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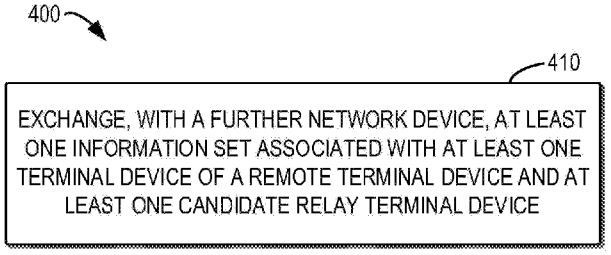

[Fig. 4]

(57) Abstract: Example embodiments of the present disclosure relate to solutions for path switching of a remote terminal device. In a solution, a network device exchanges, with a further network device, at least one information set associated with at least one terminal device of a remote terminal device and at least one candidate relay terminal device. The remote terminal device is to be switched, with the at least one information set, to a relay link with a target relay terminal device among the at least one candidate relay terminal device indicated by either one of the network devices.

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DEVICES AND METHODS FOR COMMUNICATION

FIELD

[0001] Example embodiments of the present disclosure generally relate to the field of communication techniques and in particular, to devices and methods for path switching of a remote terminal device.

BACKGROUND

[0002] For the third-generation partnership project (3GPP) Release 18 (Rel-18) , there are four typical scenarios of service continuity for user equipment (UE) to Network (U2N) Relay as follows: inter-gNB indirect-to-direct path switching, inter-gNB direct-to-indirect path switching, intra-gNB indirect-to-indirect path switching, inter-gNB indirect-to-indirect path switching. For the U2N Relay service, a remote UE may communicate with a relay UE in sidelink. For the sidelink relay, under a scenario of the inter-gNB path switch, it is an open issue whether the source gNB or the target gNB performs the selection of a relay UE and a path type.

[0003] SUMMARY

[0004] In general, embodiments of the present disclosure provide methods, devices, computer storage medium and for path switching of a remote terminal device.

[0005] In a first aspect, there is provided a network device. The network device comprises a processor configured to: exchange, with a further network device, at least one information set associated with at least one terminal device of a remote terminal device and at least one candidate relay terminal device, wherein the remote terminal device is to be switched, with the at least one information set, to a relay link with a target relay terminal device among the at least one candidate relay terminal device indicated by either one of the network devices.

[0006] In a second aspect, there is provided a first network device. The first network device comprises a processor configured to: select a plurality of candidate relay terminal devices for path switching of a remote terminal device; and send, to one or more target network devices, first information about the plurality of candidate relay terminal devices to trigger switching of the remote terminal device to a relay link with a target relay terminal device among the plurality of candidate relay terminal devices.

[0007] In a third aspect, there is provided a second network device. The second network device comprises a processor configured to: receive, from a first network device, first information about a plurality of candidate relay terminal devices to trigger switching of a remote terminal device to a relay link with a target relay terminal device among

the at least one candidate relay terminal device; and send, to the first network device, feedback for the first information.

[0008] In a fourth aspect, there is provided a first network device. The first network device comprises a processor configured to: determine whether a target relay terminal device associated with a second network device is selected by the first network device or the second network device, wherein a remote terminal device is to be switched to a relay link with the target relay terminal device; and send, to the second network device, an indication whether the target relay terminal device is selected by the first network device or the second network device.

[0009] In a fifth aspect, there is provided a second network device. The second network device comprises a processor configured to: receive, from a first network device, an indication whether a target relay terminal device is selected by the first network device or the second network device, wherein a remote terminal device is to be switched to a relay link with the target relay terminal device; and perform, based on the indication, path switching associated with the target relay terminal device.

[0010] In a sixth aspect, there is provided a method which comprises: at a network device, exchanging, with a further network device, at least one information set associated with at least one terminal device of a remote terminal device and at least one candidate relay terminal device, wherein the remote terminal device is to be switched, with the at least one information set, to a relay link with a target relay terminal device among the at least one candidate relay terminal device indicated by either one of the network devices.

[0011] In a seventh aspect, there is provided a method which comprises: at a first network device, selecting a plurality of candidate relay terminal devices for path switching of a remote terminal device; and sending, to one or more target network devices, first information about the plurality of candidate relay terminal devices to trigger switching of the remote terminal device to a relay link with a target relay terminal device among the plurality of candidate relay terminal devices.

[0012] In an eighth aspect, there is provided a method which comprises: at a second network device, receiving, from a first network device, first information about a plurality of candidate relay terminal devices to trigger switching of a remote terminal device to a relay link with a target relay terminal device among the at least one candidate relay terminal device; and sending, to the first network device, feedback for the first information.

[0013] In a ninth aspect, there is provided a method which comprises: at a first network device, determining whether a target relay terminal device associated with a second network device is selected by the first network device or the second network device, wherein a remote terminal device is to be switched to a relay link with the target

relay terminal device; and send, to the second network device, an indication whether the target relay terminal device is selected by the first network device or the second network device.

[0014] In a tenth aspect, there is provided a method which comprises: at a second network device, receiving, from a first network device, an indication whether a target relay terminal device is selected by the first network device or the second network device, wherein a remote terminal device is to be switched to a relay link with the target relay terminal device; and performing, based on the indication, path switching associated with the target relay terminal device.

[0015] In an eleventh aspect, there is provided a computer readable medium having instructions stored thereon, the instructions, when executed on at least one processor, causing the at least one processor to carry out the method according to any of the sixth, seventh, eighth, ninth or tenth aspect.

[0016] Other features of the present disclosure will become easily comprehensible through the following description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] Through the more detailed description of some example embodiments of the present disclosure in the accompanying drawings, the above and other objects, features and advantages of the present disclosure will become more apparent, wherein:

[0018] FIG. 1 illustrates an example communication environment in which example embodiments of the present disclosure can be implemented;

[0019] FIG. 2A illustrates a signaling diagram of a procedure for a switching of a layer 2 (L2) U2N remote UE to a direct Uu cell according to some embodiments of the present disclosure;

[0020] FIG. 2B illustrates a signaling diagram of a procedure for switching of a L2 U2N remote UE to an indirect path via a L2 U2N Relay UE in an RRC_CONNECTED mode according to some embodiments of the present disclosure;

[0021] FIG. 2C shows a RRC setup procedure of a remote UE through a U2N Relay UE with a gNB according to some embodiments of the present disclosure;

[0022] FIG. 3A illustrates a high-level signaling diagram of a process for information exchange between the network devices according to some embodiments of the present disclosure;

[0023] FIG. 3B illustrates a signaling diagram of a process for information exchange between network devices according to some embodiments of the present disclosure;

[0024] FIG. 4 illustrates a flowchart of a method of information exchange according to some embodiments of the present disclosure;

[0025] FIG. 5 illustrates a flowchart of a method of relay selection according to some embodiments of the present disclosure;

[0026] FIG. 6A illustrates a signaling diagram of a process for relay selection with the assistance information from a targe network device according to some embodiments of the present disclosure;

[0027] FIG. 6B illustrates a signaling diagram of a process for relay selection with the cooperation of a source network device and a targe network device according to some embodiments of the present disclosure;

[0028] FIG. 6C illustrates a signaling diagram of a process for relay selection with the cooperation of t a source network device and a targe network device according to some other embodiments of the present disclosure;

[0029] FIG. 7 illustrates a flow of a method of relay selection according to some embodiments of the present disclosure;

[0030] FIG. 8 illustrates a flowchart of a method of relay selection mode indication according to some embodiments of the present disclosure;

[0031] FIG. 9A illustrates a signaling diagram of a process for the relay selection mode indication according to some embodiments of the present disclosure;

[0032] FIG. 9B illustrates a signaling diagram of a process for the relay selection mode indication according to some other embodiments of the present disclosure;

[0033] FIG. 10 illustrates a flowchart of a method of the relay selection mode indication according to some embodiments of the present disclosure; and

[0034] FIG. 11 illustrates a simplified block diagram of an apparatus that is suitable for implementing example embodiments of the present disclosure.

[0035] Throughout the drawings, the same or similar reference numerals represent the same or similar element.

DETAILED DESCRIPTION

[0036] Principle of the present disclosure will now be described with reference to some embodiments. It is to be understood that these embodiments are described only for the purpose of illustration and help those skilled in the art to understand and implement the present disclosure, without suggesting any limitations as to the scope of the disclosure. The disclosure described herein can be implemented in various manners other than the ones described below.

[0037] In the following description and claims, unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skills in the art to which this disclosure belongs.

[0038] As used herein, the term ‘terminal device’ refers to any device having wireless or wired communication capabilities. Examples of the terminal device include,

but not limited to, user equipment (UE) , personal computers, desktops, mobile phones, cellular phones, smart phones, personal digital assistants (PDAs) , portable computers, tablets, wearable devices, internet of things (IoT) devices, Ultra-reliable and Low Latency Communications (URLLC) devices, Internet of Everything (IoE) devices, machine type communication (MTC) devices, devices on vehicle for V2X communication where X means pedestrian, vehicle, or infrastructure/network, devices for Integrated Access and Backhaul (IAB) , Space borne vehicles or Air borne vehicles in Non-terrestrial networks (NTN) including Satellites and High Altitude Platforms (HAPs) encompassing Unmanned Aircraft Systems (UAS) , eXtended Reality (XR) devices including different types of realities such as Augmented Reality (AR) , Mixed Reality (MR) and Virtual Reality (VR) , the unmanned aerial vehicle (UAV) commonly known as a drone which is an aircraft without any human pilot, devices on high speed train (HST) , or image capture devices such as digital cameras, sensors, gaming devices, music storage and playback appliances, or Internet appliances enabling wireless or wired Internet access and browsing and the like. The 'terminal device' can further has 'multicast/broadcast' feature, to support public safety and mission critical, V2X applications, transparent IPv4/IPv6 multicast delivery, IPTV, smart TV, radio services, software delivery over wireless, group communications and IoT applications. It may also incorporate one or multiple Subscriber Identity Module (SIM) as known as Multi-SIM. The term "terminal device" can be used interchangeably with a UE, a mobile station, a subscriber station, a mobile terminal, a user terminal or a wireless device.

[0039] The term "network device" refers to a device which is capable of providing or hosting a cell or coverage where terminal devices can communicate. Examples of a network device include, but not limited to, a Node B (NodeB or NB) , an evolved NodeB (eNodeB or eNB) , a next generation NodeB (gNB) , a transmission reception point (TRP) , a remote radio unit (RRU) , a radio head (RH) , a remote radio head (RRH) , an IAB node, a low power node such as a femto node, a pico node, a reconfigurable intelligent surface (RIS) , and the like. In a distributed architecture, the network device may be a centralized unit (CU) or a distributed unit (DU) .

[0040] The terminal device or the network device may have Artificial intelligence (AI) or Machine learning capability. It generally includes a model which has been trained from numerous collected data for a specific function, and can be used to predict some information.

[0041] The terminal or the network device may work on several frequency ranges, e.g., FR1 (e.g., 450 MHz to 6000 MHz) , FR2 (e.g., 24.25GHz to 52.6GHz) , frequency band larger than 100 GHz as well as Tera Hertz (THz) . It can further work on licensed/ unlicensed/shared spectrum. The terminal device may have more than one connection

with the network devices under Multi-Radio Dual Connectivity (MR-DC) application scenario. The terminal device or the network device can work on full duplex, flexible duplex and cross division duplex modes.

[0042] The embodiments of the present disclosure may be performed in test equipment, e.g., signal generator, signal analyzer, spectrum analyzer, network analyzer, test terminal device, test network device, channel emulator. In some embodiments, the terminal device may be connected with a first network device and a second network device. One of the first network device and the second network device may be a master node and the other one may be a secondary node. The first network device and the second network device may use different radio access technologies (RATs) . In some embodiments, the first network device may be a first RAT device and the second network device may be a second RAT device. In some embodiments, the first RAT device is eNB and the second RAT device is gNB. Information related with different RATs may be transmitted to the terminal device from at least one of the first network device or the second network device. In some embodiments, first information may be transmitted to the terminal device from the first network device and second information may be transmitted to the terminal device from the second network device directly or via the first network device. In some embodiments, information related with configuration for the terminal device configured by the second network device may be transmitted from the second network device via the first network device. Information related with reconfiguration for the terminal device configured by the second network device may be transmitted to the terminal device from the second network device directly or via the first network device.

[0043] As used herein, the term “remote terminal device” refers to a terminal device which is far away from a serving network device. In some scenarios, communications between a remote terminal device and a network device may be forwarded by another terminal device which will be referred to as a relay terminal device. The remote terminal device may be switched between a link with the network device and a relay link with the relay terminal device for a UE to network relay service, for example.

[0044] As used herein, the singular forms ‘a’ , ‘an’ and ‘the’ are intended to include the plural forms as well, unless the context clearly indicates otherwise. The term ‘includes’ and its variants are to be read as open terms that mean ‘include, but is not limited to. ’ The term ‘based on’ is to be read as ‘at least in part based on. ’ The term ‘one embodiment’ and ‘an embodiment’ are to be read as ‘at least one embodiment. ’ The term ‘another embodiment’ is to be read as ‘at least one other embodiment. ’ The terms ‘first, ’ ‘second, ’ and the like may refer to different or same objects. Other definitions, explicit and implicit, may be included below.

[0045] In some examples, values, procedures, or apparatus are referred to as 'best, ' 'lowest, ' 'highest, ' 'minimum, ' 'maximum, ' or the like. It will be appreciated that such descriptions are intended to indicate that a selection among many used functional alternatives can be made, and such selections need not be better, smaller, higher, or otherwise preferable to other selections.

[0046] As used herein, the term "resource, " "transmission resource, " "uplink resource, " or "downlink resource" may refer to any resource for performing a communication, such as a resource in time domain, a resource in frequency domain, a resource in spatial domain, a resource in code domain, or any other resource enabling a communication, and the like. In the following, unless explicitly stated, a resource in both frequency domain and time domain will be used as an example of a transmission resource for describing some example embodiments of the present disclosure. It is noted that example embodiments of the present disclosure are equally applicable to other resources in other domains.

[0047] As used herein, the term "transmission resource pool" or "Tx Resource pool" may refer to configured transmission resource pool within which Sidelink UE, including a V2X UE and a relay UE, will detect or be configured with transmission radio resources.

[0048] As used herein, the term "handover" may refer to a service switch of a UE from a cell to another cell which indicates the UE which is in RRC_CONNECTED state moves from one serving cell towards another serving cell. The handover may be divided into intra-gNB handover and inter-gNB handover, which indicated the UE which is in RRC_CONNECTED state moves from one serving cell towards another serving cell. Some embodiments will be discussed in the inter-gNB handover scenario.

[0049] FIG. 1 illustrates a schematic diagram of an example communication environment 100 in which example embodiments of the present disclosure can be implemented. In the communication environment 100, a plurality of communication devices, including a first terminal device 110, a second terminal device 115, a first network device 120, and a second network device 125 can communicate with each other.

[0050] In the example of FIG. 1, the terminal devices 110 may be UEs, and the network devices 120 and 125 may be base stations such as gNBs serving the UEs. The serving area of the first and second network devices 120 and 125 may be called a first cell 130 and a second cell 135, respectively. The first terminal device 110 may camp on the first cell 130, and the second device 115 may camp on the second cell 140.

[0051] It is to be understood that the number of devices and their connections shown in FIG. 1 are only for the purpose of illustration without suggesting any limitation. The communication environment 100 may include any suitable number of devices configured to implementing example embodiments of the present disclosure. Although

not shown, it would be appreciated that one or more additional devices may be located in the cells 130 and 135, and one or more additional cells may be deployed in the communication environment 100.

[0052] It is also to be understood that the network device 120 and/or 125 may be other network device than gNBs, which, for example, may be a CU in a distributed architecture, or an access and mobility management function (AMF) or other devices or functions in a core network. It is noted that although illustrated as a network device, the network device 120 and/or 125 may be another device than a network device. Although illustrated as a terminal device, the terminal device 110 and/or 115 may be another device than a terminal device.

[0053] In the following, for the purpose of illustration, some example embodiments are described with the terminal device 110 operating as a UE and the network device 120 operating as a base station. However, in some example embodiments, operations described in connection with a terminal device may be implemented at a network device or other devices, and operations described in connection with a network device may be implemented at a terminal device or other devices.

[0054] The communications in the environment 100 may conform to any suitable standards including, but not limited to, Global System for Mobile Communications (GSM) , Long Term Evolution (LTE) , LTE-Evolution, LTE-Advanced (LTE-A) , New Radio (NR) , Wideband Code Division Multiple Access (WCDMA) , Code Division Multiple Access (CDMA) , GSM EDGE Radio Access Network (GERAN) , Machine Type Communication (MTC) and the like. The embodiments of the present disclosure may be performed according to any generation communication protocols either currently known or to be developed in the future. Examples of the communication protocols include, but not limited to, the first generation (1G) , the second generation (2G) , 2.5G, 2.75G, the third generation (3G) , the fourth generation (4G) , 4.5G, the fifth generation (5G) communication protocols, 5.5G, 5G-Advanced networks, or the sixth generation (6G) networks.

[0055] In some embodiments, as shown in FIG. 1, the first terminal device 110 is moving out of the coverage of the first network device 120 and into the coverage of the second network device 125. In this case, the first terminal device 110 may be handed over from the first network device 120 to the second network device 125. The first network device 120 may be referred to as a source network device such as a source gNB, and the second network device 125 may be referred to as a target network device such as a target gNB.

