



(51) International Patent Classification:

H04L 69/22 (2022.01) H04L 43/028 (2022.01)
H04L 43/18 (2022.01) H04L 43/04 (2022.01)

(21) International Application Number:

PCT/IN2024/050820

(22) International Filing Date:

14 June 2024 (14.06.2024)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

202321045000 05 July 2023 (05.07.2023) IN

(71) Applicant: **JIO PLATFORMS LIMITED** [IN/IN]; Of-
fice - 101, Saffron, Nr. Centre Point, Panchwati 5 Ras-
ta, Ambawadi, Ahmedabad - 380006, Gujarat, Ahmedabad
380006 (IN).

(72) Inventors: **BISHT, Birendra**; Office - 101, Saffron, Nr.
Centre Point, Panchwati 5 Rasta, Ambawadi, Ahmedabad

- 380006, Gujarat, Ahmedabad 380006 (IN). **BHATNA-
GAR, Aayush**; Office - 101, Saffron, Nr. Centre Point,
Panchwati 5 Rasta, Ambawadi, Ahmedabad - 380006, Gu-
jarat, Ahmedabad 380006 (IN). **SINGH, Harbinder Pal**;
Office - 101, Saffron, Nr. Centre Point, Panchwati 5 Ras-
ta, Ambawadi, Ahmedabad - 380006, Gujarat, Ahmedabad
380006 (IN). **KUMAR, Abhay**; Office - 101, Saffron, Nr.
Centre Point, Panchwati 5 Rasta, Ambawadi, Ahmedabad -
380006, Gujarat, Ahmedabad 380006 (IN). **KELKAR, Pri-
ti**; Office - 101, Saffron, Nr. Centre Point, Panchwati 5 Ras-
ta, Ambawadi, Ahmedabad - 380006, Gujarat, Ahmedabad
380006 (IN). **REDDY, P R Srikanth**; Office - 101, Saffron,
Nr. Centre Point, Panchwati 5 Rasta, Ambawadi, Ahmed-
abad - 380006, Gujarat, Ahmedabad 380006 (IN). **VER-
MA, Himanshu**; Office - 101, Saffron, Nr. Centre Point,
Panchwati 5 Rasta, Ambawadi, Ahmedabad - 380006, Gu-
jarat, Ahmedabad 380006 (IN).

(74) Agent: **SAHNEY, Garima**; SAIKRISHNA &
ASSOCIATES, ADVOCATES, B-140, Sector 51, Noi-
da-201301, Uttar Pradesh, India, Noida 201301 (IN).

(54) Title: METHOD AND SYSTEM FOR EXTRACTING DESIRED SIP PACKETS AT SIB NODE SERVER

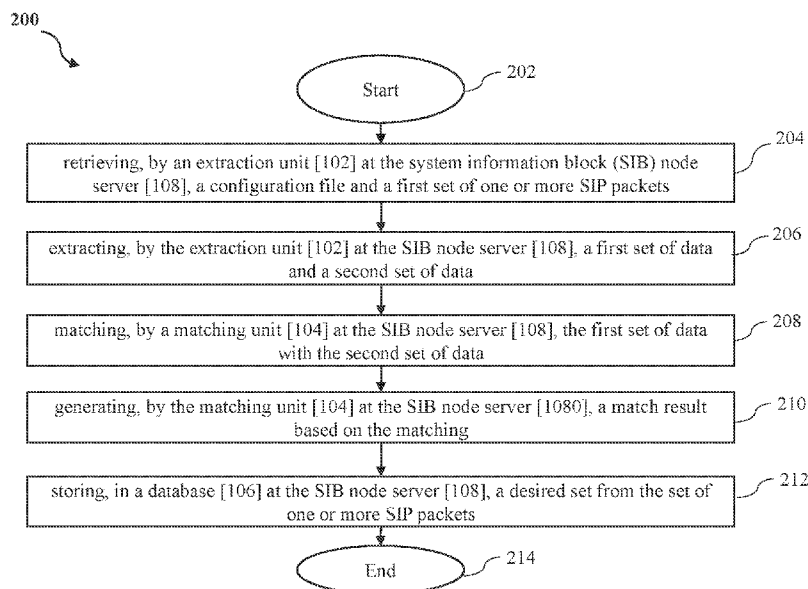


FIG. 2

(57) Abstract: The present disclosure relates to a method and a system for extracting desired SIP packets at SIB 5 node server [108]. The disclosure encompasses method wherein one or more users raising a complaint with a network operator; basis the complaint(s) received from user(s), network operator prepares a configuration file through command line interface of SIB node server [108]; the SIB node server [108] matches SIP packet with details in the configuration file; if match is found, SIP packet is stored in database [106] connected to or part of SIB node server [108], else SIP packet 0 is not stored.

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

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *of inventorship (Rule 4.17(iv))*

Published:

- *with international search report (Art. 21(3))*

METHOD AND SYSTEM FOR EXTRACTING DESIRED SIP PACKETS AT SIB NODE SERVER

FIELD OF THE DISCLOSURE

5

[0001] The present disclosure relates generally to the field of wireless communication systems. More particularly, the present disclosure relates to methods and systems for extracting desired Session Initiation Protocol (SIP) packets at System Information Block (SIB) node/node server.

10 BACKGROUND

[0002] The following description of related art is intended to provide background information pertaining to the field of the disclosure. This section may include certain aspects of the art that may be related to various features of the present disclosure. However, it should be appreciated that
15 this section be used only to enhance the understanding of the reader with respect to the present disclosure, and not as admissions of prior art.

[0003] Wireless communication technology has rapidly evolved over the past few decades, with each generation bringing significant improvements and advancements. The first generation of
20 wireless communication technology was based on analog technology and offered only voice services. However, with the advent of the second-generation (2G) technology, digital communication and data services became possible, and text messaging was introduced. The third-generation (3G) technology marked the introduction of high-speed internet access, mobile video calling, and location-based services. The fourth-generation (4G) technology revolutionized
25 wireless communication with faster data speeds, better network coverage, and improved security. Currently, the fifth-generation (5G) technology is being deployed, promising even faster data speeds, low latency, and the ability to connect multiple devices simultaneously. With each generation, wireless communication technology has become more advanced, sophisticated, and capable of delivering more services to its users.

30

[0004] A System Information Block (SIB) node/ node server provides functionality of Serving Call Session Control Function (S-CSCF), Interrogative Call Session Control Function (I-CSCF) and Breakout Gateway Control Function (BGCF) as defined in 3GPP standards. The SIB node receives Session Initiation Protocol (SIP) compatible packets. In a conventional SIB node, due to
35 high network traffic, capturing and analyzing the traffic /relevant SIP packets becomes

challenging. This leads to problem in identifying packet as there is no way to identify/ filter the relevant packets after users/ subscribers raised a complaint to a network operator. The network operator (also known as a telecom service provider or carrier) include traditional telecommunications companies (telcos), mobile network operators (MNOs), internet service providers (ISPs), cable companies, and satellite communication providers. These operators may operate on a local, regional, national, or international scale, serving residential, business, and government customers with communication services. As a result, to troubleshoot or debug a user raised complaint, the network operator had to extract all SIP packets arriving at SIB node. Since the network traffic is generally high, a large amount of data had to extracted to a database connected to/part of SIB node server. As a result, troubleshooting or debugging an issue would be resource intensive, time consuming and inefficient process due to prohibitively voluminous data involved in the same. In the existing technologies, there is no way to identify/filter desired/relevant SIP packets at SIB node server.

[0005] Thus, there exists an imperative need in the art to extract only desired SIP packets at SIB node server, which the present disclosure aims to address.

OBJECTS OF THE DISCLOSURE

[0006] Some of the objects of the present disclosure, which at least one embodiment disclosed herein satisfies are listed herein below.

[0007] It is an object of the present disclosure to provide a system and a method for extracting only desired SIP packets at a SIB node server.

[0008] It is another object of the present disclosure to provide a solution that extracts the desired SIP packets efficiently for a particular subscriber or group of subscribers for debugging or trace routing purposes.

