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(54) Title: SYSTEM AND METHOD FOR ON THE FLY PROTOCOL CONVERSION IN OBTAINING POLICY ENFORCEMENT INFORMATION

(57) Abstract: A system, machine readable medium and method for utilizing protocol conversions in policy changing enforcement is disclosed. A message, in a first protocol, is received from a network gateway device including identifying information unique to a client attempting to access a resource from a server. The message is processed using one or more portions of the client identifying information as a unique key identifier. A policy access request is generated, in a second protocol, and includes at least the unique key identifier. The policy access request is sent to a policy server, wherein the policy server is configured to provide policy enforcement information of the client associated with the policy access request. The policy enforcement information is received and one or more policies from the policy enforcement information are enforced to network traffic between the client and the server.

SYSTEM AND METHOD FOR ON THE FLY PROTOCOL CONVERSION IN OBTAINING POLICY ENFORCEMENT INFORMATION

FIELD

[0001] This technology generally relates to network communication security, and more particularly, to a system and method for on-the-fly protocol conversion in obtaining policy charging enforcement information.

BACKGROUND

[0002] In existing systems, client devices, such as mobile devices, will attempt to access a service or resource from one or more servers via a cellular based network. During initiation of the connection, the client device will start a data context with a gateway node in which the gateway node will send an Authorization, Authentication and Accounting (AAA) message to a policy server in a cellular network based protocol. In the case that a virtual policy enforcement proxy device is positioned between the gateway node and the server, and the policy enforcement device must retrieve policy information of the client device from a policy server in which messages sent between the proxy device and policy server may be in a protocol different than the protocol of the AAA message. This can be costly and burdensome using current technologies.

[0003] What is needed is a network traffic management device which is able to utilize unique information of the user in generating a policy access request to a policy server, wherein the network traffic management device is able to apply policy enforcement functions from the policy server to the network traffic between the client device and the server(s).

SUMMARY

[0004] In an aspect, a method for utilizing protocol conversions in policy changing enforcement is disclosed. The method comprises receiving, at a network

traffic management device, a message from a network gateway device including identifying information unique to a client attempting to make a request to access a resource from a server, the message being in a first protocol. The method comprises processing the message at the network traffic management device and using one or more portions of the client identifying information as a unique key identifier. The method comprises generating a policy access request to obtain policy enforcement information for the client, wherein the policy access request includes at least the unique key identifier and is in a second protocol different from the first protocol. The method comprises sending the policy access request to a policy server, wherein the policy server is configured to provide policy enforcement information of the client associated with the policy access request. The method comprises retrieving policy enforcement information for the client from the policy server. The method comprises enforcing one or more policies from the policy enforcement information to network traffic between the client and the server.

[0005] In an aspect, a non-transitory machine readable medium having stored thereon instructions for protocol conversions in policy changing enforcement is disclosed. The medium comprises machine executable code which when executed by at least one machine, causes the machine to receive a message from a network gateway device including identifying information unique to a client attempting to make a request to access a resource from a server, the message being in a first protocol. The machine is configured to processes the message using one or more portions of the client identifying information as a unique key identifier. The machine is configured to generate a policy access request to obtain policy enforcement information for the client, wherein the policy access request includes at least the unique key identifier and is in a second protocol different from the first protocol. The machine is configured to send the policy access request to a policy server, wherein the policy server is configured to provide policy enforcement information of the client associated with the policy access request. The machine is configured to retrieve policy enforcement information for the client from the

policy server. The machine is configured to enforce one or more policies from the policy enforcement information to network traffic between the client and the server.

[0006] In an aspect, a network traffic management device for protocol conversions in policy changing enforcement is disclosed. The network traffic management device comprises a network interface that receives a request from the client device over a network, whereby the request is to access a resource from a server. The network traffic management device comprises a memory having stored thereon instructions for protocol conversions in policy changing enforcement. The network traffic management device comprises a processor coupled to the memory and the network interface. The processor is configured to execute instructions which causes the processor to receive a message from a network gateway device including identifying information unique to a client attempting to make a request to access a resource from a server, the message being in a first protocol. The processor is configured to processes the message using one or more portions of the client identifying information as a unique key identifier. The processor is configured to generate a policy access request to obtain policy enforcement information for the client, wherein the policy access request includes at least the unique key identifier and is in a second protocol different from the first protocol. The processor is configured to send the policy access request to a policy server, wherein the policy server is configured to provide policy enforcement information of the client associated with the policy access request. The processor is configured to retrieve policy enforcement information for the client from the policy server. The processor is configured to enforce one or more policies from the policy enforcement information to network traffic between the client and the server.

