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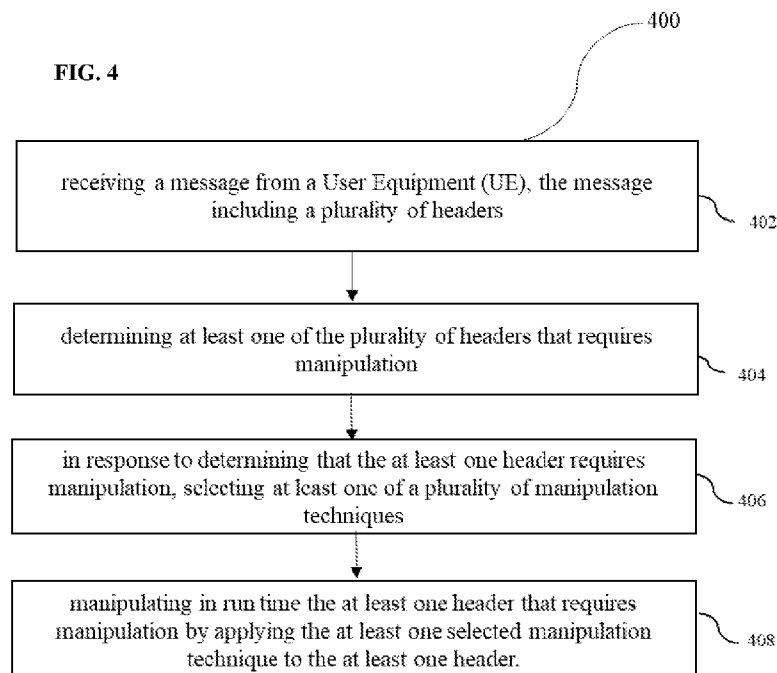
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(54) Title: METHOD AND A SYSTEM FOR MESSAGE MANIPULATION IN A COMMUNICATION NETWORK

FIG. 4



(57) Abstract: The disclosure relates to a method (400) and system (108) of a message manipulation in a communication network (106). The method (400) includes a step of receiving a message including a plurality of headers, from a user equipment (UE) (102) and determining at least one of the plurality of the headers in the message that requires manipulation. The method (400) further includes a step of selecting at least one of a plurality of manipulation techniques based on predefined parameters. The predefined parameters includes priority, trigger points, and action. The method (400) further includes a step of applying at least one selected manipulation techniques to the at least one header. The applied manipulation techniques include at least one of removing a header, modifying a header, or updating a header with predefined values.

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METHOD AND SYSTEM FOR A MESSAGE MANIPULATION IN A COMMUNICATION NETWORK

FIELD OF THE INVENTION

[0001] The present invention relates to the field of wireless communication system, and more particularly relates to a method and a system for message manipulation in a communication network.

BACKGROUND OF THE INVENTION

[0002] In a communication network, back-to-back releases are needed for adding or removing something from a message, which is received from a user equipment (UE) or from a previous IP Messaging Service (IMS) node. For example, in a scenario when a new device enters the communication network (system), the new device or previous IMS node may send some malfunctioning header or header with value which is not supported in network or header without exact value which is required to provide required service by network, to a System Information Block (SIB) which is not handled by the communication network. Such malfunctioning header or header with inappropriate value may not be compatible with the IMS nodes present in the communication network. As a result, this can lead to breakdown in the entire communication network, thereby causing downtime for applying new releases to handle such messages. Call failures may also increase due to such behavior of such device or node.

[0003] In the above scenarios, it is therefore required to provide a patch so that a call through the new device is successfully delivered. However, this makes the entire process complicated and introduces downtime.

[0004] Therefore, there is a need for solutions for configuring the headers of the new devices in the network in real-time in an effective and simple manner.

SUMMARY OF THE INVENTION

[0005] One or more embodiments of the present disclosure provide a method and a system of a message manipulation in a communication network.

[0006] In one aspect of the present invention, the method for message manipulation in a communication network is disclosed. The method includes the step of receiving, a message from a User Equipment (UE), the message including a plurality of headers. The method further includes a step of determining at least one of a plurality of headers that requires manipulation. In response to determining that the at least one header requires manipulation, the method further includes a step of selecting, at least one of a plurality of manipulation techniques. The method further includes a step of manipulating in run time, the at least one header that requires manipulation by applying the at least one selected manipulation technique to the at least one header.

[0007] In one embodiment, the message pertains to the UE establishing a call with a communication device.

[0008] In another embodiment, the method determines the at least one header that requires manipulation when the at least one header among the plurality of headers is malfunctioning, based on the non-compatibility with the communication device, wherein non-compatibility of the header is due to the header being corrupted.

[0009] In yet another embodiment, the method selects at least one of the plurality of manipulation techniques based on one or more pre-defined parameters.

[0010] In yet another embodiment, the one or more pre-defined parameters include at least one of, priority, trigger point and action and a combination thereof.

[0011] In yet another embodiment, the trigger point includes at least one of, specific version of the UE and the communication device.

[0012] In yet another embodiment, the priority includes hierarchy of issues pertaining to the malfunctioned header that is required to be resolved among the plurality of headers received from the UE.

[0013] In yet another embodiment, the action includes at least one of, remove, modify and update, the at least one header with pre-defined values.

[0014] In yet another embodiment, the step of determining, at least one of the plurality of headers that requires manipulation, includes the step of checking whether at least one header among the plurality of headers included in the message is malfunctioning.

[0015] In yet another embodiment, the method further includes the step of manipulating, a body of the message by one of, removing, adding, appending, replacing and modifying domain parameters of the body and adding media attributes to media streams of the body.

[0016] In yet another embodiment, the step of manipulating in run time, the at least one header that requires manipulation by applying the at least one selected manipulation technique to the at least one header, includes the step of, comparing, a value included in the at least one of the header that requires manipulation with a range pre-defined values; identifying, the difference between the value included in the at least one of the header and the range pre-defined values based on comparison; and manipulating, the value included in the at least one of the header, to ensure the manipulated value is within the range of the pre-defined values based on the identified difference.

[0017] In another aspect of the present invention, a system for message manipulation in a communication network is disclosed. Accordingly, the system includes a transceiver configured to receive, a message from a User Equipment (UE), the message including a plurality of headers. The system further includes a determination unit configured to determine at least one of the plurality of headers that requires

manipulation. In response to determining that the at least one header requires manipulation, the system further includes a selection unit configured to select at least one of a plurality of manipulation techniques. The system further includes a manipulation unit configured to manipulate in run time the at least one header that requires manipulation by applying the at least one selected manipulation technique to the at least one header.

[0018] 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

[0019] 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.