[0009] It is another object of the present disclosure to provide a solution that enables faster debugging or troubleshooting of subscriber related issues by extracting only the desired SIP packets at the SIB node server.

[0010] It is another object of the present disclosure to provide a solution that is less resource intensive, faster and more efficient as compared to prior art approaches of analysing entire network traffic.

- 5 [0011] It is yet another objective of the present disclosure to logically combine different headers of the network packets to extract more relevant SIP packets.

SUMMARY OF THE DISCLOSURE

- 10 [0012] This section is provided to introduce certain aspects of the present disclosure in a simplified form that are further described below in the detailed description. This summary is not intended to identify the key features or the scope of the claimed subject matter.

- [0013] The present disclosure encompasses a method for extracting desired set of one or more session initiation protocol (SIP) packets at a system information block (SIB) node server. The method comprises retrieving a first set of one or more SIP packets and a configuration file by an extraction unit at the SIB node server. It is to be noted that the configuration file relates to a second set of one or more SIP packets. The method further comprises extracting a first set of data from the first set of one or more SIP packets and a second set of data from the configuration file by the extraction unit at the SIB node server. The method further comprises matching the first set of data with the second set of data from the configuration file by a matching unit at the SIB node server. The method further comprises generating a match result by the matching unit at the SIB node server based on the matching. It is emphasized that the match result is one of a match-success result and a match-fail result. It is further emphasized that the match-success result is generated in an event the first set of data matches the second set of data while the match-fail result is generated in an event the first set of data does not match the second set of data. The method further comprises storing the desired set from the set of one or more SIP packets in a database at the SIB node server. It is to be noted that the desired set comprises one or more SIP packets from the first set of one or more SIP packets for which the match-success result is generated by the matching unit.

30

- [0014] Further, as per the method, the first set of one or more SIP packets including the one or more SIP packets being is received at the SIB node server, and the second set of one or more SIP packets including irrelevant one or more SIP packets is stored in the configuration file.

[0015] Further, as per the method the configuration file is created by a file manager unit upon receiving a command via a command line interface in response to a complaint received by a network operator.

- 5 [0016] Furthermore, the first set of data comprises at least a set of subscriber details, and the second set of data comprises at least a set of header details.

[0017] Also, the method comprises performing, by a debugging unit, a debug operation on the desired set from the set of one or more SIP packets.

- 10 [0018] The present disclosure also encompasses a system for extracting a desired set of one or more session initiation protocol (SIP) packets. The system comprises a system information block (SIB) node server. The SIB node server comprises an extraction unit which is configured to retrieve a configuration file, a first set of one or more SIP packets and a configuration file related to a predefined set of one or more SIP packets. The extraction unit is further configured to extract
15 a first set of data from the first set of one or more SIP packets and a second set of data from the configuration file. The SIB node server further comprises a matching unit connected to the extraction unit. The matching unit is configured to match the first set of data with the second set of data from the configuration file. The matching unit is further configured to generate a match result based on the matching. It is important to note that the match result is one of a match-success
20 result and a match-fail result. It is further noted that the match-success result is generated in an event the first set of data matches the second set of data while the match-fail result is generated in an event the first set of data does not match the second set of data. The SIB node server further comprises a database connected to the matching unit. The database is configured to store the desired set from the set of one or more SIP packets. It is important to note that the desired set
25 comprises one or more SIP packets from the first set of one or more SIP packets for which the match-success result is generated.

- [0019] The present disclosure also encompasses a non-transitory computer readable storage medium for extracting a desired set of one or more session initiation protocol (SIP) packets at a
30 system information block (SIB) node server. The instructions when executed by one or more units of a system configured for extracting the desired set of one or more SIP packets at the SIB node server, cause an extraction unit to retrieve a configuration file, a first set of one or more SIP packets and a configuration file related to a pre-defined set of one or more SIP packets. The instructions upon retrieval further cause the extraction unit to extract a first set of data from the first set of one
35 or more SIP packets and a second set of data from the configuration file. The instructions upon

extraction further cause a matching unit to match the first set of data with the second set of data from the configuration file. The instructions upon matching further cause the matching unit to generate a match result based on the matching. It is to be noted that the match result is one of a match-success result and a match-fail result. It is further noted that the match-success result is generated in an event the first set of data matches the second set of data while the match-fail result is generated in an event the first set of data does not match the second set of data. The instructions upon generation further cause a database to store the desired set from the set of one or more SIP packets. It is to be noted that the desired set comprises one or more SIP packets from the first set of one or more SIP packets for which the match-success result is generated.

10

BRIEF DESCRIPTION OF DRAWINGS

[0020] 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.

20

[0021] FIG.1A illustrates an exemplary block diagram representation of a 5th generation core (5GC) network architecture.

[0022] FIG.1B illustrates an exemplary block diagram of a system [100] for extracting desired set of one or more session initiation protocol (SIP) packets at a system information block (SIB) node server [108], in accordance with exemplary embodiments of the present disclosure.

25

[0023] FIG.2 illustrates an exemplary method flow diagram indicating the process [200] for extracting the desired set of SIP packets at the SIB node server [108], in accordance with exemplary embodiments of the present disclosure.

30

[0024] FIG. 3 illustrates an exemplary scenario indicating the process [300] for extracting the desired set of SIP packets at the SIB node server [108], in accordance with exemplary embodiments of the present disclosure.

35

[0025] FIG.4 illustrates an exemplary block diagram of a computing device upon which an embodiment of the present disclosure may be implemented, in accordance with exemplary embodiments of the present disclosure.

5

[0026] The foregoing shall be more apparent from the following more detailed description of the disclosure.

DETAILED DESCRIPTION

10

[0027] In the following description, for the purposes of explanation, various specific details are set forth in order to provide a thorough understanding of embodiments of the present disclosure. It will be apparent, however, that embodiments of the present disclosure may be practiced without these specific details. Several features described hereafter can each be used independently of one another or with any combination of other features. An individual feature may not address any of the problems discussed above or might address only some of the problems discussed above. Some of the problems discussed above might not be fully addressed by any of the features described herein. Example embodiments of the present disclosure are described below, as illustrated in various drawings in which like reference numerals refer to the same parts throughout the different drawings.

20

[0028] The ensuing description provides exemplary embodiments only, and is not intended to limit the scope, applicability, or configuration of the disclosure. Rather, the ensuing description of the exemplary embodiments will provide those skilled in the art with an enabling description for implementing an exemplary embodiment. It should be understood that various changes may be made in the function and arrangement of elements without departing from the spirit and scope of the disclosure as set forth.

25

[0029] It should be noted that the terms "mobile device", "user equipment", "user device", "communication device," "device" and similar terms are used interchangeably for the purpose of describing the disclosure. These terms are not intended to limit the scope of the disclosure or imply any specific functionality or limitations on the described embodiments. The use of these terms is solely for convenience and clarity of description. The disclosure is not limited to any particular type of device or equipment, and it should be understood that other equivalent terms or variations

30

thereof may be used interchangeably without departing from the scope of the disclosure as defined herein.

[0030] Specific details are given in the following description to provide a thorough understanding of the embodiments. However, it will be understood by one of ordinary skill in the art that the embodiments may be practiced without these specific details. For example, circuits, systems, networks, processes, and other components may be shown as components in block diagram form in order not to obscure the embodiments in unnecessary detail. In other instances, well-known circuits, processes, algorithms, structures, and techniques may be shown without unnecessary detail in order to avoid obscuring the embodiments.

[0031] Also, it is noted that individual embodiments may be described as a process which is depicted as a flowchart, a flow diagram, a data flow diagram, a structure diagram, or a block diagram. Although a flowchart may describe the operations as a sequential process, many of the operations can be performed in parallel or concurrently. In addition, the order of the operations may be re-arranged. A process is terminated when its operations are completed but could have additional steps not included in a figure.

[0032] The word “exemplary” and/or “demonstrative” is used herein to mean serving as an example, instance, or illustration. For the avoidance of doubt, the subject matter disclosed herein is not limited by such examples. In addition, any aspect or design described herein as “exemplary” and/or “demonstrative” is not necessarily to be construed as preferred or advantageous over other aspects or designs, nor is it meant to preclude equivalent exemplary structures and techniques known to those of ordinary skill in the art. Furthermore, to the extent that the terms “includes,” “has,” “contains,” and other similar words are used in either the detailed description or the claims, such terms are intended to be inclusive—in a manner similar to the term “comprising” as an open transition word—without precluding any additional or other elements.