[0007] In one or more of the above claimed aspects, the policy enforcement information along with the associated unique key information of the user is stored in memory. In one or more of the above claimed aspects, the client communicates

with the gateway device via a cellular network and the first protocol is a RADIUS protocol or a DIAMETER protocol.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Figure 1 is a diagram of an example system environment that includes a network traffic management device;

[0009] Figure 2 is a block diagram of the network traffic management device shown in Figure 1; and

[0010] Figure 3 is an example flow chart diagram depicting portions of processes in accordance with the present disclosure.

[0011] While these examples are susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail preferred examples with the understanding that the present disclosure is to be considered as an exemplification and is not intended to limit the broad aspect to the embodiments illustrated.

DETAILED DESCRIPTION

[0012] In general, a system, machine readable medium and method for utilizing protocol conversions in policy changing enforcement is disclosed. A client request is received at a gateway node, such as a Gateway GPRS Support Node (GGSN), to establish a data context. The GGSN performs AAA functions and transmits the AAA message in a protocol such a RADIUS, DIAMETER and the like. The AAA message will contain unique identification information of the client. . The received AAA message is processed by an access module 210 of a network traffic management device and one or more of the unique client identification information is used by the access module 210 as a unique key identifier associated with the client identifying information. A policy access request is generated by the access module 210 to obtain policy enforcement

information for the user, wherein the policy access request includes at least the unique key identifier and is in another protocol, such as TCP. The policy access request, such as an LDAP search request, is sent from the network traffic management device to a policy server, wherein the policy server utilizes the unique key identifier in the policy access request to look up policy enforcement information of the client. The policy enforcement information for the client is sent from the policy server to the network traffic management device, wherein the network traffic management device is able to use the received client policy information to enforced traffic between the client and the server.

[0013] Figure 1 is a diagram of an example system environment that includes a network traffic management device in accordance with an aspect of the present disclosure. The example system environment 100 includes one or more Web and/or non Web application servers 102 (referred generally as "servers"), one or more policy servers 102', one or more client devices 106 and one or more network traffic management devices 110, although the environment 100 could include other numbers and types of devices in other arrangements. The network traffic management device 110 is coupled to the servers 102, 102' via local area network (LAN) 104 and client devices 106 via a wide area network 108. Generally, client device requests are sent over the network 108 which are received or intercepted by the network traffic management device 110.

[0014] Client devices 106 comprise network computing devices capable of connecting to other network computing devices, such as network traffic management devices 110 and/or servers 102. Such connections are performed over wired and/or wireless networks, such as network 108, to send and receive data, such as for Web-based requests, receiving server responses to requests and/or performing other tasks. In a particular aspect, the client device 106 is a mobile phone, smartphone and/or tablet device which is connected to a cellular network within network 108 which allows communications with the servers 102 via the network traffic management device 110. Other non-limiting and non-

exhausting examples of client devices 106 include personal computers (e.g., desktops, laptops), smart televisions, video game devices, and the like. In an example, client devices 106 can run one or more Web browsers that provide an interface for operators, such as human users, to interact with for making requests for resources to different web server-based applications and/or Web pages via the network 108, although other server resources may be requested by client devices. One or more Web-based applications may run on one or more of the servers 102 that provide the requested data back as one or more server responses to the client device 106 via the network traffic management device 110.

[0015] The servers 102 comprise one or more server network devices or machines capable of operating one or more Web-based and/or non Web-based applications that may be accessed by other network devices (e.g. client devices, network traffic management devices) in the environment 100. The servers 102 can provide web objects and other data representing requested resources, such as particular Web page(s), image(s) of physical objects, JavaScript and any other objects, that are responsive to the client devices' requests. It should be noted that the servers 102 may perform other tasks and provide other types of resources. One or more of the policy servers 102' provide policy enforcement information for the particular user making the request. It should be noted that while only two servers 102 are shown in the environment 100 depicted in Figure 1, other numbers and types of servers may be utilized in the environment 100. It is also contemplated that one or more of the servers 102, 102' may comprise a cluster of servers managed by one or more network traffic management devices 110. In one or more aspects, the servers 102, 102' may be configured implement to execute any version of Microsoft® IIS server, and/or Apache® server, although other types of servers may be used. Further, additional servers may be coupled to the network 108 and many different types of applications may be available on servers 102, 102'.

[0016] Network 108 comprises a publicly accessible network, such as the Internet, which is connected to client devices 106. However, it is contemplated that the

network 108 may comprise other types of private and public networks that include other devices. Communications, such as requests from clients 106 and responses from servers 102, take place over the network 108 according to standard network protocols, such as the HTTP, UDP and/or TCP/IP protocols in this example. However, the principles discussed herein are not limited to this example and can include other protocols. Further, it should be appreciated that network 108 may include local area networks (LANs), wide area networks (WANs), direct connections and any combination thereof, as well as other types and numbers of network types. On an interconnected set of LANs or other networks, including those based on differing architectures and protocols, routers, switches, hubs, gateways, bridges, cell towers and other intermediate network devices may act as links within and between LANs and other networks to enable messages and other data to be sent from and to network devices. Also, communication links within and between LANs and other networks typically include twisted wire pair (e.g., Ethernet), coaxial cable, analog telephone lines, full or fractional dedicated digital lines including Tl, T2, T3, and T4, Integrated Services Digital Networks (ISDNs), Digital Subscriber Lines (DSLs), wireless links including satellite links and other communications links known to those skilled in the relevant arts.

