(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
11 June 2020 (11.06.2020)

WIPO | PCT

(10) International Publication Number
WO 2020/113821 A1

(51) International Patent Classification:
H04W 76/18 (2018.01)

(21) International Application Number:
PCT/CN2019/075222

(22) International Filing Date:
15 February 2019 (15.02.2019)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
PCT/CN2018/118898
03 December 2018 (03.12.2018) CN

(71) Applicant: **QUALCOMM INCORPORATED** [US/US]; ATTN: International IP Administration, 5775 Morehouse Drive, San Diego, California 92121-1714 (US).

(72) Inventors; and

(71) Applicants *(for US only)*: **CHENG, Peng** [CN/CN]; 5775 Morehouse Drive, San Diego, California 92121-1714 (US). **LIU, Huichun** [CN/CN]; 5775 Morehouse Drive, San Diego, California 92121-1714 (US).

(74) Agent: **NTD PATENT & TRADEMARK AGENCY LTD.**; 10th Floor, Tower C, Beijing Global Trade Center, 36 North Third Ring Road East, Dongcheng District, Beijing 100013 (CN).

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

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

Declarations under Rule 4.17:
— *of inventorship (Rule 4.17(iv))*

(54) **Title:** RADIO BEARERS FOR INDICATION OF LINK FAILURE IN DUAL-CONNECTIVITY SYSTEMS

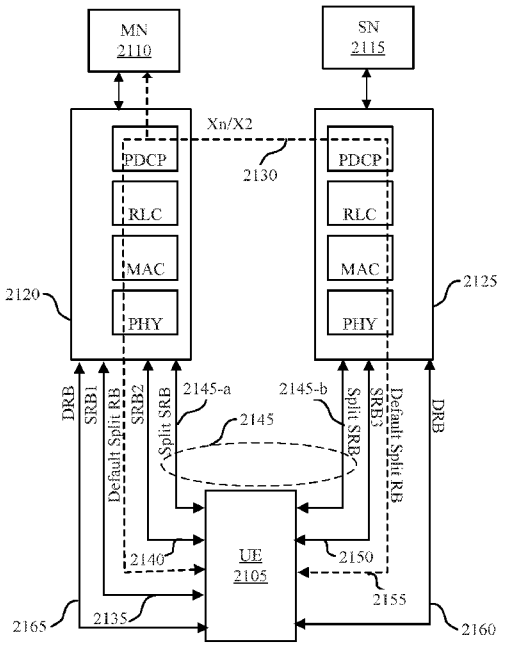


FIG. 21

2100

(57) **Abstract:** Methods, systems, and devices for wireless communications are described. A user equipment (UE) may detect a radio link failure between the UE and a master node of a dual-connectivity configuration. The UE may identify, based on the absence of an active radio bearer associated with the master node and the secondary node, a default split signaling radio bearer. The UE may transmit an indication of the radio link failure to the secondary node via the default split signaling radio bearer. In some aspects, the UE may detect the radio link failure and determine whether the UE is configured to communicate with a secondary node via a signaling radio bearer. Based on a determination that the UE is not configured to communicate with the secondary node via a signaling radio bearer, the UE may transmit an indication of the radio link failure to the secondary node via a data radio bearer.

WO 2020/113821 A1

[Continued on next page]

Published:
— *with international search report (Art. 21(3))*

RADIO BEARERS FOR INDICATION OF LINK FAILURE IN DUAL-CONNECTIVITY SYSTEMS

CROSS REFERENCE

[0001] The present Application for Patent claims priority to International Patent Application No. PCT/CN2018/118898 by Purkayastha et al., entitled "Fast Recovery from Link Failure in Dual-Connectivity Systems," filed December 3, 2018, assigned to the assignee hereof, and expressly incorporated by reference in its entirety herein.

TECHNICAL FIELD

[0002] The following relates generally to wireless communications, and more specifically to radio bearers for indication of link failure in dual-connectivity systems.

[0003] Wireless communications systems are widely deployed to provide various types of communication content such as voice, video, packet data, messaging, broadcast, and so on. These systems may be capable of supporting communication with multiple users by sharing the available system resources (such as time, frequency, and power). Examples of such multiple-access systems include fourth generation (4G) systems such as Long Term Evolution (LTE) systems, LTE-Advanced (LTE-A) systems, or LTE-A Pro systems, and fifth generation (5G) systems which may be referred to as New Radio (NR) systems. These systems may employ technologies such as code division multiple access (CDMA), time division multiple access (TDMA), frequency division multiple access (FDMA), orthogonal frequency division multiple access (OFDMA), or discrete Fourier transform spread orthogonal frequency division multiplexing (DFT-S-OFDM). A wireless multiple-access communications system may include a number of base stations or network access nodes, each simultaneously supporting communication for multiple communication devices, which may be otherwise known as user equipment (UE).

[0004] Some wireless networks may be configured to operate in a dual-connectivity configuration, in which a UE maintains simultaneous connections with at least a first base station, referred to as a master node (MN), and a second base station, referred to as a secondary node (SN). In some examples, one or more of the radio links between the UE and the MN and/or between the UE and the SN may experience a radio link failure (RLF). When an RLF is detected, conventional techniques utilize a radio resource control (RRC)

reestablishment procedure to establish a new radio link between the UE and the affected base station (MN and/or SN) or between the UE and a target base station (or target node). However, such conventional techniques are time-consuming, utilize considerable over-the-air resources, and do not leverage the dual-connectivity configuration to reduce the impact associated with an RLF event.

SUMMARY

[0005] The described techniques relate to improved methods, systems, devices, and apparatuses that support radio bearers for indication of link failure in dual-connectivity systems. Generally, the described techniques provide for a fast recovery procedure that utilizes a secondary cell group (SCG) link to trigger a handover instead of using conventional radio link failure (RLF) recovery procedures, such as a radio resource control (RRC) reestablishment procedure. Generally, the handover procedure provides for fast recovery from the RLF with less interruption of data traffic than such conventional RLF recovery procedures. For example, a user equipment (UE) may be connected to a master node (MN) and a secondary node (SN) by wireless radio links in a dual-connectivity configuration. The UE may detect or otherwise determine that an RLF has occurred between the UE and the MN. In response, the UE may transmit or otherwise provide an indication of the RLF to the SN in the dual-connectivity configuration. The SN may receive the indication of the RLF between the UE and the MN and transmit, forward, or otherwise provide an indication of a RLF to the MN (such as via a wireless transmission between the SN and the MN and/or via a backhaul link between the SN and MN). In some aspects, the indication of the RLF may be carried or otherwise conveyed in a measurement report. The MN may receive the indication of the RLF from the SN and identify a target node for the UE, such as based at least in part on the measurement report. Accordingly, the MN may initiate or otherwise perform a handover procedure of the UE from the MN to the target node.

[0006] In general, a UE may be configured to communicate with an SN using a split signaling radio bearer (SRB), which may be a radio bearer that is split (such as by being shared) between the MN and the SN, or using a direct SRB, which may be a radio bearer that is only or primarily used by the SN. In this case, a UE may, upon detecting an RLF with the MN, transmit an indication of the RLF to the SN using either the configured split SRB or direct SRB.

[0007] In some aspects, however, a UE may detect an RLF with the MN before a split SRB has been established, and some UEs may not support a direct SRB. Thus, the UE may detect an RLF with the MN at a time when the UE has not been configured with an active radio bearer (such as a split SRB or direct SRB) on which to communicate with the SN, and therefore may be unable to transmit the indication of the RLF to the SN.

[0008] To address the possibility of the UE detecting an RLF when there is an absence of an active radio bearer on which the UE can communicate with the SN, the UE may be configured with a default split radio bearer associated with the MN and the SN. In this case, the UE may use the default split radio bearer to communicate an indication of an RLF to the SN when the UE determines an absence of an active radio bearer. Alternatively, or additionally, if the UE determines that the UE is not configured to communicate with the SN using an SRB, the UE may transmit the indication of the RLF to the SN using a data radio bearer (DRB). In this case, the UE may transmit the indication of the RLF to the SN within an RRC container, and may include an RLF type indicator in an associated packet data convergence protocol (PDCP) header or medium access control (MAC) sub-header to notify the SN that the RRC container includes an indication of an RLF.

[0009] A method of wireless communications at a UE is described. The method may include detecting a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration, identifying, based on the detection of the radio link failure and on an absence of an active radio bearer associated with the master node and a secondary node, a default split radio bearer associated with the master node and the secondary node, and transmitting an indication of the radio link failure to the secondary node via the default split radio bearer.

