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(54) Title: METHOD AND SYSTEM FOR ROUTING A REGISTRATION REQUEST IN A COMMUNICATION NETWORK

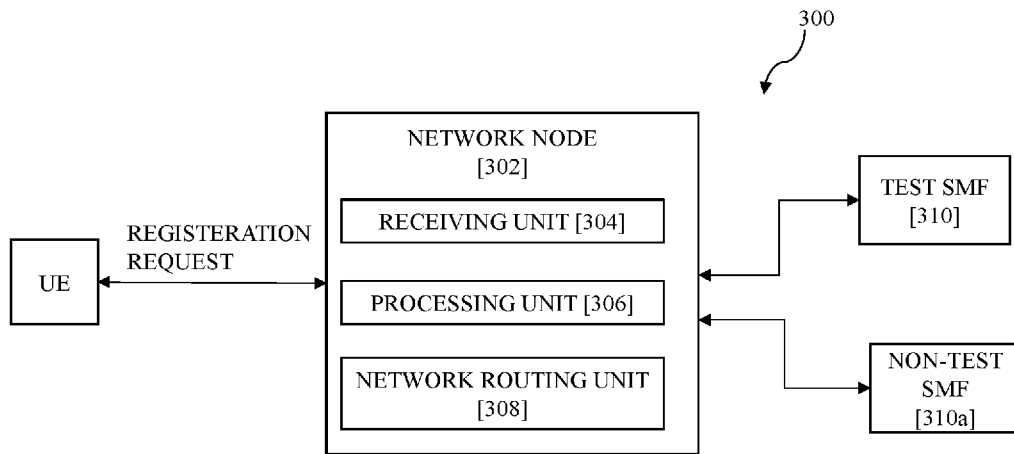


Figure 3

(57) Abstract: The present disclosure relates to a method [400] and a system [300] for routing a registration request in a communication network. The present disclosure encompasses a network node [302]. The network node [302] incorporates a receiving unit [304], configured to receive, from a User Equipment (UE), a registration request for establishment of a connection between the UE and a target network node [302] from a plurality of target network nodes, where the registration request comprises an identifier associated with the UE. The network node [302] further incorporates a processing unit [306], configured to, analyze the identifier to determine a category of the identifier, and determine the target network node [302] from the plurality of target network nodes based on the category of the identifier. Further, the network node [302] incorporates a network routing unit [308], configured to route the registration request to the target network node [302].



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## METHOD AND SYSTEM FOR ROUTING A REGISTRATION REQUEST IN A COMMUNICATION NETWORK

### TECHNICAL FIELD

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Embodiments of the present disclosure generally relate to network performance management systems. More particularly, embodiments of the present disclosure relate to methods and systems for routing a registration request in a communication network.

### 10 BACKGROUND

The following description of the 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 is used only to enhance the understanding of the reader with respect to the present disclosure, and not as admissions of the prior art.

Wireless communication technology has rapidly evolved over the past few decades, with each generation bringing significant improvements and advancements. The first generation of wireless  
20 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. 3G technology marked the introduction of high-speed internet access, mobile video calling, and location-based services. The fourth-generation (4G) technology revolutionized wireless communication with faster data speeds,  
25 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 In the 5G network, to fulfill the demand of increasing users to access 5G services, various nodes are deployed so that experience of the users with the 5G network can be maintained. Conventionally, in production many a times SMF release upgrades and deployments are planned, live traffic is directly sent on such SMF nodes which leads to a high probability of service outage and affect network performance. Thus, in addition to other existing limitations, efficient upgrading  
35 or deployment of additional nodes such as SMF node at the network is a technical problem.

Thus, in order to improve the 3GPP radio access network capacity and performance, there exists an imperative need in the art to efficiently deploy or upgrade the SMF node in a wireless communication network, which the present disclosure aims to address.

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## SUMMARY

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.

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An aspect of the present disclosure may relate to a method for routing a registration request in a communication network. The method comprise steps of receiving, at the network node, from a user equipment (UE), the registration request for establishment of a connection between the UE and a target network node from a plurality of target network nodes, where the registration request comprises an identifier associated with the UE. Further, the method comprise steps of analysing, by the network node, the identifier to determine a category of the identifier. Further, the method comprise steps of determining, by the network node, the target network node from the plurality of target network nodes based on the category of the identifier. Furthermore, the method comprises steps of routing, by the network node, the registration request to the target network node.

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In an exemplary aspect of the present disclosure, the the network node is an Access and Mobility Management Function (AMF).

In an exemplary aspect of the present disclosure, the plurality of target network nodes comprises a test Session Management Function (SMF) and a non-test SMF.

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In an exemplary aspect of the present disclosure, the identifier is Subscriber Permanent Identifier (SUPI), and wherein the category of the identifier comprises a test SUPI and a non-test SUPI

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In an exemplary aspect of the present disclosure, the method further comprises routing the registration request to the test SMF when the category of the identifier is the test SUPI.

In an exemplary aspect of the present disclosure, the test SMF is one of a newly deployed SMF and an upgraded SMF, wherein the test SMF is deployed in a 5G core network to handle live user traffic after passing through at least one network testing procedure.

- 5 In an exemplary aspect of the present disclosure, the method further comprises transmitting, via the network node, a connection acknowledgement to the UE, in an event of successful registration of the UE with the target network node.

Another aspect of the present disclosure may relate to a network node for routing a registration request in a communication network. The present disclosure encompasses a network node. The network node further incorporates a receiving unit, configured to receive, from a user equipment (UE), a registration request for establishment of a connection between the UE and a target network node from a plurality of target network nodes, where the registration request comprises, an identifier associated with the UE. The network node further incorporates a processing unit at least  
10 connected to the receiving unit, configured to, analyze the identifier to determine a category of the identifier, and determine the target network node from the plurality of target network nodes based on the category of the identifier. Further, the network node incorporates a network routing unit at least connected to the processing unit, configured to route the registration request to the target network node.

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Yet another aspect of the present disclosure may relate to a non-transitory computer readable storage medium storing instructions for routing a registration request in a communication network, the instructions include executable code which, when executed by one or more units of a network node, causes: a receiving unit to receive, from a user equipment (UE), a registration request for  
25 establishment of a connection between the UE and a target network node from a plurality of target network nodes, where the registration request comprises an identifier associated with the UE; a processing unit, configured to analyse the identifier to determine a category of the identifier, and determine the target network node from the plurality of target network nodes based on the category of the identifier; and the a network routing unit, configured to route the registration request to the  
30 target network node.