[0017] The network 108 may include a GPRS cellular network, such as a GSM (e.g. 2G, 3G, 4G) or WCDMA network which contains Gateway GPRS Support Nodes (GGSN) and the like. The GGSN perform AAA functions when data context connections are set up between a particular client and the GGSN. The GGSN, once verifying the client, transmits a message toward the servers 102 which contains information uniquely identifying the requesting client. In an aspect, the message transmitted from the GGSN is in RADIUS, DIAMETER or another like protocol. In essence, the network 108 includes any communication medium by which data may travel between client devices 106, servers 102, network traffic management devices 110, and the like.

[0018] LAN 104 comprises a private local area network that allows communications between the one or more network traffic management devices 110 and one or more servers 102, 102' in the secured network. It is contemplated, however, that the LAN 104 may comprise other types of private and public networks with other devices. Networks, including local area networks, besides being understood by those skilled in the relevant arts, have already been generally described above in connection with network 108 and thus will not be described further.

[0019] As per the network protocols, requests from the requesting client devices 106 may be sent and received as one or more streams of data packets over network 108 using protocols such as TCP/IP, RADIUS, DIAMETER and the like. Such protocols can be utilized by the client devices 106, network traffic management device 110 and the access and web servers 102, to establish connections, send and receive data for existing connections, perform AAA transactions (e.g. GGSN) and policy enforcement functions and the like. It is to be understood that the one or more servers 102 may be hardware and/or software, and/or may represent a system with multiple servers that may include internal or external networks.

[0020] As shown in the example environment 100 depicted in Figure 1, the network traffic management device 110 is interposed between client devices 106 with which it communicates with client devices 106 via network 108 and servers 102, 102' (in a secured or non-secured network) via LAN 104. The network traffic management device 110 may manage the network communications by performing several network traffic related functions involving the communications. As will be discussed in more detail below, the network traffic management device 110 is able utilize client identifying information from an AAA message sent from a GGSN as a unique key identifier that is used in a policy access request that is in another protocol from the protocol which the AAA message was received in. Some other functions include, but are not limited to,

load balancing, access control, and validating HTTP requests using JavaScript code that are sent back to requesting client devices 106.

[0021] Although examples of the server 102, the network traffic management device 110, and the client devices 106 are described and illustrated herein, each of the computers of the system 100 could be implemented on any suitable computer system or computing device. It is to be understood that the example devices and systems of the system 100 are for exemplary purposes, as many variations of the specific hardware and software used to implement the system 100 are possible, as will be appreciated by those skilled in the relevant art(s). In addition, two or more computing systems or devices may be substituted for any one of the devices in the system 100. Accordingly, principles and advantages of distributed processing, such as redundancy, replication, and the like, also can be implemented, as desired, to increase the robustness and performance of the devices of the system 100.

[0022] Figure 2 is a block diagram of the network traffic management device shown in Figure 1 in accordance with an aspect of the present disclosure. As shown in Figure 2, an example network traffic management device 110 includes one or more device processors 200, one or more device I/O interfaces 202, one or more network interfaces 204, and one or more device memories 206 which are coupled together by bus 208. In an aspect, the network traffic management device 110 includes one or more access modules 210 that can be within or outside the device memory 206. It should be noted that the network traffic management device 110 can be configured to include other types and/or numbers of components and is thus not limited to the configuration shown in Figure 2.

[0023] Device processor 200 of the network traffic management device 110 comprises one or more microprocessors configured to execute non-transitory computer/machine readable and executable instructions stored in the device memory 206. Such instructions, when executed by one or more processors 200 of the network traffic management device 110 cause the access module 110 to implement general functions and specific functions related to the process

described below. It is understood that the processor 200 may comprise other types and/or combinations of processors, such as digital signal processors, micro-controllers, application specific integrated circuits ("ASICs"), programmable logic devices ("PLDs"), field programmable logic devices ("FPLDs"), field programmable gate arrays ("FPGAs"), and the like.

[0024] Device I/O interfaces 202 comprise one or more user input and output device interface mechanisms. The interface may include a computer keyboard, mouse, touchscreen, display device, and the corresponding physical ports and underlying supporting hardware and software to enable the network traffic management device 110 to communicate with other network devices in the environment 100. Such communications may include accepting user data input and providing user output, although other types and numbers of user input and output devices may be used. Additionally or alternatively, as will be described in connection with network interface 204 below, the network traffic management device 110 may communicate with the outside environment for certain types of operations (e.g., configuration) via one or more network management ports.