[0010] An apparatus for wireless communications at a UE is described. The apparatus may include a processor, memory in electronic communication with the processor, and instructions stored in the memory. The instructions may be executable by the processor to cause the apparatus to detect a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration, identify, based on the detection of the radio link failure and on an absence of an active radio bearer associated with the master node and a secondary node, a default split radio bearer associated with the master node and the

secondary node, and transmit an indication of the radio link failure to the secondary node via the default split radio bearer.

[0011] Another apparatus for wireless communications at a UE is described. The apparatus may include means for detecting a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration, identifying, based on the detection of the radio link failure and on an absence of an active radio bearer associated with the master node and a secondary node, a default split radio bearer associated with the master node and the secondary node, and transmitting an indication of the radio link failure to the secondary node via the default split radio bearer.

[0012] A non-transitory computer-readable medium storing code for wireless communications at a UE is described. The code may include instructions executable by a processor to detect a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration, identify, based on the detection of the radio link failure and on an absence of an active radio bearer associated with the master node and a secondary node, a default split radio bearer associated with the master node and the secondary node, and transmit an indication of the radio link failure to the secondary node via the default split radio bearer.

[0013] Some examples of the method, apparatuses, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for performing, based on detecting the radio link failure, a handover procedure from the master node to a target node.

[0014] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, transmitting the indication of the radio link failure may include operations, features, means, or instructions for transmitting a measurement report including measurements associated with the target node.

[0015] Some examples of the method, apparatuses, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for receiving, from the secondary node via the default split radio bearer, a reconfiguration message after transmitting the indication of the radio link failure, where the handover procedure may be performed based on the reconfiguration message.

[0016] Some examples of the method, apparatuses, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for receiving an indication of the default split radio bearer, where the default split radio bearer may be identified based on the indication of the default split radio bearer.

[0017] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, the indication of the default split radio bearer may be received from the master node before detecting the radio link failure.

[0018] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, the indication of the default split radio bearer may be received via RRC signaling or within a SIB.

[0019] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, the default split radio bearer includes an SRB1 split signaling radio bearer.

[0020] Some examples of the method, apparatuses, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for determining the absence of the active radio bearer.

[0021] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, determining the absence of the active radio bearer may include operations, features, means, or instructions for determining whether the UE may be configured to communicate with the secondary node via an SRB1 split signaling radio bearer.

[0022] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, determining the absence of the active radio bearer may include operations, features, means, or instructions for determining whether the UE may be configured to communicate with the secondary node via an SRB3 direct signaling radio bearer.

[0023] A method of wireless communications at a UE is described. The method may include detecting a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration, determining, based on the detection of the radio link failure, whether the UE is configured to communicate with a secondary node in the dual-connectivity configuration via a signaling radio bearer, and transmitting, based on a determination that the

UE is not configured to communicate with the secondary node via the signaling radio bearer, an indication of the radio link failure to the secondary node via a data radio bearer.

[0024] An apparatus for wireless communications at a UE is described. The apparatus may include a processor, memory in electronic communication with the processor, and instructions stored in the memory. The instructions may be executable by the processor to cause the apparatus to detect a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration, determine, based on the detection of the radio link failure, whether the UE is configured to communicate with a secondary node in the dual-connectivity configuration via a signaling radio bearer, and transmit, based on a determination that the UE is not configured to communicate with the secondary node via the signaling radio bearer, an indication of the radio link failure to the secondary node via a data radio bearer.

[0025] Another apparatus for wireless communications at a UE is described. The apparatus may include means for detecting a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration, determining, based on the detection of the radio link failure, whether the UE is configured to communicate with a secondary node in the dual-connectivity configuration via a signaling radio bearer, and transmitting, based on a determination that the UE is not configured to communicate with the secondary node via the signaling radio bearer, an indication of the radio link failure to the secondary node via a data radio bearer.

[0026] A non-transitory computer-readable medium storing code for wireless communications at a UE is described. The code may include instructions executable by a processor to detect a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration, determine, based on the detection of the radio link failure, whether the UE is configured to communicate with a secondary node in the dual-connectivity configuration via a signaling radio bearer, and transmit, based on a determination that the UE is not configured to communicate with the secondary node via the signaling radio bearer, an indication of the radio link failure to the secondary node via a data radio bearer.

[0027] Some examples of the method, apparatuses, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for

performing, based on detecting the radio link failure, a handover procedure from the master node to a target node.

[0028] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, transmitting the indication of the radio link failure may include operations, features, means, or instructions for transmitting a measurement report including measurements associated with the target node.

[0029] Some examples of the method, apparatuses, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for receiving, from the secondary node via the data radio bearer, a reconfiguration message after transmitting the indication of the radio link failure, where the handover procedure may be performed based on the reconfiguration message.

[0030] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, transmitting the indication of the radio link failure to the secondary node may include operations, features, means, or instructions for transmitting the indication of the radio link failure to the secondary node in a RRC container.

[0031] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, transmitting the indication of the radio link failure to the secondary node may include operations, features, means, or instructions for transmitting a radio link failure type indicator in a packet data convergence protocol (PDCP) header associated with the RRC container.

[0032] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, transmitting the indication of the radio link failure to the secondary node may include operations, features, means, or instructions for transmitting a radio link failure type indicator in a medium access control (MAC) sub-header associated with the RRC container.

[0033] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, determining whether the UE may be configured to communicate with the secondary node via the signaling radio bearer may include operations, features, means, or instructions for determining whether the UE may be configured to communicate with the secondary node via an SRB1 split signaling radio bearer.

[0034] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, determining whether the UE may be configured to communicate with the secondary node via the signaling radio bearer may include operations, features, means, or instructions for determining whether the UE may be configured to communicate with the secondary node via an SRB3 direct signaling radio bearer.

[0035] A method of wireless communications at a secondary node of a dual-connectivity configuration is described. The method may include receiving, from a UE via a data radio bearer, a first indication of a radio link failure of a radio link between the UE and a master node of the dual-connectivity configuration and transmitting a second indication of the radio link failure to the master node.

[0036] An apparatus for wireless communications at a secondary node of a dual-connectivity configuration is described. The apparatus may include a processor, memory in electronic communication with the processor, and instructions stored in the memory. The instructions may be executable by the processor to cause the apparatus to receive, from a UE via a data radio bearer, a first indication of a radio link failure of a radio link between the UE and a master node of the dual-connectivity configuration and transmit a second indication of the radio link failure to the master node.

[0037] Another apparatus for wireless communications at a secondary node of a dual-connectivity configuration is described. The apparatus may include means for receiving, from a UE via a data radio bearer, a first indication of a radio link failure of a radio link between the UE and a master node of the dual-connectivity configuration and transmitting a second indication of the radio link failure to the master node.

[0038] A non-transitory computer-readable medium storing code for wireless communications at a secondary node of a dual-connectivity configuration is described. The code may include instructions executable by a processor to receive, from a UE via a data radio bearer, a first indication of a radio link failure of a radio link between the UE and a master node of the dual-connectivity configuration and transmit a second indication of the radio link failure to the master node.

[0039] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, the first indication of the radio link failure may be received within a RRC container.

[0040] Some examples of the method, apparatuses, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for identifying a radio link failure type indicator in a packet data convergence protocol (PDCP) header associated with the RRC container, where the second indication of the radio link failure may be transmitted to the master node based on identifying the radio link failure type indicator.

[0041] Some examples of the method, apparatuses, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for identifying a radio link failure type indicator in a medium access control (MAC) sub-header associated with the RRC container, where the second indication of the radio link failure may be transmitted to the master node based on identifying the radio link failure type indicator.

[0042] Some examples of the method, apparatuses, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for receiving a handover request from the master node after transmitting the indication of the radio link failure to the master node, and transmitting, to the UE via the data radio bearer, an indication of the handover request.

[0043] Some examples of the method, apparatuses, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for transitioning, based on the handover request, from the dual-connectivity configuration to a single-connectivity configuration with the UE.

[0044] A method of wireless communication at a master node of a dual-connectivity configuration is described. The method may include transmitting, to a UE, an indication of a default split radio bearer for communicating an indication of a radio link failure of a radio link between the UE and the master node, receiving, from a secondary node of the dual-connectivity configuration, the indication of the radio link failure for the UE, identifying, based on the indication of the radio link failure, a target node for the UE, and transmitting, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node.