[0033] As used herein, an “electronic device,” or “portable electronic device,” or “user device” or “communication device” or “user equipment” or “device” refers to any electrical, electronic, electromechanical and computing device. The user device is capable of receiving and/or transmitting one or parameters, performing function/s, communicating with other user devices and transmitting data to the other user devices. The user equipment may have a processor, a display, a memory, a battery and an input-means such as a hard keypad and/or a soft keypad. The user equipment may be capable of operating on any radio access technology including but not limited

to IP-enabled communication, Zig Bee, Bluetooth, Bluetooth Low Energy, Near Field Communication, Z-Wave, Wi-Fi, Wi-Fi direct, etc. For instance, the user equipment may include, but not limited to, a mobile phone, smartphone, virtual reality (VR) devices, augmented reality (AR) devices, laptop, a general-purpose computer, desktop, personal digital assistant, tablet
5 computer, mainframe computer, or any other device as may be obvious to a person skilled in the art for implementation of the features of the present disclosure.

[0034] Further, the user device and/or a system as described herein to implement technical features as disclosed in the present disclosure may also comprise a “processor” or “processing unit,”
10 wherein processor refers to any logic circuitry for processing instructions. The processor may be a general-purpose processor, a special purpose processor, a conventional processor, a digital signal processor, a plurality of microprocessors, one or more microprocessors in association with a DSP core, a controller, a microcontroller, Application Specific Integrated Circuits, Field Programmable Gate Array circuits, any other type of integrated circuits, etc. The processor may perform signal
15 coding data processing, input/output processing, and/or any other functionality that enables the working of the system according to the present disclosure. More specifically, the processor is a hardware processor.

[0035] As portable electronic devices and wireless technologies continue to improve and grow in
20 popularity, the advancing wireless technologies for data transfer are also expected to evolve and replace the older generations of technologies. In the field of wireless data communications, the dynamic advancement of various generations of cellular technology are also seen. The development, in this respect, has been incremental in the order of second generation (2G), third generation (3G), fourth generation (4G), and now fifth generation (5G), and more such generations
25 are expected to continue in the forthcoming time.

[0036] Radio Access Technology (RAT) refers to the technology used by mobile devices/ user equipment (UE) to connect to a cellular network. It refers to the specific protocol and standards that govern the way devices communicate with base stations, which are responsible for providing
30 the wireless connection. Further, each RAT has its own set of protocols and standards for communication, which define the frequency bands, modulation techniques, and other parameters used for transmitting and receiving data. Examples of RATs include GSM (Global System for Mobile Communications), CDMA (Code Division Multiple Access), UMTS (Universal Mobile Telecommunications System), LTE (Long-Term Evolution), and 5G. The choice of RAT depends
35 on a variety of factors, including the network infrastructure, the available spectrum, and the mobile

device's/device's capabilities. Mobile devices often support multiple RATs, allowing them to connect to different types of networks and provide optimal performance based on the available network resources.

5 [0037] A Serving Call Session Control Function (S-CSCF) is the primary node implemented by a server in an IMS responsible for session control. Subscribers are allocated a S-CSCF for the duration of their IMS registration in order to facilitate routing of SIP packets as part of service establishment procedures. The Session Initiation Protocol (SIP) refers to a set of rules for initiating and terminating a communication session. The communication session includes but may not be
10 limited to a voice communication, a text communication, and a video communication. In the context of the Session Initiation Protocol (SIP), the IP packets refer to the basic fundamental units of data that are transmitted thereby facilitating the exchange of signalling messages and media streams between SIP endpoints over IP networks. These IP packets contain various types of data, including but not limited to SIP signalling messages, media streams and other related information
15 for transmission between the SIP endpoints. Consequently, the S-CSCF downloads a subscriber profile from the HSS (Home Subscriber Server) at the time of registration, which allows the S-CSCF to ascertain a relevant Application Server (AS) for a service request. The relevant Application Server (AS) may be required to handle the service request to ensure that the service request may be accurately processed.

20 [0038] An Interrogating Call Session Control Function (I-CSCF) implemented by a server is responsible for onward routing of SIP packets to the 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. Routing SIP requests arriving from other SIP networks is also a
25 responsibility of the I-CSCF. The I-CSCF queries the HSS in order to discover the S-CSCF, which is assigned to a particular subscriber, or select a new S-CSCF based on configured capabilities.

[0039] A Breakout Gateway Control Function (BGCF) implemented by a server is an IMS element that chooses the network where PSTN breakout happens, in case when call is placed by a user
30 from wirelessly communicating device to wired device. If the breakout is to occur in the same network as the BGCF, then the BGCF selects a MGCF (Media Gateway Control Function) which will be responsible for the interworking with the PSTN.

[0040] The S-CSCF, I-CSCF and BGCF are collectively being referred to as SIB node server. It
35 is noted that a SIB node server may be a single server or plurality of servers connected to a network.

[0041] As discussed in the background section, there is no way prescribed in the art for extracting only desired SIP packets at SIB node server [108].

5 [0042] The present disclosure aims to overcome the above-mentioned and other existing problems in this field of technology by a method and a system for extracting desired set of one or more SIP packets at SIB node server [108].

[0043] Hereinafter, exemplary embodiments of the present disclosure will be described with
10 reference to the accompanying drawings.

[0044] Referring to Figure 1A, an exemplary block diagram representation of 5th generation core (5GC) network architecture, in accordance with exemplary embodiment of the present disclosure. As shown in Figure 1A, the 5GC network architecture [100A] includes a user equipment (UE)
15 [102u], a radio access network (RAN) [104r], an access and mobility management function (AMF) [106a], a Session Management Function (SMF) [108s], a Service Communication Proxy (SCP) [110s], an Authentication Server Function (AUSF) [112a], a Network Slice Specific Authentication and Authorization Function (NSSAAF) [114n], a Network Slice Selection Function (NSSF) [116n], a Network Exposure Function (NEF) [118n], a Network Repository
20 Function (NRF) [120n], a Policy Control Function (PCF) [122p], a Unified Data Management (UDM) [124u], an application function (AF) [126a], a User Plane Function (UPF) [128u], a data network (DN) [130d], wherein all the components are assumed to be connected to each other in a manner as obvious to the person skilled in the art for implementing features of the present disclosure.

25 [0045] Radio Access Network (RAN) [104r] is the part of a mobile telecommunications system that connects user equipment (UE) [102u] to the core network (CN) and provides access to different types of networks (e.g., 5G network). It consists of radio base stations and the radio access technologies that enable wireless communication.

30 [0046] Access and Mobility Management Function (AMF) [106a] is a 5G core network function responsible for managing access and mobility aspects, such as UE registration, connection, and reachability. It also handles mobility management procedures like handovers and paging.

[0047] Session Management Function (SMF) [108s] is a 5G core network function responsible for managing session-related aspects, such as establishing, modifying, and releasing sessions. It coordinates with the User Plane Function (UPF) [128u] for data forwarding and handles IP address allocation and QoS enforcement.

5

[0048] Service Communication Proxy (SCP) [110s] is a network function in the 5G core network that facilitates communication between other network functions by providing a secure and efficient messaging service. It acts as a mediator for service-based interfaces.

10 [0049] Authentication Server Function (AUSF) [112a] is a network function in the 5G core responsible for authenticating UEs during registration and providing security services. It generates and verifies authentication vectors and tokens.

15 [0050] Network Slice Specific Authentication and Authorization Function (NSSAAF) [114n] is a network function that provides authentication and authorization services specific to network slices. It ensures that UEs can access only the slices for which they are authorized.

20 [0051] Network Slice Selection Function (NSSF) [116n] is a network function responsible for selecting the appropriate network slice for a UE based on factors such as subscription, requested services, and network policies.

[0052] Network Exposure Function (NEF) [118n] is a network function that exposes capabilities and services of the 5G network to external applications, enabling integration with third-party services and applications.

