntactically deciphered by the HSS (218).

5. The system (108) as claimed in claim 4, wherein the storage unit (216) is configured to store data syntactically and semantically which are not deciphered by the HSS (218).
6. The system (108) as claimed in claim 1, wherein the trusted domain type pertain to domains maintained by a service provider and non-trusted domain type pertains to domains maintained by a third party entity.
7. The system (108) as claimed in claim 1, wherein the limiting unit (212) is configured to provide limited access of the HSS (218) to the non-trusted domain type or send error code to the non-trusted domain type, wherein the limited access is based on a data limit check between the HSS (218) and the one or more AS units (110).
8. A method (500) for managing a data repository, the method (500) comprising the steps of:
  - receiving, by one or more processors (202), one or more service indications from one or more Application Server (AS) units (110) via a network (106);
  - pre-configuring, by the one or more processors (202), the one or more service indications associated with the one or more AS units (110);
  - determining, by the one or more processors (202), a type of the one or more AS units (110), wherein the type of the one or more AS units (110) is one of a trusted domain type and a non-trusted domain type; and
  - limiting, by the one or more processors (202), the one or more service indications based on determining the type of the one or more AS units (110).
9. The method (500) as claimed in claim 8, wherein upon receipt of the one or more service indications, the method (500) comprises the step of registering, by the one or more processors (202), the one or more AS units (110) and the one or more service indications received from the one or more AS units (110) at a Home Subscriber Server (HSS) (218).

10. The method (500) as claimed in claim 8, wherein upon registration, the method (500) comprises the step of serving a User Data Request (UDR) and a notification request for the one or more service indications that are associated with the one or more AS units (110).
11. The method (500) as claimed in claim 8, wherein the method (500) comprises the step of storing, by the one or more processors (202), data corresponding to one or more service indications corresponding to multiple services provided by each of the one or more AS units (110).
12. The method (500) as claimed in claim 8, wherein the trusted domain type pertain to domains maintained by a service provider and non-trusted domain type is one of a regulatory application and a third-party application.
13. The method (500) as claimed in claim 8, wherein the step of limiting the one or more service indication comprises providing, by the one or more processors (202), limited access of the HSS (218) to the non-trusted domain type or send error code to the non-trusted domain type, wherein the limited access is based on a data limit check between the HSS (218) and the one or more AS units (110).
14. A non-transitory computer-readable medium having stored thereon computer-readable instructions that, when executed by a processor (202), cause the processor (202) for processing requests in a network (106), the method (500) comprising:
  - receive, one or more service indications from one or more Application Server (AS) units (110) via a network (106);
  - pre-configure, the one or more service indications associated with the one or more AS units (110);

determine, a type of the one or more AS units (110), wherein the type of the one or more AS units (110) is one of a trusted domain type and a non-trusted domain type; and

limit, the one or more service indications based on determining the type of the one or more AS units (110).

15. A user equipment (102) comprising:

an application module (306) for hosting one or more applications on the user equipment (102);

one or more primary processors (302) communicatively coupled to one or more processors (202) in a system (108), the one or more primary processors (302) coupled with a memory (304), wherein said memory (304) stores instructions which when executed by the one or more primary processors (304) causes the UE (102) to:

generate and transmit a request to an one or more Application Server (AS) units (110),

wherein the one or more processors (202) is configured to perform the steps as claimed in claim 8.