Yet another aspect of the present disclosure may relate to a user equipment (UE) for routing a registration request in a communication network comprising a memory, and a processor coupled to the memory, the processor configured to: transmit, to a network node, a request for establishing  
35 a connection between the UE and a target network node, and receive, from the network node, a

connection establishment acknowledgement associated with the request, wherein the connection establishment acknowledgement is received based on: analysing, by the network node, the identifier to determine a category of the identifier, based on the category of the identifier, determining, by the network node, the target network node from the plurality of target network nodes, and routing, by the network node, the registration request to the target network node.

## OBJECTS OF THE DISCLOSURE

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

It is an object of the present disclosure to provide a system and a method for routing a registration request in a communication network.

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It is another object of the present disclosure to sanitize all possible 5G call flows with test user before making 5G SMF live in production.

It is yet another object of the present disclosure to allow smooth and risk-free deployment/upgrade of 5G SMF node in production environment without affecting end user's 4G/5G services.

20

## DESCRIPTION OF THE DRAWINGS

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. Also, the embodiments shown in the figures are not to be construed as limiting the disclosure, but the possible variants of the method and system according to the disclosure are illustrated herein to highlight the advantages of the disclosure. It will be appreciated by those skilled in the art that disclosure of such drawings includes disclosure of electrical components or circuitry commonly used to implement such components.

30

Figure 1 illustrates an exemplary block diagram representation of 5<sup>th</sup> Generation Core (5GC) network architecture;

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Figure 2 illustrates an exemplary block diagram of a computing device upon which the features of the present disclosure may be implemented in accordance with exemplary implementation of the present disclosure;

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Figure 3 illustrates an exemplary block diagram of a network node for routing a registration request in a communication network, in accordance with exemplary implementations of the present disclosure; and

10 Figure 4 illustrates a method flow diagram for routing a registration request in a communication network in accordance with exemplary implementations of the present disclosure.

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

15

**DETAILED DESCRIPTION**

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 may 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.

25 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.

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,

processes, and other components may be shown as components in block diagram form in order not to obscure the embodiments in unnecessary detail.

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 may 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.

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.

As used herein, a “processing unit” or “processor” or “operating processor” includes one or more processors, wherein processor refers to any logic circuitry for processing instructions. A 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 Digital Signal Processing (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 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 or processing unit is a hardware processor.

As used herein, “a user equipment”, “a user device”, “a smart-user-device”, “a smart-device”, “an electronic device”, “a mobile device”, “a handheld device”, “a wireless communication device”, “a mobile communication device”, “a communication device” may be any electrical, electronic and/or computing device or equipment, capable of implementing the features of the present disclosure. The user equipment/device may include, but is not limited to, a mobile phone, smart

phone, laptop, a general-purpose computer, desktop, personal digital assistant, tablet computer, wearable device or any other computing device which is capable of implementing the features of the present disclosure. Also, the user device may contain at least one input means configured to receive an input from unit(s) which are required to implement the features of the present disclosure.

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As used herein, “storage unit” or “memory unit” 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  
10 memory devices or other types of machine-accessible storage media. The storage unit stores at least the data that may be required by one or more units of the system to perform their respective functions.

As used herein “interface” or “user interface” refers to a shared boundary across which two or more  
15 separate components of a system exchange information or data. The interface may also be referred to a set of rules or protocols that define communication or interaction of one or more modules or one or more units with each other, which also includes the methods, functions, or procedures that may be called.

20 All modules, units, components used herein, unless explicitly excluded herein, may be software modules or hardware processors, the processors being a general-purpose processor, a special purpose processor, a conventional processor, a digital signal processor (DSP), a plurality of microprocessors, one or more microprocessors in association with a DSP core, a controller, a microcontroller, Application Specific Integrated Circuits (ASIC), Field Programmable Gate Array  
25 circuits (FPGA), any other type of integrated circuits, etc.

As used herein the transceiver unit include at least one receiver and at least one transmitter configured respectively for receiving and transmitting data, signals, information or a combination thereof between units/components within the system and/or connected with the system.

30

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 configurations and combinations thereof are within the scope of the  
35 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 As discussed in the background section, the current known solutions have several shortcomings. The present disclosure aims to overcome the above-mentioned and other existing problems in this field of technology by providing method and system of routing a registration request in a communication network. The present disclosure involves a User Equipment (UE) sending a registration request to a network node, specifically an Access and Mobility Management Function  
10 (AMF). The request includes a unique identifier, known as the Subscriber Permanent Identifier (SUPI), which is further categorized as a test SUPI or a non-test SUPI.

The network node analyzes the SUPI to determine the category of SUPI and based on the category of SUPI, determines the target network node from a plurality of nodes, which include a test Session  
15 Management Function (SMF) and a non-test SMF. The registration request is then routed to the appropriate SMF. If the SUPI is a test SUPI, the request is routed to a test SMF, which may conclude a newly deployed or upgraded SMF in a 5G core network. If the SUPI is a non-test SUPI, the request is routed to a non-test SMF.

20 The system and method disclosed ensures that the UE is connected to the most suitable network node, for facilitating efficient network operation and enhancing user experience.

**Figure 1** illustrates an exemplary block diagram representation of 5<sup>th</sup> generation core (5GC) network architecture, in accordance with exemplary implementation of the present disclosure. As  
25 shown in figure 1, the 5GC network architecture [100] includes a user equipment (UE) [102], a radio access network (RAN) [104], an access and mobility management function (AMF) [106], a Session Management Function (SMF) [108], a Service Communication Proxy (SCP) [110], an Authentication Server Function (AUSF) [112], a Network Slice Specific Authentication and Authorization Function (NSSAAF) [114], a Network Slice Selection Function (NSSF) [116], a  
30 Network Exposure Function (NEF) [118], a Network Repository Function (NRF) [120], a Policy Control Function (PCF) [122], a Unified Data Management (UDM) [124], an application function (AF) [126], a User Plane Function (UPF) [128], a data network (DN) [130], 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.