25

[0053] Network Repository Function (NRF) [120n] is a network function that acts as a central repository for information about available network functions and services. It facilitates the discovery and dynamic registration of network functions.

30 [0054] Policy Control Function (PCF) [122p] is a network function responsible for policy control decisions, such as QoS, charging, and access control, based on subscriber information and network policies.

[0055] Unified Data Management (UDM) [124u] is a network function that centralizes the management of subscriber data, including authentication, authorization, and subscription information.

- 5 [0056] Application Function (AF) [126a] is a network function that represents external applications interfacing with the 5G core network to access network capabilities and services.

[0057] User Plane Function (UPF) [128u] is a network function responsible for handling user data traffic, including packet routing, forwarding, and QoS enforcement.

10

[0058] Data Network (DN) [130d] refers to a network that provides data services to user equipment (UE) in a telecommunications system. The data services may include but are not limited to Internet services, private data network related services.

- 15 [0059] In an implementation of the disclosure in Figure 1B, an exemplary block diagram of a system [100] for extracting desired set of one or more Session Initiation Protocol (SIP) packets at a System Information Block (SIB) node server [108] is shown, in accordance with the exemplary embodiments of the present disclosure. The system [100] comprises a user equipment (UE) [107], a file manager unit [110], a SIB node server [108] and a debugging unit [112]. The SIB node server
20 [108] of the system [100] comprises an extraction unit [102], a matching unit [104] and a database [106]. It is to be noted that the user equipment UE [107] can be a processing unit. It is also to be noted that processing unit may partly reside in the user equipment, or the processing unit can operate distinctly from the user equipment in the network. It is further noted that the UE [107] can interact with the system [100] and can therefore reside outside of the system [100]. Also, all of the
25 components/ units of the system [100] are assumed to be connected to each other unless otherwise indicated below. Also, in Fig. 1B only a few units are shown, however, the system [100] may comprise multiple such units or the system [100] may comprise any such numbers of said units, as required to implement the features of the present disclosure. Further, in an implementation, the system [100] may reside in a server or a network entity. In yet another implementation, the system
30 [100] may reside partly in the server/ network entity and partly in the user device.

- [0060] Further, in accordance with the present disclosure, it is to be acknowledged that the functionality described for the various the components/units can be implemented interchangeably. While specific embodiments may disclose a particular functionality of these units for clarity, it is recognized that various
35 configurations and combinations thereof are within the scope of the disclosure. The functionality of specific

units as disclosed in the disclosure should not be construed as limiting the scope of the present disclosure. Consequently, alternative arrangements and substitutions of units, provided they achieve the intended functionality described herein, are considered to be encompassed within the scope of the present disclosure.

5 [0061] Further, the file manager unit [110] and the database [106] refers to a machine or computer-readable medium including any mechanism for storing information in a form readable by a computer or similar machine. For example, a computer-readable medium includes read-only memory (“ROM”), random access memory (“RAM”), magnetic disk storage media, optical storage media, flash memory devices or other types of machine-accessible storage media. Also,
10 the storage unit is configured to store a data that is required by one or more units of the system [100] to perform their respective operations.

[0062] Additionally, the extraction unit [102], the matching unit [104], and the debugging unit [112] are processors. The processor may be a general-purpose processor, a special purpose
15 processor, a conventional processor, a digital signal processor, a plurality of microprocessors, one or more microprocessors in association with a DSP core, a controller, a microcontroller, Application Specific Integrated Circuits, Field Programmable Gate Array circuits, any other type of integrated circuits, etc.

20 [0063] The system [100] is configured for extracting only desired SIP packets at SIB node server [108], with the help of the interconnection between the components/units of the system [100].

[0064] The extraction unit [102] is configured to retrieve a configuration file and a first set of one or more SIP packets, wherein the configuration file relates to a predefined set of one or more SIP
25 packets. The configuration file is created by the file manager unit [110] of the system [100] upon receiving a command via a command line interface. The extraction unit [102] is further configured to extract a first set of data from the first set of one or more SIP packets and a second set of data from the configuration file. It is further important to note that the first set of one or more SIP packets includes the one or more SIP packets received at the SIB node server [108], and the second
30 set of one or more SIP packets includes one or more SIP packets stored in the configuration file. The first set of data comprises at least a set of subscriber details, and the second set of data comprises at least a set of header details. For instance, the SIB node server [108] uses the configuration file (in an XML format having i.e., “.xml” extension) for subscriber’s tracing where subscriber’s detail(s) such as A-party number, B-party number, location, device name etc. received
35 by SIB node server [108] in the form of SIP packets (each packet having multiple headers). The headers details contained in configuration file are one or more of those which are present in the

SIP packets as prescribed by standard. It is also emphasized that one or more of logical operators like AND, OR, REGULAR, and the like can be applied to headers made part of configuration file. Also, the multiple headers can be added in logical permutation combination (AND or OR operator or REGULAR expression). The meaning of AND, OR, REGULAR, and the like is same as what
5 is known to a person ordinarily skilled in the art and these are to be construed in broadest sense possible without limiting the scope of the present disclosure.

[0065] The matching unit [104] is configured to match the first set of data with the second set of data. Based upon the same, the matching unit [104] generates a match result based on the matching.
10 The match result is one of a match-success result and a match-fail result. The match-success result is generated in an event the first set of data matches the second set of data while the match-fail result is generated in an event the first set of data does not match the second set of data. For instance, in an exemplary scenario, subscriber's detail(s) is matched with information in the configuration file which was fed to the SIB node server [108] through the command line interface.

15 [0066] The database [106] is responsible for storing the desired set from the set of one or more SIP packets. It is important to note that the desired set comprises one or more SIP packets from the first set of one or more SIP packets for which the match-success result is generated by the matching unit [104]. The debugging unit [112] of the system [100] is configured to perform a
20 debug operation on the desired set from the one or more SIP packets.

[0067] In yet another implementation of the disclosure, a non-transitory computer readable storage medium for extracting a desired set of one or more session initiation protocol (SIP) packets at a system information block (SIB) node server [108]. The instructions when executed by one or more
25 units of a system [100] configured for extracting the desired set of one or more SIP packets at the SIB node server [108], cause an extraction unit [102] to retrieve a configuration file, a first set of one or more SIP packets and a configuration file related to a pre-defined set of one or more SIP packets. The instructions upon retrieval further cause the extraction unit [102] to extract a first set of data from the first set of one or more SIP packets and a second set of data from the configuration
30 file. The instructions upon extraction further cause a matching unit [104] to match the first set of data with the second set of data from the configuration file. The instructions upon matching further cause the matching unit [104] to generate a match result based on the matching. It is to be noted that the match result is one of a match-success result and a match-fail result. It is further noted that the match-success result is generated in an event the first set of data matches the second set of data
35 while the match-fail result is generated in an event the first set of data does not match the second

set of data. The instructions upon generation further cause a database [106] to store the desired set from the set of one or more SIP packets. It is to be noted that the desired set comprises one or more SIP packets from the first set of one or more SIP packets for which the match-success result is generated.

5

[0068] In an implementation of the disclosure in Figure 2, an exemplary method flow diagram [200], for extracting desired set of one or more session initiation protocol (SIP) packets at a system information block (SIB) node server [108], in accordance with exemplary embodiments of the present disclosure is shown. In an implementation the method [200] is performed by the system
10 [100]. As shown in Figure 2, the method [200] starts at step [202].

[0069] At step [204], the method [200] as disclosed by the present disclosure comprises retrieving a first set of one or more SIP packets and a configuration file by an extraction unit [102] at the system information block (SIB) node server [108]. It is to be noted that the configuration file
15 relates to a second set of one or more SIP packets.

[0070] In an implementation of the present disclosure, the first set of one or more SIP packets including the one or more SIP packets is received at the SIB node server [108], and the second set of one or more SIP packets including one or more SIP packets stored in the configuration file.

20

[0071] In an implementation of the present disclosure, the configuration file is created by a file manager unit [110] upon receiving a command via a command line interface in response to a complaint received by a network operator. Thus, when one or more errors occur, a configuration file is created storing the header details of the erroneous SIP packets.