[0020] **FIG. 1** is an exemplary block diagram of an environment for message manipulation in a communication network, according to one or more embodiments of the present invention;

[0021] **FIG. 2a** is an exemplary block diagram of an architecture for a system of message manipulation in a communication network, according to one or more embodiments of the present invention;

[0022] **FIG. 2b** is an exemplary block diagram of an architecture for a system associated with a System Information Block (SIB) for message manipulation in a communication network, according to one or more embodiments of the present invention;

[0023] **FIG. 3** are exemplary block diagrams of an architecture for the system of **FIG. 2a** and **FIG. 2b**, according to one or more embodiments of the present invention;

[0024] **FIG. 4** shows a flow diagram of a method for message manipulation in a communication network, according to one or more embodiments of the present invention.

[0025] The foregoing shall be more apparent from the following detailed description of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0026] 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.

[0027] 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.

[0028] 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.

[0029] Various embodiments of the invention provide a system and a method for message manipulation in a communication network are disclosed. The present invention describes a solution for manipulating a message in the communication network by identifying one or more headers included in the message that requires manipulation and applying at least one manipulation technique to the identified one or more header of the message in real time in an effective and simpler manner in order to avoid breakdown in a communication network.

[0030] Referring to **FIG. 1**, **FIG. 1** illustrates an exemplary block diagram of an environment **100** of message manipulation in a communication network **106**, according to one or more embodiments of the present invention. The environment **100** includes, a User Equipment (UE) **102**, a server **104**, a communication network **106** and a system **108**. The UE **102** aids a user to interact with the system **108** for

transmitting a message to a processor **202** to establish a call within a communication network **106**. In one embodiment, the message includes a plurality of headers.

[0031] For the purpose of description and explanation, the description will be explained with respect to one or more 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**, and should nowhere be construed as limiting the scope of the present disclosure. Each of the at least one UE **102** from the of the first UE **102a**, the second UE **102b**, and the third UE **102c** is configured to connect to the server **104** via the communication network **106**.

[0032] In an embodiment, each of the first UE **102a**, the second UE **102b**, and the third UE **102c** 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.

[0033] The communication 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 communication 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.

[0034] The environment **100** includes the server **104** accessible via the communication 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.

[0035] The environment **100** further includes the system **108** communicably coupled to the server **104** and each of the first UE **102a**, the second UE **102b**, and the third UE **102c** via the communication network **106**. The system **108** is adapted to be embedded within the server **104** or is embedded as the individual entity. However, for the purpose of description, the system **108** is described as an integral part of the server **104**, without deviating from the scope of the present disclosure. The system **108** is configured to manipulate message in the communication network **106**.

[0036] Operational and constructional features of the system **108** will be explained in detail with respect to the following figures.

[0037] Referring to **FIG. 2a**, **FIG. 2a** illustrates an exemplary block diagram of the system **108** according to one or more embodiments of the present invention. In this regard, the system **108** includes one or more processors **202**, a memory **204**, a transceiver **206**, a determination unit **210**, a selection unit **212**, a manipulation unit **214**. 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**.

[0038] The memory **204** is communicably connected to the processor **202** which 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 create or share data packets over the communication network **106**. The memory **204** may include any non-transitory storage device including, for example, volatile memory such as RAM, or non-volatile memory such as EPROM, flash memory, and the like.

[0039] The transceiver **206** of the processor **202** is communicably connected to each of the at least first UE **102a**, the second UE **102b**, and the third UE **102c** via the communication network **106**. Accordingly, the transceiver **206** is configured to receive a message request from the UE **102**. In one embodiment, the received message includes plurality of headers. In another embodiment, the transceiver **206** is configured to receive a message request from any Internet Protocol Multimedia Subsystem (IMS) node.

[0040] The determination unit **210** of the processor **202** is configured to determine at least one header among the plurality of headers that requires manipulation. In other words, the determination unit **210** determines a corrupted header or an inappropriate header among the plurality of headers in the message that is received at the transceiver **206**. The determination unit **210** checks the plurality of headers to detect that at least one header of the message is malfunctioning. For example, the UE **102** transmits message which includes the plurality of headers. The determination unit **210** checks each of the plurality of headers and determines whether each of the plurality of headers are compatible with a communication device **314** (as shown in **FIG. 3**). Hereinafter, for the purpose of description, the communication device **314** is referred to as the called device **314**, without deviating from the scope of the present disclosure. When at least one header among the plurality of headers is not compatible with the called device **314**, the determination device **210** identifies malfunctioning of that one header among the plurality of headers which is not compatible with the called device **314**.

[0041] The selection unit **212** of the processor **202** is configured to select at least one of a plurality of manipulation techniques. These plurality of manipulation techniques, for example, can be implemented as logics which can be applied to the at least one header. The selection unit **212** selects the at least one of the plurality of manipulation techniques based on one or more pre-defined parameters including at least one of, priority, trigger point and action and a combination thereof.

[0042] In one embodiment, the plurality of manipulation techniques include removing, modifying or updating a header with predefined values. In another embodiment, the plurality of manipulation techniques of the header involves forcefully removing, adding, appending, replacing or modifying domain parameters in a Session Description Protocol (SDP) header as well as body and adding media attributes to media streams to improve efficiency.

[0043] The manipulation unit **214** of the processor **202** is configured to manipulate in run time, the at least one header that requires manipulation by applying the at least one selected manipulation technique to the at least one header.

[0044] Referring to **FIG. 2b**, **FIG. 2b** illustrates an exemplary block diagram of an architecture for the system **102** associated with a System Information Block (SIB) for message manipulation in a communication network **106**, according to one or more embodiments of the present invention.

[0045] In accordance with some embodiments as shown in **FIG. 2b**, SIB is a product comprising the functionalities of three Internet Protocol (IP) Multimedia Subsystem (IMS) core network nodes namely Serving Call Session Control Function (S-CSCF), Interrogating Call Session Control Function (I-CSCF) and Breakout Gateway Control Function (BGCF). SIB provides stack-less Session Initiation Protocol (SIP) communication among I-CSCF, S-CSCF and BGCF on a same Instance of SIB. SIB also serves all the standard functionalities of the nodes (I-CSCF, S-CSCF and BGCF) in the communication network **106**.

[0046] In one embodiment, I-CSCF is responsible for onward routing of SIP messages to an appropriate S-CSCF for a given subscriber. This routing capability is utilized in specific scenarios only, such as during registration in order to assign or ascertain the S-CSCF which should be used. Routing SIP message arriving from another SIP network is also a responsibility of the I-CSCF. The I-CSCF queries a Home Subscriber Server (HSS) in order to obtain the address of the relevant S-CSCF for a particular subscriber or user to process SIP message requests. Mw interfaces between the I-CSCF and the S-CSCF within the same network are considered to be internal IMS interfaces.