[0045] An apparatus for wireless communication at a master node of a dual-connectivity configuration is described. The apparatus may include a processor, memory in electronic communication with the processor, and instructions stored in the memory. The instructions

may be executable by the processor to cause the apparatus to transmit, to a UE, an indication of a default split radio bearer for communicating an indication of a radio link failure of a radio link between the UE and the master node, receive, from a secondary node of the dual-connectivity configuration, the indication of the radio link failure for the UE, identify, based on the indication of the radio link failure, a target node for the UE, and transmit, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node.

[0046] Another apparatus for wireless communication at a master node of a dual-connectivity configuration is described. The apparatus may include means for transmitting, to a UE, an indication of a default split radio bearer for communicating an indication of a radio link failure of a radio link between the UE and the master node, receiving, from a secondary node of the dual-connectivity configuration, the indication of the radio link failure for the UE, identifying, based on the indication of the radio link failure, a target node for the UE, and transmitting, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node.

[0047] A non-transitory computer-readable medium storing code for wireless communication at a master node of a dual-connectivity configuration is described. The code may include instructions executable by a processor to transmit, to a UE, an indication of a default split radio bearer for communicating an indication of a radio link failure of a radio link between the UE and the master node, receive, from a secondary node of the dual-connectivity configuration, the indication of the radio link failure for the UE, identify, based on the indication of the radio link failure, a target node for the UE, and transmit, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node.

[0048] Some examples of the method, apparatuses, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for performing the handover procedure.

[0049] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, the indication of the default split radio bearer may be transmitted to the UE via RRC signaling.

[0050] Some examples of the method, apparatuses, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for transmitting the indication of the default split radio bearer to at least one additional UE associated with a cell, where the UE is associated with the cell.

[0051] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, the indication of the default split radio bearer may be transmitted to the UE and the at least one additional UE within a SIB.

[0052] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, the target node may be different from the master node and the secondary node.

[0053] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, the indication of the radio link failure includes a measurement report.

[0054] Some examples of the method, apparatuses, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for decoding the measurement report, where the target node may be identified based on the measurement report.

[0055] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, receiving the indication of the radio link failure may include operations, features, means, or instructions for receiving a backhaul container message that may be encapsulated according to an Xn or X2 protocol.

[0056] A method of wireless communication at a master node of a dual-connectivity configuration is described. The method may include receiving, from a secondary node of the dual-connectivity configuration, a RRC container including an indication of a radio link failure of a radio link between the master node and a UE, identifying, based on the indication of the radio link failure, a target node for the UE, and transmitting, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node.

[0057] An apparatus for wireless communication at a master node of a dual-connectivity configuration is described. The apparatus may include a processor, memory in electronic

communication with the processor, and instructions stored in the memory. The instructions may be executable by the processor to cause the apparatus to receive, from a secondary node of the dual-connectivity configuration, a RRC container including an indication of a radio link failure of a radio link between the master node and a UE, identify, based on the indication of the radio link failure, a target node for the UE, and transmit, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node.

[0058] Another apparatus for wireless communication at a master node of a dual-connectivity configuration is described. The apparatus may include means for receiving, from a secondary node of the dual-connectivity configuration, a RRC container including an indication of a radio link failure of a radio link between the master node and a UE, identifying, based on the indication of the radio link failure, a target node for the UE, and transmitting, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node.

[0059] A non-transitory computer-readable medium storing code for wireless communication at a master node of a dual-connectivity configuration is described. The code may include instructions executable by a processor to receive, from a secondary node of the dual-connectivity configuration, a RRC container including an indication of a radio link failure of a radio link between the master node and a UE, identify, based on the indication of the radio link failure, a target node for the UE, and transmit, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node.

[0060] Some examples of the method, apparatuses, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for performing the handover procedure.

[0061] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, the target node may be different from the master node and the secondary node.

[0062] In some examples of the method, apparatuses, and non-transitory computer-readable medium described herein, the indication of the radio link failure includes a measurement report.

[0063] Some examples of the method, apparatuses, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for decoding the measurement report, where the target node may be identified based on the measurement report.

[0064] Details of one or more implementations of the subject matter described in this disclosure are set forth in the accompanying drawings and the description below. Other features, aspects, and advantages will become apparent from the description, the drawings and the claims. Note that the relative dimensions of the following figures may not be drawn to scale.

BRIEF DESCRIPTION OF THE DRAWINGS

[0065] FIG. 1 illustrates an example of a system for wireless communications that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0066] FIG. 2 illustrates an example of a wireless communication system that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0067] FIGs. 3A and 3B illustrate an example of a process that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0068] FIG. 4 illustrates an example of a process that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0069] FIG. 5 illustrates an example of a process that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0070] FIGs. 6A and 6B illustrate an example of a process that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0071] FIGs. 7A and 7B illustrate an example of a process that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0072] FIGs. 8A and 8B illustrate an example of a process that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0073] FIG. 9 illustrates an example of a wireless communication system that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0074] FIGs. 10 and 11 show block diagrams of devices that support radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0075] FIG. 12 shows a block diagram of a communications manager that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0076] FIG. 13 shows a diagram of a system including a device that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0077] FIGs. 14 and 15 show block diagrams of devices that support radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0078] FIG. 16 shows a block diagram of a communications manager that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0079] FIG. 17 shows a diagram of a system including a device that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0080] FIGs. 18 through 20 show flowcharts illustrating methods that support radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0081] FIG. 21 shows a diagram of a system that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0082] FIG. 22 illustrates an example of a process that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0083] FIG. 23 illustrates an example of a process that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0084] FIGs. 24 and 25 show block diagrams of devices that support radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0085] FIG. 26 shows a block diagram of a communications manager that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0086] FIG. 27 shows a diagram of a system including a device that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0087] FIGs. 28 and 29 show block diagrams of devices that support radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0088] FIG. 30 shows a block diagram of a communications manager that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0089] FIG. 31 shows a diagram of a system including a device that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0090] FIGs. 32 through 36 show flowcharts illustrating methods that support radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure.

[0091] Like reference numbers and designations in the various drawings indicate like elements.

DETAILED DESCRIPTION

[0092] Some wireless networks may be configured to operate in a dual-connectivity (DC) configuration. For example, the wireless network may be configured to operate in an evolved universal terrestrial radio access network (E-UTRAN) new radio (NR), which may be referred to as EN-DC, as 5G EN-DC, and/or as a 5G NR dual-connectivity configuration or system. Broadly, the dual-connectivity configuration supports the UE being connected to two base stations (or nodes) at the same time. In some examples, one base station (such as a master node (MN)) may be a 5G or NR base station and a second base station (such as a secondary node (SN)) may be an LTE base station. In other examples, the MN may be an LTE base station and the SN may be a 5G or NR base station. In even further examples, both the MN and SN may be 5G or NR base stations, or they may both be LTE base stations. The dual-connectivity configuration may be supported when inter-connectivity has been established between the MN and SN base stations, via one or more backhaul links, core network functions, and the like. In some examples, the MN also may be referred to as a master cell group (MCG) and the SN may be referred to as a secondary cell group (SCG). Some examples of dual-connectivity may include the UE being simultaneously connected to the LTE and 5G NR base stations and/or the UE utilizing the LTE base station for control plane information and the 5G NR base station for user plane traffic. In some aspects, the dual-connectivity configuration may support direct and/or split radio bearers, an MCG signaling radio bearer (SRB) between the UE and the MN, and/or an SCG SRB between the UE and the SN. Broadly, the dual-connectivity configuration leverages benefits of both LTE and 5G functionalities and capabilities simultaneously to improve overall system performance.

[0093] In general, radio bearers (such as logical channels) used for communications between the UE and the MN and SN may include SRBs that carry signaling information and data radio bearers (DRBs) that carry user data. For example, an SRB may be used to carry

radio resource control (RRC) information or other control information between the UE and the MN and/or SN, and a DRB may be used to carry user plane traffic.

[0094] Certain SRBs may be associated with certain types of control information, and may be established at certain times during an RRC connection procedure. For example, SRB1 may be established during an RRC connection setup, and may be used to communicate RRC reconfiguration information during a handover procedure in which the UE transitions (such as by being handed over) from one MN to another MN.

[0095] In some aspects, a UE may communicate with the MN and SN directly, using direct SRBs such as the MCG SRB and SCG SRB (the latter of which also may be referred to as SRB3). Such direct SRBs may not be shared between the MN and SN.