25

[0072] Next, at step [206], the method [200] as disclosed by the present disclosure comprises extracting a first set of data from the first set of one or more SIP packets and a second set of data from the configuration file by the extraction unit [102] at the SIB node server [108].

30 [0073] In an implementation of the disclosure, the first set of data comprises at least a set of subscriber details while the second set of data comprises at least a set of header details.

[0074] Next, at step [208], the method [200] as disclosed by the present disclosure comprises matching the first set of data with the second set of data from the configuration file by a matching
35 unit [104] at the SIB node server [108]. For e.g., the first set of data, i.e. the subscriber's call

detail(s) such as but not limited to A-party number (calling party), B-party number (receiving party), location, device name) is matched with the second set of data, i.e., header details in the configuration file (.xml).

5 [0075] Next, at step [210], the method [200] as disclosed by the present disclosure comprises generating a match result based on the matching by the matching unit [104] at the SIB node server [108]. It is to be noted that the match result is one of a match-success result and a match-fail result. It is further noted that the match-success result is generated in an event the first set of data matches the second set of data while the match-fail result is generated in an event the first set of data does
10 not match the second set of data. In the above example, if the subscriber details such as the A party number and the B party number are the same as those stored in the header details in the configuration file, then the match-success result is generated. If the subscriber details do not match with the header details in the configuration file, then the match-fail result is generated.

15 [0076] Next, at step [212], the method [200] as disclosed by the present disclosure comprises storing the desired set from the set of one or more SIP packets in a database [106] at the SIB node server [108]. It is further noted that the desired set comprises one or more SIP packets from the first set of one or more SIP packets for which the match-success result is generated by the matching unit [104]. Thus, the entire first set of SIP packets received at the SIB node server are not stored
20 as per the implementation of the present disclosure. Instead, more advantageously, the present disclosure encompasses storing only the desired set of SIP packets from the first set of SIP packets, i.e., storing only those SIP packets that match the header of the SIP packets in the configuration file.

25 [0077] In an implementation of the present disclosure, a debugging unit [112] performs a debug operation on the desired set from the set of one or more SIP packets.

[0078] Thereafter, the method terminates at step [214].

30 [0079] Referring to Fig. 3, an exemplary scenario indicating the process [300] for extracting desired set of one or more session initiation (SIP) packets at a system information block (SIB) node server [108] is shown, in accordance with exemplary embodiments of the present disclosure. When one or more users raise a complaint with a network operator, the network operator prepares/configures/creates a configuration file through command line interface at the SIB node
35 server [108]. This can be seen at [Step 1] where the SIB node server [108] extracts the subscriber

details from SIP packets and header details from the configuration file (.xml). Then, after preparation/configuration/creation of the configuration file, the SIB node server [108] compares an input SIP packet with the information/data present in the configuration file. This can be seen at [Step 2] when the SIB node server [108] matches the subscriber's details with header details in the configuration file. If input SIP packet matches with the information/data present in the configuration file, the SIB node server [108] is configured to store the SIP packet in a database [106] connected to or part of SIB node server [108], else the SIP packet is not stored in the database [106]. This can be seen at [Step 3]. Thereon, the SIB node server [108] will capture the SIP packet for further debugging.

10

[0080] Fig. 4 illustrates an exemplary block diagram of a computing device [1000] upon which an embodiment of the present disclosure may be implemented. In an implementation, the computing device [1000] implements the method [200] for extracting a desired set of one or more Session Initiation Protocol (SIP) packets at a System Information Block (SIB) node server [108] in a multi-network environment by utilising the system [100]. In another implementation, the computing device [1000] itself implements the method [200] for extracting a desired set of one or more Session Initiation Protocol (SIP) packets at a System Information Block (SIB) node server [108] in a multi-network environment using one or more units configured within the computing device [1000], wherein said one or more units are capable of implementing the features as disclosed in the present disclosure.

20

[0081] The computing device [1000] may include a bus [1002] or other communication mechanism for communicating information, and a hardware processor [1004] coupled with bus [1002] for processing information. The hardware processor [1004] may be, for example, a general-purpose microprocessor. The computing device [1000] may also include a main memory [1006], such as a random-access memory (RAM), or other dynamic storage device, coupled to the bus [1002] for storing information and instructions to be executed by the processor [1004]. The main memory [1006] also may be used for storing temporary variables or other intermediate information during execution of the instructions to be executed by the processor [1004]. Such instructions, when stored in non-transitory storage media accessible to the processor [1004], render the computing device [1000] into a special-purpose machine that is customized to perform the operations specified in the instructions. The computing device [1000] further includes a read only memory (ROM) [1008] or other static storage device coupled to the bus [1002] for storing static information and instructions for the processor [1004].

35

[0082] A storage device [1010], such as a magnetic disk, optical disk, or solid-state drive is provided and coupled to the bus [1002] for storing information and instructions. The computing device [1000] may be coupled via the bus [1002] to a display [1012], such as a cathode ray tube (CRT), Liquid crystal Display (LCD), Light Emitting Diode (LED) display, Organic LED (OLED) display, etc. for displaying information to a computer user. An input device [1014], including alphanumeric and other keys, touch screen input means, etc. may be coupled to the bus [1002] for communicating information and command selections to the processor [1004]. Another type of user input device may be a cursor controller [1016], such as a mouse, a trackball, or cursor direction keys, for communicating direction information and command selections to the processor [1004], and for controlling cursor movement on the display [1012]. This input device typically has two degrees of freedom in two axes, a first axis (e.g., x) and a second axis (e.g., y), that allow the device to specify positions in a plane.

[0083] The computing device [1000] may implement the techniques described herein using customized hard-wired logic, one or more ASICs or FPGAs, firmware and/or program logic which in combination with the computing device [1000] causes or programs the computing device [1000] to be a special-purpose machine. According to one embodiment, the techniques herein are performed by the computing device [1000] in response to the processor [1004] executing one or more sequences of one or more instructions contained in the main memory [1006]. Such instructions may be read into the main memory [1006] from another storage medium, such as the storage device [1010]. Execution of the sequences of instructions contained in the main memory [1006] causes the processor [1004] to perform the process steps described herein. In alternative embodiments, hard-wired circuitry may be used in place of or in combination with software instructions.

[0084] The computing device [1000] also may include a communication interface [1028] coupled to the bus [1002]. The communication interface [1028] provides a two-way data communication coupling to a network link [1020] that is connected to a local network [1022]. For example, the communication interface [1028] may be an integrated services digital network (ISDN) card, cable modem, satellite modem, or a modem to provide a data communication connection to a corresponding type of telephone line. As another example, the communication interface [1028] may be a local area network (LAN) card to provide a data communication connection to a compatible LAN. Wireless links may also be implemented. In any such implementation, the communication interface [1028] sends and receives electrical, electromagnetic or optical signals that carry digital data streams representing various types of information.

[0085] The computing device [1000] can send messages and receive data, including program code, through the network(s), the network link [1020] and the communication interface 1028. In the Internet example, a server [1030] might transmit a requested code for an application program through the Internet [1028], the ISP [1026], the host [1024], the local network [1022] and the communication interface [1028]. The received code may be executed by the processor [1004] as it is received, and/or stored in the storage device [1010], or other non-volatile storage for later execution.

[0086] As is evident from the above, the present disclosure provides a technically advanced solution for extracting only desired SIP packets at SIB node server [108]. The system and the method disclosed in present disclosure allows capturing of desired SIP packets efficiently for a particular subscriber or group of subscribers for debugging or trace routing purposes. The system and the method disclosed in present disclosure allows faster debugging/troubleshooting of subscriber related issues, because entire network traffic need not be analysed anymore. It is emphasized that only desired SIP packets are attempted to be downloaded and analysed to debug an issue. The approach disclosed in present disclosure would be less resource intensive, faster and more efficient as compared to earlier approaches of analysing entire network traffic. Further, the system and the method disclosed in the present disclosure enable different headers to be logically combined using operators such as OR, AND or REGULAR and the like to extract desired SIP packets at SIB node server [108]. Moreover, the system and the method for extracting only desired SIP packets at SIB node server [108] as disclosed in the present disclosure allows for easier and efficient subscriber tracing where subscriber's call detail(s) such as (A-party number, B-party number, location, device name etc.).