[0056] In some embodiments, the communication between the first terminal device 110 and the second network device 125 may be relayed by the second terminal device 115 to improve the communication quality of the first terminal device 110. In this scenario,

the first terminal device 110 may be referred to as a remote terminal device such as a remote UE, and the second terminal device 115 may be referred to as a relay terminal device such as a relay UE. A link between the first terminal device 110 and the second network device 125 may be referred to as a direct link, and a link between the first terminal device 110 and the second terminal device 115 may be referred to as a relay link or an indirect link.

[0057] In some embodiments, a link from the network device 120 or 125 to the terminal device 110 or 115 may be referred to as a downlink (DL) , while a link from the terminal device 110 or 115 to the network device 120 or 125 may be referred to as an uplink (UL) . In DL, the network device 120 is a transmitting (TX) device (or a transmitter) and the terminal device 110 is a receiving (RX) device (or a receiver) . In UL, the terminal device 110 is a TX device (or a transmitter) and the network device 120 is a RX device (or a receiver) . A link between the first and second terminal devices 110 and 115 may be referred to as a sidelink.

[0058] There may be four scenarios of service continuity for U2N Relay as follows: inter-gNB indirect-to-direct path switching (for example, “remote UE <-> relay UE A <-> gNB X” to “remote UE <-> gNB Y”) , inter-gNB direct-to-indirect path switching (for example, “remote UE <-> gNB X” to “remote UE <-> relay UE A <-> gNB Y”) , intra-gNB indirect-to-indirect path switching (i.e., “remote UE <-> relay UE A <-> gNB X” to “remote UE <->relay UE B <-> gNB X”) , inter-gNB indirect-to-indirect path switching (i.e., “remote UE<->relay UE A <-> gNB X” to “remote UE <-> relay UE B <-> gNB Y”) .

[0059] Example intra-gNB path switch procedures will be discussed below with reference to FIGS. 2A and 2B.

[0060] FIG. 2A shows a procedure 200 for a switching of a layer 2 (L2) UE to Network (U2N) remote UE to a direct Uu cell according to some embodiments of the present disclosure.

[0061] In the procedure 200, a remote UE 205 may first communicate (207) , via a relay UE 210, UL/DL data with a gNB 220. Based on the measurement reporting of the remote UE 205, the gNB 220 may make (222) a decision of switching to a direct cell. Then, after the remote UE 210 and the relay UE 215 may perform radio resource control (RRC) reconfiguration with the gNB 220, a PC5 link may be released (224) between the remote UE 210 and the relay UE 215.

[0062] FIG. 2B shows a procedure 230 for switching of a L2 U2N remote UE to an indirect path via a L2 U2N Relay UE in an RRC_CONNECTED mode according to some embodiments of the present disclosure.

[0063] In the procedure 230, the remote UE 205 may first communicate (232) UL/DL data with the gNB 220 in a direct path. Based on the measurement reporting of the

remote UE 205, the gNB 220 may make (234) a decision of switching to a target relay UE such as the relay UE 215. Then, RRC reconfiguration for the relay UE 215 may be performed (236) between the gNB 20 and the relay UE 215. RRC configuration may also be performed (238) between the gNB 220 and the remote UE where a PC5 connection is established (236) between the remote UE 210 and the relay UE 215.

[0064] For L2 U2N Relay operation, a U2N relay UE may be in RRC_CONNECTED to perform relaying of unicast data. For example, both the L2 U2N relay UE and the L2 U2N remote UE may be in RRC_CONNECTED to perform transmission/reception of relayed unicast data. The L2 U2N relay UE may be in RRC_IDLE, RRC_INACTIVE or RRC_CONNECTED as long as all the L2 U2N remote UE (s) that are connected to the L2 U2N relay UE are either in RRC_INACTIVE or in RRC_IDLE.

[0065] A single unicast link may be established between one L2 U2N relay UE and one L2 U2N remote UE. The traffic to the next generation (NG) -radio access network (RAN) of the L2 U2N remote UE via a given L2 U2N relay UE and the traffic of the L2 U2N relay UE may be separated in different Uu radio link control (RLC) channels. For L2 U2N Relay, the L2 U2N remote UE may be configured to use resource allocation mode 2 for data to be relayed.

[0066] FIG. 2C shows a RRC setup procedure 240 of a remote UE through a U2N Relay UE with a gNB according to some embodiments of the present disclosure.

[0067] In the procedure 240, the L2 U2N remote UE 210 and the L2 U2N relay UE 215 may perform (242) a discovery procedure, and perform (244) a NR sidelink PC5 unicast link establishment procedure to establish a PC5-RRC connection. The L2 U2N remote UE may send (246) the first RRC message (for example, RRCSetupRequest) for its connection establishment with the gNB 220 via the L2 U2N relay UE 215, using a specified PC5 Relay RLC channel configuration. If the L2 U2N relay UE 215 is not in RRC_CONNECTED, it may need to do its own Uu RRC connection establishment upon reception of a message on the specified PC5 Relay RLC channel. After the RRC connection establishment procedure of the L2 U2N relay UE 215, the gNB 210 may configure signaling resource block 0 (SRB0) relaying Uu Relay RLC channel to the U2N relay UE 215. As shown in FIG. 2C, the gNB 220 may respond (248) with an RRCSetup message to the L2 U2N remote UE. The RRCSetup message may be sent to the L2 U2N Remote UE using SRB0 relaying Uu Relay RLC channel over Uu and a specified PC5 Relay RLC channel over PC5.

[0068] At 250, the gNB 220 and the L2 U2N relay UE 215 may perform a relaying channel setup procedure over Uu, and according to the configuration from the gNB 220, the L2 U2N relay UE 210 may establish a PC5 Relay RLC channel for relaying of SRB1 towards the L2 U2N relay UE 215 over PC5 and vice versa. A RRCSetupComplete message may be sent (252) by the L2 U2N remote UE 210 to the gNB 220 via the L2

U2N relay UE 215 using SRB1 relaying channel over PC5 and SRB1 relaying channel configured to the L2 U2N relay UE 115 over Uu. Then, the L2 U2N remote UE 220 may be in RRC_CONNECTED with the gNB 220.

[0069] The L2 U2N remote UE 215 and the gNB 220 may establish security following a Uu security mode procedure, and security messages may be forwarded through the L2 U2N relay UE 215. As shown in FIG. 2C, a SecurityModeCommand message may be sent (254) from the gNB 220 to the remote UE 210, and a SecurityModeComplete message may be sent (256) from the remote UE 210 to the gNB 220. The gNB 220 may send (258) an RRCReconfiguration message to the L2 U2N remote UE 210 via the L2 U2N relay UE 215, to setup the end-to-end SRB2/data radio blocks (DRBs) of the L2 U2N remote UE 210. The L2 U2N remote UE 210 may send (260) an RRCReconfigurationComplete message to the gNB 220 via the L2 U2N relay UE 210 as a response. In addition, at 262, the gNB may configure additional Uu Relay RLC channels between the gNB 220 and the L2 U2N relay UE 215, and PC5 Relay RLC channels between the L2 U2N relay UE and L2 U2N Remote UE for the relaying traffic.

[0070] Sidelink mode 1 may be used for sidelink communications between a remote UE and a relay UE. In sidelink mode 1, the gNB may schedule a UE to perform sidelink transmission. For example, a dedicated resource pool may be allocated for mode 1 resource scheme, and physical sidelink shared channel (PSSCH) /physical sidelink control channel (PSCCH) resource allocation may be performed. Dynamic scheduling and configured grant (semi-persistent scheduling (SPS) scheduling) may be supported. The dynamic scheduling may be based on downlink control information (DCI) . Two types of configuration grant (CG) , including type 1 CG and type 2 CG, may be allowed where Type 1 CG may be based on RRC configuration and Type 2 CG may be activated via DCI based on RRC configuration. Moreover, it may be supported to schedule more than one resources for a transport block (TB) in an initial transmission and retransmission (s) . The gNB may not receive sidelink signals.

[0071] The UE may transmit sidelink control information (SCI) /data on the scheduled PSCCH/PSSCH resources. At the same time, RRC connection between the UE and the gNB (Uu connection) may be established. Dedicated Radio Network Temporary Identifier (RNTI) may be used for sidelink scheduling DCI, which is different from Uu RNTI. Sidelink acknowledgement/non-acknowledgement (A/N) may be forwarded to the gNB on physical uplink control channel (PUCCH) /physical uplink shared channel (PUSCH) according to configuration.

[0072] In sidelink mode 2, the UE may select sidelink resource to perform sidelink transmission. The Mode 2 scheme may include full sensing (Rel-16) , partial sensing (Rel-17) , and random selection (Rel-17) . In full sensing, an initial candidate resource

set may be set as a full set. Unavailable resources may be excluded from the candidate resource set. Then, the final candidate resource set may be determined. The inter-UE coordination (IUC) feature may be used when IUC is (pre-) configured and triggered where a preferred resource set may be determined by one UE for transmissions of the other UE or a non-preferred resource set may be excluded.

[0073] For sidelink relay, under an inter-gNB path switch scenario, it is an open issue whether the source gNB or the target gNB performs the selection of a relay UE and a path type. One option is to reuse the existing network procedures to support single-hop lay 2 (L2) U2N Relay. For example, the source gNB may decide to trigger path switching for a L2 U2N remote UE. If the optimizations of the handover decision that use the Uu quality or RRC state of the relay UE are needed, it may be better that these optimizations are achieved by providing the measurement reports including such information to the source gNB. To trigger the path switching, the source gNB may send a handover request to the target gNB, and the target gNB may feed a handover request acknowledgement back to the source gNB. During inter-gNB path switching, the source gNB may signal a serving cell of the relay UE to the target gNB via existing information element (IE) Target Cell Global ID.

[0074] As another option, the target gNB may perform the selection of the relay UE. For example, the source gNB may first decide whether to use a direct path or an indirect path in the target gNB. The determination may be mainly based on the measurement report from the remote UE. After the source gNB determines the path type, the target gNB may determine a target relay UE. The target gNB may have better information to determine the target relay UE. Alternatively, the source gNB and the target gNB may jointly decide the final relay UE. Multiple rounds of signaling exchange might be needed between a source gNB and a target gNB over an interface such as an XnAP interface between the two gNBs for the selection of the path type and the final relay UE.

[0075] Some embodiments of the present disclosure provide an information exchange scheme between network devices in path switching of a remote terminal device. According to the scheme, two network devices, which may be, for example, a source network device and a target network device, exchange at least one information set which is associated with at least one terminal device of a remote terminal device and at least one candidate relay terminal device. For example, the at least one information set may comprise one or more information sets associated with the remote terminal device and/or one or more information sets associated with one or more candidate relay terminal devices. With the at least one information set, the remote terminal device is to be switched to a relay link with a target relay terminal device among the at least

one candidate relay terminal device which is indicated by either one of the network networks.

[0076] With such information exchange, either or both of the source and target network devices may decide whether to use a direct path or an indirect path for the remote terminal device. Moreover, either or both of the source and target network devices may select the target relay terminal device among the candidate relay terminal devices. More flexibility may be allowed in the path switching of the remote terminal device.

[0077] Some embodiments in this regard will be described in detail below with reference to FIGS. 3A, 3B and 4.

[0078] FIG. 3A shows a high-level signaling diagram of a process 300 for information exchange between the network devices according to some embodiments of the present disclosure.

[0079] In the process 300, a network device 320 (for example, the first network device 120) exchanges (322) , with a network device 325 (for example, the second network device 125) , at least one information set associated with at least one terminal device of a remote terminal device (for example, the first terminal device 110) and at least one candidate relay terminal device. With the at least one information set, the remote terminal device is to be switched to a relay link with a target relay terminal device (for example, the second terminal device 115) among the at least one candidate relay terminal device indicated by either one of the network networks.

[0080] The at least one information set may comprise a plurality of information set. For example, the at least one information set may comprise a first information set, also referred to as an information set A. The first information set may be associated with context of the remote terminal device. For example, the first information set may comprise at least one of: a temporary identification (ID) of the remote terminal device assigned by a serving cell, a global ID of the remote terminal device assigned by a core network, an indication whether the remote terminal device is authorized for a U2N relay service, a path switch type associated with the remote terminal device, or any other information related to the context of the remote terminal device.

[0081] Alternatively, or in addition, the at least one information set may comprise a second information set, also referred to as an information set B. The second information set may be associated with capability of the remote terminal device. As an example, the second information set may comprise at least one of: security capability of the remote terminal device, including at least one of security algorithm or integrity protection algorithm of the remote terminal device during relay link establishment, a Quality of Service (QoS) split configuration for the remote terminal device in a relay link, a maximum bit rate of the remote terminal device in a relay link, or any information related to the capability of the remote terminal device.

[0082] Alternatively, or in addition, the at least one information set may comprise a third information set, also referred to as an information set C. The third information set may be associated with the at least one candidate relay terminal device. For example, the third information set may comprise at least one of: at least one temporary ID of the at least one candidate relay terminal device assigned by at least one serving cell, at least one global ID of the at least one candidate relay terminal device assigned by at least one core network, at least one serving cell ID of the at least one candidate relay terminal device, at least one state of the at least one relay terminal device, at least the number of connecting relay links of the at least one candidate relay terminal device, quality of at least one link between the at least one relay terminal device and at least one of the network devices, or any other information related to candidate relay terminal devices.

[0083] It is to be understood that the above information included in the information sets are only illustrative, but not limited. Either of the information sets may be associated with a remote terminal device and/or a relay terminal device. For example, in some embodiments, the first and/or second information sets may be associated with a relay terminal device, and the third information set may be associated with a remote terminal device.

[0084] It is also to be understood that depending on the specific implementations, the number of exchanged information sets may be any suitable number. For example, any of the first, second and third information sets as described above may be further divided. Two or more of the first, second and third information sets as described above may be integrated. Moreover, some information in one of the first, second and third information sets may be included in other information sets.

[0085] The at least one information set may be exchanged during or before a handover procedure of the remote terminal device. For example, the at least one information may be carried within one of the following messages: a HANDOVER REQUEST, a HANDOVER REQUEST ACKNODLEDGEMENT; or a predefined message before the handover procedure, for example, a newly defined message particularly used for U2N relay service continuity. As such, the remote terminal device may be switched to the target terminal device by the handover procedure.

[0086] In the embodiments where one or more predefined messages before a handover procedure are used to carry the information sets, the network device 320, which may be the source network device, may use the predefined messages to exchange, with the network device 325, which may be a target network device, information about the at least one candidate relay terminal device before. Based on the exchanged information, the network device 320 may determine a relay selection mode, for example, whether the target relay terminal device is selected by the network device 320 or the network

device 325. Then, the network device 320 may indicate the determination to the network device 325 and further perform the handover procedure with the network device 325. Some other embodiments with respect to the selection mode will be further discussed in the following paragraphs with reference to FIGS. 8, 9A, 9B and 10.

[0087] In some example embodiments, the information sets may be carried in a handover request from a source network device such as a source gNB to a target network device such as a target gNB during a handover procedure of a remote terminal device such as a remote UE to a relay path with a relay terminal device such as a relay UE. For example, new IEs such as RemoteUEContext, RemoteUECapability and CandidateRelayinfosetList, may be added into the HandoverRequestIEs as follows:

[0088]

```
HandoverRequestIEs ::={
    {AMF-UE-NGAP-ID}
    {HandoverType}
    {Cause}
    {UEAggregateMaximumBitRate}
    {CoreNetworkAssistanceInformationForInactive}
    {UESecurityCapabilities}
    {SecurityContext}
    {NewSecurityContextInd}
    {NASC}
    {PDUSessionResourceSetupListHOReq}
    {AllowedNSSAI}
    {TraceActivation}
    {MaskedIMEISV}
    {SourceToTarget-TransparentContainer}
    {MobilityRestrictionList}
    {LocationReportingRequestType}
    {RRCInactiveTransitionReportRequest}
    .....
    {RemoteUEContext}
    {RemoteUECapability}
    {CandidateRelayinfosetList}
}
```

[0089] The shown IEs may indicate the information set A, B and C, respectively. As an example, the information set A, which may be a Remote UE context information set, may carry at least one of the following detailed information: Remote UE ID, which may be assigned by the serving cell of a source gNB such as the first network device 120; Remote UE global ID, which may be assigned by an access and mobility

management function (AMF) ; the indication on whether this remote UE is authorized to take U2N relay service; Remote UE's preferred path switch type, for example, whether the remote UE would like to or the source gNB would like to make the remote UE switch to a Uu direct link or to an indirect relay link.

[0090] The information set B, which may be a Remote UE capability set, may carry at least one of the following detailed information: Remote UE's security capability, including at least one of the following information: Remote UE's security algorithm during relay link establishment or Remote UE's integrity protection algorithm during relay link establishment; Remote UE's supported PC5 QoS split configuration; Remote UE's supported maximum bit rate in a relay link.

[0091] The information set C, which may be a Candidate Relay UE information set, may carry at least one of the following detailed information: Relay UE ID, which is assigned by a serving cell of the source gNB; Global Relay UE ID, which is assigned by the AMF; the serving cell ID of the relay UE; Relay UE's RRC state; Relay UE's current number of connecting relay links; or Relay UE's Uu Reference Signal Receiving Power (RSRP) . In some example embodiments, the information set C may be one set list or a single information set of one specific relay UE.

[0092] Such basic information element exchange between the source and target gNBs may well support inter-gNB U2N Relay path switch.