35

Radio Access Network (RAN) [104] is the part of a mobile telecommunications system that connects user equipment (UE) [102] 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.

5

Access and Mobility Management Function (AMF) [106] 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.

10 Session Management Function (SMF) [108] 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) for data forwarding and handles IP address allocation and QoS enforcement.

15 Service Communication Proxy (SCP) [110] 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.

20 Authentication Server Function (AUSF) [112] 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.

25 Network Slice Specific Authentication and Authorization Function (NSSAAF) [114] 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.

30 Network Slice Selection Function (NSSF) [116] 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.

30

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

Network Repository Function (NRF) [120] 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.

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

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

10

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

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

Data Network (DN) [130] 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.

20

- Figure 2** illustrates an exemplary block diagram of a computing device [200] (or referred herein as computer system [200]) upon which the features of the present disclosure may be implemented in accordance with exemplary implementation of the present disclosure. In an implementation, the computing device [200] may also implement a method for routing a registration request in a communication network utilising the system. In another implementation, the computing device [200] itself implements the method for routing a registration request in a communication network using one or more units configured within the computing device [200], wherein said one or more units are capable of implementing the features as disclosed in the present disclosure.

- 30 The computing device [200] may include a bus [202] or other communication mechanism for communicating information, and a hardware processor [204] coupled with bus [202] for processing information. The hardware processor [204] may be, for example, a general-purpose microprocessor. The computer system [200] may also include a main memory [206], such as a random-access memory (RAM), or other dynamic storage device, coupled to the bus [202] for storing information and instructions to be executed by the processor [204]. The main memory

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[206] also may be used for storing temporary variables or other intermediate information during execution of the instructions to be executed by the processor [204]. Such instructions, when stored in non-transitory storage media accessible to the processor [204], render the computer system [200] into a special-purpose machine that is customized to perform the operations specified in the instructions. The computer system [200] further includes a read only memory (ROM) [208] or other static storage device coupled to the bus [202] for storing static information and instructions for the processor [204].

A storage device [210], such as a magnetic disk, optical disk, or solid-state drive is provided and coupled to the bus [202] for storing information and instructions. The computer system [200] may be coupled via the bus [202] to a display [212], 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 [214], including alphanumeric and other keys, touch screen input means, etc. may be coupled to the bus [202] for communicating information and command selections to the processor [204]. Another type of user input device may be a cursor controller [216], such as a mouse, a trackball, or cursor direction keys, for communicating direction information and command selections to the processor [204], and for controlling cursor movement on the display [212]. 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.

The computer system [200] 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 computer system [200] causes or programs the computer system [200] to be a special-purpose machine. According to one implementation, the techniques herein are performed by the computer system [200] in response to the processor [204] executing one or more sequences of one or more instructions contained in the main memory [206]. Such instructions may be read into the main memory [206] from another storage medium, such as the storage device [210]. Execution of the sequences of instructions contained in the main memory [206] causes the processor [204] to perform the process steps described herein. In alternative implementations of the present disclosure, hard-wired circuitry may be used in place of or in combination with software instructions.

The computer system [200] also may include a communication interface [218] coupled to the bus [202]. The communication interface [218] provides a two-way data communication coupling to a

network link [220] that is connected to a local network [222]. For example, the communication interface [218] 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 [218] 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 [218] sends and receives electrical, electromagnetic or optical signals that carry digital data streams representing various types of information.

10 The computer system [200] can send messages and receive data, including program code, through the network(s), the network link [220] and the communication interface [218]. In the Internet example, a server [230] might transmit a requested code for an application program through the Internet [228], the ISP [226], the local network [222], the host [224] and the communication interface [218]. The received code may be executed by the processor [204] as it is received, and/or  
15 stored in the storage device [210], or other non-volatile storage for later execution.

Referring to **Figure 3**, an exemplary block diagram of a system [300] for routing a registration request in a communication network, is shown, in accordance with the exemplary implementations of the present disclosure. In one example, the system [300] may be implemented as a network node  
20 [302]. In another example, the system [300] may be implemented as or within the computer system [200] explained in conjunction with Figure 2.

As depicted in Figure 3, the system [300] may be in communication with a User Equipment, also referred to as UE. Examples of such User Equipment (UE) may include, but are not limited to, a  
25 personal computer (PC), a mobile device, a tablet, or similar devices known in the state of the art. It may further be noted that, the system [300] may be in communication with additional network entities other than those depicted in Figure 3. Such network entities have been not depicted and explained for the sake of brevity, and would be well understood by a person skilled in the art.

30 Continuing with the present example, the system [300] comprises at least one receiving unit [304], at least one processing unit [306], at least one network routing unit [308], at least one test Session Management Function (SMF) [310] and, at least one non-test Session Management Function (SMF) [310a]. Also, all of the components/ units of the system [300] are assumed to be connected to each other unless otherwise indicated below. As shown in the figure 3, all units shown within  
35 the system [300] should also be assumed to be connected to each other. Also, in Figure 3, only a

few units are shown, however, the system [300] may comprise multiple such units or the system [300] may comprise any such numbers of said units, as required to implement the features of the present disclosure.

5 Further, in an implementation, the system [300] may reside in a server or a network. In another implementation, the system [300] may reside partly in the server or network and partly in the user device.

The system [300] is configured for routing a registration request in a communication network, with  
10 the help of the interconnection between the components/units of the system [300]. The network node [302] incorporates a receiving unit [304], configured to receive, from a user equipment (UE), a registration request for establishment of a connection between the UE and a target network node [302] from a plurality of target network nodes, where the registration request comprises, an  
15 identifier associated with the UE. Further, the network node [302] is an Access and Mobility Management Function (AMF).

The system [300] mentioned here facilitates a connection between the UE and the network node [302], via the receiving unit [304] at the network node [302]. Further, for establishing a connection  
20 in between the UE and network node [302], a registration request is sent to the network node [302]. The registration request as mentioned includes an identifier that is linked with the UE and is transferred to the receiving unit [304] in a plurality of data packets. The identifier mentioned here may include a special identity for separating one UE from multiple UE that may present around, in a network.

25 The receiving unit [304] at the network node [302] receives this registration request and further transmits the information within the registration request to one or more units present at the network node [302]. It is to be noted that the receiving unit [304] mentioned here, is a processor or a combination of processors that are tasked for transmitting/ receiving one or more set of instructions as per requirement.