[0096] Some dual-connectivity systems support communications between the UE and the MN and/or SN via a split SRB. A split SRB may be an SRB that is shared between the MN and the SN and is used to communicate signaling information between the UE and both the MN and SN; such as using both an LTE RAN and an NR RAN, for example. Thus, a UE that is configured to use a split SRB may be capable of communicating with both the MN and the SN on a single split SRB, such as a split SRB1, using the RANs associated with the MN and SN. A split SRB may be split at a higher layer, such as at a packet data convergence protocol (PDCP) layer, and may include an SN leg and an MN leg for communicating with the SN and MN, respectively.

[0097] In some aspects, a UE may communicate with an MN indirectly, via the SN. For example, a UE may communicate with the SN via a direct SRB or via the SN leg of a split SRB, and the SN may forward or otherwise transmit such communications to the MN via a backhaul link, such as by encapsulating such communications within Xn/X2 messages. Similarly, the MN may communicate with the UE by transmitting messages to the SN, and the SN may forward the messages to the UE using an SRB.

[0098] In some aspects, the UE communicates with the MN and/or the SN over one or more wireless links or radio links, which also may be referred to as an MCG link and an SCG link. Broadly, the radio links may be sub-6 GHz and/or mmW radio links. In some examples, one or more of the radio links between the UE and the MN and/or the UE and the SN may experience a radio link failure (RLF). Generally, the RLF may occur due to obstruction, link degradation, and the like, such that the radio link becomes unavailable

and/or fails to satisfy a performance threshold for continued use. Generally, the UE may perform channel measurements to monitor link performance and identify an RLF based on the channel measurements. When an RLF is detected, conventional techniques typically utilize a radio resource control (RRC) reestablishment procedure and/or may rely on an RLF recovery procedure to establish a radio link between the UE and the affected base station (MN and/or SN) and/or between the UE and a target base station (or target node). However, such conventional techniques are time-consuming, involve considerable signaling exchange, and do not leverage the dual-connectivity configuration to reduce the impact associated with an RLF event. Thus, in some aspects, a UE may leverage the dual-connectivity configuration to transmit an indication of the RLF to the SN for forwarding to the MN to trigger a handover instead of using conventional RLF recovery procedures, such as an RRC reestablishment procedure/ The UE may transmit such an indication to the SN via, for example, a split SRB or direct SRB that may have been previously configured by the MN.

[0099] In some aspects, however, the UE may detect an RLF with the MN before a split SRB has been established. Furthermore, some UEs may not support a direct SRB with the SN. Thus, in some aspects, a UE may detect an RLF with the MN when it does not have an active radio bearer available for transmitting the indication of the RLF to the SN, and thus may not have a mechanism for notifying the MN of the RLF to trigger a handover procedure.

[0100] Aspects of the disclosure are initially described in the context of a wireless communications system. Generally, the described techniques enable a UE to transmit an indication of an MN radio link failure to the SN via an active radio bearer or via an alternative radio bearer in cases when the UE determines the absence of an active radio bearer. In some aspects, if the UE determines an absence of an active radio bearer, the UE may transmit the indication of the RLF to the SN via a default split radio bearer. In some aspects, if the UE determines that the UE is not configured to communicate with the SN via an SRB, the UE may transmit the indication of the RLF to the SN via a DRB.

[0101] Aspects of the disclosure are further illustrated by and described with reference to apparatus diagrams, system diagrams, and flowcharts that relate to radio bearers for indication of link failure in dual-connectivity systems.

[0102] **FIG. 1** illustrates an example of a wireless communications system 100 that supports radio bearers for indication of link failure in dual-connectivity systems in

accordance with aspects of the present disclosure. The wireless communications system 100 includes base stations 105, UEs 115, and a core network 130. In some examples, the wireless communications system 100 may be a LTE network, an LTE-Advanced (LTE-A) network, an LTE-A Pro network, or a NR network. In some aspects, wireless communications system 100 may support enhanced broadband communications, ultra-reliable (such as mission critical) communications, low latency communications, or communications with low-cost and low-complexity devices.

[0103] Base stations 105 may wirelessly communicate with UEs 115 via one or more base station antennas. Base stations 105 described herein may include or may be referred to by those skilled in the art as a base transceiver station, a radio base station, an access point, a radio transceiver, a NodeB, an eNodeB (eNB), a next-generation NodeB or giga-NodeB (either of which may be referred to as a gNB), a Home NodeB, a Home eNodeB, or some other suitable terminology. Wireless communications system 100 may include base stations 105 of different types (such as macro or small cell base stations). The UEs 115 described herein may be able to communicate with various types of base stations 105 and network equipment including macro eNBs, small cell eNBs, gNBs, relay base stations, and the like.

[0104] Each base station 105 may be associated with a particular geographic coverage area 110 in which communications with various UEs 115 are supported. Each base station 105 may provide communication coverage for a respective geographic coverage area 110 via communication links 125, and communication links 125 between a base station 105 and a UE 115 may utilize one or more carriers. Communication links 125 shown in wireless communications system 100 may include uplink transmissions from a UE 115 to a base station 105, or downlink transmissions from a base station 105 to a UE 115. Downlink transmissions also may be called forward link transmissions while uplink transmissions also may be called reverse link transmissions.

[0105] The geographic coverage area 110 for a base station 105 may be divided into sectors making up a portion of the geographic coverage area 110, and each sector may be associated with a cell. For example, each base station 105 may provide communication coverage for a macro cell, a small cell, a hot spot, or other types of cells, or various combinations thereof. In some examples, a base station 105 may be movable and therefore provide communication coverage for a moving geographic coverage area 110. In some

examples, different geographic coverage areas 110 associated with different technologies may overlap, and overlapping geographic coverage areas 110 associated with different technologies may be supported by the same base station 105 or by different base stations 105. The wireless communications system 100 may include, for example, a heterogeneous LTE/LTE-A/LTE-A Pro or NR network in which different types of base stations 105 provide coverage for various geographic coverage areas 110.

[0106] The term "cell" refers to a logical communication entity used for communication with a base station 105 (such as over a carrier), and may be associated with an identifier for distinguishing neighboring cells (such as a physical cell identifier (PCID), a virtual cell identifier (VCID)) operating via the same or a different carrier. In some examples, a carrier may support multiple cells, and different cells may be configured according to different protocol types (such as machine-type communication (MTC), narrowband Internet-of-Things (NB-IoT), enhanced mobile broadband (eMBB), or others) that may provide access for different types of devices. In some aspects, the term "cell" may refer to a portion of a geographic coverage area 110 (such as a sector) over which the logical entity operates.

[0107] UEs 115 may be dispersed throughout the wireless communications system 100, and each UE 115 may be stationary or mobile. A UE 115 also may be referred to as a mobile device, a wireless device, a remote device, a handheld device, or a subscriber device, or some other suitable terminology, where the "device" also may be referred to as a unit, a station, a terminal, or a client. A UE 115 also may be a personal electronic device such as a cellular phone, a personal digital assistant (PDA), a tablet computer, a laptop computer, or a personal computer. In some examples, a UE 115 also may refer to a wireless local loop (WLL) station, an Internet of Things (IoT) device, an Internet of Everything (IoE) device, or an MTC device, or the like, which may be implemented in various articles such as appliances, vehicles, meters, or the like.

[0108] Some UEs 115, such as MTC or IoT devices, may be low cost or low complexity devices, and may provide for automated communication between machines (such as via Machine-to-Machine (M2M) communication). M2M communication or MTC may refer to data communication technologies that allow devices to communicate with one another or a base station 105 without human intervention. In some examples, M2M communication or MTC may include communications from devices that integrate sensors or meters to measure

or capture information and relay that information to a central server or application program that can make use of the information or present the information to humans interacting with the program or application. Some UEs 115 may be designed to collect information or enable automated behavior of machines. Examples of applications for MTC devices include smart metering, inventory monitoring, water level monitoring, equipment monitoring, healthcare monitoring, wildlife monitoring, weather and geological event monitoring, fleet management and tracking, remote security sensing, physical access control, and transaction-based business charging.

[0109] Some UEs 115 may be configured to employ operating modes that reduce power consumption, such as half-duplex communications (such as a mode that supports one-way communication via transmission or reception, but not transmission and reception simultaneously). In some examples half-duplex communications may be performed at a reduced peak rate. Other power conservation techniques for UEs 115 include entering a power saving "deep sleep" mode when not engaging in active communications, or operating over a limited bandwidth (such as according to narrowband communications). In some aspects, UEs 115 may be designed to support critical functions (such as mission critical functions), and a wireless communications system 100 may be configured to provide ultra-reliable communications for these functions.