[0093] In some embodiments, one or more information sets may be sent upon selection of the at least one candidate relay terminal device for path switching of the remote terminal device. For example, after the network device 320 (such as the first network device 120 in FIG. 1) selects the at least one candidate relay terminal device for the switching of the remote terminal device (such as the first terminal device 110 in FIG. 1) , the network device 320 may send, to the network device 325 (such as the second network device 125 in FIG. 1) , the information about the at least one candidate relay terminal device, which may be carried in the first information set, to trigger the switching of the remote terminal device (such as the first terminal device 110 in FIG. 1) to a relay link with a target relay terminal device (such as the second terminal device 115 in FIG. 1) .

[0094] After the network device 325 receives, from the network device 320, the first information set about the at least one candidate relay terminal device, the network device 325 may send feedback to the network device 320, for example, to accept or reject the determination of the network device 320 on the relay selection.

[0095] For example, in some embodiments, the network device 320 may send the first information set about a candidate relay terminal device in a handover request to the network device 325. Accordingly, the network device 325 may send, to the network device 320, a handover request acknowledgment, or a handover preparation failure as

the feedback. In this example, no assistance information from the network device 325 is needed. Some other embodiments with respect to the relay selection may be further discussed in the following paragraphs with reference to FIGS. 5, 6A to 6C and 7.

[0096] An example of information exchange between the network devices will be discussed below with reference to FIG. 3B.

[0097] FIG. 3B shows a signaling diagram of a process 330 for information exchange between network devices according to some embodiments of the present disclosure. In this example, a source gNB 335 and a target gNB 340 are examples of the network devices 320 and 325 in FIG. 3A for switching a remote UE to a relay link with a relay UE.

[0098] In the process 330, the source gNB 335 may trigger a path switch procedure, and the source gNB 335 make determination on the relay UE selection and path type selection without target gNB assistance information. The source gNB 335 may select one candidate relay UE of only one target cell and send the determination towards the target gNB 340. As shown in FIG. 3B, the source gNB 335 may send (342) a HANDOVER REQUEST to the target gNB 340 which may indicate a target relay UE and a target cell. It is up to the target gNB 340 on whether to accept or reject the determination of the source gNB 335 on the relay UE selection, by applying a HANDOVER REQUEST ACKNOWLEDGMENT or HANDOVER PREPARATION FAILURE. In this example, as shown in FIG. 3B, the target gNB 340 may send a HANDOVER REQUEST ACKNOWLEDGMENT to the source gNB 335 without target gNB assistance information.

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[0099] FIG. 4 shows a method 400 of information exchange according to some embodiments of the present disclosure. The method 400 can be implemented by either the network device 320 or the network device 325 as shown in FIG. 3A. For the purpose of discussion, the method 400 will be described from the perspective of the network device 320.

[0100] As shown in FIG. 4, at block 410, the network device 320 exchanges, with a further network device such as the network device 325, at least one information set associated with at least one terminal device of a remote terminal device and at least one candidate relay terminal device. The remote terminal device is to be switched, with the at least one information set, to a relay link with a target relay terminal device among the at least one candidate relay terminal device indicated by either one of the network devices.

[0101] In some embodiments, the information set may be exchanged during a handover procedure of the remote terminal device. Alternatively, the information set may be

carried in at least one of a handover request, a handover request acknowledgement between the network devices, or a predefined message before the handover procedure.

[0102] In some embodiments, the network device 320 may exchange, with the network device 325, information about the at least one candidate relay terminal device in the at least one information set carried in the predefined message. Based on the information, the network device 320 may determine whether the target relay terminal device is selected by the network device 320 or the network device 325.

[0103] In some embodiments, the information set comprises at least one of: a first information set, a second information set, or a third information set associated. The first information set may be associated with context of the remote terminal device, which may comprise at least one of: a temporary ID of the remote terminal device assigned by a serving cell, a global ID of the remote terminal device assigned by a core network, an indication whether the remote terminal device is authorized for a U2N relay service, or a path switch type associated with the remote terminal device.

[0104] Alternatively, or in addition, the second information set may be associated with capability of the remote terminal device, which may comprise at least one of: security capability of the remote terminal device, including at least one of security algorithm or integrity protection algorithm of the remote terminal device during relay link establishment, a QoS split configuration for the remote terminal device in a relay link, or a maximum bit rate of the remote terminal device in a relay link.

[0105] Alternatively, or in addition, the third information set may be associated with the at least one candidate relay terminal device, which may comprise at least one of: at least one temporary ID of the at least one candidate relay terminal device assigned by at least one serving cell, at least one global ID of the at least one candidate relay terminal device assigned by at least one core network, at least one serving cell ID of the at least one candidate relay terminal device, at least one state of the at least one relay terminal device, the number of connecting relay links of the at least one candidate relay terminal device, or quality of at least one link between the at least one relay terminal device and at least one of the network devices.

[0106] In some embodiments, the network device 320, which may be a source network device, may select the at least one candidate relay terminal device for the switching of the remote terminal device. The network device 320 may send, to the further network device 325, which may be a target network device, the first information set about the at least one candidate relay terminal device to trigger the switching of the remote terminal device to the relay link with the target relay terminal device. In some embodiments, the network device 320 may send the first information set about a candidate relay terminal device in a handover request to the further network device 325.

[0107] In some embodiments, the network device 320, which may be a target network device, may receive, from the further network device 325, which may be a source network device, the first information set about the at least one candidate relay terminal device to trigger the switching of the remote terminal device to the relay link with the target relay terminal device. The network device 320 may send feedback to the further network device 325. In some embodiments, the network device 320 may receive the first information set about a candidate relay terminal device in a handover request from the network device 325. Then, the network device 320 may send, to the further network device 325, a handover request acknowledgment, or a handover preparation failure as the feedback.

[0108] All operations and features related to the network devices 320 and 325 as described above with reference to FIGS. 3A and 3B are likewise applicable to the method 400 and have similar effects. For the purpose of simplification, the details will be omitted.

[0109] As discussed above, in the U2N Relay scenario, as an option, a source gNB may trigger handover while the source gNB may determine on the relay UE. As another option, the source gNB may trigger handover while the target gNB may determine on the relay UE. Alternatively, both of the two abovementioned options may be co-existed.

[0110] Some embodiments of the present disclosure provide a relay selection scheme. This scheme allows a source network device such as the source gNB to select a plurality of candidate relay terminal devices such as relay UEs for path switching of a remote terminal device such as a remote UE. Then, the source network device sends, to one or more target network devices such as target gNBs, the first information about the plurality of candidate relay terminal devices to trigger switching of the remote terminal device to a relay link with a target relay terminal device among the plurality of candidate relay terminal devices. In some embodiments, the source and target network devices may exchange the abovementioned information sets.

[0111] In this way, during the path switch procedure, the source gNB may determine on when to trigger the handover procedure. Moreover, the source gNB may decide on which relay UE (or target gNB) may be selected and whether to apply a direct Uu link or an indirect relay link. The source gNB may or may not ask assistance information from the target gNB to get more information for the candidate relay UE, so that to get better determination on which candidate relay UE to be selected. Thus, the path switching of the remote UE between different gNBs may be more flexible and efficient.

[0112] Signaling procedures between the source and target gNBs may be different with and without target gNB assistance information. Different information element may be applied for the cases with and without target gNB assistance information.

[0113] Some embodiments in this regard will be described in detail below with reference to FIGS. 5, 6A to 6C and 7.

[0114] FIG. 5 shows a method 500 of relay selection according to some embodiments of the present disclosure. The method 500 may be implemented by a source network device which may be either the first network device 120 or the second network device 125 as shown in FIG. 1. For the purpose of discussion, the method 500 will be described from the perspective of the first network device 120 with reference to FIG. 1.

[0115] As shown in FIG. 5, at block 510, the first network device 120 selects a plurality of candidate relay terminal devices for path switching of a remote terminal device such as the first terminal device 110. At block 520, the first network device 120 sends, to one or more target network devices (for example, including the second network device 125) , first information about the plurality of candidate relay terminal devices to trigger switching of the remote terminal device to a relay link with a target relay terminal device (such as the second terminal device 115) among the plurality of candidate relay terminal devices.

[0116] The first information may be carried in one or more information sets as discussed above. In some example embodiments, the first information may comprise some information as included in the information set C of candidate U2N Relay UE information set as discussed above.

[0117] In some embodiments, due to the lack of knowledge about the candidate terminal devices, the first network device 120 may get more information for the candidates from one or more target network devices. As such, the first network device 120 may get better determination on which candidate relay terminal device to be finally selected.

[0118] For example, the first network device 120 may receive, from the one or more target network devices, second information about the plurality of candidate relay terminal devices, as the assistance information. The second information may be carried in one or more information sets as discussed above. As an example, in the embodiments where the first information may comprise some information as included in the information set C of candidate U2N Relay UE information set, the second information may comprise some other information as included in the information set C. Based on the first and second information about the plurality of candidate relay terminal devices, the first network device 120 may determine the target relay terminal device from the plurality of candidate relay terminal devices. Then, the first network device 120 may send, to a target network device associated with the target relay terminal device, a request for the switching of the remote terminal device to the relay link with the target relay terminal device.

[0119] In some embodiments, the first information comprises at least one of: a global ID of a candidate relay terminal device of the plurality of candidate relay terminal

devices, cell information such as a cell ID associated with a candidate relay terminal device of the plurality of candidate relay terminal devices, or context of a candidate relay terminal device of the plurality of candidate relay terminal devices. The second information may comprise at least one of: at least one state of at least one candidate relay terminal device of the plurality of candidate relay terminal devices, at least one configuration for at least one transmission resource pool of at least one candidate relay terminal device of the plurality of candidate relay terminal devices, capability of at least one candidate relay terminal device of the plurality of candidate relay terminal devices, quality of at least one link between the remote terminal device and at least one candidate relay terminal device of the plurality of candidate relay terminal devices, or the number of connecting relay links of at least one candidate relay terminal device of the plurality of candidate relay terminal devices.

[0120] In some embodiments, the source network device may determine when to trigger the handover procedure while the target network device may decide on which relay UE may be selected and whether to apply a direct Uu link or an indirect relay link. In some embodiments, after the first network device 120 sends the first information about the plurality of candidate relay terminal devices to one or more target network devices, the first network device 120 may receive, from the one or more target network devices, the second information about at least one candidate relay terminal device from among the plurality of candidate relay terminal devices. The at least one candidate relay terminal device may be selected by the one or more target network devices from among the plurality of candidate relay terminal devices. For the at least one candidate relay terminal device, the first network device 120 may determine the target relay terminal device and send, to a target network device associated with the target relay terminal device, a request for the switching of the remote terminal device to the relay link with the target relay terminal device.

[0121] In some examples, the first network device 120 may send, to the target network device associated with the target relay terminal device, a confirmation for the second information received from the target network device, so as to confirm the relay terminal device selected by the target network device.

[0122] In this case, the first information sent by the first network device 120 to the one or more target network devices may comprise at least one of: at least one temporary ID of the plurality of candidate relay terminal devices, at least one global ID of the plurality of candidate relay terminal devices, at least one serving cell ID associated with the plurality of candidate relay terminal devices, and/or at least one measurement result of at least one link between the remote terminal device and the plurality of candidate relay terminal devices. The second information comprises at least one of: at least one state of the at least one candidate relay terminal device, quality of at least one link

between the at least one candidate relay terminal device and the target network device, capability of the at least one candidate relay terminal device, at least one available link between the remote terminal device and the at least one candidate relay terminal device, and/or at least one configuration for at least one transmission resource pool of the at least one candidate relay terminal device. Such first and second information may be carried in one or more information sets as discussed above.

[0123] In some embodiments, a timer may be configured at the first network device 120 for the reception of the second information. For example, the first network device 120 may receive, from the one or more target network devices, the second information during running of the timer. If the second information is not received during the running of the timer, the first network device 120 may determine the target relay terminal device from the plurality of candidate relay terminal devices by itself. Then, the first network device 120 may send, to the target network device associated with the target relay terminal device, a request for the switching of the remote terminal device to the relay link with the target relay terminal device.

[0124] In this way, during the path switch procedure, a source network device which may be a source gNB may determine when to trigger the handover procedure. On the other hand, a target network device which may be a target gNB may decide on which relay UE should be selected and whether to apply a direct Uu link or an indirect relay link. As an example, the source gNB may provide a full set of candidate relay UE list towards multiple target gNBs, and each target gNB may filter out one candidate relay UE which may be the most appropriate and feedback to the source gNB. Then, the source gNB may trigger the handover procedure.

[0125] During the path switch procedure, the source gNB may acquire relay UE information from multiple target gNBs. It is optionally for the source gNB to feedback the confirmation on each target gNB so that for the completion of the path switch procedure. Signaling procedures between source and target gNBs may be different with and without a source gNB confirmation. Different information element may be applied for the cases with and without the source gNB confirmation.

[0126] Example processes of relay selection will be discussed below with reference to FIGS. 6A to 6C.

[0127] FIG. 6A shows a signaling diagram of a process 600 for relay selection with the assistance information from a targe network device according to some embodiments of the present disclosure. In this example, a source gNB 605 is an example of a source network device, and a target gNB 610 is an example of a target network device, for switching a remote UE to a relay link with a relay UE.

[0128] In the process 600, the source gNB 605 may trigger the path switch procedure, and the source gNB 605 may make determination on the relay UE selection and path

type selection with the assistance information from the target gNB 610. As shown in FIG. 6A, after the source gNB 605 selects multiple candidate relay UEs of one target cell or multiple target cells, the source gNB 605 may send (612) the information of those relay UEs (as an example of the first information) towards the target gNB 610, for example, in U2N path switch preparation. The first information may comprise a Candidate relay UE list which may comprise Relay UE global ID, Relay UE cell information such as Evolved Universal Terrestrial Radio Access (E-UTRA) Cell Global Identifier (ECGI) or NR Cell Global Identifier (NCGI) , and/or Relay UE context.

[0129] Then, as shown in FIG. 6A, the target gNB 610 may send (614) the complementary information of those relay UEs (as an example of the second information) towards the source gNB 605, for example, in a U2N path switch report. The complementary information may also comprise a Candidate relay UE list which may comprise a Relay UE RRC state, a Relay UE transmission (Tx) resource pool configuration, Relay UE capability, PC5-RSRP between U2N remote UE and U2N relay UE, and/or Relay UE's available PC5 link leftover.

[0130] Optionally, at 616, one timer may be configured and maintained at the source gNB side. If the source gNB 605 does not receive the U2N path switch report during the running of the timer, then the source gNB 605 may make the final determination up to its implementation

[0131] After the source gNB 605 makes the final determination on one relay UE of the target cell, the source gNB 605 may send (618) a HANDOVER request. The target gNB 610 may send (620) a HANDOVER REQUEST ACKNOWLEDGMENT or HANDOVER PREPARATION FAILURE on whether to accept or reject the handover request from the source gNB 605.

[0132] FIG. 6B shows a signaling diagram of a process 630 for relay selection with the cooperation of the source gNB 605 and the targe gNB 610 according to some embodiments of the present disclosure.

[0133] In the process 630, the source gNB 605 may trigger a path switch procedure while the target gNB 610 may make the determination on relay UE selection, without the confirmation from the source gNB 605. As shown in FIG. 6B, the source gNB 605 may send (632) to the target gNB 610 the candidate relay UE list, which may include all appropriate relay UEs of which reported by U2N remote UE, for example, in U2N path switch preparation. At least one of the following information can be included in the list: Relay UE temp ID, Relay UE global ID, Relay UE's serving cell ID, or Relay UE's PC5 RSRP measurement result (measured by remote UE) .

[0134] Upon reception of the U2N path switch preparation from the source gNB 605, the target gNB 610 may choose the most appropriate relay UE of which belong to its

serving cell. At 634, the target gNB 610 may provide more detailed UE information towards the source gNB 605, for example, in a U2N path switch report. Such UE information may include at least one of the following information: Relay UE's RRC state, Relay UE's Uu RSRP, Relay UE's capability, Relay UE's current available PC5 link, or Relay UE's Tx resource pool.

[0135] Accordingly, the source gNB 605 may receive multiple most appropriate relay UEs from multiple different target gNBs. In that case, the source gNB 605 may select the final one which may be served by the target gNB 610. Then, at 636, the source gNB 605 may carry the relay UE information in the HANDOVER REQUEST message and perform the handover procedure.

[0136] Optionally, as shown in FIG. 6B, at 638, one timer may be configured and maintained at the source gNB side. If the source gNB 605 cannot receive the U2N path switch report during the running of the timer, then the source gNB 605 may make the final determination up to its implementation.

[0137] FIG. 6C shows a signaling diagram of a process 630 for relay selection with the cooperation of the source gNB 605 and the targe gNB 610 according to some other embodiments of the present disclosure.

[0138] In the process 630, the source gNB 605 may trigger a path switch procedure while the target gNB 610 may make the determination on relay UE selection, with the confirmation from the source gNB 605. As shown in FIG. 6C, the source gNB 605 may send (642) the candidate relay UE list towards multiple different target gNBs of which reported by the remote UE, for example, in the U2N path switch preparation. The list may include at least one of the following information: Relay UE temp ID, Relay UE global ID, Relay UE's serving cell ID, Relay UE's PC5 RSRP measurement result (measured by the remote UE) .

[0139] Upon reception of the U2N path switch preparation from the source gNB 605, the target gNB 610 may choose the most appropriate relay UE of which belong to its serving cell. Then, at 644, the target gNB 610 may provide more detailed UE information towards the source gNB 605, for example, in a U2N path switch report. The provided UE information may include at least one of the following information: Relay UE's RRC state, Relay UE's Uu RSRP, Relay UE's capability, Relay UE's current available PC5 link, or Relay UE's Tx resource pool.