30

Further, the network node [302] mentioned here is an Access and Mobility Management Function (AMF), where the AMF is one of a target network node from the plurality of network nodes. Also, the network node [302] includes any other necessary node that may be obvious to the person skilled in the art for implementing the solution as disclosed herein.

35

It is to be noted that the AMF in the network node [302] is responsible for managing the access of the UE with the network, primarily during a case of mobility of UE from one location to another. The AMF manages the access of UE in a manner that any case of loss of connection or disruption is eliminated at the UE during the mobility.

5

For example, in case a UE is required to connect with a network node [302], the UE then sends a registration request to the receiving unit [304] at the network node [302], here an AMF. Further, the receiving unit [304] subsequent to receiving the registration request, further sends the registration request to one or more units, linked with the receiving unit [304] for further processing.

10

The network node [302] further incorporates a processing unit [306] connected at least with the receiving unit [304], configured to analyze the identifier to determine a category of the identifier. Further, the identifier is Subscriber Permanent Identifier (SUPI), and wherein the category of the identifier comprises a test SUPI and a non-test SUPI.

15

The receiving unit [304] as mentioned transfers the received registration request to the processing unit [306]. The processing unit [306] posts receiving the registration request, extracts the information (here 'identifier') from the registration request. The identifier received at the processing unit [306] is the Subscriber Permanent Identifier (SUPI). The SUPI mentioned here may include an International Mobile Equipment Identity (IMEI) for identification of the UE from other UE's in the network cluster. It is to be noted that the SUPI may include further information other than the IMEI, for the identification and managing of the UE.

20

25

Here the processing unit [306] is referred to a processor or a combination of processors that are configured to process/ execute one or more set of instructions/ commands, as per requirements.

30

Further, the processing unit [306] further processes the SUPI to determine the category of the SUPI. Here the category of the SUPI is referred to a test SUPI and a non-test SUPI. Firstly, the test SUPI refers to an identifier of a UE that is being used for testing the functionality and performance of the UE in the network. Conversely, the non-test SUPI is referred to the identifier of the UE that are used by a user in live network, by the users.

For example, the processing unit [306] works differently based on the category of the identifier, such as in case the processing unit [306] recognizes the identifier as a test SUPI, then the

processing unit [306] will work accordingly, and further if the processing unit [306] recognizes the identifier as a non-test SUPI, then the processing unit [306] will work differently.

5 The processing unit [306] is further configured to determine the target network node [302] from the plurality of target network nodes based on the category of the identifier. The plurality of target network nodes may include a test Session Management Function (SMF) [310] and a non-test SMF [310a].

10 The processing unit [306] as mentioned determines the target network node based on the identifier (or specifically based on the SUPI). The plurality of target network nodes disclosed here may include one of a test Session Management Function (SMF) [310] and a non-test Session Management Function (SMF) [310a].

15 It is to be noted that the Session Management Function (SMF) [108] is primarily used for managing sessions in the network, which may further include a continuous exchange of data in between the UE and the network.

20 In one example, in case the identifier is a test SUPI, the processing unit [306] may categorize the target network node as a test SMF [310]. Here the test SMF [310] concludes a network node [302], primary created for testing purposes of a newly launched UE or any upgradation in the UE. The test SMF [310] as mentioned functions separate from the normal SMF [108] (or say non-test SMF), thereby reducing any additional traffic on the live network.

25 In another example, in case the identifier is a non-test SUPI, the processing unit [306] may categorize the target network node as a non-test SMF [310a]. Here, the non-test SMF [310a] concludes a network node [302], designed for the live network and works differently in accordance with the test SMF [310].

30 The network node [302] further incorporates a network routing unit [308] connected at least with the processing unit [306], configured to route the registration request to the target network node [302], where the network routing unit [308] is configured to route the registration request to the test SMF [310] when the category of the identifier is the test SUPI. Further, the test SMF [310] is one of a newly deployed SMF [108] and an upgraded SMF [108], wherein the test SMF [310] is deployed in a 5G core network to handle live user traffic after passing through at least one testing  
35 procedure.

Here the network routing unit [308] is merely a processor or a combination of processors, designed primarily to route one or more registration request. Post determination of the target network node, the network routing unit [308] further routes the registration request to the target network node [302]. In case the target network node [302] is the test SMF [310]. The network routing unit [308] accordingly routes the registration request to the test SMF [310]. Here, the test SMF [310] is one of a newly developed SMF [108] or an upgraded SMF [108] with an inclusion of one or more features within the existing SMF [108], recently deployed in a fifth generation (5G) core network. The test SMF [310] is further to be deployed for handling live user traffic in the network, only after passing through at least one testing procedure.

Here, the at least one testing procedure involves one or more necessary changes, that are required to handle the live user traffic without causing any disruption in the performance standards of the live user traffic.

For example, in case a specific entity desires to launch a new model or upgrade a version of an existing UE in the market. In such case, the new model of UE is required to be tested within a Research and Development (R&D) center of the specific entity before the market release. In such events, the testing is performed within the test SMF [310] and similarly the registration request for the UE is routed to the test SMF [310], and the test SMF [310] functions accordingly.

Conversely, in case the target network node [302] is the non-test SMF [310a], the network routing unit [308] accordingly routes the registration request to the test SMF [310]. Here the non-test SMF [310a] is either a test SMF [310] that is being deployed in the live data traffic, after passing the at least one testing procedures or a pre-existing SMF [108] that is already present in the live data traffic.

For example, by using the previous example, post completing the testing of the new model or upgraded version of the existing UE model, the UE model is launched in the market, and further when the user desires to connect with the network, the registration request of the UE will be sent to the non-test SMF [310a], allowing the UE is now to be operated within live data traffic.

Further, upon successful registration of UE with the target network node [302], the receiving unit [304] is configured to transmit a connection establishment acknowledgement to the UE.

35

Further, post successful registration of the UE with the target network node [302] be it either, the test SMF [310] or the non-test SMF [310a], the receiving unit [304] further transmits an acknowledgement to the UE. Here, the acknowledgement may be in form of a text message, voice input or similar known in the art. Further, the acknowledgement also provides a means to double  
5 check the target network node that is connected with the UE.