[0025] Network interface 204 comprises one or more mechanisms that enable the network traffic management device 110 to engage in network communications over the LAN 104 and the network 108 using one or more of a number of protocols, such as TCP/IP, HTTP, UDP, RADIUS, DIAMETER, DNS and the like. However, it is contemplated that the network interface 204 may be constructed for use with other communication protocols and types of networks. Network interface 204 is sometimes referred to as a transceiver, transceiving device, or network interface card (NIC), which transmits and receives network data packets to one or more networks, such as the LAN 104 and the network 108. In an example, where the network traffic management device 110 includes more than one device processor 200 (or a processor 200 has more than one core), each processor 200 (and/or core) may use the same single network interface 204 or a plurality of network interfaces 204. Further, the network interface 204 may

include one or more physical ports, such as Ethernet ports, to couple the network traffic management device 110 with other network devices, such as servers 102, 102'. Moreover, the interface 204 may include certain physical ports dedicated to receiving and/or transmitting certain types of network data, such as device management related data for configuring the network traffic management device 110 or client request/server response related data.

[0026] Bus 208 may comprise one or more internal device component communication buses, links, bridges and supporting components, such as bus controllers and/or arbiters. The bus 208 enables the various components of the network traffic management device 110, such as the processor 200, device I/O interfaces 202, network interface 204, and memory 206 to communicate data. However, it is contemplated that the bus 208 may enable one or more components of the network traffic management device 110 to communicate with components in other devices as well. Example buses include HyperTransport, PCI, PCI Express, InfiniBand, USB, Firewire, Serial ATA (SATA), SCSI, IDE and AGP buses. However, it is contemplated that other types and numbers of buses may be used, whereby the particular types and arrangement of buses will depend on the particular configuration of the network traffic management device 110.

[0027] Device memory 206 comprises non-transitory computer readable media, namely computer readable or processor readable storage media, which are examples of machine-readable storage media. Computer readable storage/machine-readable storage media may include volatile, nonvolatile, removable, and non-removable media implemented in any method or technology for storage of information. Such storage media includes computer readable/machine-executable instructions, data structures, program modules, or other data, which may be obtained and/or executed by one or more processors, such as device processor 200 to perform general and specific functions. In particular, such instructions cause the processor 200 to perform actions, including perform one or more portions of the process discussed below. Examples of

computer readable storage media include RAM, BIOS, ROM, EEPROM, flash/firmware memory or other memory technology, CD-ROM, digital versatile disks (DVD) or other optical storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to store the information, which can be accessed by the network traffic management device 110.

[0028] The access module 210 is configured to retrieve and apply policy enforcement functions for a particular user when the protocols between the received GGSN's AAA message and a policy access request are different from one another. As stated above, an AAA message is received at the network traffic management device from a cellular base GGSN, wherein the AAA message contains unique client identifying information. The received AAA message is in a first protocol, such as RADIUS, DIAMETER or the like. The access module 210 extracts one or more of the client identifying information as a unique key identifier, whereby the unique key identifier is used in a policy access request for the client. The policy access request is generated to obtain policy enforcement information for the user, wherein the policy access request is in a second protocol, such as TCP. The policy access request is sent from the network traffic management device to a policy server, wherein the policy server utilizes the unique key identifier to look up policy enforcement information of the client. The policy enforcement information for the client is received from the policy server and enforced at network traffic between the client and the server.

[0029] Figure 3 illustrates an example flow chart in accordance with the process described in accordance with the present disclosure. In the example, a client device 106 sends a client request via the network 108 to access a network resource from one or more servers 102. In an aspect, the client device 106 is a mobile device (e.g. phone, tablet) that is capable of sending and receiving data at least partially over a GPRS cellular network, such as a GSM (e.g. 2G, 3G, 4G) or WCDMA within network 108.

[0030] When setting up a connection, the client device sends a request to a GGSN, or other network gateway device which performs AAA functions, to start a data context. During activation process (or shortly thereafter), the GGSN forwards an AAA message to the network traffic management device 110 using a cellular based protocol, such as RADIUS, DIAMETER and the like. As stated above, the AAA message includes information unique to that particular client, such as the client's IP address, Access Point Name (APN), MS-ISDN, the client device's phone number and the like

[0031] The access module 210 of the network traffic management device 110 receives the AAA message from the gateway device (Block 300). The access module 210 processes the received message and extracts one or more portions of the client's unique information from the GGSN's message as a unique key address for the client (Block 302). In an aspect, the unique key address may include the client device's MS-ISDN, the source IP-address of the device 106, the APN and/or the like.