[0140] At the source gNB side, the source gNB 605 may receive multiple U2N path switch reports from multiple gNBs. In that case, the source gNB 605 may finally select one candidate relay UE. At 646, the source gNB 605 may send the U2N path switch confirmation message towards the specific target gNB which may be the target gNB 610. As such, the source gNB 605 may receive multiple most appropriate relay UEs from multiple different target gNBs and select the final one. At 648, the source gNB

605 may carry the relay UE information in the HANDOVER REQUEST message and perform the handover procedure.

[0141] Optionally, at 650, one timer may be configured and maintained at the source gNB side. If the source gNB 605 cannot receive the U2N path switch report during the running of the timer, then the source gNB 605 may make the final determination up to its implementation.

[0142] FIG. 7 shows a method 700 of relay selection according to some embodiments of the present disclosure. The method 700 may be implemented by a target network device which may be either the first network device 120 or the second network device 125 as shown in FIG. 1. For the purpose of discussion, the method 700 will be described from the perspective of the second network device 125 with reference to FIG. 1.

[0143] As shown in FIG. 7, at block 710, the second network device 125, which may be a target network device receives, from the first network device, which may be a source network device, first information about a plurality of candidate relay terminal devices to trigger switching of a remote terminal device (such as the first terminal device 110) to a relay link with a target relay terminal device (such as the second terminal device 115) among the at least one candidate relay terminal device. At block 720, the second network device 125 sends, to the first network device 120, feedback for the first information. The first information may be carried in one or more information sets as discussed above.

[0144] In some embodiments, the second network device 125 may send, to the first network device 120, second information about the plurality of candidate relay terminal devices as the feedback. Then, the second network device 125 may receive, from the first network device 120, a request for the switching of the remote terminal device to the relay link with a target relay terminal device from among the plurality of candidate relay terminal devices. The second information may be carried in one or more information sets as discussed above.

[0145] In some embodiments, the first information may comprise at least one of: a global ID of a candidate relay terminal device of the plurality of candidate relay terminal devices, cell information associated with a candidate relay terminal device of the plurality of candidate relay terminal devices, or context of a candidate relay terminal device of the plurality of candidate relay terminal devices. Alternatively, or in addition, the second information may comprise at least one of: at least one state of at least one candidate relay terminal device of the plurality of candidate relay terminal devices, at least one configuration for at least one transmission resource pool of at least one candidate relay terminal device of the plurality of candidate relay terminal devices, capability of at least one candidate relay terminal device of the plurality of candidate relay terminal devices, quality of at least one link between the remote terminal device and at least one

candidate relay terminal device of the plurality of candidate relay terminal devices, or the number of connecting relay links of at least one candidate relay terminal device of the plurality of candidate relay terminal devices.

[0146] In some embodiments, the second network device 125 may determine at least one candidate relay terminal device from the plurality of candidate relay terminal devices. The second network device 125 may send, to the first network device 120, second information about the at least one candidate relay terminal device. In some embodiments, the second network device 125 may receive, from the first network device 120, a request for the switching of the remote terminal device to the relay link with a target relay terminal device from among the at least one candidate relay terminal device.

[0147] In some embodiments, the first information may comprise at least one of: at least one temporary ID of the plurality of candidate relay terminal devices, at least one global ID of the plurality of candidate relay terminal devices, at least one serving cell ID associated with the plurality of candidate relay terminal devices, or at least one measurement result of at least one link between the remote terminal device and the plurality of candidate relay terminal devices. Alternatively, or in addition, the second information may comprise at least one of: at least one state of the at least one candidate relay terminal device, quality of at least one link between the at least one candidate relay terminal device and the target network device, capability of the at least one candidate relay terminal device, at least one available link between the remote terminal device and the at least one candidate relay terminal device, or at least one configuration for at least one transmission resource pool of the at least one candidate relay terminal device.

[0148] In some embodiments, the second network device 125 may receive, from the first network device 120, a confirmation for the second information transmitted to the first network device.

[0149] All operations and features related to the target network device as described above with reference to FIGS. 5 and 6A to 6C are likewise applicable to the method 700 and have similar effects. For the purpose of simplification, the details will be omitted.

[0150] As discussed above, during the U2N path switch procedure, it is possible that relay UE selection modes based on both the source gNB and the target gNB determination may simultaneously exist. It may be necessary to maintain a mechanism for both the source gNB and the target gNB on the alignment on which entity to decide on the relay UE selection.

[0151] Some embodiments of the present disclosure provide an indication scheme. With the scheme, after a network device determines whether a target relay terminal device associated with a further network device is selected by the network device or the

further network device. A remote terminal device is to be switched to a relay link with the target relay terminal device. The network device sends, to the further network device, an indication whether the target relay terminal device is selected by the first network device or the second network device.

[0152] For example, the source gNB may indicate on whether it is the source gNB or the target gNB determination on the relay UE. Either an explicit indication or an implicit indication may be applied. Thus, the relay UE selection may be more flexible and efficient, thereby improving the flexibility and efficiency of the path switching of a remote UE between different gNBs. Signaling procedures between the source and target gNBs may include additional steps. Different information elements may be applied for the source gNB determination and the target gNB determination.

[0153] Some embodiments in this regard will be described in detail below with reference to FIGS. 8, 9A, 9B and 10.

[0154] FIG. 8 shows a method 800 of relay selection mode indication according to some embodiments of the present disclosure. The method 800 may be implemented by a source network device which may be either the first network device 120 or the second network device 125 as shown in FIG. 1. For the purpose of discussion, the method 800 will be described from the perspective of the first network device 120 with reference to FIG. 1.

[0155] As shown in FIG. 8, at block 810, the first network device 120, which may be a source network device, determines whether a target relay terminal device (such as the second terminal device 115) associated with the second network device 125, which may be a target network device, is selected by the first network device 120 or the second network device 125. A remote terminal device such as the first terminal device 110 is to be switched to a relay link with the target relay terminal device. At block 820, the first network device 120 sends, to the second network device 125, an indication whether the target relay terminal device is selected by the first network device 120 or the second network device 125.

[0156] In some embodiments, the first network device 120 may send, to the second network device 125, a relay selection mode as an explicit indication to explicitly indicate whether the target relay terminal device is selected by the first network device 120 or the second network device 125. In some embodiments, the first network device 120 may receive, from the second network device 125, a confirmation for the relay selection mode to indicate whether the relay selection mode is accepted by the second network device 125 or not.

[0157] In some embodiments, the first network device 120 may send, to the second network device 125, a configuration of a timer for validation of the relay selection mode. During the running of the timer, the indicated relay selection mode may be valid. In

some embodiments, the first network device 120 may send, to the second network device 125, a list of cells associated with the second network device for which the relay selection mode is applied.

[0158] In some embodiments, the first network device 120 may send, to the second network device 125, a list of candidate relay terminal devices as an implicit indication to implicitly indicate whether the target relay terminal device is selected by the first network device 120 or the second network device 125. The use of such an implicit indication may further reduce the signaling overhead.

[0159] In some embodiments, the list of candidate relay terminal devices may include one candidate relay terminal device to implicitly indicate that the target relay terminal device is selected by the first network device 120. Alternatively, or in addition, the list of candidate relay terminal devices may include more than one candidate relay terminal device to implicitly indicate that the target relay terminal device is selected by the second network device 125.

[0160] Example processes of selection mode indications will be discussed below with reference to FIGS. 9A and 9B.

[0161] FIG. 9A shows a signaling diagram of a process 900 for the selection mode indication according to some embodiments of the present disclosure. In this example, a source gNB 905 is an example of a source network device, and a target gNB 910 is an example of a target network device, for switching a remote UE to a relay link with a relay UE.

[0162] In the process 900, the source gNB 905 may indicate whether it is the source gNB determination on relay UE selection or the target gNB determination on relay UE selection with an explicit indication. As shown in FIG. 9A, the source gNB 905 may send (912) the U2N path switch mode selection message towards the target gNB 910, for example, in a U2N path switch mode selection message. The message may include Relay UE selection mode, whether it is based on source gNB determination or target gNB determination.

[0163] Alternatively, or in addition, the message may include a mode maintain timer. When the target gNB 910 receives this timer configuration, the timer may start, during which, both the source gNB 905 and the target gNB 910 may follow the relay UE selection mode configured by the source gNB 905. When the timer expires, the source gNB 905 may reconfigure the relay UE selection mode. Alternatively, or in addition, the message may include an available cell list (for example, a list of ECGI/NCGI) . For those cells of the target gNB 910 falling into the cell list may follow the configuration of the relay UE selection mode.

[0164] When the target gNB 910 receives the U2N path switch mode selection message from the source gNB 905, the target gNB 910 may decide whether to accept or reject

the configuration. Then, as shown in FIG. 9A, the target gNB 910 may send (914) back the path switch mode confirmation message towards the source gNB 905. In the following, the source gNB 905 and the target gNB 910 may perform the relay UE selection configuration procedure and handover procedure, for example, as discussed above with reference to FIGS. 6A to 6C.

[0165] Optionally, at 916, one or more timers may be configured and maintained at the source gNB side. If the source gNB 905 cannot receive the U2N path switch report during the running of a timer, also called timer1, or if the source gNB 905 cannot receive the U2N path switch mode confirmation during the running of another timer, also called timer2, then the source gNB 905 may make the final determination up to its implementation.

[0166] Optionally, the content of path switch mode selection may be combined with the U2N path switch preparation. The content of path switch mode confirmation may be combined with the U2N path switch report.

[0167] FIG. 9B shows a signaling diagram of a process 920 for the selection mode indication according to some other embodiments of the present disclosure.

[0168] In the process 920, the source gNB 905 may indicate whether it is the source gNB determination on the relay UE selection or the target gNB determination on the relay UE selection with an implicit indication, instead of sending an explicit path switch mode selection message from the source gNB 905 towards a target gNB such as a target gNB1 922, a target gNB2 924 or a target gNB3 926.

[0169] If the candidate relay UE list only includes the information about a single relay UE, then it may be the source gNB's determination on the relay UE selection. Otherwise, if there is the information about multiple relay UEs included within the candidate relay UE list, while for each serving cell there is only one candidate relay UE, then it may also be the source gNB's determination on the relay UE selection.

[0170] As shown in FIG. 9B, the source gNB may generate (930) the message including a candidate relay list [Relay A, Relay B, Relay C] . The source gNB may indicate (932) to the target gNB1 922 Relay A which belongs to cell A under the target gNB1 922, indicate (934) to the target gNB2 924 Relay B which belongs to cell B under the target gNB2 924, and indicate (936) to the target gNB3 926 Relay C which belongs to cell C under the target gNB3 926.

[0171] The target gNB such as a target gNB1 922, a target gNB2 924 or a target gNB3 926 may send the complementary relay UE information back to the source gNB 905 for more appropriate relay UE selection, as discussed above with reference to FIGS. 6A to 6C.

[0172] If there are the information about multiple relay UEs included within the candidate relay UE list, while for at least one serving cell there are multiple candidate relay

UEs, then it may be the target gNB's determination on the relay UE selection. In the following, the source gNB 905 and the selected target gNB may perform the handover procedure.

[0173] FIG. 10 shows a method 1000 of relay selection mode indication according to some embodiments of the present disclosure. The method 1000 may be implemented by a target network device which may be either the first network device 120 or the second network device 125 as shown in FIG. 1. For the purpose of discussion, the method 800 will be described from the perspective of the second network device 125 with reference to FIG. 1.

[0174] As shown in FIG. 10, at block 1010, the second network device 125 receives, from the first network device 120, an indication whether a target relay terminal device such as the second terminal device 115 is selected by the first network device 120 or the second network device 125. A remote terminal device such as the first terminal device 110 is to be switched to a relay link with the target relay terminal device. At block 1020, the second network device 125 performs, based on the indication, path switching associated with the target relay terminal device.

[0175] In some embodiments, the second network device 125 may receive, from the first network device 120, a relay selection mode to explicitly indicate whether the target relay terminal device is selected by the first network device 120 or the second network device 125.

[0176] In some embodiments, the second network device 125 may send, to the first network device 120, a confirmation for the relay selection mode to indicate whether the relay selection mode is accepted by the second network device 125 or not.

[0177] In some embodiments, the second network device 125 may receive, from the first network device 120, a configuration of a timer for validation of the relay selection mode.

[0178] In some embodiments, the second network device 125 may receive, from the first network device 120, a list of cells associated with the second network device 125. The relay selection mode may be applied for the list of cells.

[0179] In some embodiments, the second network device 125 may receive, from the first network device 120, a list of candidate relay terminal devices to implicitly indicate whether the target relay terminal device is selected by the first network device 120 or the second network device 125.

[0180] In some embodiments, the second network device 125 may receive, from the first network device 120, the list of candidate relay terminal devices including one candidate relay terminal device to implicitly indicate that the target relay terminal device is selected by the first network device 120. Alternatively, or in addition, the second network device 125 may receive, from the first network device 120, the list

of candidate relay terminal devices including more than one candidate relay terminal device to implicitly indicate that the target relay terminal device is selected by the second network device 125.

[0181] All operations and features related to the target network device as described above with reference to FIGS. 8, 9A and 9B are likewise applicable to the method 1000 and have similar effects. For the purpose of simplification, the details will be omitted.

[0182] FIG. 11 is a simplified block diagram of a device 1100 that is suitable for implementing embodiments of the present disclosure. The device 1100 can be considered as a further example implementation of any of the first, second, third, and fourth communication devices as shown in FIG. 1. Accordingly, the device 1100 can be implemented at or as at least a part of the first network device 120 or the second network device 125.

[0183] As shown, the device 1100 includes a processor 1110, a memory 1120 coupled to the processor 1110, a suitable transmitter (TX) /receiver (RX) 1140 coupled to the processor 1110, and a communication interface coupled to the TX/RX 1140. The memory 1110 stores at least a part of a program 1130. The TX/RX 1140 is for bidirectional communications. The TX/RX 1140 has at least one antenna to facilitate communication, though in practice an Access Node mentioned in this application may have several ones. The communication interface may represent any interface that is necessary for communication with other network elements, such as X2/Xn interface for bidirectional communications between eNBs/gNBs, S1/NG interface for communication between a Mobility Management Entity (MME) /Access and Mobility Management Function (AMF) /SGW/UPF and the eNB/gNB, Un interface for communication between the eNB/gNB and a relay node (RN) , or Uu interface for communication between the eNB/gNB and a terminal device.

[0184] The program 1130 is assumed to include program instructions that, when executed by the associated processor 1110, enable the device 1100 to operate in accordance with the embodiments of the present disclosure, as discussed herein with reference to FIGS. 1 to 10. The embodiments herein may be implemented by computer software executable by the processor 1110 of the device 1100, or by hardware, or by a combination of software and hardware. The processor 1110 may be configured to implement various embodiments of the present disclosure. Furthermore, a combination of the processor 1110 and memory 1120 may form processing means 1150 adapted to implement various embodiments of the present disclosure.

[0185] The memory 1120 may be of any type suitable to the local technical network and may be implemented using any suitable data storage technology, such as a non-transitory computer readable storage medium, semiconductor based memory devices, magnetic memory devices and systems, optical memory devices and systems, fixed

memory and removable memory, as non-limiting examples. While only one memory 1120 is shown in the device 1100, there may be several physically distinct memory modules in the device 1100. The processor 1110 may be of any type suitable to the local technical network, and may include one or more of general purpose computers, special purpose computers, microprocessors, digital signal processors (DSPs) and processors based on multicore processor architecture, as non-limiting examples. The device 1100 may have multiple processors, such as an application specific integrated circuit chip that is slaved in time to a clock which synchronizes the main processor.

[0186] In some embodiments, a network device comprises a circuitry configured to: exchange, with a further network device, at least one information set associated with at least one terminal device of a remote terminal device and at least one candidate relay terminal device, wherein the remote terminal device is to be switched, with the at least one information set, to a relay link with a target relay terminal device among the at least one candidate relay terminal device indicated by either one of the network devices.

[0187] In some embodiments, a first network device comprises a circuitry configured to: select a plurality of candidate relay terminal devices for path switching of a remote terminal device; and send, to one or more target network devices, first information about the plurality of candidate relay terminal devices to trigger switching of the remote terminal device to a relay link with a target relay terminal device among the plurality of candidate relay terminal devices.

[0188] In some embodiments, a second network device comprises a circuitry configured to: receive, from a first network device, first information about a plurality of candidate relay terminal devices to trigger switching of a remote terminal device to a relay link with a target relay terminal device among the at least one candidate relay terminal device; and send, to the first network device, feedback for the first information.

[0189] In some embodiments, a first network device comprises a circuitry configured to: determine whether a target relay terminal device associated with a second network device is selected by the first network device or the second network device, wherein a remote terminal device is to be switched to a relay link with the target relay terminal device; and send, to the second network device, an indication whether the target relay terminal device is selected by the first network device or the second network device.

[0190] In some embodiments, a second network device comprises a circuitry configured to: receive, from a first network device, an indication whether a target relay terminal device is selected by the first network device or the second network device, wherein a remote terminal device is to be switched to a relay link with the target relay terminal device; and perform, based on the indication, path switching associated with the target relay terminal device.

[0191] The circuity may be configured to perform all the operations of the network device as described above with reference to FIGS. 1-11.