Referring to **Figure 4**, an exemplary method flow diagram [400] for routing a registration request in a communication network, in accordance with exemplary implementations of the present disclosure is shown. In an implementation the method [400] is performed by the system [300].  
10 Further, in an implementation, the system [300] may be present in a server or a network, to implement the features of the present disclosure. Also, as shown in Figure 4, the method [400] starts at step [402].

At step 404, the method [400] comprises - receiving, at the network node [302], from a user  
15 equipment (UE), the registration request for establishment of a connection between the UE and a target network node [302] from a plurality of target network nodes, where the registration request comprises an identifier associated with the UE. Further the network node [302] is an Access and Mobility Management Function (AMF).

20 The method [400] states that a registration request is sent at a network node [302] from a User Equipment (UE). The registration request as mentioned includes an identifier that is linked with the UE and is transferred to the network node [302] in a plurality of data packets. Further, the identifier may include a special identity for separating one UE from multiple UE that may present around, in a network.

25 Further, the network node [302] mentioned here is an Access and Mobility Management Function (AMF), where the AMF is one of a target network node from the plurality of network nodes, responsible for managing the access of the UE with the network.

30 At step 406, the method [400] comprises – analyzing, by the network node [302], the identifier to determine a category of the identifier. Further, the identifier is Subscriber Permanent Identifier (SUPI), and wherein the category of the identifier comprises a test SUPI and a non-test SUPI.

The method [400] further states that, post receiving the registration request, the network node  
35 [302] extracts the information (here ‘identifier’) from the registration request. The identifier is the

Subscriber Permanent Identifier (SUPI), mainly used for identification of the UE from other UE's in the network.

Further, the network node [302] further processes the SUPI to determine the category of the SUPI such as a test SUPI and a non-test SUPI. The test SUPI refers to an identifier of a UE that is being used for testing the functionality and performance of the UE in the network. Conversely, the non-test SUPI is referred to the identifier of the UE that are used by a user in live network, by the users.

At step 408, the method [400] comprises – determining, by the network node [302], the target network node [302] from the plurality of target network nodes based on the category of the identifier. wherein the plurality of target network nodes comprises a test Session Management Function (SMF) [310] and a non-test SMF [310a].

The method [400] further states that the network node [302] further determines the target network node based on the identifier (or specifically based on the SUPI). The plurality of target network nodes disclosed here may include one of a test Session Management Function (SMF) [310] and a non-test Session Management Function (SMF) [310a].

Further, in case the identifier is a test SUPI, the network node [302] categorizes the target network node as a test SMF [310]. Here the test SMF [310] concludes a network node [302], primarily created for testing purposes of a newly launched UE or any upgradation in the UE. The test SMF [310] as mentioned functions separate from the normal SMF [108] (or say non-test SMF [310a]), thereby reducing any additional live data traffic on the network.

Meanwhile, in case the identifier is a non-test SUPI, the network node [302] may categorize the target network node as a non-test SMF [310a]. Here, the non-test SMF [310a] concludes a network node [302], designed for the live data traffic, and works differently in accordance with the test SMF [310].

At step 410, the method [400] comprises – routing, by the network node [302], the registration request to the target network node [302]. The method [400] further comprises routing the registration request to the test SMF [310] when the category of the identifier is the test SUPI, where the test SMF [310] is one of a newly deployed SMF [108] and an upgraded SMF [108], wherein the test SMF [310] is deployed in a 5G core network to handle live user traffic after passing through at least one network testing procedure.

The method [400] further states that, post determination of the target network node, the network routing unit [308] further routes the registration request to the target network node [302]. In case the target network node [302] is the test SMF [310]. The network routing unit [308] accordingly  
5 routes the registration request to the test SMF [310]. Here, the test SMF [310] is one of a newly developed SMF [108] or an upgraded SMF [108] with an inclusion of one or more features within the existing SMF [108], recently deployed in a fifth generation (5G) core network. The test SMF [310] is further to be deployed for handling live user traffic in the network, only after passing through at least one testing procedure. Here, the at least one testing procedure involves one or  
10 more necessary changes, that are required to handle the live user traffic without causing any disruption in the performance standards of the live user traffic.

For example, in case a specific entity desires to launch a new model or upgrade a version of an existing UE in the market. Then, the new model of UE is required to be tested within a Research  
15 and Development (R&D) center of the specific entity before the market release. In such events, when the UE desires to connect to a particular network node [302], the UE sends a registration request to the network node [302], for example an AMF. The registration request incorporates an identifier (i.e. SUPI) of the UE. The AMF analyzes the SUPI as test SUPI, and accordingly determines the target network node as a Test SMF [310] and the registration request is then routed  
20 to a test SMF [310].

Conversely, in case the target network node [302] is the non-test SMF [310a]. The network routing unit [308] accordingly routes the registration request to the non-test SMF [310a]. Here the non-test SMF [310a] is either a test SMF [310] that is being deployed in the live data traffic, after  
25 passing the at least one testing procedures or a pre-existing SMF that is already present in the live data traffic.

For example, by using the previous example, the UE is launched within the market, and when the user further desires to connect to the target network node. Here the AMF analyzes the SUPI as test  
30 SUPI, and accordingly determines the target network node as a non-test SMF [310a] and the registration request is then routed to a non-test SMF [310a], implying the UE is now to be operated in live data traffic.

Further, the method [400] further comprises transmitting, via the network node [302], a connection acknowledgement to the UE, in an event of successful registration of the UE with the target network node.

5 Post successful registration of the UE with the target network node [302] be it either, the test SMF [310] or the non-test SMF [310a], the network node [302] further transmits an acknowledgement to the UE. Here, the acknowledgement may be in form of a text message, voice input or similar known in the art. Further, the acknowledgement also provides a means to double check the target network node that is connected with the UE.

10

The method [400] terminates at step 412.

The present disclosure further discloses a non-transitory computer readable storage medium storing instructions for routing a registration request in a communication network, the instructions  
15 include executable code which, when executed by one or more units of a network node [302], causes: a receiving unit [304] of the network node [302] to receive from a UE, a registration request for establishment of a connection between the UE and a target network node [302] from a plurality of target network nodes; a processing unit [306] of the network node [302] to analyze the identifier to determine a category of the identifier, and determine the target network node [302] from the  
20 plurality of target network nodes based on the category of the identifier; and a network routing unit [308] to route the registration request to the target network node [302].