1/5

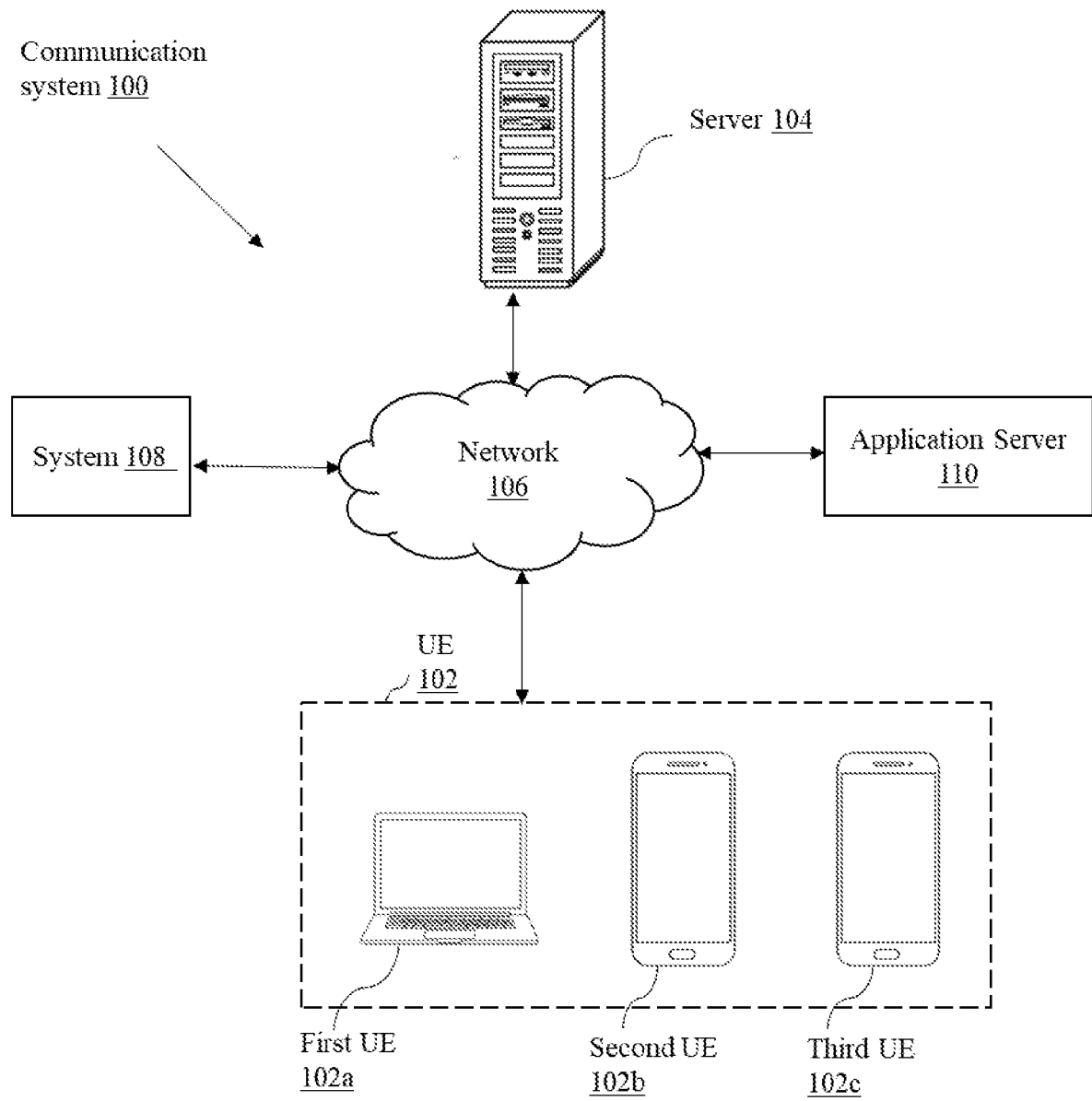


FIG. 1

2/5