[0192] The term "circuitry" used herein may refer to hardware circuits and/or combinations of hardware circuits and software. For example, the circuitry may be a combination of analog and/or digital hardware circuits with software/firmware. As a further example, the circuitry may be any portions of hardware processors with software including digital signal processor (s) , software, and memory (ies) that work together to cause an apparatus, such as a terminal device or a network device, to perform various functions. In a still further example, the circuitry may be hardware circuits and or processors, such as a microprocessor or a portion of a microprocessor, that requires software/ firmware for operation, but the software may not be present when it is not needed for operation. As used herein, the term circuitry also covers an implementation of merely a hardware circuit or processor (s) or a portion of a hardware circuit or processor (s) and its (or their) accompanying software and/or firmware.

[0193] In summary, embodiments of the present disclosure provide the following solutions.

[0194] In one aspect, a network device comprises a processor configured to: exchange, with a further network device, at least one information set associated with at least one terminal device of a remote terminal device and at least one candidate relay terminal device, wherein the remote terminal device is to be switched, with the at least one information set, to a relay link with a target relay terminal device among the at least one candidate relay terminal device indicated by either one of the network devices.

[0195] In some embodiments, the information set is exchanged during a handover procedure of the remote terminal device, or the information set is carried in at least one of a handover request, a handover request acknowledgement between the network devices, or a predefined message before the handover procedure.

[0196] In some embodiments, the processor is further configured to: exchange, with the further network device, information about the at least one candidate relay terminal device in the at least one information set carried in the predefined message; and determine, based on the information, whether the target relay terminal device is selected by the network device or the further network device.

[0197] In some embodiments, the information set comprises at least one of: a first information set, a second information set, or a third information set associated.

[0198] In some embodiments, the first information set associated with context of the remote terminal device, comprises at least one of: a temporary identification (ID) of the remote terminal device assigned by a serving cell, a global ID of the remote terminal device assigned by a core network, an indication whether the remote terminal device is authorized for a user equipment (UE) to network (U2N) relay service, or a path switch type associated with the remote terminal device; the second information set

associated with capability of the remote terminal device, comprises at least one of: security capability of the remote terminal device, including at least one of security algorithm or integrity protection algorithm of the remote terminal device during relay link establishment, a Quality of Service (QoS) split configuration for the remote terminal device in a relay link, or a maximum bit rate of the remote terminal device in a relay link; and/or the third information set associated with the at least one candidate relay terminal device, comprises at least one of: at least one temporary ID of the at least one candidate relay terminal device assigned by at least one serving cell, at least one global ID of the at least one candidate relay terminal device assigned by at least one core network, at least one serving cell ID of the at least one candidate relay terminal device, at least one state of the at least one relay terminal device, the number of connecting relay links of the at least one candidate relay terminal device, or quality of at least one link between the at least one relay terminal device and at least one of the network devices.

[0199] In some embodiments, the processor is further configured to: select the at least one candidate relay terminal device for the switching of the remote terminal device; and send, to the further network device, the first information set about the at least one candidate relay terminal device to trigger the switching of the remote terminal device to the relay link with the target relay terminal device.

[0200] In some embodiments, the processor is further configured to: send the first information set about a candidate relay terminal device in a handover request to the further network device.

[0201] In some embodiments, the processor is further configured to: receive, from the further network device, the first information set about the at least one candidate relay terminal device to trigger the switching of the remote terminal device to the relay link with the target relay terminal device; and send feedback to the further network device.

[0202] In some embodiments, the processor is further configured to: receive the first information set about a candidate relay terminal device in a handover request from the network device; and send, to the further network device, a handover request acknowledgment, or a handover preparation failure as the feedback.

[0203] In one aspect, a first network device comprises a processor configured to: select a plurality of candidate relay terminal devices for path switching of a remote terminal device; and send, to one or more target network devices, first information about the plurality of candidate relay terminal devices to trigger switching of the remote terminal device to a relay link with a target relay terminal device among the plurality of candidate relay terminal devices.

[0204] In some embodiments, the processor is further configured to: receive, from the one or more target network devices, second information about the plurality of candidate

relay terminal devices; determine the target relay terminal device from the plurality of candidate relay terminal devices based on the first and second information; and send, to a target network device of the one or more target network devices associated with the target relay terminal device, a request for the switching of the remote terminal device to the relay link with the target relay terminal device.

[0205] In some embodiments, the first information comprises at least one of: a global identification (ID) of a candidate relay terminal device of the plurality of candidate relay terminal devices, cell information associated with a candidate relay terminal device of the plurality of candidate relay terminal devices, or context of a candidate relay terminal device of the plurality of candidate relay terminal devices; and/or the second information comprises at least one of: at least one state of at least one candidate relay terminal device of the plurality of candidate relay terminal devices, at least one configuration for at least one transmission resource pool of at least one candidate relay terminal device of the plurality of candidate relay terminal devices, capability of at least one candidate relay terminal device of the plurality of candidate relay terminal devices, quality of at least one link between the remote terminal device and at least one candidate relay terminal device of the plurality of candidate relay terminal devices, or the number of connecting relay links of at least one candidate relay terminal device of the plurality of candidate relay terminal devices.

[0206] In some embodiments, the processor is further configured to: receive, from the one or more target network devices, second information about at least one candidate relay terminal device from among the plurality of candidate relay terminal devices; determine the target relay terminal device from the at least one candidate relay terminal device; and send, to a target network device of the one or more target network devices associated with the target relay terminal device, a request for the switching of the remote terminal device to the relay link with the target relay terminal device.

[0207] In some embodiments, the first information comprises at least one of: at least one temporary identification (ID) of the plurality of candidate relay terminal devices, at least one global ID of the plurality of candidate relay terminal devices, at least one serving cell ID associated with the plurality of candidate relay terminal devices, or at least one measurement result of at least one link between the remote terminal device and the plurality of candidate relay terminal devices; and/or the second information comprises at least one of: at least one state of the at least one candidate relay terminal device, quality of at least one link between the at least one candidate relay terminal device and the target network device, capability of the at least one candidate relay terminal device, at least one available link between the remote terminal device and the at least one candidate relay terminal device, or at least one configuration for at least one transmission resource pool of the at least one candidate relay terminal device.

[0208] In some embodiments, the processor is further configured to: send, to the target network device associated with the target relay terminal device, a confirmation for the second information received from the target network device.

[0209] In some embodiments, the processor is further configured to: receive, from the one or more target network devices, the second information during running of a timer.

[0210] In some embodiments, the processor is further configured to: in response to a failure of reception of the second information during the running of the timer, determine the target relay terminal device from the plurality of candidate relay terminal devices; and send, to a target network device of the one or more target network devices associated with the target relay terminal device, a request for the switching of the remote terminal device to the relay link with the target relay terminal device.

[0211] In one aspect, a second network device comprises a processor configured to: receive, from a first network device, first information about a plurality of candidate relay terminal devices to trigger switching of a remote terminal device to a relay link with a target relay terminal device among the at least one candidate relay terminal device; and send, to the first network device, feedback for the first information.

[0212] In some embodiments, the processor is further configured to: send, to the first network device, second information about the plurality of candidate relay terminal devices as the feedback; and receive, from the first network device, a request for the switching of the remote terminal device to the relay link with a target relay terminal device from among the plurality of candidate relay terminal devices.

[0213] In some embodiments, the first information comprises at least one of: a global identification (ID) of a candidate relay terminal device of the plurality of candidate relay terminal devices, cell information associated with a candidate relay terminal device of the plurality of candidate relay terminal devices, or context of a candidate relay terminal device of the plurality of candidate relay terminal devices; and/or the second information comprises at least one of: at least one state of at least one candidate relay terminal device of the plurality of candidate relay terminal devices, at least one configuration for at least one transmission resource pool of at least one candidate relay terminal device of the plurality of candidate relay terminal devices, capability of at least one candidate relay terminal device of the plurality of candidate relay terminal devices, quality of at least one link between the remote terminal device and at least one candidate relay terminal device of the plurality of candidate relay terminal devices, or the number of connecting relay links of at least one candidate relay terminal device of the plurality of candidate relay terminal devices.

[0214] In some embodiments, the processor is further configured to: determine at least one candidate relay terminal device from the plurality of candidate relay terminal

devices; and send, to the first network device, second information about the at least one candidate relay terminal device.

[0215] In some embodiments, the processor is further configured to: receive, from the first network device, a request for the switching of the remote terminal device to the relay link with a target relay terminal device from among the at least one candidate relay terminal device.

[0216] In some embodiments, the first information comprises at least one of: at least one temporary identification (ID) of the plurality of candidate relay terminal devices, at least one global ID of the plurality of candidate relay terminal devices, at least one serving cell ID associated with the plurality of candidate relay terminal devices, or at least one measurement result of at least one link between the remote terminal device and the plurality of candidate relay terminal devices; and/or the second information comprises at least one of: at least one state of the at least one candidate relay terminal device, quality of at least one link between the at least one candidate relay terminal device and the target network device, capability of the at least one candidate relay terminal device, at least one available link between the remote terminal device and the at least one candidate relay terminal device, or at least one configuration for at least one transmission resource pool of the at least one candidate relay terminal device.

[0217] In some embodiments, the processor is further configured to: receive, from the first network device, a confirmation for the second information transmitted to the first network device.

[0218] In one aspect, a first network device comprises a processor configured to: determine whether a target relay terminal device associated with a second network device is selected by the first network device or the second network device, wherein a remote terminal device is to be switched to a relay link with the target relay terminal device; and send, to the second network device, an indication whether the target relay terminal device is selected by the first network device or the second network device.

[0219] In some embodiments, the processor is further configured to: send, to the second network device, a relay selection mode to explicitly indicate whether the target relay terminal device is selected by the first network device or the second network device.

[0220] In some embodiments, the processor is further configured to: receive, from the second network device, a confirmation for the relay selection mode to indicate whether the relay selection mode is accepted by the second network device or not.

[0221] In some embodiments, the processor is further configured to: send, to the second network device, a configuration of a timer for validation of the relay selection mode.

[0222] In some embodiments, the processor is further configured to: send, to the second network device, a list of cells associated with the second network device, wherein the relay selection mode is applied for the list of cells.

[0223] In some embodiments, the processor is further configured to: send, to the second network device, a list of candidate relay terminal devices to implicitly indicate whether the target relay terminal device is selected by the first network device or the second network device.

[0224] In some embodiments, the processor is further configured to: send, to the second network device, the list of candidate relay terminal devices including one candidate relay terminal device to implicitly indicate that the target relay terminal device is selected by the first network device; and/or send, to the second network device, the list of candidate relay terminal devices including more than one candidate relay terminal device to implicitly indicate that the target relay terminal device is selected by the second network device.

[0225] In one aspect, a second network device comprises a processor configured to: receive, from a first network device, an indication whether a target relay terminal device is selected by the first network device or the second network device, wherein a remote terminal device is to be switched to a relay link with the target relay terminal device; and perform, based on the indication, path switching associated with the target relay terminal device.

[0226] In some embodiments, the processor is further configured to: receive, from the first network device, a relay selection mode to explicitly indicate whether the target relay terminal device is selected by the first network device or the second network device.

[0227] In some embodiments, the processor is further configured to: send, to the first network device, a confirmation for the relay selection mode to indicate whether the relay selection mode is accepted by the second network device or not.

[0228] In some embodiments, the processor is further configured to: receive, from the first network device, a configuration of a timer for validation of the relay selection mode.

[0229] In some embodiments, the processor is further configured to: receive, from the first network device, a list of cells associated with the second network device, wherein the relay selection mode is applied for the list of cells.

[0230] In some embodiments, the processor is further configured to: receive, from the first network device, a list of candidate relay terminal devices to implicitly indicate whether the target relay terminal device is selected by the first network device or the second network device.

[0231] In some embodiments, the processor is further configured to: receive, from the first network device, the list of candidate relay terminal devices including one candidate relay terminal device to implicitly indicate that the target relay terminal device is selected by the first network device; and/or receive, from the first network device, the list of candidate relay terminal devices including more than one candidate relay

terminal device to implicitly indicate that the target relay terminal device is selected by the second network device.

[0232] In a further aspect, a computer readable medium having instructions stored thereon, the instructions, when executed on at least one processor, causing the at least one processor to perform the method implemented by the network device as discussed above.

[0233] In a yet further aspect, a computer program comprising instructions, the instructions, when executed on at least one processor, causing the at least one processor to perform the method implemented by the network device as discussed above.

[0234] Generally, various embodiments of the present disclosure may be implemented in hardware or special purpose circuits, software, logic or any combination thereof. Some aspects may be implemented in hardware, while other aspects may be implemented in firmware or software which may be executed by a controller, microprocessor or other computing device. While various aspects of embodiments of the present disclosure are illustrated and described as block diagrams, flowcharts, or using some other pictorial representation, it will be appreciated that the blocks, apparatus, systems, techniques or methods described herein may be implemented in, as non-limiting examples, hardware, software, firmware, special purpose circuits or logic, general purpose hardware or controller or other computing devices, or some combination thereof.

[0235] The present disclosure also provides at least one computer program product tangibly stored on a non-transitory computer readable storage medium. The computer program product includes computer-executable instructions, such as those included in program modules, being executed in a device on a target real or virtual processor, to carry out the process or method as described above with reference to FIGS. 1 to 11. Generally, program modules include routines, programs, libraries, objects, classes, components, data structures, or the like that perform particular tasks or implement particular abstract data types. The functionality of the program modules may be combined or split between program modules as desired in various embodiments. Machine-executable instructions for program modules may be executed within a local or distributed device. In a distributed device, program modules may be located in both local and remote storage media.

[0236] Program code for carrying out methods of the present disclosure may be written in any combination of one or more programming languages. These program codes may be provided to a processor or controller of a general purpose computer, special purpose computer, or other programmable data processing apparatus, such that the program codes, when executed by the processor or controller, cause the functions/ operations specified in the flowcharts and/or block diagrams to be implemented. The program code may execute entirely on a machine, partly on the machine, as a stand-

alone software package, partly on the machine and partly on a remote machine or entirely on the remote machine or server.

[0237] The above program code may be embodied on a machine readable medium, which may be any tangible medium that may contain, or store a program for use by or in connection with an instruction execution system, apparatus, or device. The machine readable medium may be a machine readable signal medium or a machine readable storage medium. A machine readable medium may include but not limited to an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, or device, or any suitable combination of the foregoing. More specific examples of the machine readable storage medium would include an electrical connection having one or more wires, a portable computer diskette, a hard disk, a random access memory (RAM) , a read-only memory (ROM) , an erasable programmable read-only memory (EPROM or Flash memory) , an optical fiber, a portable compact disc read-only memory (CD-ROM) , an optical storage device, a magnetic storage device, or any suitable combination of the foregoing.

[0238] Further, while operations are depicted in a particular order, this should not be understood as requiring that such operations be performed in the particular order shown or in sequential order, or that all illustrated operations be performed, to achieve desirable results. In certain circumstances, multitasking and parallel processing may be advantageous. Likewise, while several specific implementation details are contained in the above discussions, these should not be construed as limitations on the scope of the present disclosure, but rather as descriptions of features that may be specific to particular embodiments. Certain features that are described in the context of separate embodiments may also be implemented in combination in a single embodiment. Conversely, various features that are described in the context of a single embodiment may also be implemented in multiple embodiments separately or in any suitable sub-combination.

[0239] Although the present disclosure has been described in language specific to structural features and/or methodological acts, it is to be understood that the present disclosure defined in the appended claims is not necessarily limited to the specific features or acts described above. Rather, the specific features and acts described above are disclosed as example forms of implementing the claims.

Claims

[Claim 1] A network device, comprising:
a processor configured to:
exchange, with a further network device, at least one information set associated with at least one terminal device of a remote terminal device and at least one candidate relay terminal device,
wherein the remote terminal device is to be switched, with the at least one information set, to a relay link with a target relay terminal device among the at least one candidate relay terminal device indicated by either one of the network devices.

[Claim 2] The network device of claim 1, wherein
the information set is exchanged during a handover procedure of the remote terminal device, or
the information set is carried in at least one of a handover request, a handover request acknowledgement between the network devices, or a predefined message before the handover procedure.

[Claim 3] The network device of claim 1, wherein the information set comprises at least one of:
a first information set,
a second information set, or
a third information set associated.

[Claim 4] The network device of claim 3, wherein
the first information set associated with context of the remote terminal device, comprises at least one of:
a temporary identification (ID) of the remote terminal device assigned by a serving cell,
a global ID of the remote terminal device assigned by a core network,
an indication whether the remote terminal device is authorized for a user equipment (UE) to network (U2N) relay service, or
a path switch type associated with the remote terminal device;
the second information set associated with capability of the remote terminal device, comprises at least one of:
security capability of the remote terminal device, including at least one of security algorithm or integrity protection algorithm of the remote terminal device during relay link establishment,
a Quality of Service (QoS) split configuration for the remote terminal device in a relay link, or

a maximum bit rate of the remote terminal device in a relay link; and/or
the third information set associated with the at least one candidate relay terminal device, comprises at least one of:
at least one temporary ID of the at least one candidate relay terminal device assigned by at least one serving cell,
at least one global ID of the at least one candidate relay terminal device assigned by at least one core network,
at least one serving cell ID of the at least one candidate relay terminal device,
at least one state of the at least one relay terminal device,
the number of connecting relay links of the at least one candidate relay terminal device, or
quality of at least one link between the at least one relay terminal device and at least one of the network devices.

[Claim 5] The network device of claim 3, wherein the processor is further configured to:
receive, from the further network device, the first information set about the at least one candidate relay terminal device to trigger the switching of the remote terminal device to the relay link with the target relay terminal device; and
send feedback to the further network device.