The present disclosure further discloses a user equipment (UE) for routing a registration request in a communication network comprising a memory, and a processor coupled to the memory, the  
25 processor configured to: transmit, to a network node [302], a request for establishing a connection between the UE and a target network node [302], and receive, from the network node [302], a connection establishment acknowledgement associated with the request, wherein the connection establishment acknowledgement is received based on: analysing, by the network node [302], the identifier to determine a category of the identifier, based on the category of the identifier,  
30 determining, by the network node [302], the target network node [302] from the plurality of target network nodes, and routing, by the network node [302], the registration request to the target network node [302].

As is evident from the above, the present disclosure provides a technically advanced solution for  
35 routing a registration request in a communication network. The present solution solves the problem

of service outage in production network in case of any issue with the upgrade or deployment of SMF. The present disclosure allows smooth and risk-free deployment/upgrade of 5G SMF node in production environment without affecting end user's 4G/5G services. The present disclosure solves the problem of service outage in production network in case of any issue with the upgrade  
5 or deployment of SMF.

While considerable emphasis has been placed herein on the disclosed implementations, it will be appreciated that many implementations can be made and that many changes can be made to the implementations without departing from the principles of the present disclosure. These and other  
10 changes in the implementations 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 [400] for routing a registration request in a communication network, the method [400] comprising:  
5 receiving, at a network node [302], from a User Equipment (UE), a registration request for establishing a connection between the UE and a target network node [302] from a plurality of target network nodes, wherein the registration request comprises an identifier associated with the UE;  
10 analysing, by the network node [302], the identifier to determine a category of the identifier;  
based on the category of the identifier, determining, by the network node [302], the target network node [302] from the plurality of target network nodes; and  
routing, by the network node [302], the registration request to the target network node [302].  
15
2. The method [400] as claimed in claim 1, wherein the network node [302] is an Access and Mobility Management Function (AMF).
3. The method [400] as claimed in claim 1, wherein the plurality of target network nodes  
20 comprises a test Session Management Function (SMF) [310] and a non-test SMF [310a].
4. The method [400] as claimed in claim 3, wherein the identifier is Subscriber Permanent Identifier (SUPI), and wherein the category of the identifier comprises a test SUPI and a non-test SUPI.  
25
5. The method [400] as claimed in claim 4, further comprising: routing the registration request to the test SMF [310] when the category of the identifier is the test SUPI.
6. The method [400] as claimed in claim 5, wherein the test SMF [310] is one of a newly  
30 deployed SMF [108] and an upgraded SMF [108], and wherein the test SMF [310] is deployed in a 5G core network to handle live user traffic after passing through at least one network testing procedure.

7. The method [400] as claimed in claim 1, further comprises transmitting, via the network node [302], a connection acknowledgement to the UE, in an event of successful registration of the UE with the target network node.
- 5 8. A network node [302] for routing a registration request in a communication network, the network node [302] comprising:
- a receiving unit [304], configured to receive, from a User Equipment (UE), a registration request for establishing a connection between the UE and a target network node [302] from a plurality of target network nodes, wherein the registration request comprises an identifier associated with the UE;
  - 10 a processing unit [306] connected at least with the receiving unit [304], configured to:
    - analyze the identifier to determine a category of the identifier; and
    - determine the target network node [302] from the plurality of target network nodes based on the category of the identifier; and
  - 15 a network routing unit [308] connected at least with the processing unit [306], configured to route the registration request to the target network node [302].
9. The network node [302] as claimed in claim 8, wherein the network node [302] is an Access and Mobility Management Function (AMF).
- 20 10. The network node [302] as claimed in claim 8, wherein the plurality of target network nodes comprises a test Session Management Function (SMF) [310] and a non-test SMF [310a].
11. The network node [302] as claimed in claim 10, wherein the identifier is Subscriber Permanent Identifier (SUPI), and wherein the category of the identifier comprises a test SUPI and a non-test SUPI.
- 25 12. The network node [302] as claimed in claim 11, wherein the network routing unit [308] is configured to route the registration request to the test SMF [310] when the category of the identifier is the test SUPI.
- 30 13. The network node [302] as claimed in claim 12, wherein the test SMF [310] is one of a newly deployed SMF [108] and an upgraded SMF [108], and wherein the test SMF [310] is deployed in a 5G core network to handle live user traffic after passing through at least one testing
- 35 procedure.



a network routing unit [308] to route the registration request to the target network node [302].

5

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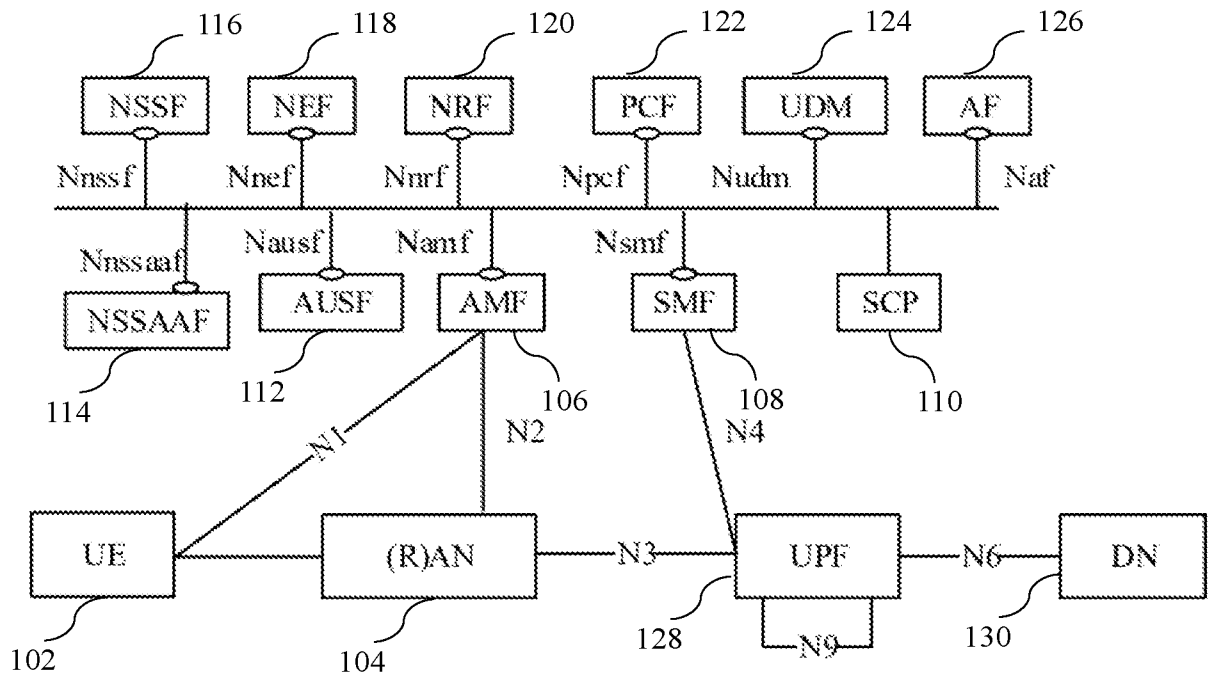