[0110] In some aspects, a UE 115 also may be able to communicate directly with other UEs 115 (such as using a peer-to-peer (P2P) or device-to-device (D2D) protocol). One or more of a group of UEs 115 utilizing D2D communications may be within the geographic coverage area 110 of a base station 105. Other UEs 115 in such a group may be outside the geographic coverage area 110 of a base station 105, or be otherwise unable to receive transmissions from a base station 105. In some aspects, groups of UEs 115 communicating via D2D communications may utilize a one-to-many (1:M) system in which each UE 115 transmits to every other UE 115 in the group. In some aspects, a base station 105 facilitates the scheduling of resources for D2D communications. In other cases, D2D communications are carried out between UEs 115 without the involvement of a base station 105.

[0111] Base stations 105 may communicate with the core network 130 and with one another. For example, base stations 105 may interface with the core network 130 through backhaul links 132 (such as via an S1, N2, N3, or another interface). Base stations 105 may

communicate with one another over backhaul links 134 (such as via an X2, Xn, or other interface) either directly (such as directly between base stations 105) or indirectly (such as via core network 130).

[0112] The core network 130 may provide user authentication, access authorization, tracking, Internet Protocol (IP) connectivity, and other access, routing, or mobility functions. The core network 130 may be an evolved packet core (EPC), which may include at least one mobility management entity (MME), at least one serving gateway (S-GW), and at least one Packet Data Network (PDN) gateway (P-GW). The MME may manage non-access stratum (such as control plane) functions such as mobility, authentication, and bearer management for UEs 115 served by base stations 105 associated with the EPC. User IP packets may be transferred through the S-GW, which itself may be connected to the P-GW. The P-GW may provide IP address allocation as well as other functions. The P-GW may be connected to the network operators IP services. The operators IP services may include access to the Internet, Intranet(s), an IP Multimedia Subsystem (IMS), or a Packet-Switched (PS) Streaming Service.

[0113] At least some of the network devices, such as a base station 105, may include subcomponents such as an access network entity, which may be an example of an access node controller (ANC). Each access network entity may communicate with UEs 115 through a number of other access network transmission entities, which may be referred to as a radio head, a smart radio head, or a transmission/reception point (TRP). In some configurations, various functions of each access network entity or base station 105 may be distributed across various network devices (such as radio heads and access network controllers) or consolidated into a single network device (such as a base station 105).

[0114] Wireless communications system 100 may operate using one or more frequency bands, typically in the range of 300 megahertz (MHz) to 300 gigahertz (GHz). Generally, the region from 300 MHz to 3 GHz is known as the ultra-high frequency (UHF) region or decimeter band, since the wavelengths range from approximately one decimeter to one meter in length. UHF waves may be blocked or redirected by buildings and environmental features. However, the waves may penetrate structures sufficiently for a macro cell to provide service to UEs 115 located indoors. Transmission of UHF waves may be associated with smaller antennas and shorter range (such as less than 100 km) compared to transmission using the

smaller frequencies and longer waves of the high frequency (HF) or very high frequency (VHF) portion of the spectrum below 300 MHz.

[0115] Wireless communications system 100 also may operate in a super high frequency (SHF) region using frequency bands from 3 GHz to 30 GHz, also known as the centimeter band. The SHF region includes bands such as the 5 GHz industrial, scientific, and medical (ISM) bands, which may be used opportunistically by devices that may be capable of tolerating interference from other users.

[0116] Wireless communications system 100 also may operate in an extremely high frequency (EHF) region of the spectrum (such as from 30 GHz to 300 GHz), also known as the millimeter band. In some examples, wireless communications system 100 may support millimeter wave (mmW) communications between UEs 115 and base stations 105, and EHF antennas of the respective devices may be even smaller and more closely spaced than UHF antennas. In some aspects, this may facilitate use of antenna arrays within a UE 115. However, the propagation of EHF transmissions may be subject to even greater atmospheric attenuation and shorter range than SHF or UHF transmissions. Techniques disclosed herein may be employed across transmissions that use one or more different frequency regions, and designated use of bands across these frequency regions may differ by country or regulating body.

[0117] In some aspects, wireless communications system 100 may utilize both licensed and unlicensed radio frequency spectrum bands. For example, wireless communications system 100 may employ License Assisted Access (LAA), LTE-Unlicensed (LTE-U) radio access technology, or NR technology in an unlicensed band such as the 5 GHz ISM band. When operating in unlicensed radio frequency spectrum bands, wireless devices such as base stations 105 and UEs 115 may employ listen-before-talk (LBT) procedures to ensure a frequency channel is clear before transmitting data. In some aspects, operations in unlicensed bands may be based on a carrier aggregation configuration in conjunction with component carriers operating in a licensed band (such as LAA). Operations in unlicensed spectrum may include downlink transmissions, uplink transmissions, peer-to-peer transmissions, or a combination of these. Duplexing in unlicensed spectrum may be based on frequency division duplexing (FDD), time division duplexing (TDD), or a combination of both.

[0118] In some examples, base station 105 or UE 115 may be equipped with multiple antennas, which may be used to employ techniques such as transmit diversity, receive diversity, multiple-input multiple-output (MIMO) communications, or beamforming. For example, wireless communications system 100 may use a transmission scheme between a transmitting device (such as a base station 105) and a receiving device (such as a UE 115), where the transmitting device is equipped with multiple antennas and the receiving device is equipped with one or more antennas. MIMO communications may employ multipath signal propagation to increase the spectral efficiency by transmitting or receiving multiple signals via different spatial layers, which may be referred to as spatial multiplexing. The multiple signals may, for example, be transmitted by the transmitting device via different antennas or different combinations of antennas. Likewise, the multiple signals may be received by the receiving device via different antennas or different combinations of antennas. Each of the multiple signals may be referred to as a separate spatial stream, and may carry bits associated with the same data stream (such as the same codeword) or different data streams. Different spatial layers may be associated with different antenna ports used for channel measurement and reporting. MIMO techniques include single-user MIMO (SU-MIMO) where multiple spatial layers are transmitted to the same receiving device, and multiple-user MIMO (MU-MIMO) where multiple spatial layers are transmitted to multiple devices.

[0119] Beamforming, which also may be referred to as spatial filtering, directional transmission, or directional reception, is a signal processing technique that may be used at a transmitting device or a receiving device (such as a base station 105 or a UE 115) to shape or steer an antenna beam (such as a transmit beam or receive beam) along a spatial path between the transmitting device and the receiving device. Beamforming may be achieved by combining the signals communicated via antenna elements of an antenna array such that signals propagating at particular orientations with respect to an antenna array experience constructive interference while others experience destructive interference. The adjustment of signals communicated via the antenna elements may include a transmitting device or a receiving device applying certain amplitude and phase offsets to signals carried via each of the antenna elements associated with the device. The adjustments associated with each of the antenna elements may be defined by a beamforming weight set associated with a particular orientation (such as with respect to the antenna array of the transmitting device or receiving device, or with respect to some other orientation).

[0120] In one example, a base station 105 may use multiple antennas or antenna arrays to conduct beamforming operations for directional communications with a UE 115. For instance, some signals (e.g. synchronization signals, reference signals, beam selection signals, or other control signals) may be transmitted by a base station 105 multiple times in different directions, which may include a signal being transmitted according to different beamforming weight sets associated with different directions of transmission. Transmissions in different beam directions may be used to identify (such as by the base station 105 or a receiving device, such as a UE 115) a beam direction for subsequent transmission and/or reception by the base station 105.

[0121] Some signals, such as data signals associated with a particular receiving device, may be transmitted by a base station 105 in a single beam direction (such as a direction associated with the receiving device, such as a UE 115). In some examples, the beam direction associated with transmissions along a single beam direction may be determined based at least in in part on a signal that was transmitted in different beam directions. For example, a UE 115 may receive one or more of the signals transmitted by the base station 105 in different directions, and the UE 115 may report to the base station 105 an indication of the signal it received with a highest signal quality, or an otherwise acceptable signal quality. Although these techniques are described with reference to signals transmitted in one or more directions by a base station 105, a UE 115 may employ similar techniques for transmitting signals multiple times in different directions (such as for identifying a beam direction for subsequent transmission or reception by the UE 115), or transmitting a signal in a single direction (such as for transmitting data to a receiving device).