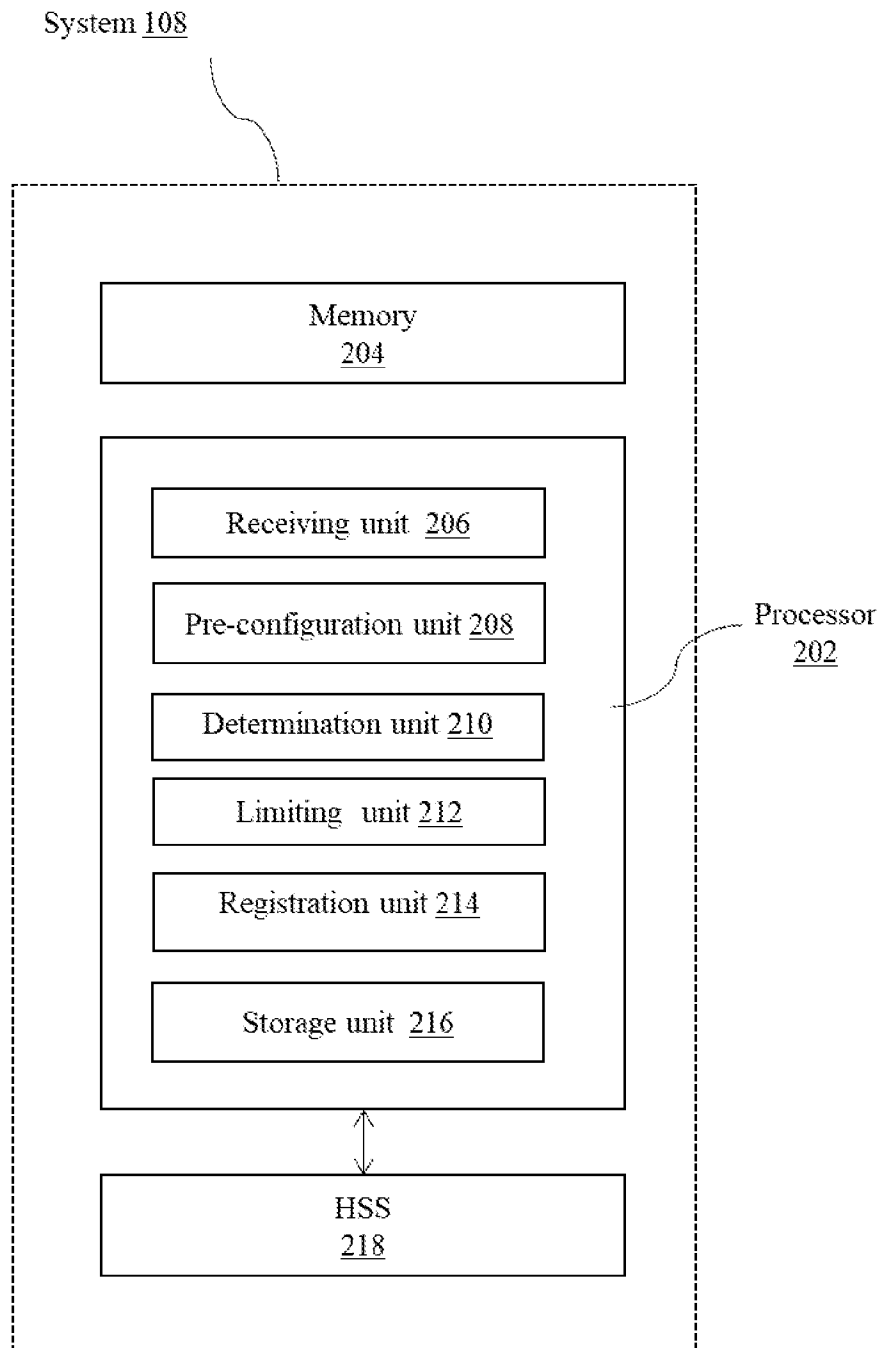


FIG. 2

3/5

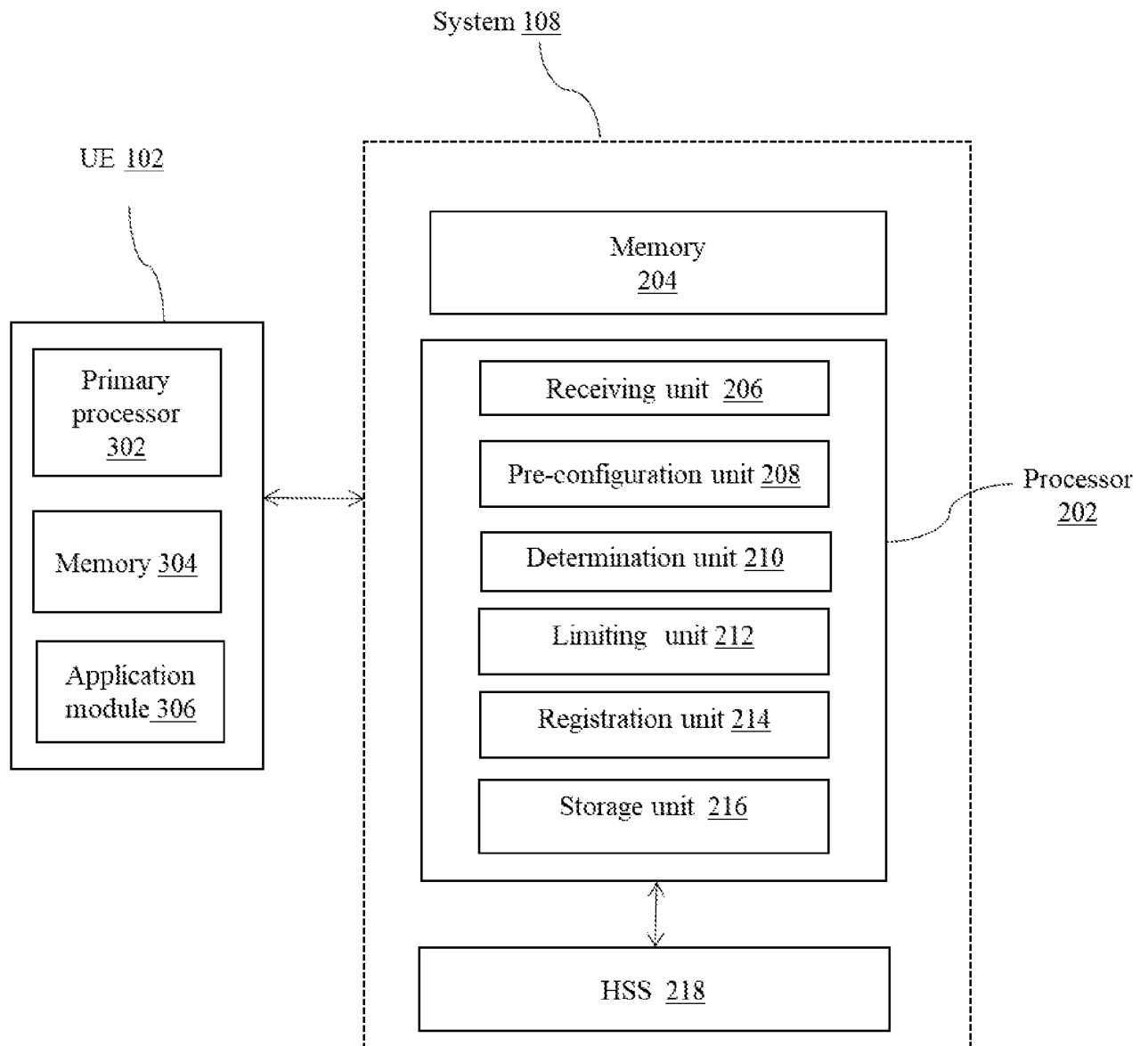