Figure 1

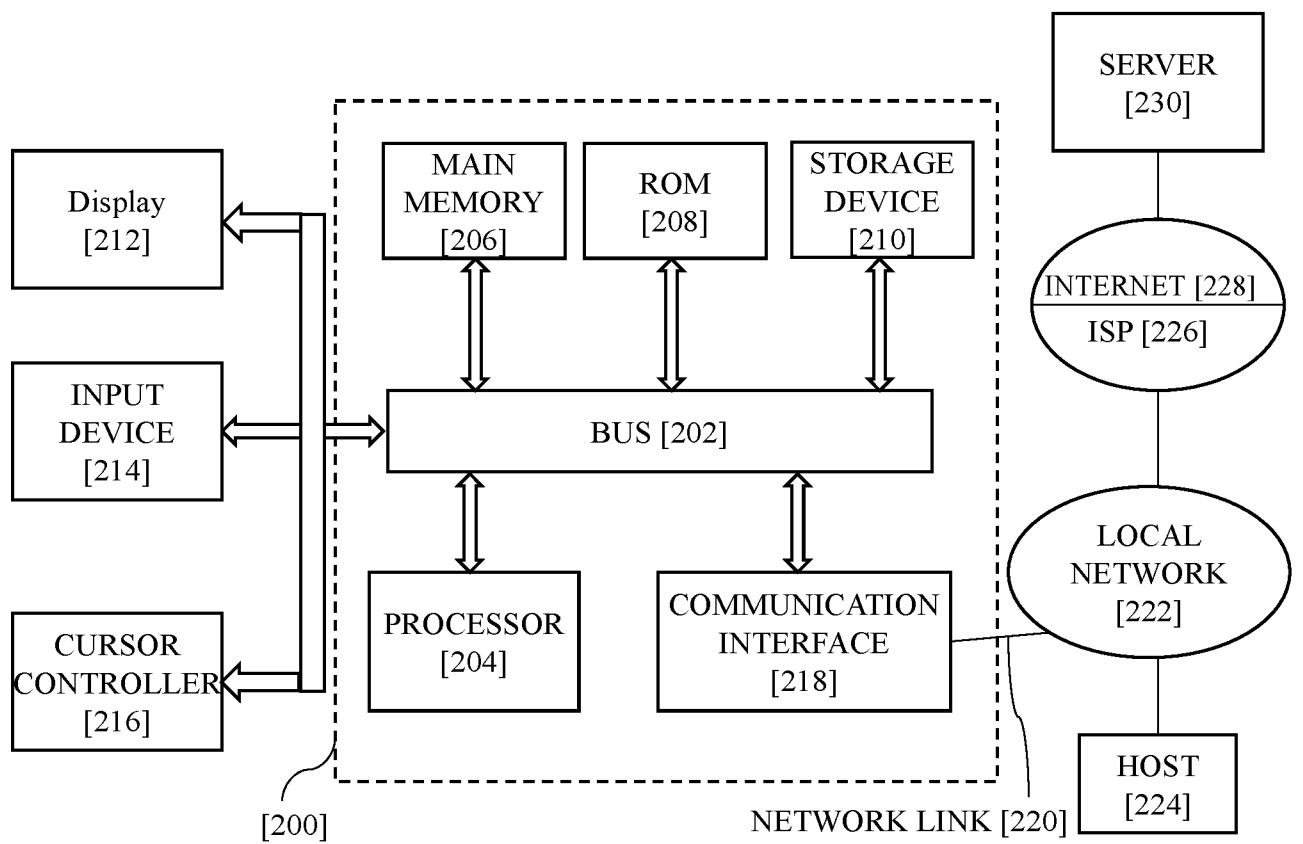


Figure 2

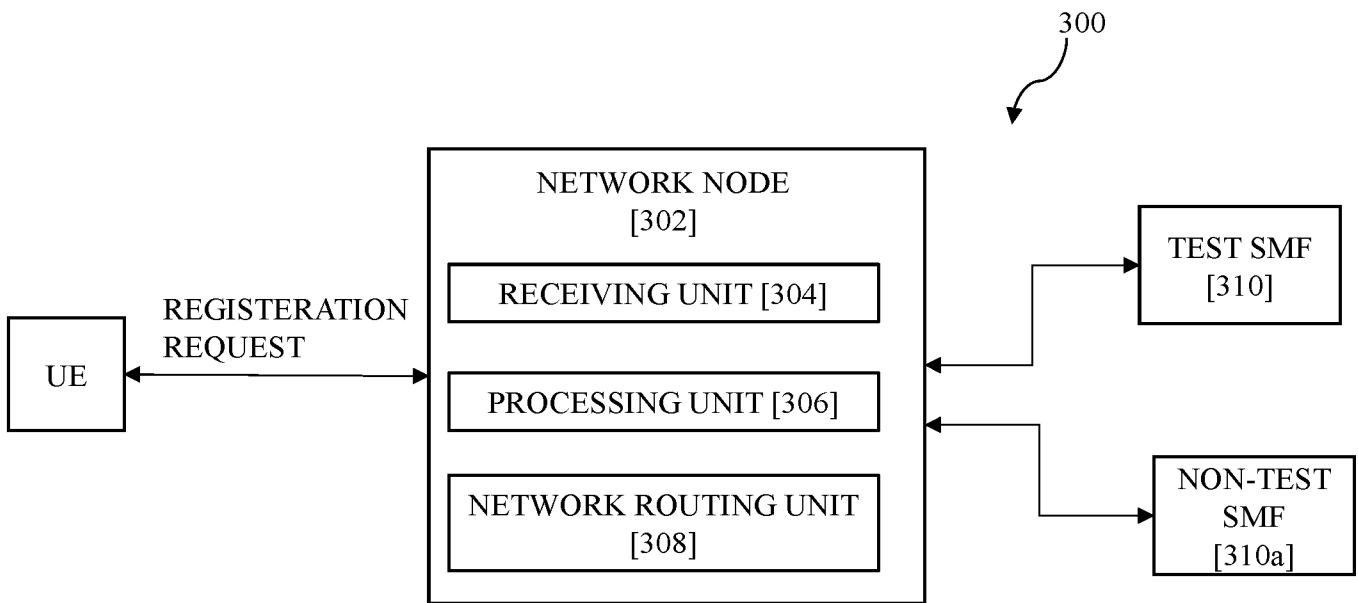


Figure 3

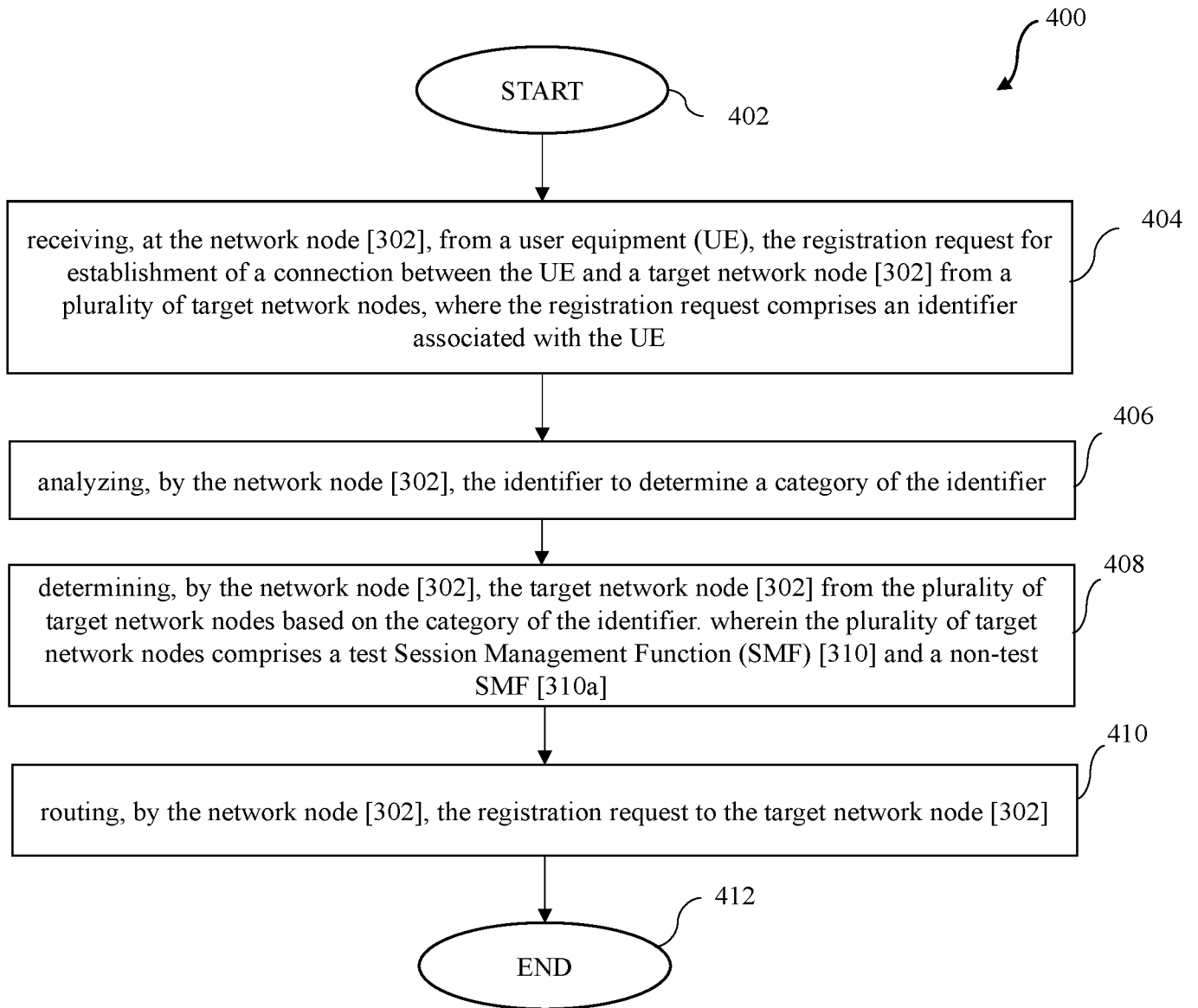


Figure 4

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/IN2024/050741

A. CLASSIFICATION OF SUBJECT MATTER H04W60/04, H04W48/18, H04W76/10 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) 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) 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	US2022400430A1 (LG ELECTRONICS INC) 15 DECEMBER 2022 (2022-12-15) ABSTRACT, PARAGRAPHS 125-130, 260	1-16
Y	US20220039003A1 (TELEFONAKTIEBOLAGET LM ERICSSON AB) 03 FEBRUARY 2022 (2022-02-03) ABSTRACT, PARAGRAPHS 22, 74-78	1-16
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
<p>* Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"D" document cited by the applicant in the international application</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"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</p> <p>"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</p> <p>"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</p> <p>"&amp;" document member of the same patent family</p>		
Date of the actual completion of the international search 30-09-2024		Date of mailing of the international search report 30-09-2024
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/IN2024/050741

Citation	Pub.Date	Family	Pub.Date
US 20220400430 A1	15-12-2022	EP 4117390 A1	11-01-2023
		KR 20220130159 A	26-09-2022
		WO 2021177528 A1	10-09-2021
US 20220039003 A1	03-02-2022	EP 3881574 A1	22-09-2021
		WO 2020098974 A1	22-05-2020