[0122] A receiving device (such as a UE 115, which may be an example of a mmW receiving device) may try multiple receive beams when receiving various signals from the base station 105, such as synchronization signals, reference signals, beam selection signals, or other control signals. For example, a receiving device may try multiple receive directions by receiving via different antenna subarrays, by processing received signals according to different antenna subarrays, by receiving according to different receive beamforming weight sets applied to signals received at a plurality of antenna elements of an antenna array, or by processing received signals according to different receive beamforming weight sets applied to signals received at a plurality of antenna elements of an antenna array, any of which may be referred to as "listening" according to different receive beams or receive directions. In some

examples a receiving device may use a single receive beam to receive along a single beam direction (such as when receiving a data signal). The single receive beam may be aligned in a beam direction determined based at least in part on listening according to different receive beam directions (such as a beam direction determined to have a highest signal strength, highest signal-to-noise ratio, or otherwise acceptable signal quality based at least in part on listening according to multiple beam directions).

[0123] In some aspects, the antennas of a base station 105 or UE 115 may be located within one or more antenna arrays, which may support MIMO operations, or transmit or receive beamforming. For example, one or more base station antennas or antenna arrays may be co-located at an antenna assembly, such as an antenna tower. In some aspects, antennas or antenna arrays associated with a base station 105 may be located in diverse geographic locations. A base station 105 may have an antenna array with a number of rows and columns of antenna ports that the base station 105 may use to support beamforming of communications with a UE 115. Likewise, a UE 115 may have one or more antenna arrays that may support various MIMO or beamforming operations.

[0124] In some aspects, wireless communications system 100 may be a packet-based network that operate according to a layered protocol stack. In the user plane, communications at the bearer or Packet Data Convergence Protocol (PDCP) layer may be IP-based. A Radio Link Control (RLC) layer may perform packet segmentation and reassembly to communicate over logical channels. A Medium Access Control (MAC) layer may perform priority handling and multiplexing of logical channels into transport channels. The MAC layer also may use hybrid automatic repeat request (HARQ) to provide retransmission at the MAC layer to improve link efficiency. In the control plane, the Radio Resource Control (RRC) protocol layer may provide establishment, configuration, and maintenance of an RRC connection between a UE 115 and a base station 105 or core network 130 supporting radio bearers for user plane data. At the Physical layer, transport channels may be mapped to physical channels.

[0125] In some aspects, UEs 115 and base stations 105 may support retransmissions of data to increase the likelihood that data is received successfully. HARQ feedback is one technique of increasing the likelihood that data is received correctly over a communication link 125. HARQ may include a combination of error detection (such as using a cyclic

redundancy check (CRC)), forward error correction (FEC), and retransmission (such as automatic repeat request (ARQ)). HARQ may improve throughput at the MAC layer in poor radio conditions (such as signal-to-noise conditions). In some aspects, a wireless device may support same-slot HARQ feedback, where the device may provide HARQ feedback in a specific slot for data received in a previous symbol in the slot. In other cases, the device may provide HARQ feedback in a subsequent slot, or according to some other time interval.

[0126] Time intervals in LTE or NR may be expressed in multiples of a basic time unit, which may, for example, refer to a sampling period of $T_s = 1/30{,}720{,}000$ seconds. Time intervals of a communications resource may be organized according to radio frames each having a duration of 10 milliseconds (ms), where the frame period may be expressed as $T_f = 307{,}200\ T_s$. The radio frames may be identified by a system frame number (SFN) ranging from 0 to 1023. Each frame may include 10 subframes numbered from 0 to 9, and each subframe may have a duration of 1 ms. A subframe may be further divided into 2 slots each having a duration of 0.5 ms, and each slot may contain 6 or 7 modulation symbol periods (such as depending on the length of the cyclic prefix prepended to each symbol period). Excluding the cyclic prefix, each symbol period may contain 2048 sampling periods. In some aspects, a subframe may be the smallest scheduling unit of the wireless communications system 100, and may be referred to as a transmission time interval (TTI). In other cases, a smallest scheduling unit of the wireless communications system 100 may be shorter than a subframe or may be dynamically selected (such as in bursts of shortened TTIs (sTTIs) or in selected component carriers using sTTIs).

[0127] In some wireless communications systems, a slot may further be divided into multiple mini-slots containing one or more symbols. In some instances, a symbol of a mini-slot or a mini-slot may be the smallest unit of scheduling. Each symbol may vary in duration depending on the subcarrier spacing or frequency band of operation, for example. Further, some wireless communications systems may implement slot aggregation in which multiple slots or mini-slots are aggregated together and used for communication between a UE 115 and a base station 105.

[0128] The term "carrier" refers to a set of radio frequency spectrum resources having a defined physical layer structure for supporting communications over a communication link 125. For example, a carrier of a communication link 125 may include a portion of a radio

frequency spectrum band that is operated according to physical layer channels for a given radio access technology. Each physical layer channel may carry user data, control information, or other signaling. A carrier may be associated with a pre-defined frequency channel (such as an evolved universal mobile telecommunication system terrestrial radio access (E-UTRA) absolute radio frequency channel number (EARFCN)), and may be positioned according to a channel raster for discovery by UEs 115. Carriers may be downlink or uplink (such as in an FDD mode), or be configured to carry downlink and uplink communications (such as in a TDD mode). In some examples, signal waveforms transmitted over a carrier may be made up of multiple sub-carriers (such as using multi-carrier modulation (MCM) techniques such as orthogonal frequency division multiplexing (OFDM) or discrete Fourier transform spread OFDM (DFT-S-OFDM)).

[0129] The organizational structure of the carriers may be different for different radio access technologies (such as LTE, LTE-A, LTE-A Pro, NR). For example, communications over a carrier may be organized according to TTIs or slots, each of which may include user data as well as control information or signaling to support decoding the user data. A carrier also may include dedicated acquisition signaling (such as synchronization signals or system information, etc.) and control signaling that coordinates operation for the carrier. In some examples (such as in a carrier aggregation configuration), a carrier also may have acquisition signaling or control signaling that coordinates operations for other carriers.

[0130] Physical channels may be multiplexed on a carrier according to various techniques. A physical control channel and a physical data channel may be multiplexed on a downlink carrier, for example, using time division multiplexing (TDM) techniques, frequency division multiplexing (FDM) techniques, or hybrid TDM-FDM techniques. In some examples, control information transmitted in a physical control channel may be distributed between different control regions in a cascaded manner (such as between a common control region or common search space and one or more UE-specific control regions or UE-specific search spaces).

[0131] A carrier may be associated with a particular bandwidth of the radio frequency spectrum, and in some examples the carrier bandwidth may be referred to as a "system bandwidth" of the carrier or the wireless communications system 100. For example, the carrier bandwidth may be one of a number of predetermined bandwidths for carriers of a

particular radio access technology (such as 1.4, 3, 5, 10, 15, 20, 40, or 80 MHz). In some examples, each served UE 115 may be configured for operating over portions or all of the carrier bandwidth. In other examples, some UEs 115 may be configured for operation using a narrowband protocol type that is associated with a predefined portion or range (such as set of subcarriers or RBs) within a carrier (such as "in-band" deployment of a narrowband protocol type).

[0132] In a system employing MCM techniques, a resource element may consist of one symbol period (such as a duration of one modulation symbol) and one subcarrier, where the symbol period and subcarrier spacing are inversely related. The number of bits carried by each resource element may depend on the modulation scheme (such as the order of the modulation scheme). Thus, the more resource elements that a UE 115 receives and the higher the order of the modulation scheme, the higher the data rate may be for the UE 115. In MIMO systems, a wireless communications resource may refer to a combination of a radio frequency spectrum resource, a time resource, and a spatial resource (such as spatial layers), and the use of multiple spatial layers may further increase the data rate for communications with a UE 115.

[0133] Devices of the wireless communications system 100 (such as base stations 105 or UEs 115) may have a hardware configuration that supports communications over a particular carrier bandwidth, or may be configurable to support communications over one of a set of carrier bandwidths. In some examples, the wireless communications system 100 may include base stations 105 and/or UEs 115 that support simultaneous communications via carriers associated with more than one different carrier bandwidth.

[0134] Wireless communications system 100 may support communication with a UE 115 on multiple cells or carriers, a feature which may be referred to as carrier aggregation or multi-carrier operation. A UE 115 may be configured with multiple downlink component carriers and one or more uplink component carriers according to a carrier aggregation configuration. Carrier aggregation may be used with both FDD and TDD component carriers.