[0087] While considerable emphasis has been placed herein on the disclosed embodiments, it will be appreciated that many embodiments can be made and that many changes can be made to the embodiments without departing from the principles of the present disclosure. These and other changes in the embodiments of the present disclosure will be apparent to those skilled in the art, whereby it is to be understood that the foregoing descriptive matter to be implemented is illustrative and non-limiting.

We Claim:

1. A method [200] for extracting a desired set of one or more Session Initiation Protocol (SIP) packets at a System Information Block (SIB) node server [108], the method [200] comprising:
 - 5 - retrieving, by an extraction unit [102] at the System Information Block (SIB) node server [108], a first set of one or more SIP packets and a configuration file, the configuration file related to a second set of one or more SIP packets;
 - extracting, by the extraction unit [102] at the SIB node server [108], a first set of data from the first set of one or more SIP packets, and a second set of data from the
10 configuration file;
 - matching, by a matching unit [104] at the SIB node server [108], the first set of data with the second set of data from the configuration file;
 - generating, by the matching unit [104] at the SIB node server [108], a match result based on the matching, wherein the match result is one of a match-success result and a
15 match-fail result, and wherein the match-success result is generated in an event the first set of data matches the second set of data, and the match-fail result is generated in an event the first set of data does not match the second set of data; and
 - storing, in a database [106] at the SIB node server [108], the desired set from the set of
20 one or more SIP packets, wherein the desired set comprises one or more SIP packets from the first set of one or more SIP packets, for which the match-success result is generated by the matching unit [104].
2. The method [200] as claimed in claim 1, wherein the first set of one or more SIP packets including the one or more SIP packets is received at the SIB node server [108], and the second
25 set of one or more SIP packets including one or more SIP packets is stored in the configuration file.
3. The method [200] as claimed in claim 1, wherein the configuration file is created by a file manager unit [110] upon receiving a command via a command line interface in response to a
30 complaint received by a network operator.
4. The method [200] as claimed in claim 1, wherein the first set of data comprises at least a set of subscriber details, and the second set of data comprises at least a set of header details.
- 35 5. The method [200] as claimed in claim 1, the method further comprising:

- performing, by a debugging unit [112], a debug operation on the desired set from the set of one or more SIP packets.
6. A system [100] for extracting a desired set of one or more Session Initiation Protocol (SIP) packets, the system [100] comprising a System Information Block (SIB) node server [108], the SIB node server [108] further comprising:
- an extraction unit [102] configured to:
 - o retrieve a configuration file, a first set of one or more SIP packets and a configuration file related to a predefined set of one or more SIP packets;
 - o extract a first set of data from the first set of one or more SIP packets, and a second set of data from the configuration file;
 - a matching unit [104] connected to at least the extraction unit [102], the matching unit [104] configured to:
 - o match the first set of data with the second set of data from the configuration file;
 - o generate a match result based on the matching, wherein the match result is one of a match-success result and a match-fail result, and wherein the match-success result is generated in an event the first set of data matches the second set of data, and the match-fail result is generated in an event the first set of data does not match the second set of data; and
 - a database [106] connected to at least the matching unit [104], the database [106] configured to store the desired set from the set of one or more SIP packets, wherein the desired set comprises one or more SIP packets from the first set of one or more SIP packets, for which the match-success result is generated.
7. The system [100] as claimed in claim 6, wherein the first set of one or more SIP packets including the one or more SIP packets is received at the SIB node server [108], and the second set of one or more SIP packets including one or more SIP packets is stored in the configuration file.
8. The system [100] as claimed in claim 6, further comprising a file manager unit [110] configured to create the configuration file upon receiving a command via a command line interface in response to a complaint received by a network operator.

9. The system [100] as claimed in claim 6, wherein the first set of data comprises at least a set of subscriber details, and the second set of data comprises at least a set of header details.
10. The system [100] as claimed in claim 6, further comprising a debugging unit [112] configured to:
- perform a debug operation on the desired set from the set of one or more SIP packets.
11. A non-transitory computer readable storage medium for extracting a desired set of one or more Session Initiation Protocol (SIP) packets, the storage medium comprising executable code which, when executed by at least: one or more units, or a System Information Block (SIB) node server [108] of a system, causes:
- an extraction unit [102] to:
 - o retrieve a configuration file, a first set of one or more SIP packets and a configuration file related to a predefined set of one or more SIP packets;
 - o extract a first set of data from the first set of one or more SIP packets, and a second set of data from the configuration file;
 - a matching unit [104] to:
 - o match the first set of data with the second set of data from the configuration file;
 - o generate a match result based on the matching, wherein the match result is one of a match-success result and a match-fail result, and wherein the match-success result is generated in an event the first set of data matches the second set of data, and the match-fail result is generated in an event the first set of data does not match the second set of data; and
 - a database [106] to store the desired set from the set of one or more SIP packets, wherein the desired set comprises one or more SIP packets from the first set of one or more SIP packets, for which the match-success result is generated.