FIG. 3

4/5

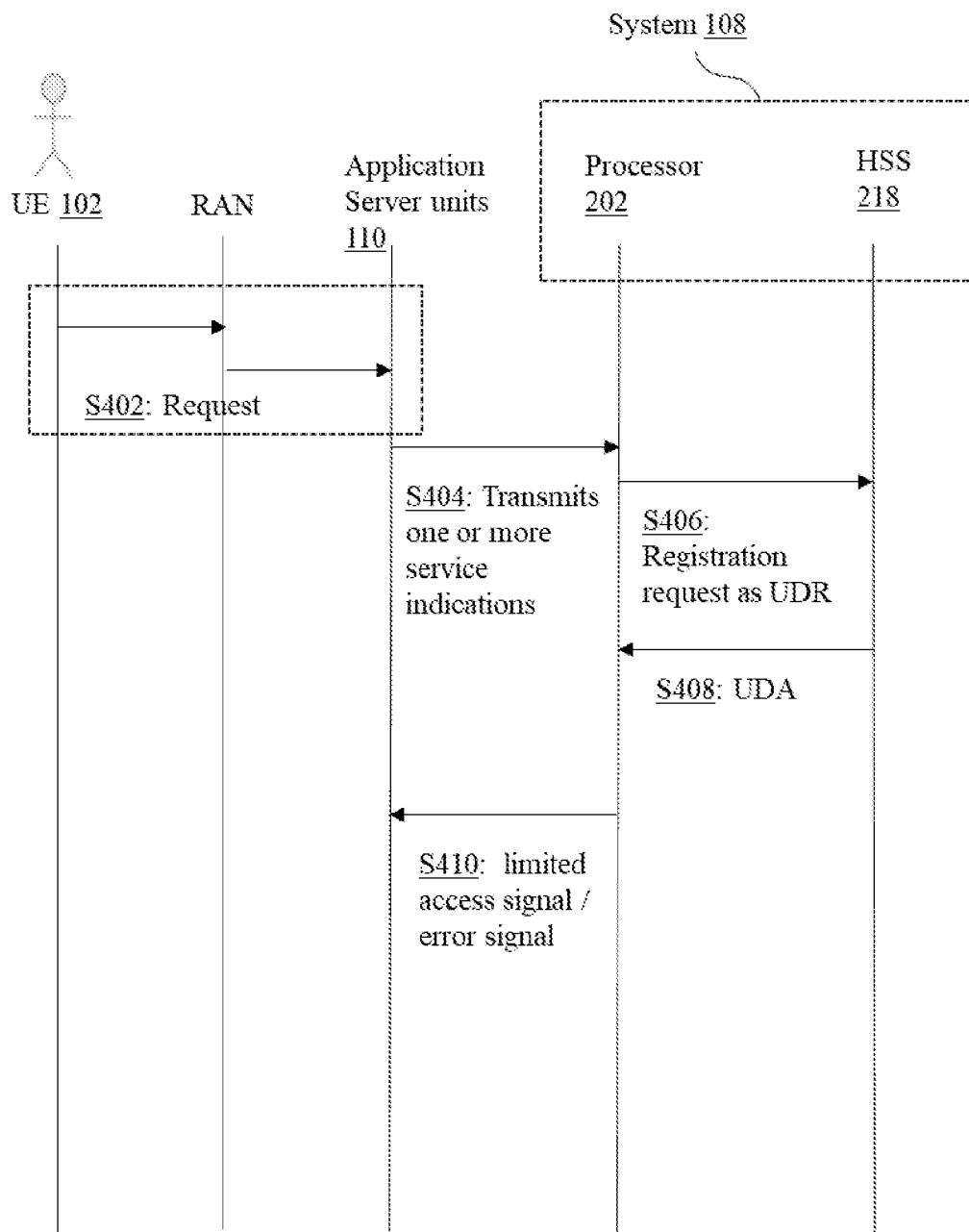