[0135] In some aspects, wireless communications system 100 may utilize enhanced component carriers (eCCs). An eCC may be characterized by one or more features including wider carrier or frequency channel bandwidth, shorter symbol duration, shorter TTI duration,

or modified control channel configuration. In some aspects, an eCC may be associated with a carrier aggregation configuration or a dual connectivity configuration (such as when multiple serving cells have a suboptimal or non-ideal backhaul link). An eCC also may be configured for use in unlicensed spectrum or shared spectrum (such as where more than one operator is allowed to use the spectrum). An eCC characterized by wide carrier bandwidth may include one or more segments that may be utilized by UEs 115 that are not capable of monitoring the whole carrier bandwidth or are otherwise configured to use a limited carrier bandwidth (such as to conserve power).

[0136] In some aspects, an eCC may utilize a different symbol duration than other component carriers, which may include use of a reduced symbol duration as compared with symbol durations of the other component carriers. A shorter symbol duration may be associated with increased spacing between adjacent subcarriers. A device, such as a UE 115 or base station 105, utilizing eCCs may transmit wideband signals (such as according to frequency channel or carrier bandwidths of 20, 40, 60, 80 MHz, etc.) at reduced symbol durations (such as 16.67 microseconds). A TTI in eCC may consist of one or multiple symbol periods. In some aspects, the TTI duration (that is, the number of symbol periods in a TTI) may be variable.

[0137] Wireless communications system 100 may be an NR system that may utilize any combination of licensed, shared, and unlicensed spectrum bands, among others. The flexibility of eCC symbol duration and subcarrier spacing may allow for the use of eCC across multiple spectrums. In some examples, NR shared spectrum may increase spectrum utilization and spectral efficiency, specifically through dynamic vertical (such as across the frequency domain) and horizontal (such as across the time domain) sharing of resources.

[0138] In some aspects, the UE 115 may detect a RLF between the UE 115 and an MN (such as a base station 105 configured or otherwise operating as an MN) in a dual-connectivity configuration. The UE 115 may identify, based on the detection of the RLF and on an absence of an active radio bearer associated with the MN and an SN (such as a base station 105 configured or otherwise operating as an SN in the dual-connectivity configuration), a default split radio bearer associated with the master node and the secondary node. The UE 115 may transmit an indication that the RLF has occurred to the SN via the default split radio bearer.

[0139] In some aspects, the UE 115 may detect a RLF between the UE 115 and an MN in a dual-connectivity configuration. The UE 115 may determine, based on the detection of the RLF, whether the UE is configured to communicate with an SN in the dual-connectivity configuration via a signaling radio bearer. The UE 115 may transmit, based on a determination that the UE is not configured to communicate with the SN via the signaling radio bearer, an indication that the RLF has occurred to the SN via a data radio bearer.

[0140] In some aspects, an SN (such as a base station 105 configured or otherwise operating as an SN) in a dual-connectivity configuration may receive, from a UE 115 via a data radio bearer, a first indication of a RLF for a radio link between the UE 115 and an MN (such as a second base station 105 operating as an MN in the dual-connectivity configuration). The SN may transmit an indication of the RLF to the MN.

[0141] In some aspects, an MN (such as a base station 105 configured or otherwise operating as an MN) in a dual-connectivity configuration may transmit, to a UE, an indication of a default split radio bearer for communicating an indication of an RLF between the UE and the MN. The MN may receive, from an SN (such as a base station 105 configured or otherwise operating as an SN in the dual-connectivity configuration) the indication of the radio link failure for the UE 115. The MN may identify, based on the indication of the RLF, a target node (such as a third base station 105) for the UE. The MN may transmit, to the SN, a handover request associated with performing a handover procedure to hand over the UE 115 from the MN to the target node.

[0142] In some aspects, a first base station 105 may (when configured or otherwise operating as an MN in a dual-connectivity configuration) receive, from a second base station 105 (such as a base station configured or otherwise operating as an SN in the dual-connectivity configuration) an RRC container the includes an indication of a radio link failure of a radio link between the first base station 105 and a UE 115. The first base station 105 may identify, based on the indication of the RLF, a target node (such as a third base station 105) for the UE. The first base station 105 may transmit, to the second base station 105, a handover request associated with performing a handover procedure to hand over the UE 115 from the first base station 105 to the target node.

[0143] **FIG. 2** illustrates an example of a wireless communication system 200 that supports radio bearers for indication of link failure in dual-connectivity systems in

accordance with aspects of the present disclosure. In some examples, wireless communication system 200 may implement aspects of wireless communication system 100.

[0144] Generally, wireless communication system 200 may include a UE 205 that is connected to a source MN 210 and SN 215 in a dual-connectivity configuration. Generally, the dual-connectivity configuration may include a network configured according to a 5G EN-DC or 5G NR dual-connectivity configuration. In some examples, the source MN 210 may be associated with a 5G or NR radio access technology (RAT) and the SN 215 may be associated with an LTE RAT. In other examples, both of the source MN 210 and the SN 215 may be associated with a 5G or NR RAT. In other examples, both of the source MN 210 and the SN 215 may be associated with an LTE RAT. Generally, the described techniques may be applied to all multi-RAT dual-connectivity (MR-DC) configurations, which also may include NR-NR DC. Generally, UE 205 may connect to the source MN 210 and/or the SN 215 via one or more wireless radio links, such as an MCG link for source MN 210 and an SCG link for SN 215. An MCG link may be a physical radio link that is used by one or more radio bearers for communications between the MN 210 and UE 205. An SCG link may be a physical radio link that is used by one or more radio bearers for communications between the SN 215 and UE 205.

[0145] In some aspects, source MN 210 may be connected to SN 215 in order to exchange information via a wireless link and/or a wired link, such as a backhaul link (such as an X2/Xn protocol connection). Source MN 210 and/or SN 215 also may be connected to a core network 220 via backhaul connection(s). Target MN 225 may generally refer to another base station which may be located proximate to UE 205, and may therefore serve as a suitable candidate to be a new MN for UE 205 in the event that source MN 210 becomes unavailable.

[0146] In some aspects, UE 205 may generally experience an RLF for a radio link between UE 205 and source MN 210 and/or between UE 205 and SN 215. For example, UE 205 may perform various channel measurements over the respective wireless links and, based on the channel measurements, determine that the radio link is suddenly unavailable and/or is experiencing performance degradation to the point that the radio link no longer supports wireless communications. In some aspects, UE 205 also may, during and/or based on the

channel measurements, identify target MN 225 (such as a target node that is a suitable candidate for UE 205 to establish a connection with).

[0147] Conventionally, RLF events are handled via an RRC connection reestablishment procedure. For example, UE 205 may detect an RLF between UE 205 and source MN 210 and perform a cell reselection procedure in response to the RLF. UE 205 would then perform a random access channel (RACH) procedure on the selected cell (such as target MN 225). UE 205 may then transmit an RRC connection reestablishment request to target MN 225, with target MN 225 responding with an RRC connection reestablishment response message being transmitted to UE 205. UE 205 may then resume MCG SRB1 and generate new keys to use for communicating with target MN 225. UE 205 would then transmit an RRC connection reestablishment complete message to target MN 225. UE 205 and target MN 225 would then need to perform an RRC connection reconfiguration procedure to establish an MCG configuration with UE 205. The data flow may then resume for MCG bearers (such as from a S-GW/user-plane function (UPF) of core network 220). UE 205 and SN 215 would then need to perform an SN addition request procedure to once again add SN 215 and establish an SCG configuration with UE 205. Data flow can then resume for the SCG bearers.

[0148] However, such RLF recovery procedures using the RRC connection reestablishment consume considerable resources while incurring extended delays in interruptions for wireless communications. For example, the RRC connection reestablishment procedure may involve a two-step procedure to first establish the MCG configuration including data bearers and then the SCG configuration at the UE 205. In the event the RRC connection reestablishment fails because UE 205 happens to select a cell that is not prepared, UE 205 invokes procedures to establish a new RRC connection that incurs additional signaling delays related to access stratum (AS) security establishment that must be completed before UE 205 can be provided radio configuration. Accordingly, upon detection of the MCG link failure (such as the RLF between UE 205 and source MN 210), UE 205 performs a cell selection procedure, which further contributes to the delay.

[0149] However, aspects of the described techniques provide a fast recovery procedure in the event of an MCG link failure (such as an RLF occurs between UE 205 and source MN 210 and/or between UE 205 and SN 215). Although some aspects of the described

techniques generally focus on the RLF being in MCG link failure, it is to be understood that the described techniques are not limited to an MCG link failure, but also can be utilized in the event of an SCG link failure between UE 205 and SN 215, such as UE 205 may utilize the MCG link to initiate a handover procedure with a target node as a new SN.