[0047] In one embodiment, S-CSCF is a primary node in the IMS responsible for session control. Subscribers will be allocated a S-CSCF for the duration of their IMS registration in order to facilitate routing of SIP message as part of service establishment procedures. The S-CSCF functions as a registrar and enables the network location information of the UE 102 to be available at the HSS. The S-CSCF provides determination to allow or deny services for the UE 102.

[0048] In one embodiment, BGCF is an IMS element that chooses the network where a Public Switched Telephone Network (PSTN) breakout happens. If the breakout occurs in the same communication network as the BGCF, then the BGCF selects a Media Gateway Control Function (MGCF) which will be responsible for the interworking with the PSTN. The MGCF facilitates call control, routing, and interfacing Packet Switch (PS) domain to Circuit Switch (CS) domain when interworking between the IMS and PSTN is required. A Mj interface is SIP based interface between the BGCF and the MGCF. The Mj interface is used to convey SIP messages between the BGCF and the MGCF for interworking with PSTN or circuit switched networks. The Mj interface carries exchange of sessions with the MGCF that the BGCF has selected to provide session breakout to the PSTN or Circuit Switched Networks. A Mi interface is the SIP based interface and used to exchange messages between the S-CSCF and the BGCF for inter-working with the PSTN. The Mi interface

allows the S-CSCF to forward the SIP messages to the BGCF for the purpose of MGCF selection.

[0049] In one embodiment, a Proxy Call Session Control Function (P-CSCF) is an edge access function which is the entry point for a UE **102** to request services from the communication network **106** such as an Internet protocol (IP) Messaging Service (IMS) network. The role of this P-CSCF is to function as a proxy by accepting incoming requests and forwarding incoming requests to the at least one of, I-CSCF, S-CSCF and BGCF of the SIB. The Mw interface is used for communication between the P-CSCF, the CSCF and the S-CSCF. The Gm Interface is key to all user based communication . The Gm Interface is used between the UE **102** and the P-CSCF for multiple purposes such as registration, de-registration, incoming calls, outgoing calls, SIP signaling and any type of communication between UE **102** and IMS network.

[0050] In one embodiment, a Telephony Application Server (TAS) contains a logic that facilitates services related to call such as digit analysis, routing, call setup, call waiting, call forwarding, conferencing. In another embodiment, TAS is used within the IMS network in order to facilitate establishment procedures related to a call, as well as supporting services such as Calling Party ID, Call Transfer and Call Barring. An IMS Service Control (ISC) interface is another SIP based connectivity which enables connectivity between the S-CSCF and the TAS. This ISC interface interacts with the MMTel supplementary services implemented on the TAS where the ISC interface is used for requesting services from the TAS. The ISC interface also supports TAS initiated requests to the IMS.

[0051] In one embodiment, a Diameter Routing Agent (DRA) provides a routing capability in real time which ensures that the messages are routed to an appropriate destination. The DRA acts as a mediator between the S-CSCF, I-CSCF and the HSS. The HSS is the main subscriber database used within the IMS which provides details of the subscribers to other entities within the network. A Cx interface is used between the S-CSCF, the I-CSCF and the HSS for downloading subscriber data to the S-CSCF

from the HSS. The Cx interface uses a diameter protocol and enable IMS registration and passing of subscriber data to the S-CSCF. The diameter protocol provides Authentication, Authorization, and Accounting (AAA) messaging services for network access and data mobility applications in 3G, IP Multimedia Systems (IMS), and LTE/4G networks.

[0052] In one embodiment, a Multimedia Resource Function (MRF) supports multimedia services and is responsible for carrying out a variety of processing tasks on media streams associated with the multimedia services. The MRF is communicably connected to the S-CSCF. A Mr interface between the MRF and the S-CSCF provides MRF connectivity to the SCSCF. The Mr interface allows interaction with the media resource for specific supplementary services (e.g. conference call) on Control Plane (CP).

[0053] In one embodiment, a Lawful Interception Management System (LIMS) is a proven solution for network operators and service providers to automate the administrative and operative tasks related to lawful interception. A X1/X2 is an interface between the LIMS and the S-CSCF. The X1 is the interface that allows the LIMS to provision tasks on a Network Function (NF). A task represents an intercept on a target. As long as the task is provisioned, the NF is instructed to intercept communication. The intercepted communication is delivered using the X2 interface.

[0054] In one embodiment, the three functional nodes (S-CSCF, I-CSCF, BGCF) are merged in order to create a SIB, that facilitates in achieving better network utilization and a capacity improvement is achieved by stack-less communication.

[0055] The SIB, performs a message manipulation at runtime. One of the key advantages of the techniques of the present disclosure is the Session Description Protocol (SDP) part. The SDP part is basically the body of the SIB message. Usually, SIB message header can be manipulated. Further, the present techniques provide for a

flexibility of manipulating the SDP body as well, which is for the media or the media component, so, that also can be validated.

[0056] **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 message manipulation in a communication network. 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. The **FIG. 3** includes a UE **102** (also referred to as calling device), a plurality of nodes for example a first node **310**, a second node **312**, and a called device **314**. The UE **102**, the first node **310**, the second node **108** and the called device **314** are communicably connected with the system **108** which is SIB.

[0057] For the purpose of description of the exemplary embodiment as illustrated in **FIG. 3**, the User Equipment (UE) **102** uses network protocol connection to communicate with the system **108**. Accordingly, the UE **102** is configured to transmit a message to the system **108** including plurality of headers.

[0058] In an embodiment, the network protocol connection is the establishment and management of communication between the UE **102** and the system **108** over the communication network **106** using a specific protocol or set of protocols. The network protocol connection includes, but not limited to, SIB protocol, Session Description Protocol (SDP), 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).

[0059] In an embodiment, UE **102** includes a primary processor **302**, and a memory **304**. In alternate embodiments, the UE **102** may include more than one primary processors **302** as per the requirement of the communication network **106**. The primary processors **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.

[0060] 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 create and transmit a message to the system **108**. 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.