[0032] As shown in Figure 3, the access module 210 inquires whether the identified unique key value had previously been processed and thus stored in one or more databases (Block 304). If the access module 210 determines whether policy information for the client is stored in the device 110. The determination can be made by identifying whether the unique key value is stored in one or more databases. If the policy information (or unique key value) not stored in the one or more databases, the access module 210 will then, on the fly, generate a policy access request and insert one or more unique key values, associated with the extracted unique client identifying information and insert it into the policy access request (Block 306).

[0033] The policy access request is sent as data packets in the TCP/IP protocol, which is different than the protocol in which the AAA message was received, from the network traffic management device 110 to one or more policy servers 102' and/or databases which contain policy enforcement parameters for user

accessible services (Block 306). In an aspect, the policy access request may be a LDAP search request which is sent from the network traffic management device 110 to one or more LDAP configured policy servers 102' (LDAP server).

[0034] The policy server 102' receives the policy search request and uses the unique key value to look up policy enforcement information of the particular client in a memory. The policy server 102 responds asynchronously to the policy search request and provides with a policy search result which includes policy enforcement information of that particular client with respect to the received AAA message. This policy enforcement information is received at the network traffic management device 110 (Block 308). In an aspect, the policy search result also includes the unique search key previously sent by the access module 210 to ensure that the access module 210 is able to correctly identify the client to which the policy information is to be enforced. Upon the access module 210 receiving in the policy search result, the access module 210 stores the policy information along with the unique key value in the memory 206 (Block 310). By having the policy enforcement information for the user, the network traffic management device 110 is able to enforce policy functions on any services requests from the client to the server(s) 102 (Block 312).

[0035] In the above example aspect involving the client request being in the DIAMETER protocol, the policy server 102' asynchronously sends the policy access response (with accompanying policy enforcement information) back to the network traffic management device 110 along with a Capabilities Exchange Answer (CEA), whereby the CEA corresponds to the CER.

[0036] Referring back to Block 304, if the access module 210 determines that the client's unique key value is already stored in the memory 206, the access module 210 will use the unique key value to retrieve the policy enforcement information for the client from memory 206 (Block 314). The access module 210 will then be able to enforce the policy parameters retrieved from the memory 206 and apply

the policy parameters to transactions between the client and the appropriate servers 102 (Block 312).

[0037] Having thus described the basic concepts, it will be rather apparent to those skilled in the art that the foregoing detailed disclosure is intended to be presented by way of example only, and is not limiting. Various alterations, improvements, and modifications will occur and are intended to those skilled in the art, though not expressly stated herein. These alterations, improvements, and modifications are intended to be suggested hereby, and are within the spirit and scope of the examples. Additionally, the recited order of processing elements or sequences, or the use of numbers, letters, or other designations therefore, is not intended to limit the claimed processes to any order except as may be specified in the claims. Accordingly, the invention is limited only by the following claims and equivalents thereto.

CLAIMS

What is claimed is:

1. A method for utilizing protocol conversions in policy changing enforcement, the method comprising:

receiving, at a network traffic management device, a message from a network gateway device including identifying information unique to a client attempting to make a request to access a resource from a server, the message in a first protocol;

processing the message at the network traffic management device using one or more portions of the client identifying information as a unique key identifier;

generating, at the network traffic management device, a policy access request to obtain policy enforcement information for the client, wherein the policy access request includes at least the unique key identifier and is in a second protocol different from the first protocol;

sending the policy access request from the network traffic management device to a policy server, wherein the policy server is configured to provide policy enforcement information of the client associated with the policy access request;

retrieving, at the network traffic management device, policy enforcement information for the client from the policy server; and

enforcing, at the network traffic management device, one or more policies from the policy enforcement information to network traffic between the client and the server.

2. The method of claim 1, further comprising storing the policy enforcement information and associated unique key information of the user in a memory.

3. The method of claim 1, wherein the client communicates with the gateway device via a cellular network and the first protocol is a RADIUS protocol.

4. The method of claim 1, wherein the client communicates with the gateway device via a cellular network and the first protocol is a DIAMETER protocol.

5. The method of claim 1, wherein the policy request is a LDAP search request.

6. A non-transitory machine readable medium having stored thereon instructions for protocol conversions in policy changing enforcement, comprising machine executable code which when executed by at least one machine, causes the machine to:

receive a message from a network gateway device including identifying information unique to a client attempting to make a request to access a resource from a server, the message in a first protocol;

process the message using one or more portions of the client identifying information as a unique key identifier;

generate a policy access request to obtain policy enforcement information for the client, wherein the policy access request includes at least the unique key identifier and is in a second protocol different from the first protocol;

send the policy access request to a policy server, wherein the policy server is configured to provide policy enforcement information of the client associated with the policy access request;

retrieve policy enforcement information for the client from the policy server; and

enforce one or more policies from the policy enforcement information to network traffic between the client and the server.