FIG. 4

5/5

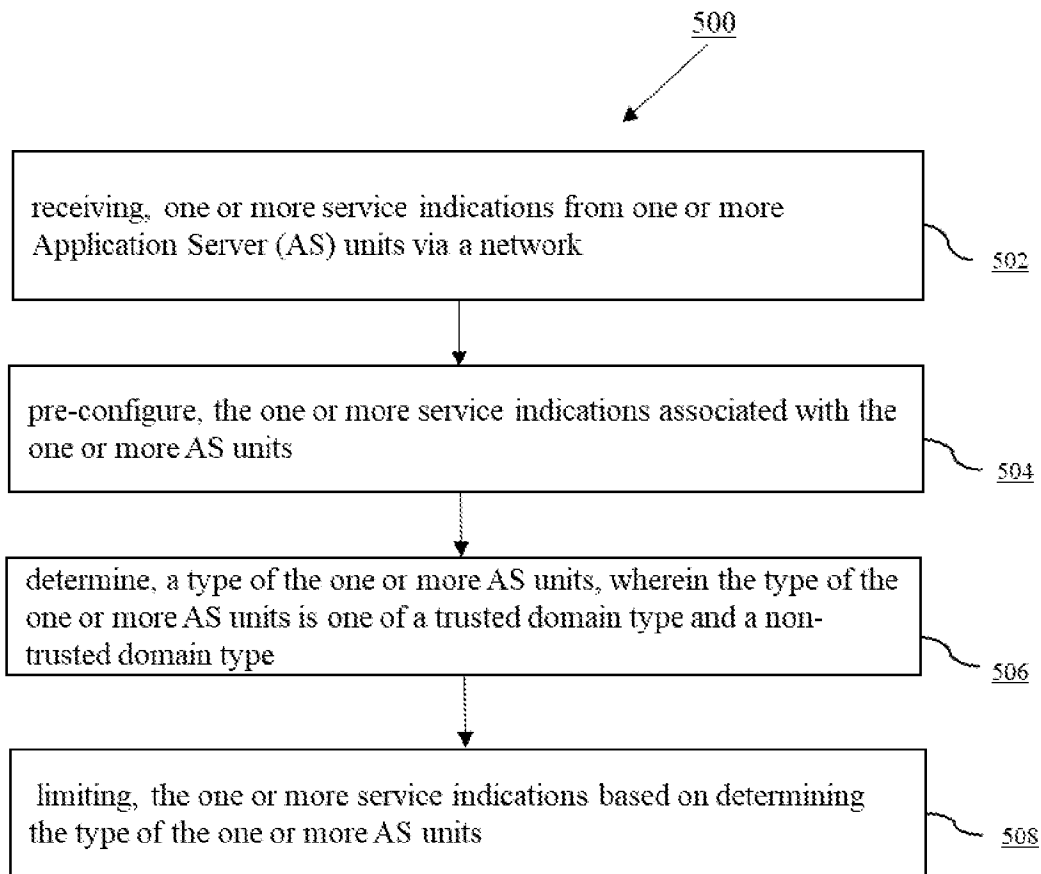


FIG. 5