[0061] For example, when a new device such as the UE **102** is introduced in the communication network **106**, the UE **102** transmits a message to the system **108** in order for establishing a call from the UE **102** to the called device **314**. The message transmitted to the system **108** includes plurality of headers. As will be understood by those skilled in the art, the header refers to supplemental data placed at the beginning of a block of data being stored or transmitted. In data transmission, the data following the header is sometimes called the payload or body. The transceiver **206** receives the message transmitted from the UE **102** which includes the plurality of headers. These plurality of headers includes at least one malfunctioning header determined by the determination unit **210** which is non-compatible with the at least one of a first node **310**, a second node **312** and the called device **314**, this non-compatibility of the header is due to the header being corrupted or includes inappropriate values. The malfunctioning header is not handled by the nodes i.e. the first node **310**, the second node **312** and the called device **314**, thereby leading to the problems including breakdown of the entire communication network **106**. Further, a call from the UE **102** will not get matured in the communication network **106**, and hence the UE **102** will not be able to make any calls to the called device **314**. In another example, another problem includes, if the UE's **102** name has a specific naming format of 20 digits or

50 characters, the UE **102** transmits a 1000 characters long name. So, if this message reaches a called device **314**, the called device **314** suffers. The called device **314** is not able to handle these many characters. As a result network services will be seriously impacted.

[0062] In order to solve the problems, some manipulation techniques are required to be implemented with respect to the malfunctioning or corrupted headers. The determination unit **210** determines the at least one header that requires manipulation based on the non-compatibility with the at least one of a first node **310**, a second node **312** and the called device **314**. For example, when the UE **102** transmits the message to the processors **202** including the plurality of headers, the determination unit **210** of the processors **202** checks whether the plurality of headers are compatible with the at least one of the first node **310**, the second node **312** and the called device **314**. In response to checking the plurality of headers, the determination unit **210** identifies that at least one header is malfunctioning when the at least one header is not compatible with the at least one of the first node **310**, the second node **312** and the called device **314**. Further, the determination unit **210** infers that the malfunctioned header requires manipulation. The selection unit **212** selects at least one of the plurality of manipulation techniques based on one or more pre-defined parameters.

[0063] In one or more embodiments, the plurality of manipulation techniques are based on one or more predefined parameters with respect to the malfunctioning headers. The manipulation techniques include at least one of removing a malfunctioning header, modifying a malfunctioning header, or updating a malfunctioning header with different header values. The one or more predefined parameters include (a) priority, (b) trigger points, and (c) action implemented based on the different header values. Various combinations of these one or more predefined parameters are implemented based on the different header values of the malfunctioning headers. When there are plurality of headers causing a problem, certain malfunctioning headers are prioritized over other malfunctioning headers, from which the problems are required to be solved. In other words, firstly, the malfunctioning

headers and the level of the problem associated with the malfunctioning headers are identified and these malfunctioning headers are arranged in a hierarchy based on the levels of the problems to be resolved with respect to the UE **102** and the called device **314**.

[0064] For example, the priorities are given only when there are plurality of headers present or multiple manipulations are required. As such, which manipulation is to be given a higher priority is decided by the one or more predefined parameters such as priority. In other words, if there are 10 types of manipulations that are required for a device such as UE **102**, first these manipulations are checked, to determine which manipulations should be taken up on priority. For example, the plurality of headers are associated with (i) 'bandwidth issue', or (ii) 'device not registered'. As such, the 'device not registered' is given a first priority or higher priority. Therefore, the problem associated with the 'device not registered' is solved first. Once this problem (i.e., 'device not registered') is resolved, the next priority of 'bandwidth issue' is considered and resolved.

[0065] The one or more predefined parameters further includes a trigger point, let's consider a user header with a device name X, and let us consider that the issue is with respect to particular version of the device X. So, this version is implemented as a trigger point, such that the only invite originating from the device X with that particular version will get triggered for the manipulation. There can be multiple trigger points, for example, with respect to a caller party etc. Accordingly, there can be multiple combinations. These combinations can be defined dynamically in real time.

[0066] The one or more predefined parameters further include actions to manipulate headers included in the message. These actions include removing, modifying, or updating the values of the malfunctioning or corrupted headers.

[0067] Subsequent to selecting at least one of the plurality of manipulation techniques based on one or more pre-defined parameters, the manipulation unit **214** manipulates the at least one malfunctioned header that requires manipulation in run time by applying the at least one selected manipulation technique to the at least one

malfunctioned header. The manipulation unit **214** also manipulates a body of the message by one of, removing, adding, appending, replacing and modifying domain parameters of the body and adding media attributes to media streams of the body. Thereby the problems caused by the malfunctioning headers are resolved by the system **108** which leads to the successful establishment of a call between the UE **102** and the called device **314**.

[0068] Referring to **FIG. 4**, **FIG. 4** is a flow chart illustrating a method **400** of message manipulation in a communication network. For the purpose of description, the method **400** is described with the embodiments as illustrated in **FIG. 2** and should nowhere be construed as limiting the scope of the present disclosure.

[0069] At step **402**, the method **400** includes the step of receiving, a message from a User Equipment (UE) **102** via a transceiver **206**. In one embodiment, the message received by the transceiver **206** includes a plurality of headers and the plurality of headers consists of multiple values. In one embodiment, the message pertains to the UE **102** establishing a call with a communication device such as a called device **314**.

[0070] At step **404**, the method **400** includes the step of determining, at least one of the plurality of headers that requires manipulation. In one embodiment, while transmitting the message from the UE **102** to the system **108**, the UE **102** transmits some malfunctioning header or header with inappropriate value to the system **108**. The determination unit **210** of the processor **202** determines at least one header among the plurality of headers that requires manipulation by checking the plurality of headers to detect the at least one header of the message is malfunctioning. For example, when a transceiver **206** receives a header from a new UE **102**, the called device **314** is not able to handle that header or the header is non compatible with the called device **314**. This non-compatibility of the header is due to the header being corrupted.

[0071] At step **406**, in order to overcome the above problems, the method **400** includes the step of, selecting at least one of a plurality of manipulation techniques. The selection unit **212** selects at least one of the plurality of manipulation techniques based on one or more pre-defined parameters. The one or more pre-defined parameters

with respect to the headers includes, priority, trigger points, and actions. Various combinations of these one or more pre-defined parameters are implemented based on the different header values.

[0072] The priority with respect to the plurality of headers indicates that the certain malfunctioning headers have higher priority as compared to other malfunctioning headers. The priority includes hierarchy of issues to be resolved with respect to the UE and the called device **314**. Further, the trigger point associated with the plurality of headers are different. The trigger point includes at least one of, specific version of the UE and the called device **314**. Action refers to whether to remove the malfunctioning header, or to update the malfunctioning header, or simply replace the malfunctioning header with another value. In other words, actions relate to adding, removing, or modifying the malfunctioning headers. As such, there can be actions based on the parameters of priority and trigger point.