[Claim 6] The network device of claim 5, wherein the processor is further configured to:
receive the first information set about a candidate relay terminal device in a handover request from the network device; and
send, to the further network device, a handover request acknowledgment, or a handover preparation failure as the feedback.

[Claim 7] A first network device, comprising:
a processor configured to:
select a plurality of candidate relay terminal devices for path switching of a remote terminal device; and
send, to one or more target network devices, first information about the plurality of candidate relay terminal devices to trigger switching of the remote terminal device to a relay link with a target relay terminal device among the plurality of candidate relay terminal devices.

[Claim 8] The first network device of claim 7, wherein the processor is further configured to:

receive, from the one or more target network devices, second information about the plurality of candidate relay terminal devices;
determine the target relay terminal device from the plurality of candidate relay terminal devices based on the first and second information; and
send, to a target network device of the one or more target network devices associated with the target relay terminal device, a request for the switching of the remote terminal device to the relay link with the target relay terminal device.

[Claim 9] The first network device of claim 8, wherein
the first information comprises at least one of:
a global identification (ID) of a candidate relay terminal device of the plurality of candidate relay terminal devices,
cell information associated with a candidate relay terminal device of the plurality of candidate relay terminal devices, or
context of a candidate relay terminal device of the plurality of candidate relay terminal devices; and/or
the second information comprises at least one of:
at least one state of at least one candidate relay terminal device of the plurality of candidate relay terminal devices,
at least one configuration for at least one transmission resource pool of at least one candidate relay terminal device of the plurality of candidate relay terminal devices,
capability of at least one candidate relay terminal device of the plurality of candidate relay terminal devices,
quality of at least one link between the remote terminal device and at least one candidate relay terminal device of the plurality of candidate relay terminal devices, or
the number of connecting relay links of at least one candidate relay terminal device of the plurality of candidate relay terminal devices.

[Claim 10] The first network device of claim 9, wherein the processor is further configured to:
receive, from the one or more target network devices, second information about at least one candidate relay terminal device from among the plurality of candidate relay terminal devices;
determine the target relay terminal device from the at least one candidate relay terminal device; and

send, to a target network device of the one or more target network devices associated with the target relay terminal device, a request for the switching of the remote terminal device to the relay link with the target relay terminal device, wherein:
the first information comprises at least one of:
at least one temporary identification (ID) of the plurality of candidate relay terminal devices,
at least one global ID of the plurality of candidate relay terminal devices,
at least one serving cell ID associated with the plurality of candidate relay terminal devices, or
at least one measurement result of at least one link between the remote terminal device and the plurality of candidate relay terminal devices; and/or
the second information comprises at least one of:
at least one state of the at least one candidate relay terminal device,
quality of at least one link between the at least one candidate relay terminal device and the target network device,
capability of the at least one candidate relay terminal device,
at least one available link between the remote terminal device and the at least one candidate relay terminal device, or
at least one configuration for at least one transmission resource pool of the at least one candidate relay terminal device.

[Claim 11] The first network device of claim 8, wherein the processor is further configured to:
receive, from the one or more target network devices, the second information during running of a timer.

[Claim 12] The first network device of claim 11, wherein the processor is further configured to:
in response to a failure of reception of the second information during the running of the timer, determine the target relay terminal device from the plurality of candidate relay terminal devices; and
send, to a target network device of the one or more target network devices associated with the target relay terminal device, a request for the switching of the remote terminal device to the relay link with the target relay terminal device.

[Claim 13] A second network device, comprising:
a processor configured to:

receive, from a first network device, first information about a plurality of candidate relay terminal devices to trigger switching of a remote terminal device to a relay link with a target relay terminal device among the at least one candidate relay terminal device; and
send, to the first network device, feedback for the first information.

[Claim 14] A first network device, comprising:
a processor configured to:
determine whether a target relay terminal device associated with a second network device is selected by the first network device or the second network device, wherein a remote terminal device is to be switched to a relay link with the target relay terminal device; and
send, to the second network device, an indication whether the target relay terminal device is selected by the first network device or the second network device.

[Claim 15] The first network device of claim 14, wherein the processor is further configured to:
send, to the second network device, a relay selection mode to explicitly indicate whether the target relay terminal device is selected by the first network device or the second network device.

[Claim 16] The first network device of claim 15, wherein the processor is further configured to:
send, to the second network device, a list of cells associated with the second network device,
wherein the relay selection mode is applied for the list of cells.

[Claim 17] The first network device of claim 14, wherein the processor is further configured to:
send, to the second network device, the list of candidate relay terminal devices including one candidate relay terminal device to implicitly indicate that the target relay terminal device is selected by the first network device; and/or
send, to the second network device, the list of candidate relay terminal devices including more than one candidate relay terminal device to implicitly indicate that the target relay terminal device is selected by the second network device.

[Claim 18] A second network device, comprising:
a processor configured to:
receive, from a first network device, an indication whether a target relay terminal device is selected by the first network device or the

second network device, wherein a remote terminal device is to be switched to a relay link with the target relay terminal device; and perform, based on the indication, path switching associated with the target relay terminal device.

[Claim 19] A communication method, comprising:
at a network device,
exchange, with a further network device, at least one information set associated with at least one terminal device of a remote terminal device and at least one candidate relay terminal device,
wherein the remote terminal device is to be switched, with the at least one information set, to a relay link with a target relay terminal device among the at least one candidate relay terminal device indicated by either one of the network devices.

[Claim 20] A communication method, comprising:
at a first network device,
select a plurality of candidate relay terminal devices for path switching of a remote terminal device; and
send, to one or more target network devices, first information about the plurality of candidate relay terminal devices to trigger switching of the remote terminal device to a relay link with a target relay terminal device among the plurality of candidate relay terminal devices.

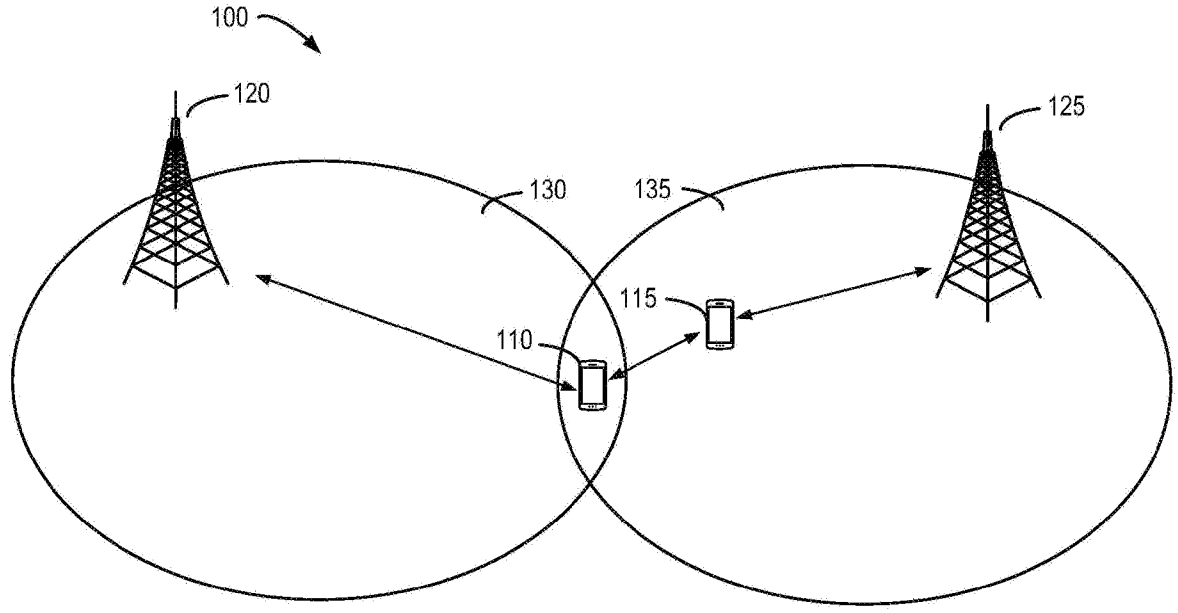
[Claim 21] A communication method, comprising:
at a second network device,
receive, from a first network device, first information about a plurality of candidate relay terminal devices to trigger switching of a remote terminal device to a relay link with a target relay terminal device among the at least one candidate relay terminal device; and
send, to the first network device, feedback for the first information.

[Claim 22] A communication method, comprising:
at a first network device,
determine whether a target relay terminal device associated with a second network device is selected by the first network device or the second network device, wherein a remote terminal device is to be switched to a relay link with the target relay terminal device; and
send, to the second network device, an indication whether the target relay terminal device is selected by the first network device or the second network device.

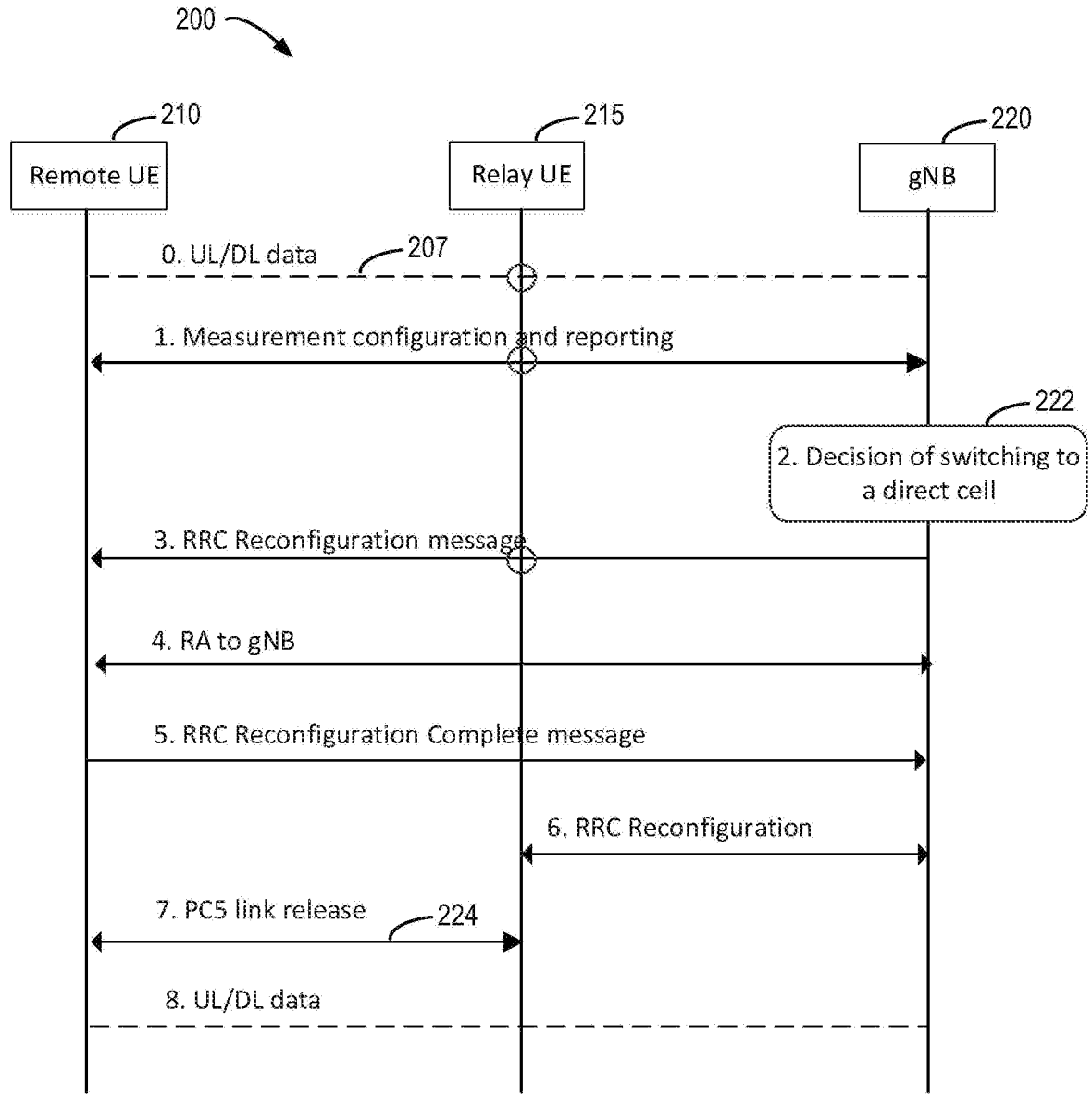
[Claim 23] A communication method, comprising:

at a second network device,
receive, from a first network device, an indication whether a target relay terminal device is selected by the first network device or the second network device, wherein a remote terminal device is to be switched to a relay link with the target relay terminal device; and
perform, based on the indication, path switching associated with the target relay terminal device.

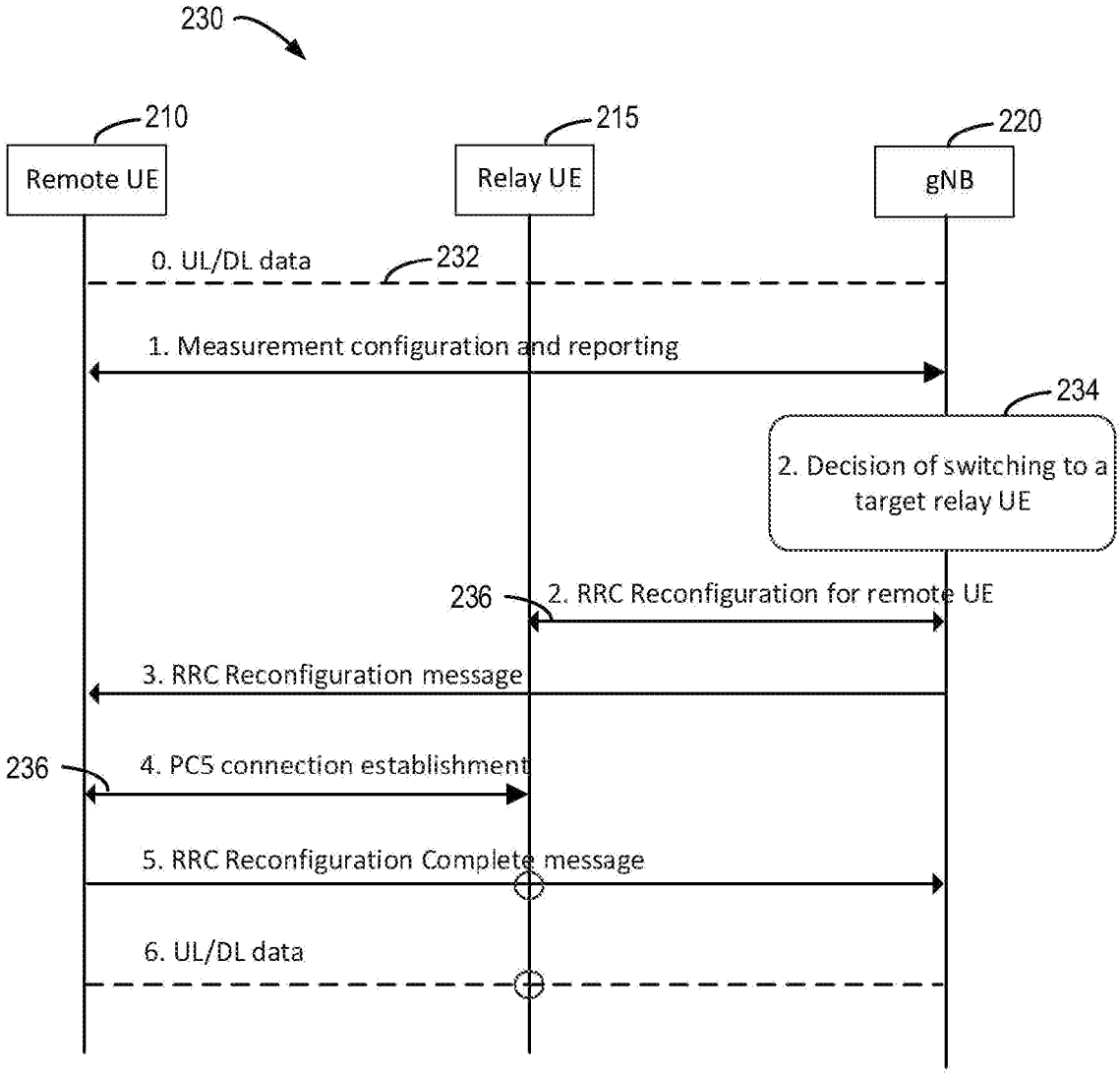
[Fig. 1]