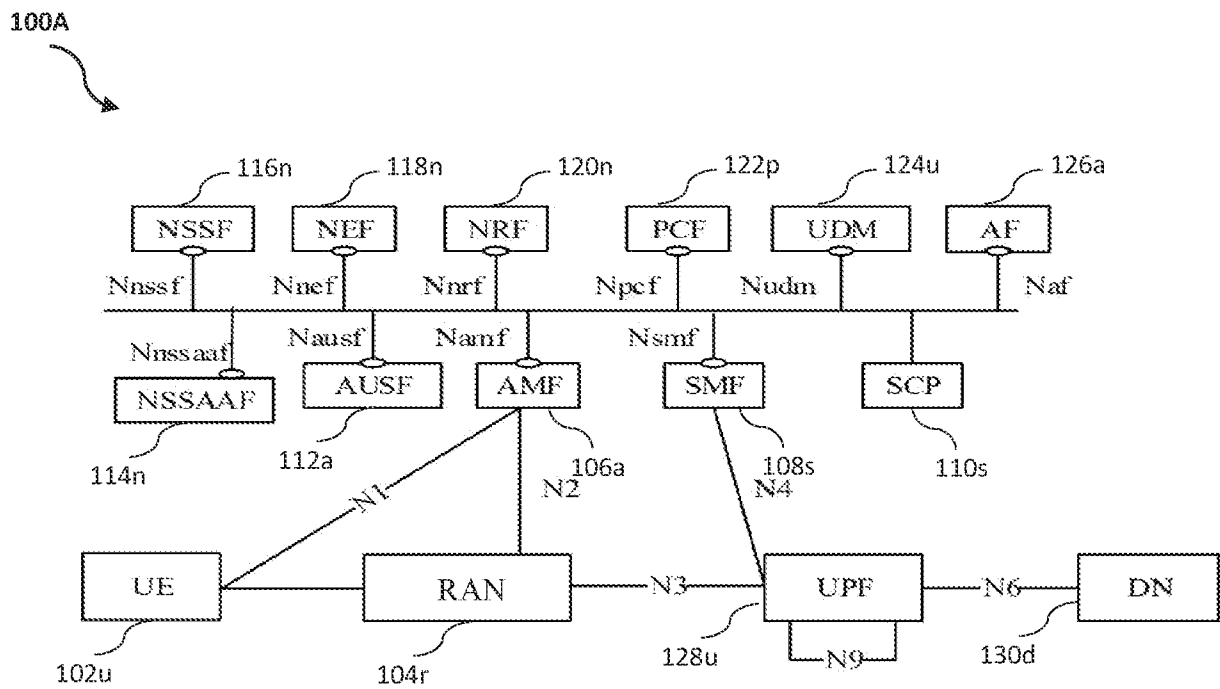


FIG. 1A

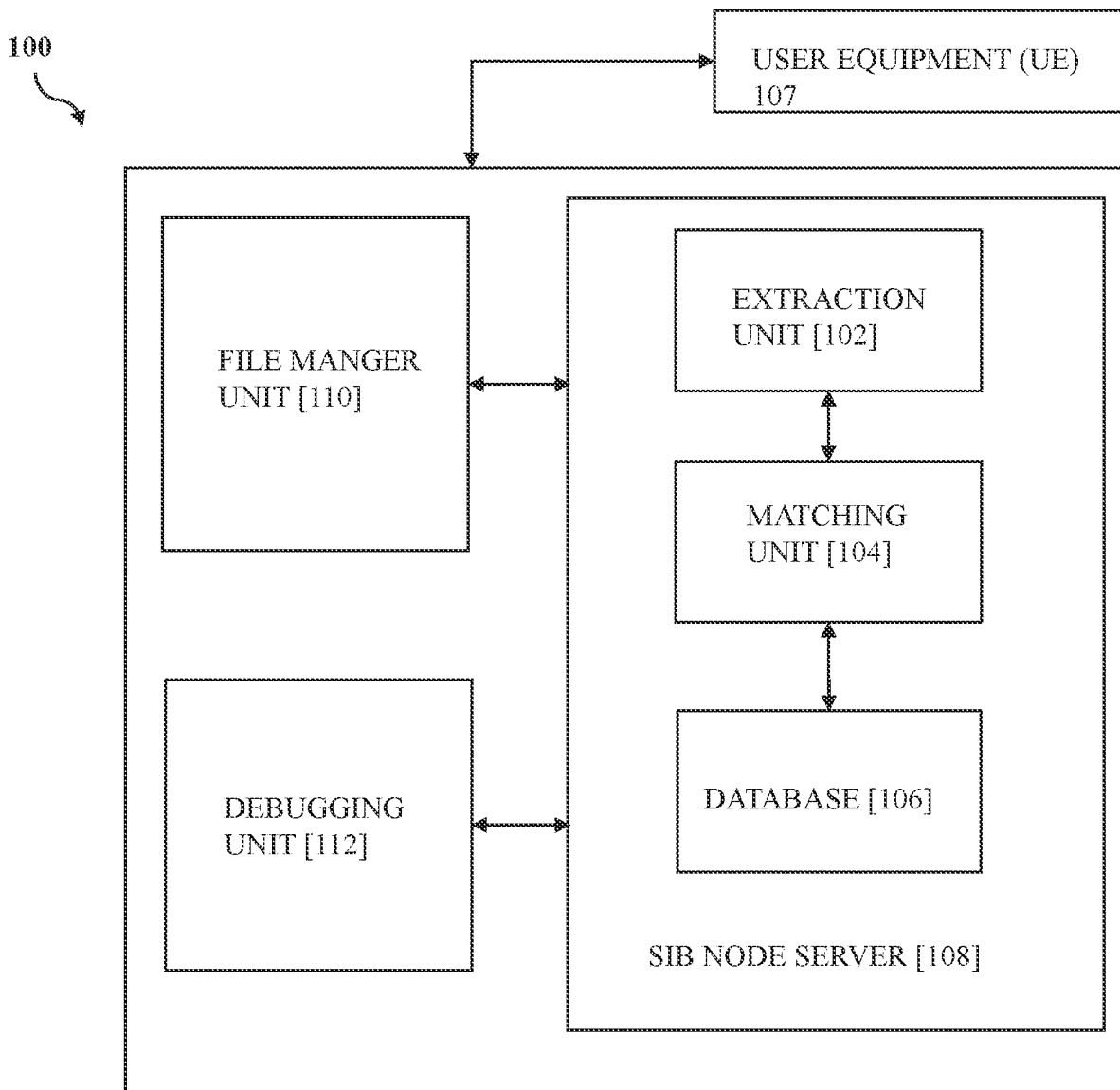


FIG. 1B

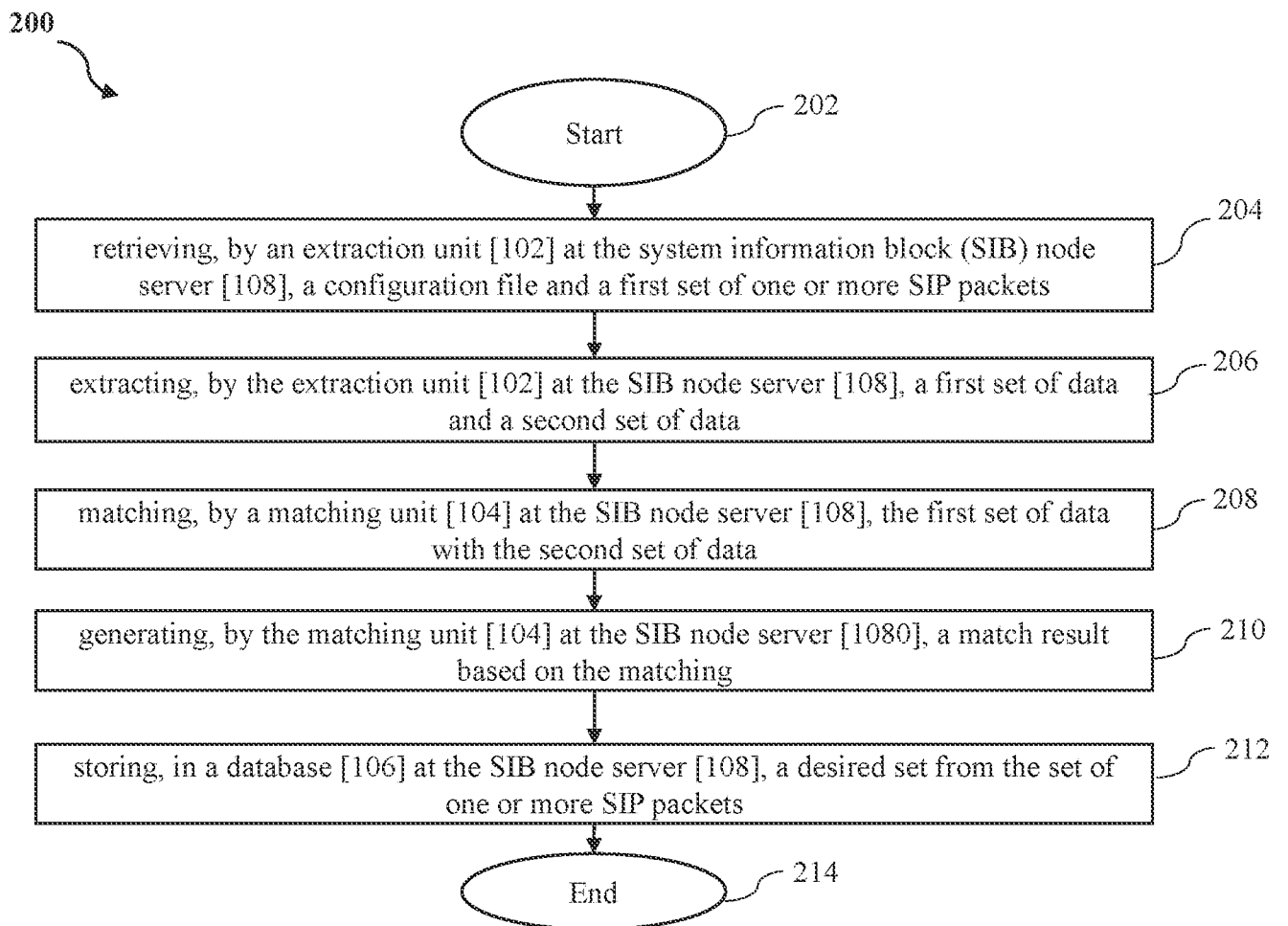


FIG. 2

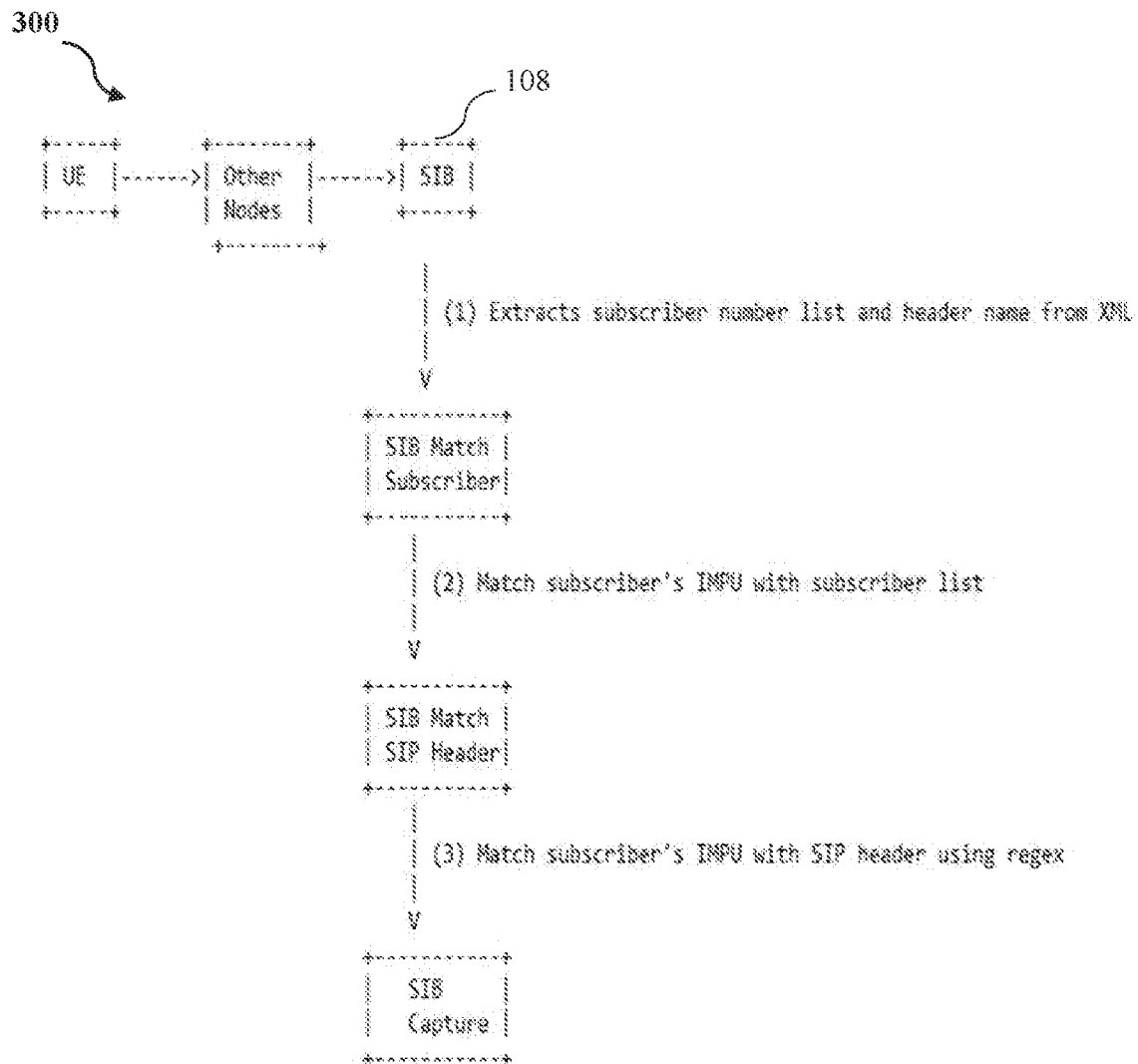


FIG. 3

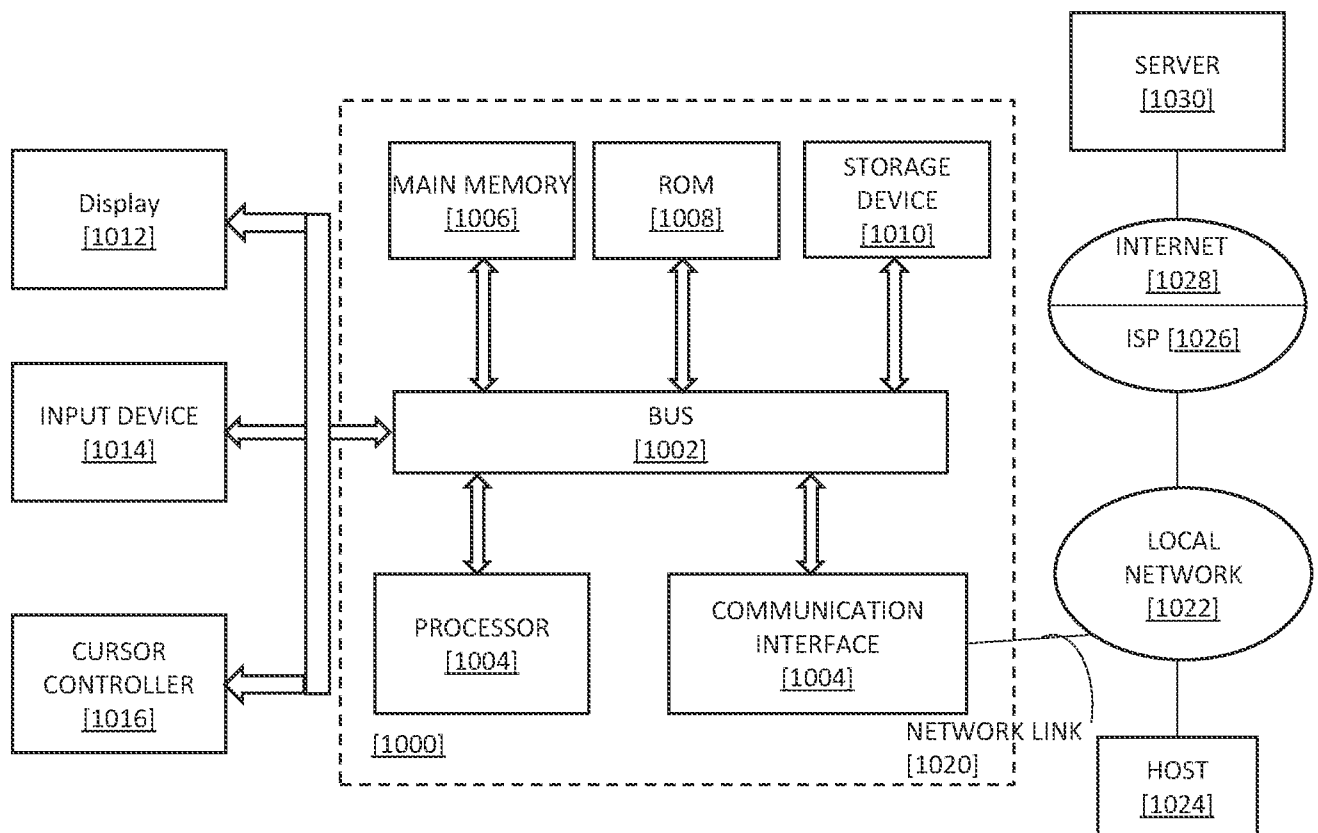


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IN2024/050820

A. CLASSIFICATION OF SUBJECT MATTER

H04L69/22, H04L43/18, H04L43/028, H04L43/04 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

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)

PatSeer, IPO Internal Database

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US2010017527A1 (HITACHI LTD) 21 JANUARY 2010 (2010-01-21) ABSTRACT, PARAGRAPHS 11, 40, 88-90 AND CLAIM 1	1-11
Y	US2008316931A1 (AT&T KNOWLEDGE VENTURES, LP) 25 DECEMBER 2008 (2008-12-25) ABSTRACT, PARAGRAPHS 24- 29, 33-35 and 43-44	1-11



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

07-10-2024

Date of mailing of the international search report

07-10-2024

Name and mailing address of the ISA/

Indian Patent Office

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

Facsimile No.

Authorized officer

Md Aabshar Makhdumi

Telephone No. +91-1125300200

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IN2024/050820

Citation	Pub.Date	Family	Pub.Date
US 2010017527 A1	21-01-2010	CN 101631142 A	20-01-2010
		EP 2146479 A1	20-01-2010
		JP 2010028286 A	04-02-2010