[0073] At step **408**, the method **400** includes the step of, manipulating in run time, the at least one header that requires manipulation by applying the at least one selected manipulation technique to the at least one header. In an embodiment, in order to manipulate the malfunctioned header included in the message, the malfunctioned header is removed, updated or replaced with another value. An example of how the at least one header is manipulated is provided herein. Let us assume there are some predefined requirements in order to successfully establish call from the UE **102** to the called device **314**. The predefined requirements pertain to at least one of, but not limited to, a range of pre-defined values included in the plurality of headers which are compatible to establish the call from the UE **102** to the called device **314**. Based on the comparison between the value included in at least one of the header with the range of the pre-defined values, the processor **202** identifies that the value included in at least one header is not within the range of pre-defined values. Based on this, the processor **202** identifies the difference between the value included in at least one of the header and the range of the pre-defined values. Thereafter, based on the difference, the processor **202** selects at least one manipulation technique and manipulates the

identified value included in the at least one header in run time by changing or updating the identified value as per the range of the pre-defined values. In particular, the processor **202** changes or modifies the identified value such that the manipulated value is within the range of the pre-defined values which are compatible to successfully establish the call from the UE **102** to the called device **314**. As such, the proposed techniques require no new development, and the problem is solved during run-time thereby preventing any downtime in the communication network **106**. Moreover, there is no need to apply reapply the patch, there is no need to wait for the patch to arrive. Instead, the proposed techniques provide for simply configuring SIP nodes such as I-CSCF, S-CSCF and BGCF so that the value is changed or configured. The value therefore gets modified in the SIP node, and the call with respect to the UE **102** works like a normal call. As such the solution is achieved during runtime, and there is no downtime in the environment **100**.

[0074] The present invention further discloses a non-transitory computer-readable medium having stored thereon computer-readable instructions. The computer-readable instructions are executed by a processor **202**. The processor **202** is configured to receive a message from a User Equipment (UE), the message including a plurality of headers. The processor **202** is further configured to determine, at least one of the plurality of headers that requires manipulation. In response to determining that the at least one header requires manipulation the processor **202** is further configured to select at least one of a plurality of manipulation techniques. The processor **202** is further configured to manipulate in run time the at least one header that requires manipulation by applying the at least one selected manipulation technique to the at least one header, and thereby manipulating message in a communication network **106**.

[0075] A person of ordinary skill in the art will readily ascertain that the illustrated embodiments and steps in description and drawings (FIG.1-4) 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.

[0076] The present disclosure incorporates technical advancement in dynamically modifying the values of the malfunctioning headers included in the messages. This message manipulation is performed in real time in an effective and simple manner. Further the present invention provides better user experience by reducing the instance of the call dropping or the call not getting connected. By using the message manipulations techniques, the code level changes are not required which makes the message manipulations techniques accessible and intuitive for users.

[0077] 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

- [0078]** Environment - 100;
- [0079]** User Equipment - 102;
- [0080]** Server - 104;
- [0081]** Communication Network - 106;
- [0082]** System - 108;
- [0083]** Processor - 202;
- [0084]** Memory – 204;

- [0085]** Transceiver - 206;
- [0086]** Determination unit - 210;
- [0087]** Selection unit - 212;
- [0088]** Manipulation unit - 214;
- [0089]** Primary processor - 302;
- [0090]** Memory - 304;
- [0091]** First Node - 310;
- [0092]** Second Node - 312;
- [0093]** Communication device /Called Device - 314.

We Claim:

1. A method (400) for message manipulation in a communication network (106), the method (400) comprises the steps of:
 - receiving, by one or more processors (202), a message from a User Equipment (UE) (102), the message including a plurality of headers;
 - determining, by the one or more processors (202), at least one of the plurality of headers that requires manipulation;
 - in response to determining that the at least one header requires manipulation, selecting, by the one or more processors (202), at least one of a plurality of manipulation techniques; and
 - manipulating in run time, by the one or more processors (202), the at least one header that requires manipulation by applying the at least one selected manipulation technique to the at least one header.
2. The method (400) as claimed in claim 1, wherein the message pertains to the UE (102) establishing a call with a communication device (314).
3. The method (400) as claimed in claim 1, wherein the one or more processors (202) determines the at least one header that requires manipulation when the at least one header among the plurality of headers is malfunctioning based on the non-compatibility with the communication device (314), wherein non-compatibility of the header is due to the header being corrupted.
4. The method (400) as claimed in claim 1, wherein the one or more processors (202), selects the at least one of the plurality of manipulation techniques based on one or more pre-defined parameters.

5. The method (400) as claimed in claim 4, wherein the one or more pre-defined parameters include at least one of, priority, trigger point and action and a combination thereof.
6. The method (400) as claimed in claim 5, wherein the trigger point includes at least one of, specific version of the UE (102) and the communication device (314).
7. The method (400) as claimed in claim 5, wherein the priority includes hierarchy of issues pertaining to the malfunctioned header that is required to be resolved among the plurality of headers received from the UE (102)
8. The method (400) as claimed in claim 5, wherein the action includes at least one of, remove, modify and update, the at least one header with pre-defined values.
9. The method (400) as claimed in claim 1, wherein the step of, determining, at least one of the plurality of headers that requires manipulation, includes the step of:
checking, by the one or more processors (202), whether the at least one header among the plurality of headers included in the message is malfunctioning.
10. The method (400) as claimed in claim 1, wherein the method (400) further comprises the step of:
manipulating, by the one or more processors (202), a body of the message by one of, removing, adding, appending, replacing and modifying domain parameters of the body and adding media attributes to media streams of the body.
11. The method (400) as claimed in claim 1, wherein the step of, manipulating in run time, the at least one header that requires manipulation by applying the at least one selected manipulation technique to the at least one header, includes the step of:

comparing, by the one or more processors (202), a value included in the at least one of the header that requires manipulation with a range of pre-defined values;

identifying, by the one or more processors (202), the difference between the value included in the at least one of the header and the range of the pre-defined values based on the comparison; and

manipulating, by the one or more processors (202), the value included in the at least one of the header, to ensure the manipulated value is within the range of the pre-defined values based on the identified difference.

12. A system (108) for message manipulation in a communication network (106), the system (108) comprising:

a transceiver (206), configured to, receive, a message from a User Equipment (UE) (102), the message including a plurality of headers;

a determination unit (210), configured to, determine, at least one of the plurality of headers that requires manipulation;

in response to determining that the at least one header requires manipulation, a selection unit (212), configured to, select, at least one of a plurality of manipulation techniques; and

a manipulation unit (214), configured to, manipulate in run time, the at least one header that requires manipulation by applying the at least one selected manipulation technique to the at least one header.

13. The system (108) as claimed in claim 12, wherein the message pertains to the UE (102) establishing a call with a communication device (314).

14. The system (108) as claimed in claim 12, wherein the determination unit (210) determines the at least one header that requires manipulation when the at least one header among the plurality of headers is malfunctioning, based on the non-

compatibility with the communication device (314), wherein non-compatibility of the header is due to the header being corrupted.