7. The machine readable medium of claim 6, wherein the machine is further configured to store the policy enforcement information and associated unique key information of the user in a memory.

8. The machine readable medium of claim 6, wherein the client communicates with the gateway device via a cellular network and the first protocol is a RADIUS protocol.

9. The machine readable medium of claim 6, wherein the client communicates with the gateway device via a cellular network and the first protocol is a DIAMETER protocol.

10. The machine readable medium of claim 6, wherein the policy access request is a LDAP search request.

11. A network traffic management device for protocol conversions in policy changing enforcement, the network traffic management device comprising:

a network interface coupled to a client device via a network, the network interface receiving a request from the client device requesting access to the server;

a memory having stored thereon instructions for protocol conversions in policy changing enforcement;

a processor coupled to the memory and the network interface, the processor configured to execute the instructions which causes the processor to:

receive a message from a network gateway device including identifying information unique to a client attempting to make a request to access a resource from a server, the message in a first protocol;

process the message using one or more portions of the client identifying information as a unique key identifier;

generate a policy access request to obtain policy enforcement information for the client, wherein the policy access request includes

at least the unique key identifier and is in a second protocol different from the first protocol;

send the policy access request to a policy server, wherein the policy server is configured to provide policy enforcement information of the client associated with the policy access request;

retrieve policy enforcement information for the client from the policy server; and

enforce one or more policies from the policy enforcement information to network traffic between the client and the server.

12. The network traffic management device of claim 11, wherein the processor is further configured to store the policy enforcement information and associated unique key information of the user in the memory.

13. The network traffic management device of claim 11, wherein the client communicates with the gateway device via a cellular network and the first protocol is a RADIUS protocol.

14. The network traffic management device of claim 11, wherein the client communicates with the gateway device via a cellular network and the first protocol is a DIAMETER protocol.