100
120
125
130
135
115
110

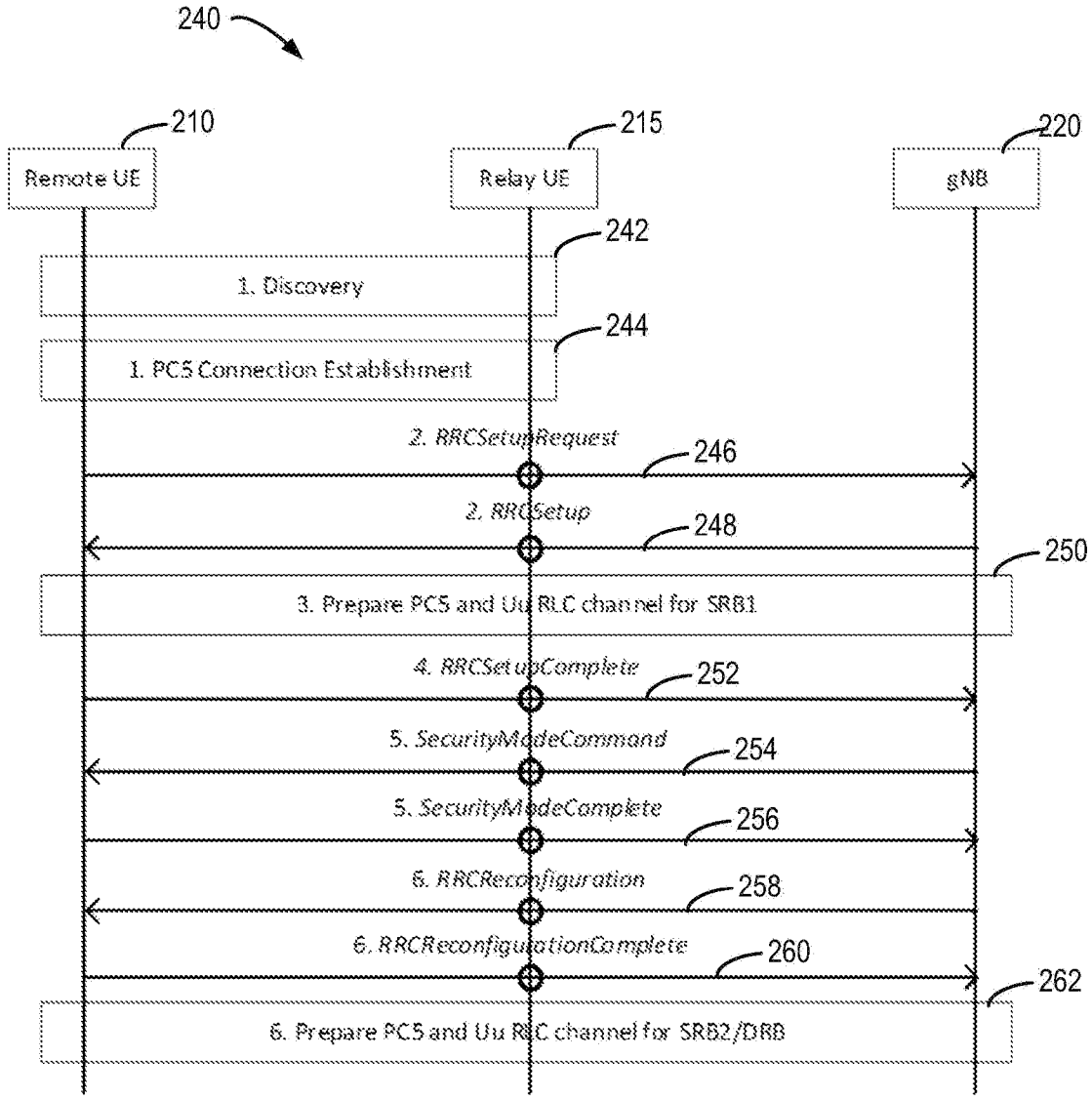
[Fig. 2A]


200
210
Remote UE
215
Relay UE
220
gNB
0. UL/DL data
207
1. Measurement configuration and reporting
222
2. Decision of switching to a direct cell
3. RRC Reconfiguration message
4. RA to gNB
5. RRC Reconfiguration Complete message
6. RRC Reconfiguration
7. PC5 link release
224
8. UL/DL data

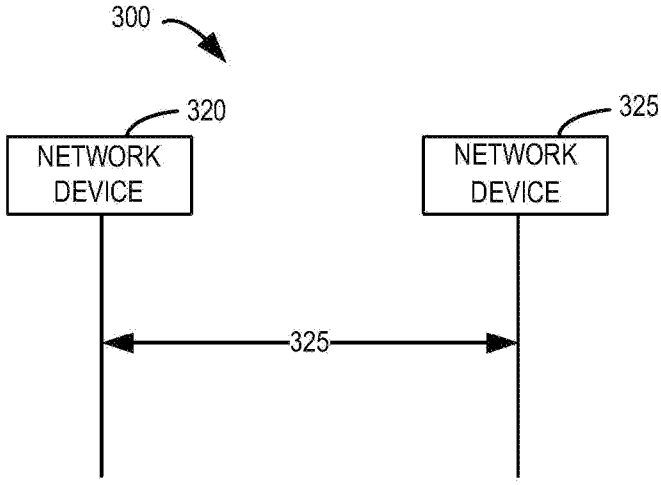
[Fig. 2B]


230
210
Remote UE
215
Relay UE
220
gNB
0. UL/DL data
232
1. Measurement configuration and reporting
234
2. Decision of switching to a target relay UE
236
2. RRC Reconfiguration for remote UE
3. RRC Reconfiguration message
236
4. PC5 connection establishment
5. RRC Reconfiguration Complete message
6. UL/DL data

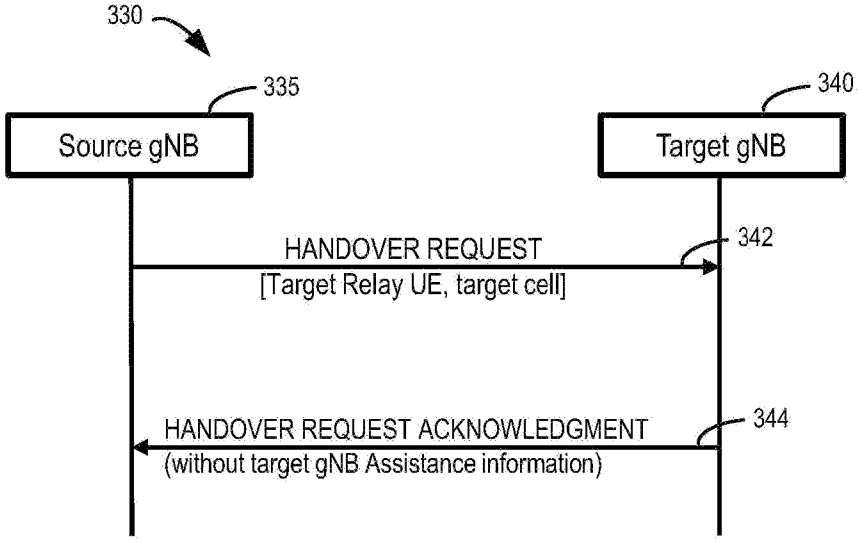
[Fig. 2C]


240
210
Remote UE
215
Relay UE
220
gNB
242
1. Discovery
244
1. PC5 Connection Establishment
2. RRCSetupRequest
246
2. RRCSetup
248
250
3. Prepare PC5 and Uu RLC channel for SRB1
4. RRCSetupComplete
252
5. SecurityModeCommand
254
5. SecurityModeComplete
256
6. RRCReconfiguration
258
6. RRCReconfigurationComplete
260
262
6. Prepare PC5 and Uu RLC channel for SRB2/DRB

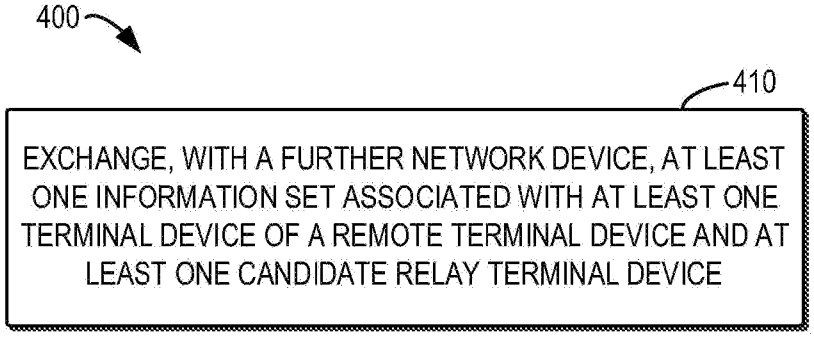
[Fig. 3A]


300
320
NETWORK DEVICE
325
NETWORK DEVICE
325

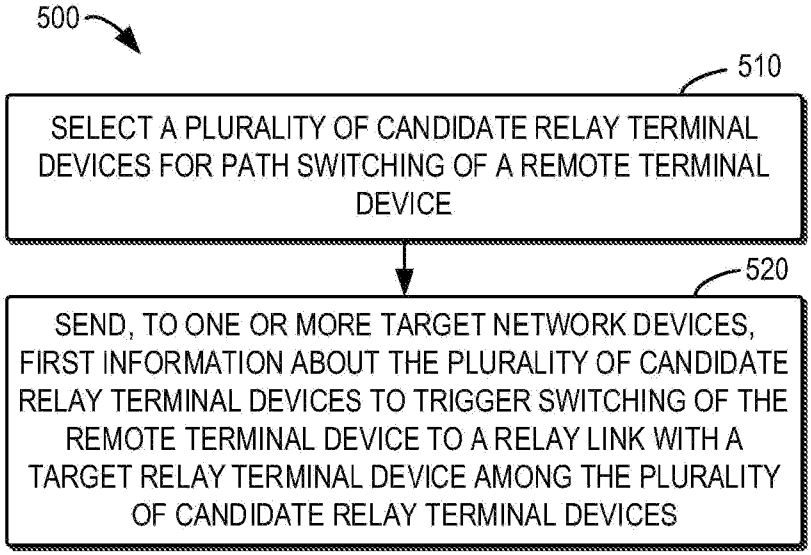
[Fig. 3B]



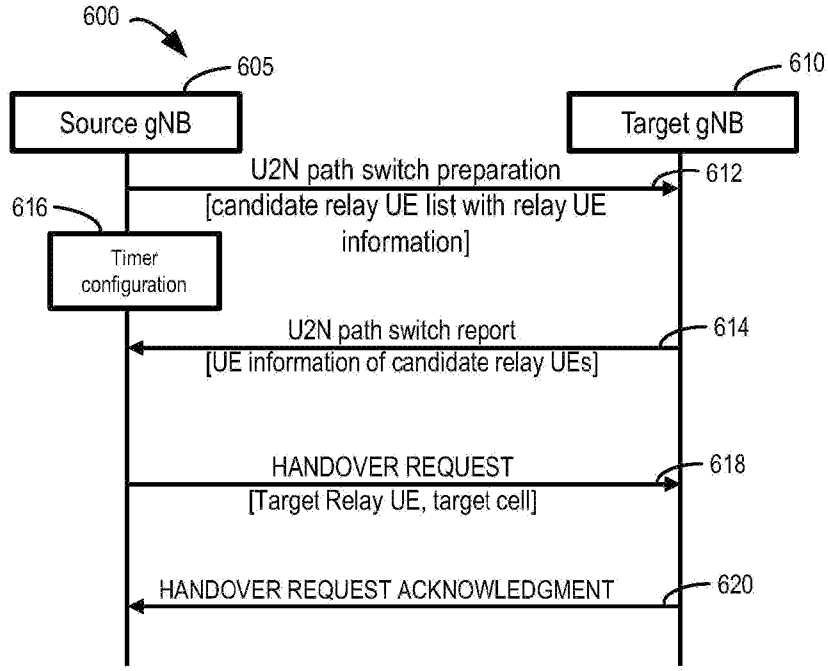
[Fig. 4]



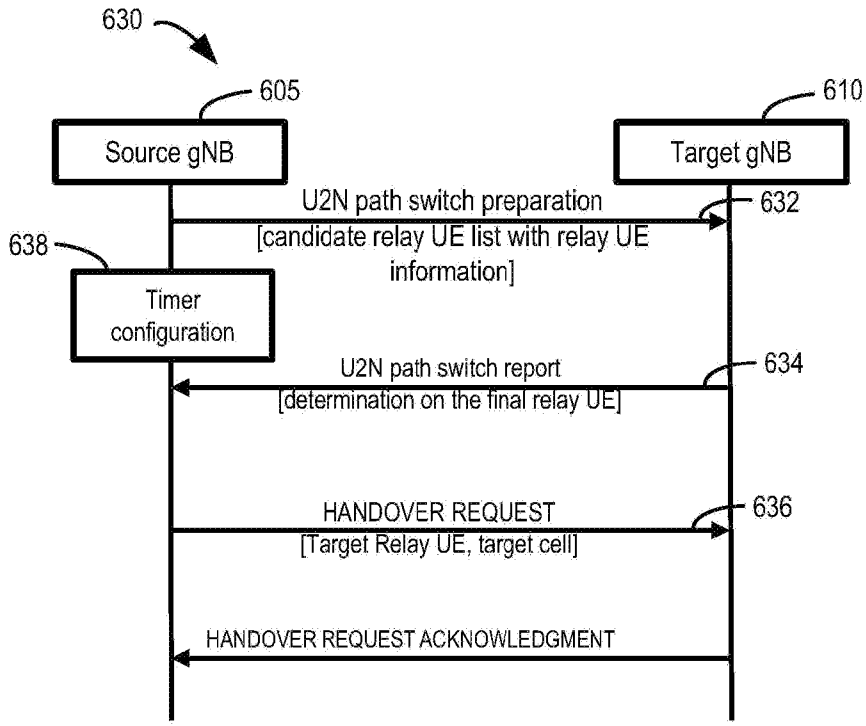
[Fig. 5]



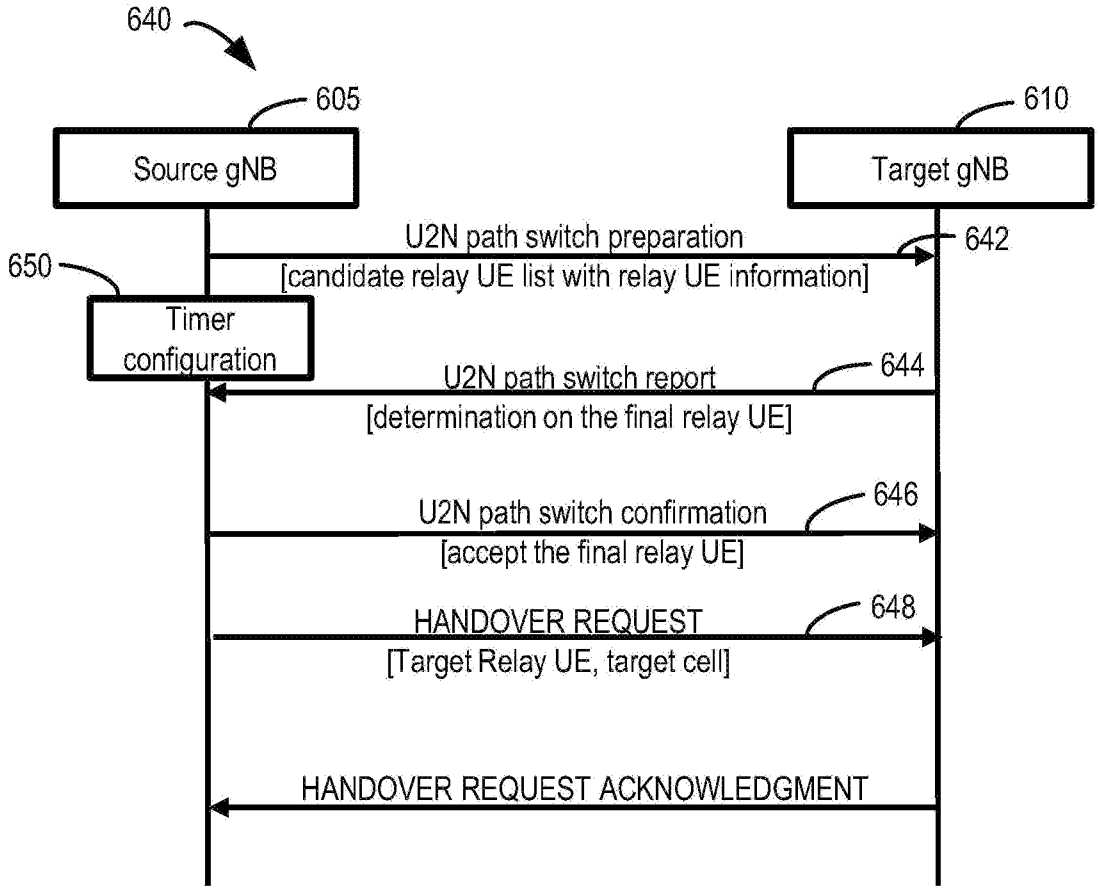
[Fig. 6A]


600
605
Source gNB
610
Target gNB
U2N path switch preparation
[candidate relay UE list with relay UE information]
612
616
Timer configuration
U2N path switch report
[UE information of candidate relay UEs]
614
HANDOVER REQUEST
[Target Relay UE, target cell]
618
HANDOVER REQUEST ACKNOWLEDGMENT
620

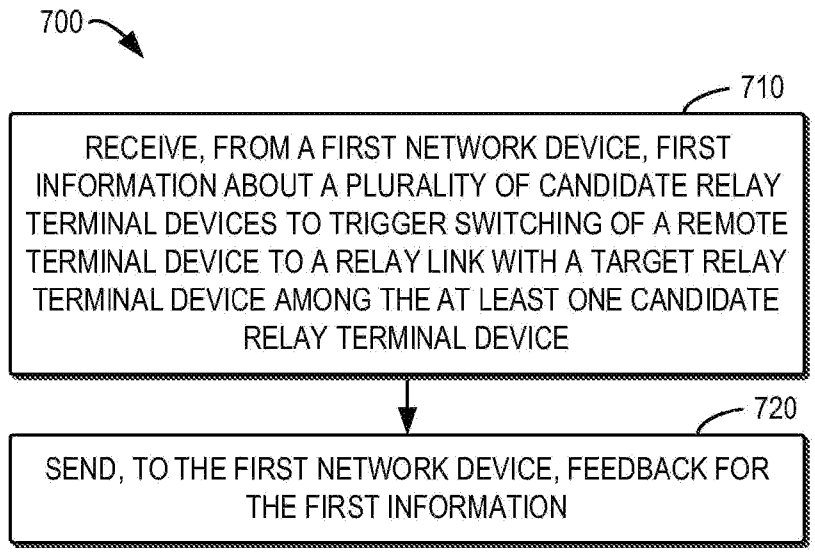
[Fig. 6B]