15. The system (108) as claimed in claim 12, wherein the selection unit (212), selects the at least one of the plurality of manipulation techniques based on one or more pre-defined parameters.
16. The system (108) as claimed in claim 15, wherein the one or more pre-defined parameters include at least one of, priority, trigger point and action and a combination thereof.
17. The system (108) as claimed in claim 16, wherein the trigger point includes at least one of, specific version of the UE (102) and the communication device (314).
18. The system (108) as claimed in claim 16, wherein the priority includes hierarchy of issues pertaining to the malfunctioned header that is required to be resolved among the plurality of headers received from the UE (102). .
19. The system (108) as claimed in claim 16, wherein the action includes at least one of, remove, modify and update, the at least one header with pre-defined values.
20. The system (108) as claimed in claim 12, wherein the determination unit (210), determines, at least one of the plurality of headers that requires manipulation, by:
checking, whether the at least one header among the plurality of headers included in the message is malfunctioning.
21. The system (108) as claimed in claim 12, wherein the manipulation unit (214) is further configured to:

manipulate, a body of the message by one of, removing, adding, appending, replacing and modifying domain parameters of the body and adding media attributes to media streams of the body.

22. The system (108) as claimed in claim 12, wherein the manipulation unit (214) manipulates in run time, the at least one header that requires manipulation by applying the at least one selected manipulation technique to the at least one header, by:

comparing, a value included in the at least one of the header that requires manipulation with a range of pre-defined values;

identifying, the difference between the value included in the at least one of the header and the range of the pre-defined values based on the comparison; and

manipulating, the value included in the at least one of the header, to ensure the manipulated value is within the range of the pre-defined values based on the identified difference.

23. A User Equipment (UE) (102), comprising:

one or more primary processors (302) communicatively coupled to one or more processors (202), 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 (302) causes the UE (102) to:

transmit, a message to the one or more processors (202) in order to establish a call with a communication device (314); and

wherein the one or more processors (202) is configured to perform the steps as claimed in claim 1.

24. A non-transitory computer-readable medium having stored thereon computer-readable instructions that, when executed by a processor (202), causes the processor (202) to:

receive, a message from a User Equipment (UE) (102), the message including a plurality of headers;

determine, at least one of the plurality of headers that requires manipulation;

in response to determining, that the at least one header requires manipulation, select, at least one of a plurality of manipulation techniques; and

manipulate in run time, the at least one header that requires manipulation by applying the at least one selected manipulation technique to the at least one header.

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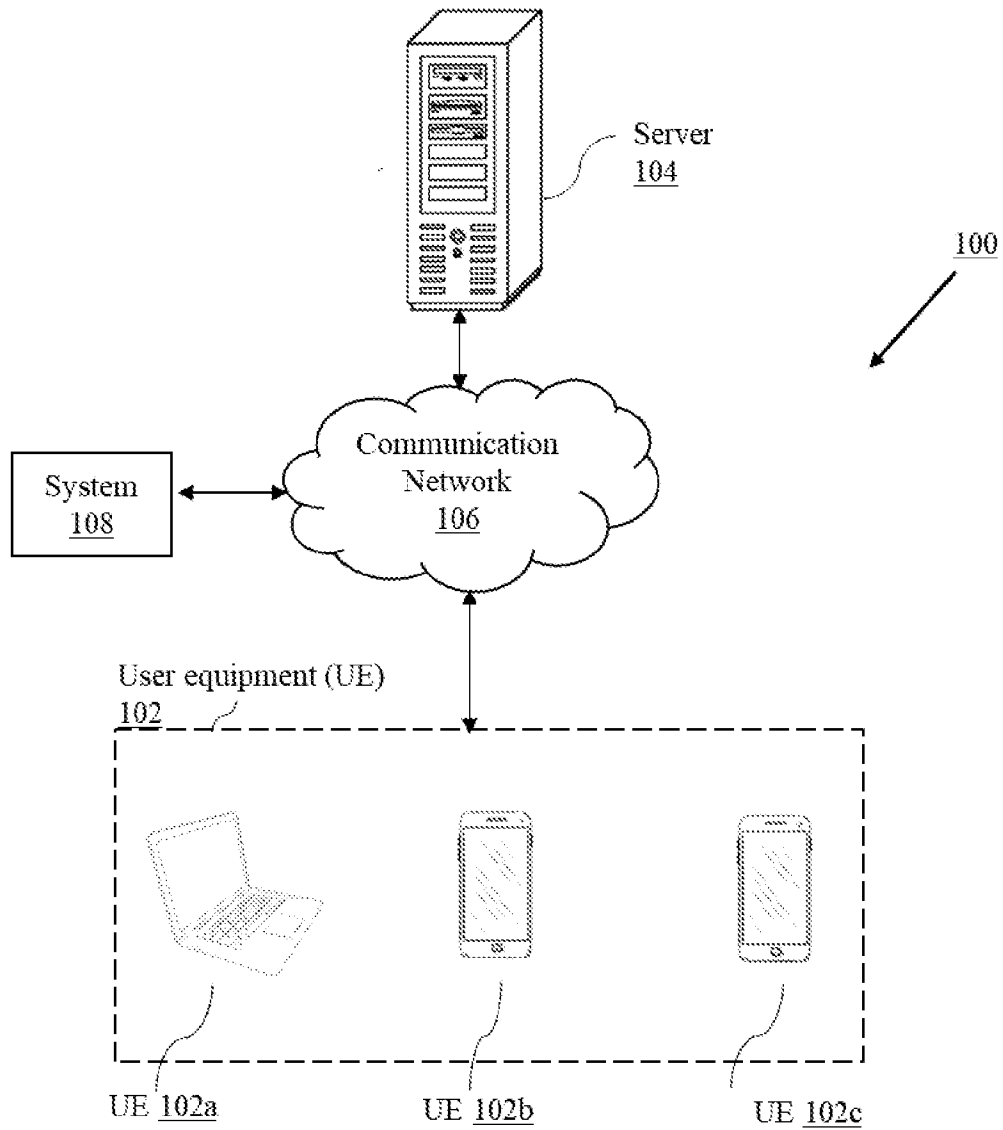