15. The network traffic management device of claim 11, wherein the policy access request is a LDAP search request.

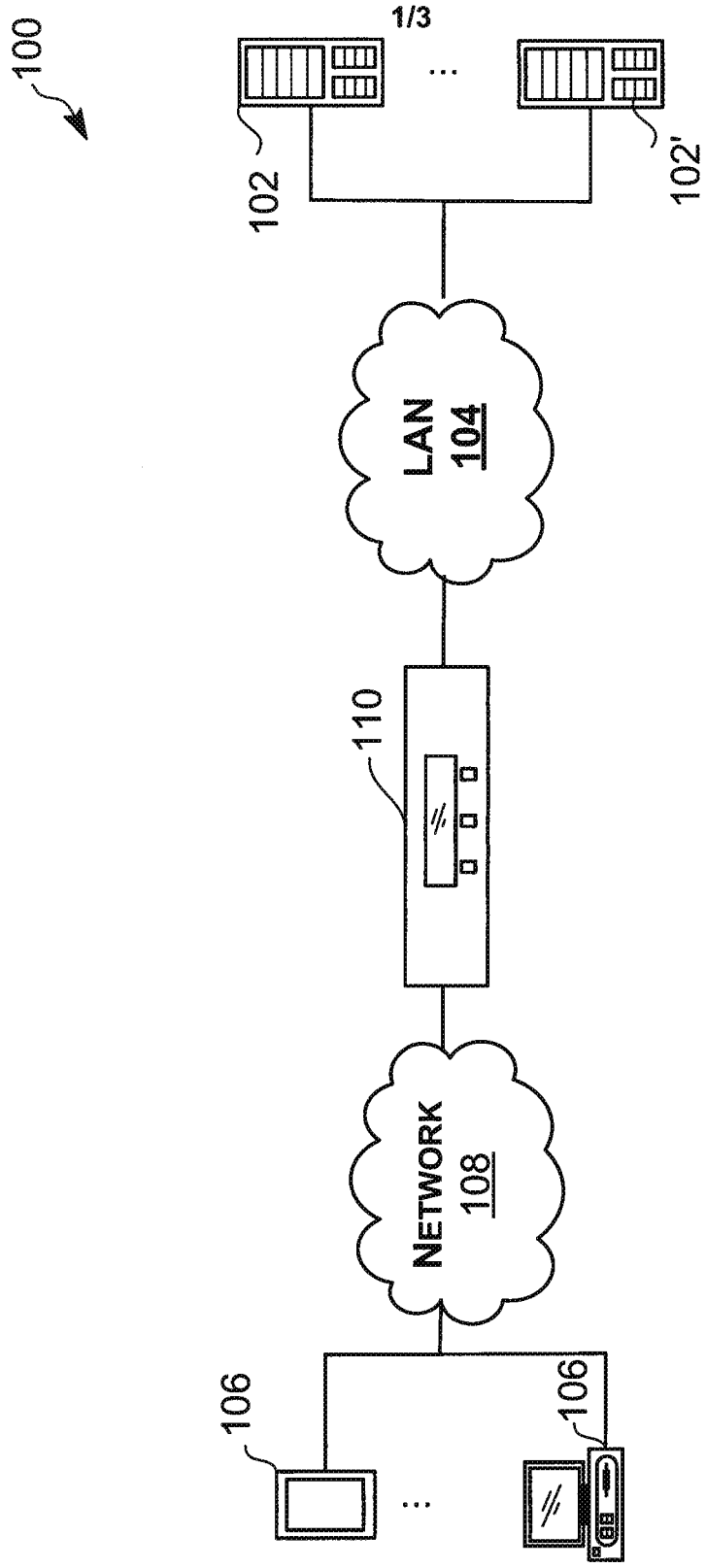

FIG. 1

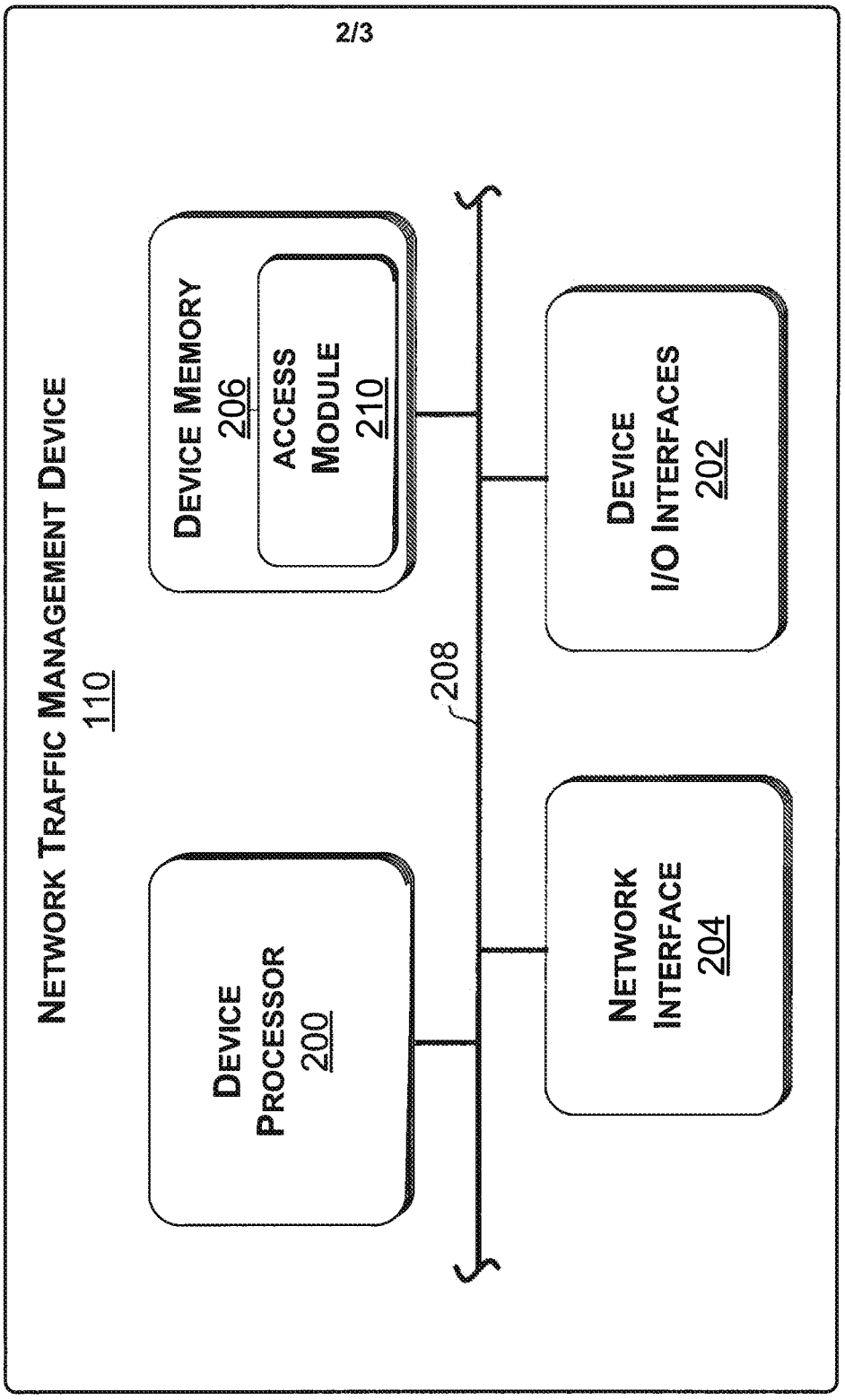
NETWORK TRAFFIC MANAGEMENT DEVICE
110
DEVICE PROCESSOR
200
DEVICE MEMORY
206
ACCESS MODULE
210
NETWORK INTERFACE
204
DEVICE I/O INTERFACES
202
208