630
605
Source gNB
610
Target gNB
U2N path switch preparation
[candidate relay UE list with relay UE information]
632
638
Timer configuration
U2N path switch report
[determination on the final relay UE]
634
HANDOVER REQUEST
[Target Relay UE, target cell]
636
HANDOVER REQUEST ACKNOWLEDGMENT

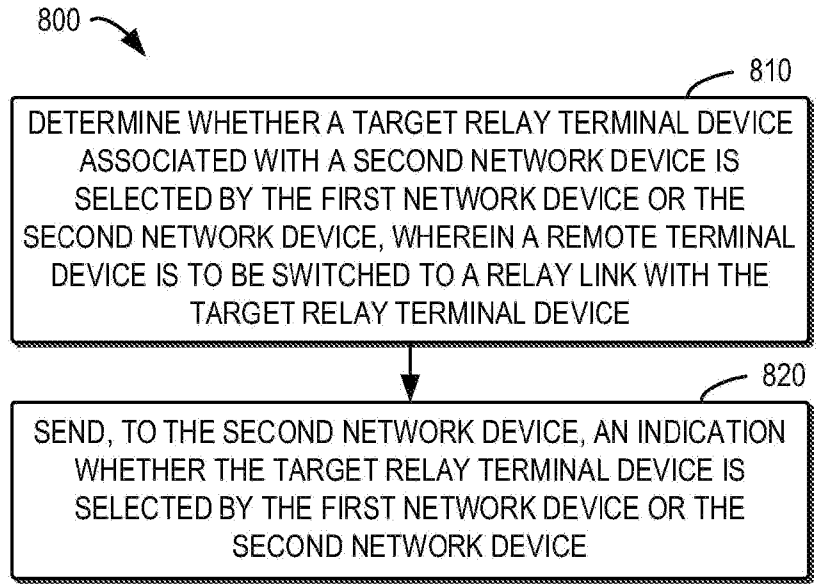
[Fig. 6C]


640
605
Source gNB
610
Target gNB
U2N path switch preparation
[candidate relay UE list with relay UE information]
642
650
Timer configuration
U2N path switch report
[determination on the final relay UE]
644
U2N path switch confirmation
[accept the final relay UE]
646
HANDOVER REQUEST
[Target Relay UE, target cell]
648
HANDOVER REQUEST ACKNOWLEDGMENT

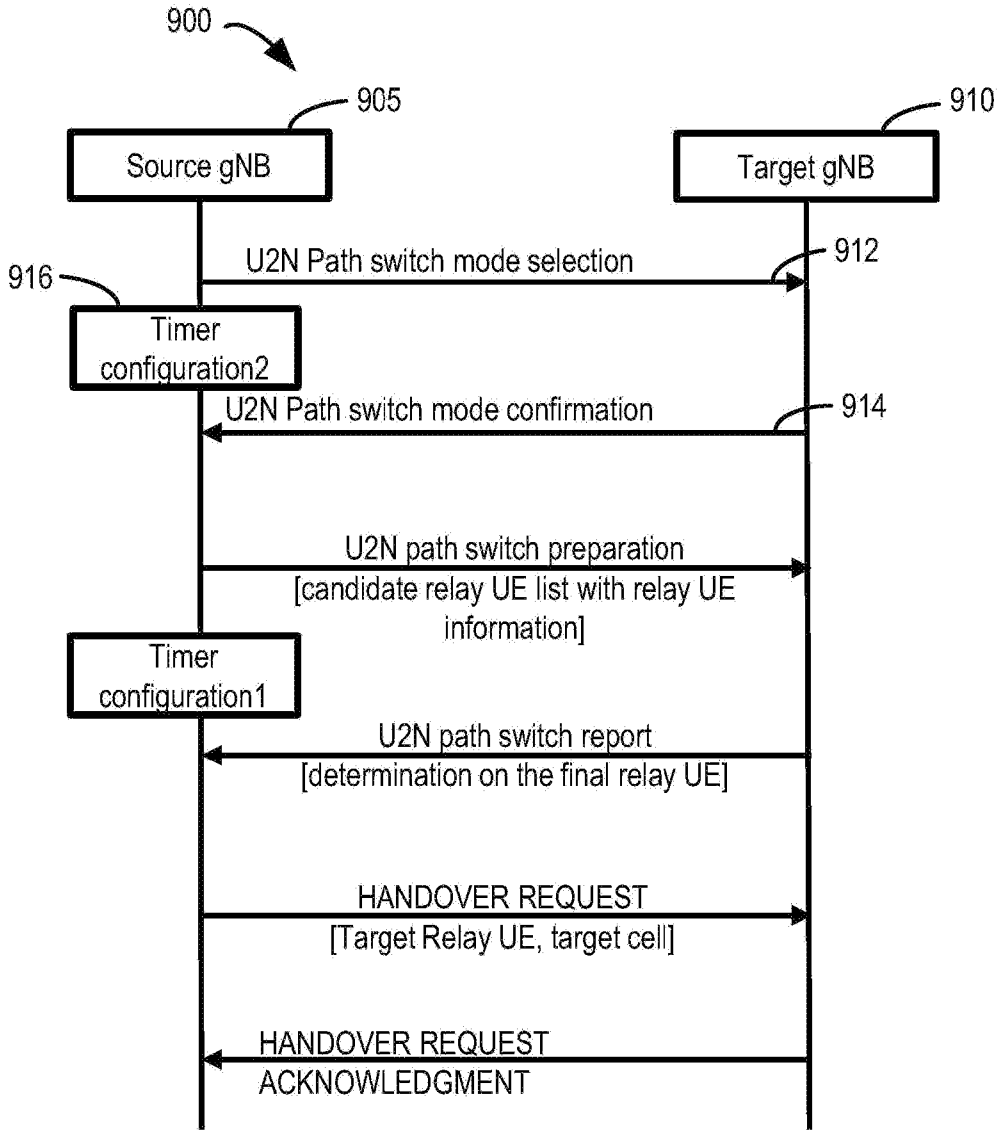
[Fig. 7]


700
710
RECEIVE, FROM A FIRST NETWORK DEVICE, FIRST INFORMATION ABOUT A PLURALITY OF CANDIDATE RELAY TERMINAL DEVICES TO TRIGGER SWITCHING OF A REMOTE TERMINAL DEVICE TO A RELAY LINK WITH A TARGET RELAY TERMINAL DEVICE AMONG THE AT LEAST ONE CANDIDATE RELAY TERMINAL DEVICE
720
SEND, TO THE FIRST NETWORK DEVICE, FEEDBACK FOR THE FIRST INFORMATION

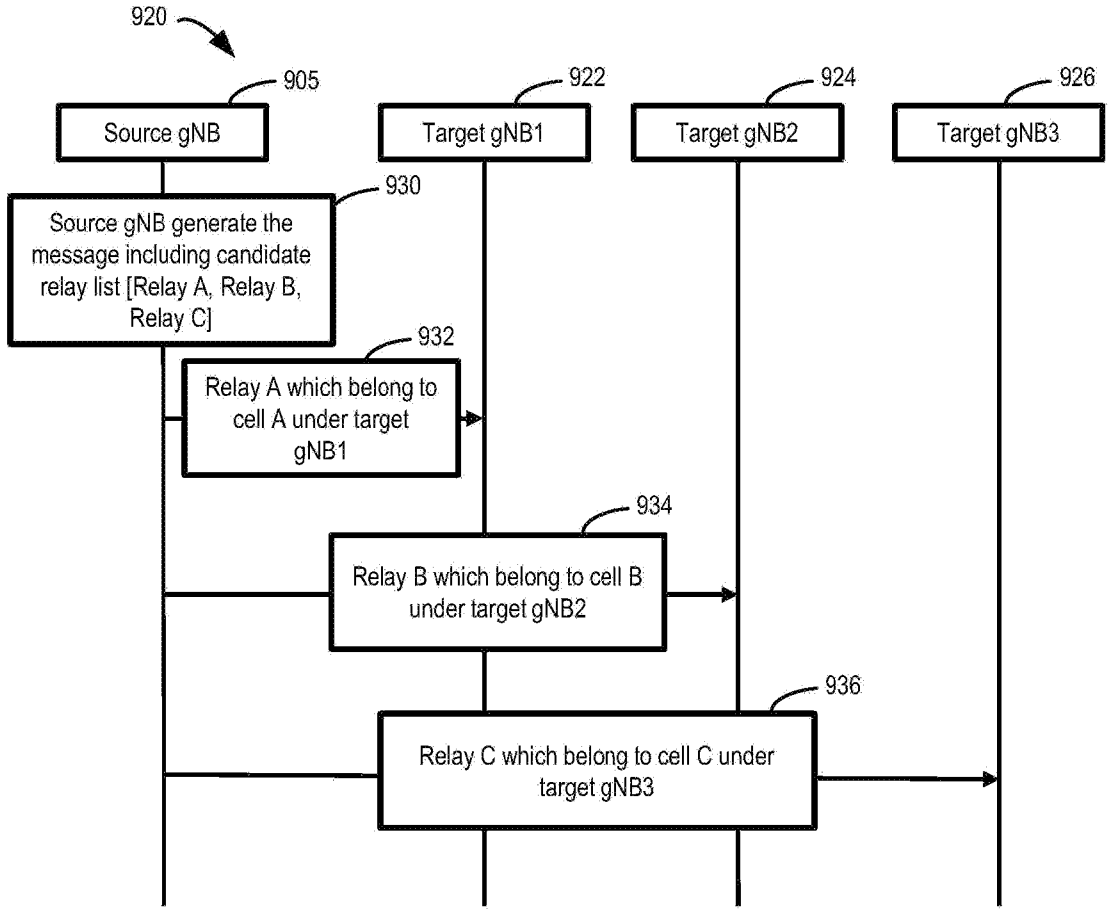
[Fig. 8]


800
810
DETERMINE WHETHER A TARGET RELAY TERMINAL DEVICE ASSOCIATED WITH A SECOND NETWORK DEVICE IS SELECTED BY THE FIRST NETWORK DEVICE OR THE SECOND NETWORK DEVICE, WHEREIN A REMOTE TERMINAL DEVICE IS TO BE SWITCHED TO A RELAY LINK WITH THE TARGET RELAY TERMINAL DEVICE
820
SEND, TO THE SECOND NETWORK DEVICE, AN INDICATION WHETHER THE TARGET RELAY TERMINAL DEVICE IS SELECTED BY THE FIRST NETWORK DEVICE OR THE SECOND NETWORK DEVICE

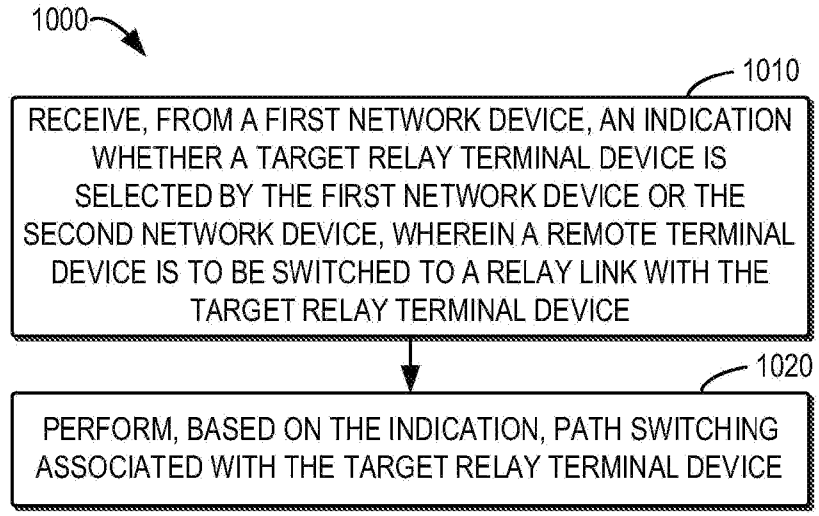
[Fig. 9A]


900
905
Source gNB
910
Target gNB
U2N Path switch mode selection
912
916
Timer configuration2
U2N Path switch mode confirmation
914
U2N path switch preparation
[candidate relay UE list with relay UE information]
Timer configuration1
U2N path switch report
[determination on the final relay UE]
HANDOVER REQUEST
[Target Relay UE, target cell]
HANDOVER REQUEST ACKNOWLEDGMENT

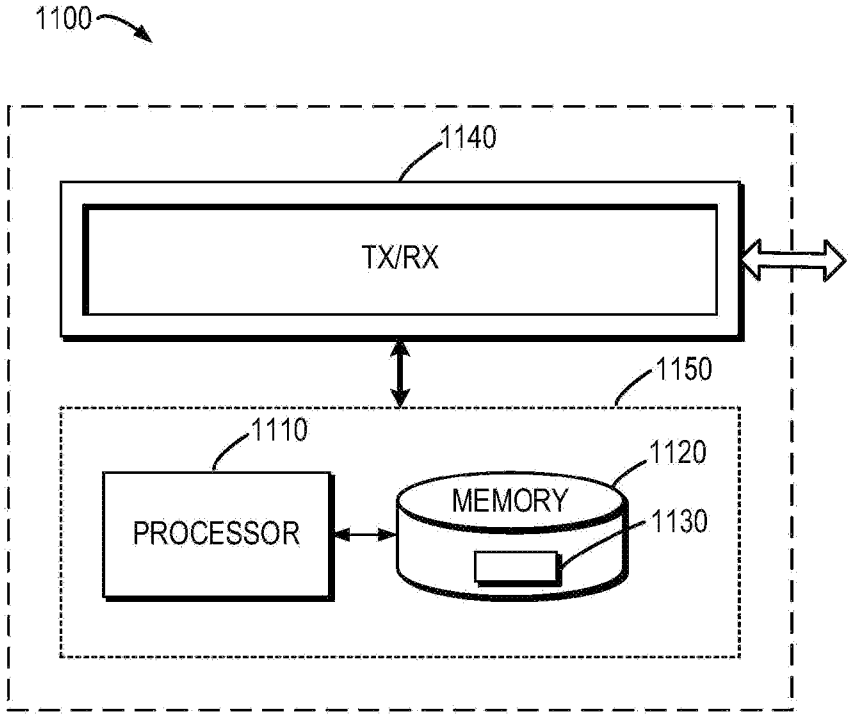
[Fig. 9B]


920
905
Source gNB
922
Target gNB1
924
Target gNB2
926
Target gNB3
930
Source gNB generate the message including candidate relay list [Relay A, Relay B, Relay C]
932
Relay A which belong to cell A under target gNB1
934
Relay B which belong to cell B under target gNB2
936
Relay C which belong to cell C under target gNB3

[Fig. 10]


1000
1010
RECEIVE, FROM A FIRST NETWORK DEVICE, AN INDICATION WHETHER A TARGET RELAY TERMINAL DEVICE IS SELECTED BY THE FIRST NETWORK DEVICE OR THE SECOND NETWORK DEVICE, WHEREIN A REMOTE TERMINAL DEVICE IS TO BE SWITCHED TO A RELAY LINK WITH THE TARGET RELAY TERMINAL DEVICE
1020
PERFORM, BASED ON THE INDICATION, PATH SWITCHING ASSOCIATED WITH THE TARGET RELAY TERMINAL DEVICE

[Fig. 11]



INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/072964

A. CLASSIFICATION OF SUBJECT MATTER

H04W40/02(2009.01)i

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)

IPC: H04W

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

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

CNTXT,ENTXT,DWPI,3GPP: U2N, inter-gNB path swith, source gNB, target gNB, exchange, candidate, relay UE, select, feedback

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2019215733 A1 (HUAWEI TECHNOLOGIES CO., LTD.) 11 July 2019 (2019-07-11) description,paragraphs[0055]-[0105]	1-23
A	US 2018160338 A1 (ZTE CORP.) 07 June 2018 (2018-06-07) the whole document	1-23
A	WO 2023273824 A1 (DATANG MOBILE COMMUNICATIONS EQUIPMENT CO., LTD.) 05 January 2023 (2023-01-05) the whole document	1-23
A	CN 113950110 A (SPREADTRUM SEMICONDUCTOR NANJING CO., LTD.) 18 January 2022 (2022-01-18) the whole document	1-23
A	HUAWEI et al. "Remaining issues on relay selection and reselection" *3GPP TSG-RAN WG2 Meeting #112 electronic R2-2010347,* 13 November 2020 (2020-11-13), the whole document	1-23

☐ 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

"T" 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	Date of mailing of the international search report
04 July 2023	**20 July 2023**

Name and mailing address of the ISA/CN	Authorized officer
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2023/072964

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
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				WO	2018058686	A1	05 April 2018
				CN	109661836	A	19 April 2019
				IN	201937010498	A	03 May 2019
				EP	3506674	A1	03 July 2019
US	2018160338	A1	07 June 2018	EP	3282755	A1	14 February 2018
				WO	2016161853	A1	13 October 2016
				CN	106162777	A	23 November 2016
WO	2023273824	A1	05 January 2023	CN	115604770	A	13 January 2023
CN	113950110	A	18 January 2022	WO	2022012426	A1	20 January 2022