FIG. 1

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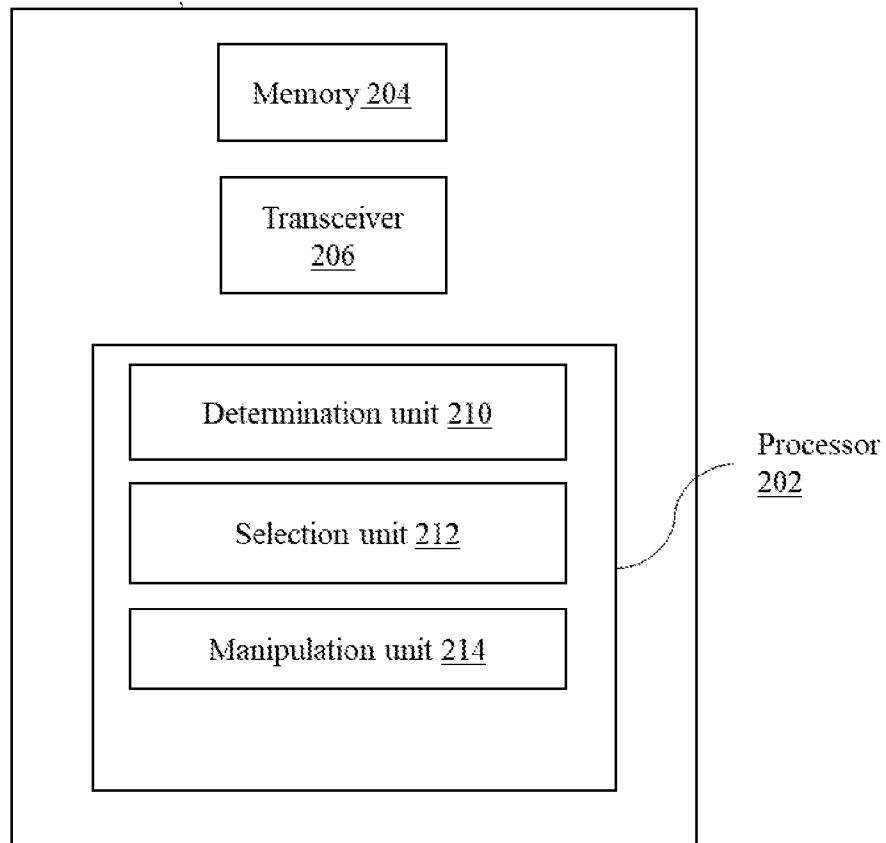
System 108

FIG. 2a

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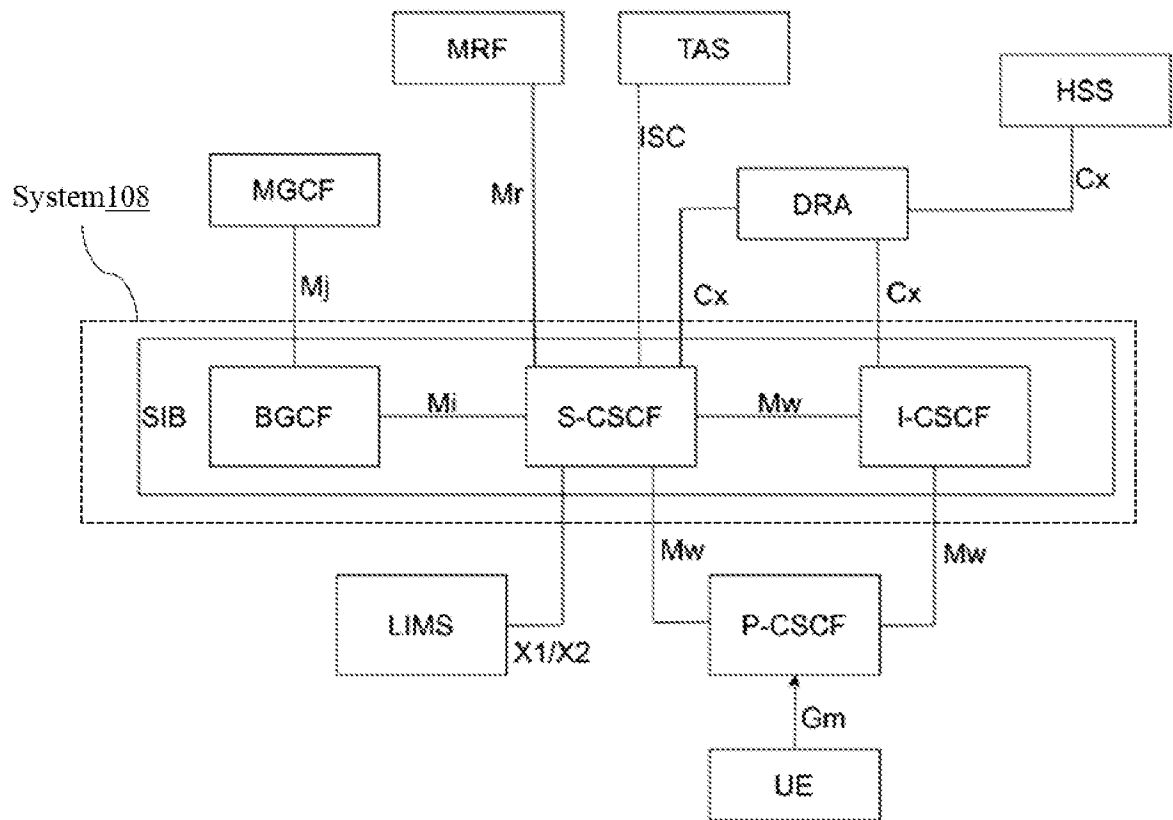