FIG. 2

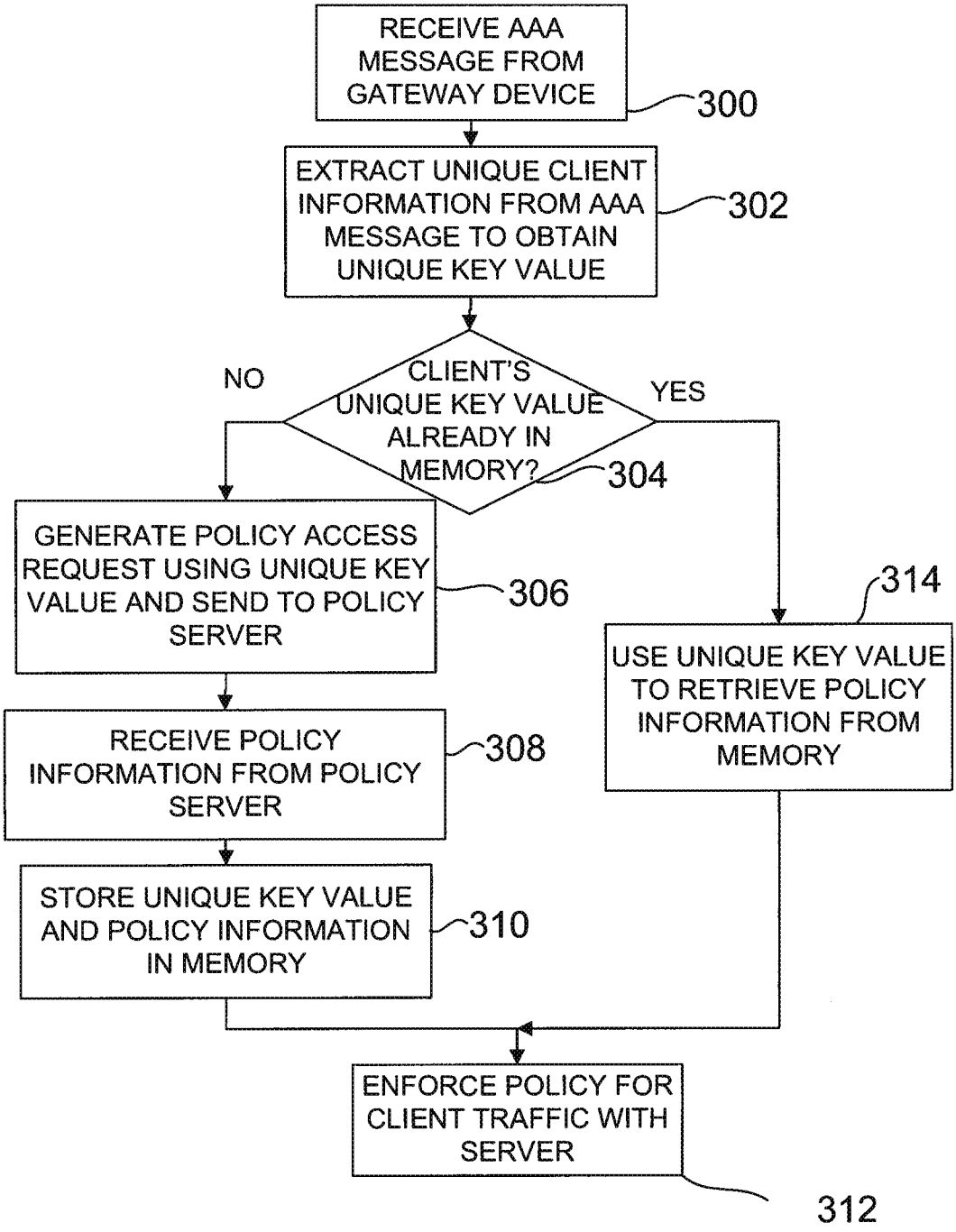
RECEIVE AAA MESSAGE FROM GATEWAY DEVICE
300
EXTRACT UNIQUE CLIENT INFORMATION FROM AAA MESSAGE TO OBTAIN UNIQUE KEY VALUE
302
CLIENT'S UNIQUE KEY VALUE ALREADY IN MEMORY?
304
NO
YES
GENERATE POLICY ACCESS REQUEST USING UNIQUE KEY VALUE AND SEND TO POLICY SERVER
306
RECEIVE POLICY INFORMATION FROM POLICY SERVER
308
STORE UNIQUE KEY VALUE AND POLICY INFORMATION IN MEMORY
310
USE UNIQUE KEY VALUE TO RETRIEVE POLICY INFORMATION FROM MEMORY
314
ENFORCE POLICY FOR CLIENT TRAFFIC WITH SERVER
312

FIG. 3