FIG. 2b

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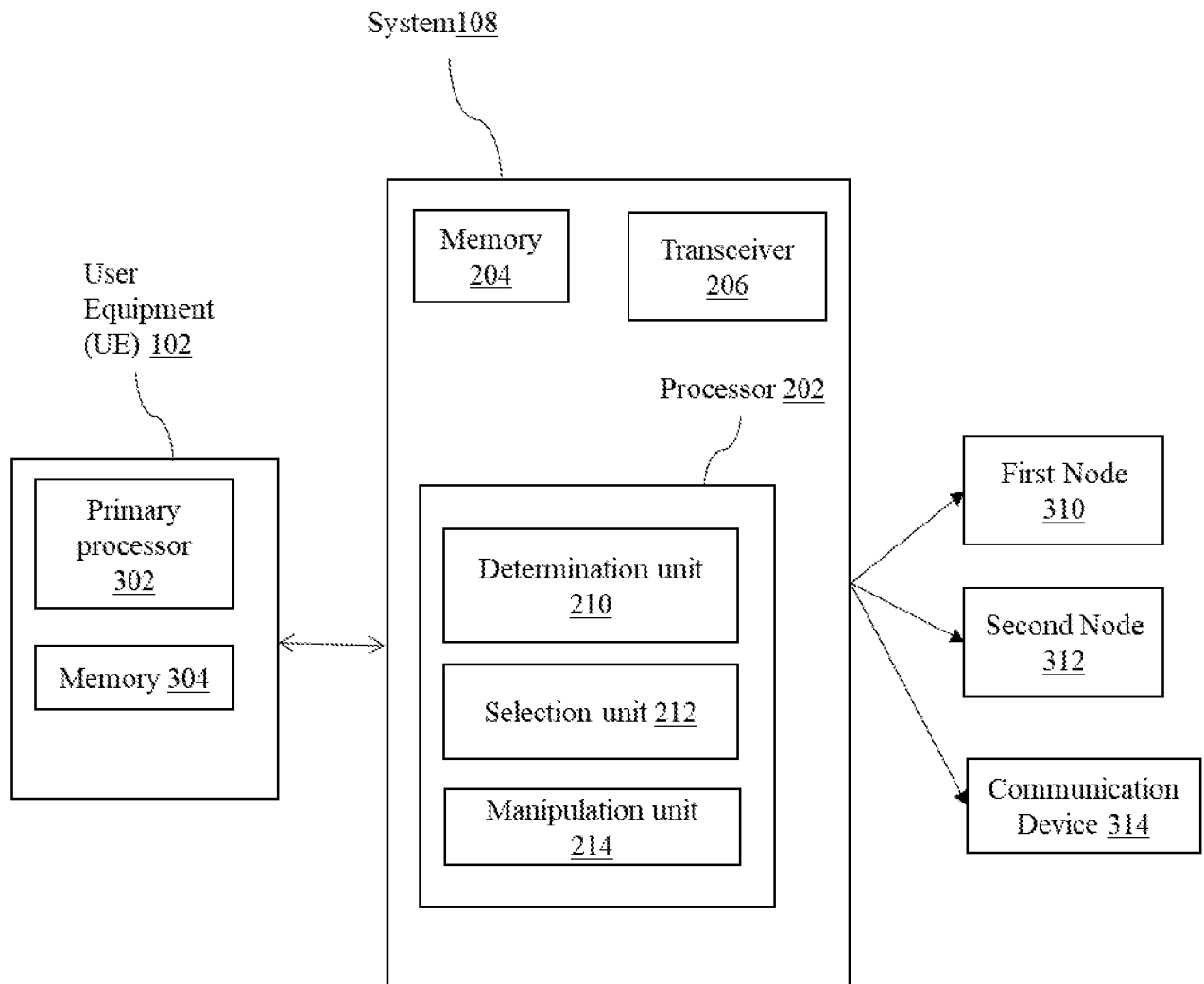


FIG. 3

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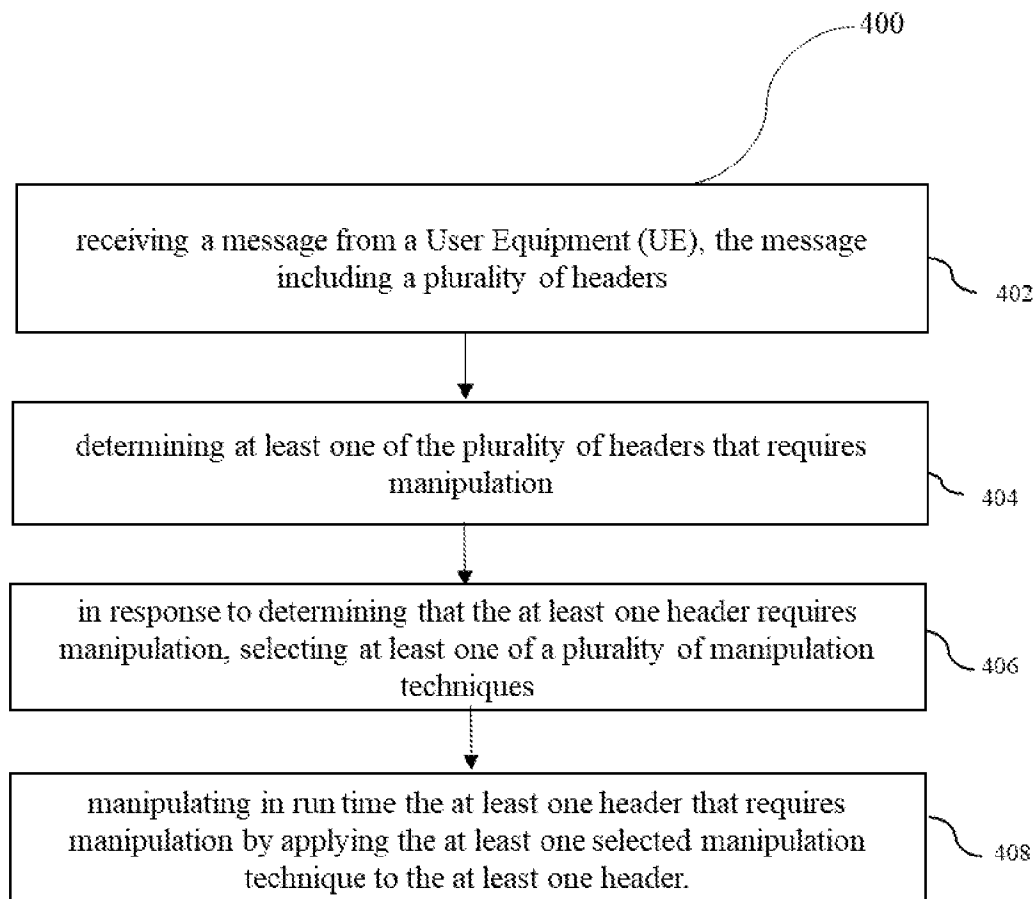


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IN2024/050922

A. CLASSIFICATION OF SUBJECT MATTER

H04L65/1104, H04L65/1016, H04W28/06, H04W48/16 Version=2024.01

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04L, H04W

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database consulted during the international search (name of database and, where practicable, search terms used)

Databases: PatSeer, IPO Internal Database

Search terms: message, manipulation, session initiation protocol

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US11558492B2 (METASWITCH NETWORKS LTD [US]) (17 JAN 2023) (17/01/2023) Columns 3,4	1-24
Y	WO2022235302A1 (ADEIA GUIDES INC [US]) (10 NOV 2022) (10/11/2022) Paragraphs 0042-0051	1-24



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"D" document cited by the applicant in the international application

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

21-10-2024

Date of mailing of the international search report

21-10-2024

Name and mailing address of the ISA/

Indian Patent Office

Plot No.32, Sector 14, Dwarka, New Delhi-110075

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IN2024/050922

Citation	Pub.Date	Family	Pub.Date
WO 2022235302 A1	10-11-2022	CA 3218921 A1	10-11-2022