[0150] Broadly, the described techniques may include UE 205 detecting an MCG link failure (such as an RLF) between UE 205 and source MN 210. UE 205 may leverage its connection with SN 215 to resolve the MCG link failure using, for example, a handover procedure of UE 205 from source MN 210 to target MN 225. For example, UE 205 may transmit or otherwise provide an indication to SN 215 of the RLF. In some aspects, this may include UE 205 transmitting or otherwise providing an RRC MCG failure notification message via SN 215 to source MN 210. This indication may be provided, for example, via a split SRB1 bearer and/or an SRB3 bearer between UE 205 and SN 215. The SN 215 may transmit or otherwise provide the indication of the RLF to source MN 210 (such as over a backhaul link). Upon receiving the MCG failure notification message (such as the indication of the RLF), source MN 210 may initiate an inter-MN handover procedure to handover UE 205 to a target node (such as target MN 225). Accordingly, source MN 210 and/or UE 205 may perform a handover procedure of UE 205 to target MN 225.

[0151] In some aspects, UE 205 may utilize a split bearer (such as a split SRB1) to provide the indication of the RLF to SN 215. For example, source MN 210 may pre-configure UE 205 to provide RLF indication information to SN 215. In some aspects, UE 205 may additionally indicate a cause for the RLF, such as an RLF detection on a MCG, a handover failure, and the like. Accordingly, UE 205 may use an SCG SRB to carry or convey the indication of the RLF to SN 215.

[0152] In some aspects, UE 205 may determine that target MN 225 is unavailable for a handover procedure. For example, UE 205 may perform various channel measurements to monitor performance of the radio links between UE 205 and source MN 210 and/or SN 215. UE 205 also may monitor for, during such channel measurements, candidate nodes that are suitable for establishing connections with. If the network determines that a target node is unavailable, UE 205 may be handed over from source MN 210 to SN 215 when an MCG RLF is detected, with the SN 215 becoming the new MN for UE 205. In that sense, SN 215 would become a new MN for UE 205. In some aspects, this may include configuring SN 215

as a single-connectivity configuration, or configuring SN 215 as a dual-connectivity configuration where UE 205 may connect to a new SN (not shown) to continue to operate in a dual-connectivity configuration.

[0153] In some aspects, an RLF also may occur for the radio link between UE 205 and SN 215 (such as an SCG RLF). If the RLF is detected before UE 205 is able to transmit the indication of the MCG RLF, UE 205 may perform an RRC reestablishment procedure with source MN 210 and/or SN 215. In some aspects, UE 205 may perform an RRC connection establishment procedure with target MN 225 in the event an MCG RLF and an SCG RLF is detected. If the SCG RLF is detected after UE 205 transmits the indication of the MCG RLF, UE 205 may attempt to perform an RRC connection reestablishment procedure with source MN 210 and/or SN 215. Again, in some aspects UE 205 may perform an RRC connection establishment procedure with target MN 225 in the event that an MCG RLF and an SCG RLF is detected.

[0154] In some aspects, the MCG RLF may be detected while UE 205 is involved in a handover procedure from SN 215 to a new SN (not shown). In this event, UE 205 may transmit the indication of the MCG RLF to SN 215 and/or the new SN, such as depending upon which phase of the SN handover procedure has been completed.

[0155] In some aspects, SN 215 may forward the indication of the RLF (such as the indication of the MCG RLF) to source MN 210 using a variety of mechanisms. In some aspects, the approach adopted by SN 215 may be dependent upon the mechanism by which UE 205 provides the indication of the RLF to SN 215. For example, when UE 205 utilizes an SRB1 to provide the indication of the RLF, SN 215 may decode the message conveyed over the SRB1 to determine that the MCG RLF is being indicated. In this context, SN 215 may generate a new message (such as a second message) for transmitting the indication of the RLF to source MN 210. In another example, UE 205 may utilize an SRB3 for providing the indication of the MCG RLF to SN 215. In this context, SN 215 may encapsulate the indication for forwarding to source MN 2 110, such as according to an Xn and/or X2 protocol.

[0156] Source MN 210 generally receives the indication of the MCG RLF from SN 215 and performs a handover of UE 205 to target MN 225. In some aspects, source MN 210 may identify the target node (such as target MN 225) based on the indication of the RLF. For

example, source MN 210 may identify the target node based on measurement report(s) conveyed in the indication, and select the target node (such as select target MN 225) based on the measurement report(s). In some aspects, source MN 210 may identify the target node based on whether or not the target node (such as target MN 225) operates utilizing the same RAT or a different RAT, the same radio frequency spectrum band or a different radio frequency spectrum band, and the like, as source MN 210. Accordingly, source MN 210 may select a target node that supports continued operation in a dual-connectivity configuration, when available.

[0157] In some aspects, the target node (such as target MN 225) may be associated with the same base station as source MN 210. For example, the base station may have a control unit (CU) that manages one or more distribution units (DUs). Source MN 210 may be a first DU of the base station and target MN 225 may be a second DU of the base station. In this context, the CU may manage one or aspects of performing a handover of UE 205 from the first DU (such as source MN 210) to the second DU (such as target MN 225) of the base station. In other aspects, target MN 225 (such as the target node) may be a separate entity with respect to source MN 210 and/or SN 215.

[0158] Accordingly, aspects of the described techniques provide a mechanism where UE 205 recovers from an MCG RLF (and/or an SCG RLF) by performing a handover procedure rather than the conventional RRC-based and/or RLF recovery-based techniques. The described fast RLF recovery procedure improves the recovery time and minimizes downtime for wireless communications.

[0159] In some aspects, handling of additional scenarios and error cases also may be addressed. For example, in one case where the target MN 225 is connected to a different RAT than the source MN (such as change from EN-DC to NR-DC, or source MN 210 is an eNB and target MN 225 is a gNB), an inter-system handover procedure may be invoked. In the situation where an inter-MN handover procedure to the target MN 225 fails because of MCG failure, UE 205 may transmit or otherwise provide an MCG failure information message to the SNs to trigger the described fast recovery procedure. If there is an SCG link failure (such as if UE 205 detects SCG RLF) after SN 215 reports MCG failure, then UE 205 may perform an RRC reestablishment procedure. If UE 205 detects simultaneous failure of SCG and MCG links, then UE 205 may initiate an RRC reestablishment procedure. If source

MN 210 fails during SN change (such as during an SN handover procedure), UE 205 may transmit or otherwise provide an MCG RLF report to the target SN if the related signaling is complete, such as target SN receive the reconfiguration complete message. If UE 205 does not succeed in sending reconfiguration complete message to the target SN and MCG RLF occurs, UE 205 may perform a reestablishment procedure.

[0160] **FIGs. 3A and 3B** illustrate an example of a process 300 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. FIG. 3B is a continuation of FIG. 3A. In some examples, process 300 may implement aspects of wireless communication systems 100 and/or 200. Aspects of process 300 may be implemented by a UE 302, an SN 304, a source MN 306, a target MN 308, the UPF 310, and/or an access and mobility management function (AMF) 312, which may be examples of the corresponding devices described herein. In some aspects, the UPF 310 and/or AMF 312 may be one or more functions operating within a core network. Aspects of process 300 may be implemented or otherwise triggered when UE 302 detects failure of the MCG link. In some aspects, UE 302 may identify or otherwise determine that target MN 308 is available, such as based on one or more channel measurements performed by UE 302.

[0161] At 314, UE 302 may detect an RLF. In some aspects, the RLF may refer to an MCG failure or an MCG RLF for a radio link between UE 302 and source MN 306. In some aspects, the RLF may be detected based on one or more channel measurements performed by UE 302.

[0162] At 316, UE 302 may transmit or otherwise provide an indication of the RLF to SN 304. In some aspects, the indication of the RLF may be carried or conveyed in an MCG failure information or notification message. In some aspects, the indication of the RLF may carry or convey an indication of a measurement report and/or an MCG link failure cause to SN 304.

[0163] In some aspects, UE 302 may transmit or otherwise provide the indication of the RLF using a bearer carrying or conveying an RRC MCG failure information or notification message. This may include the message being transmitted over a split SRB1 and/or an SRB3. When a split SRB1 has been established, UE 302 may use this bearer for providing the indication of the RLF. In some aspects, source MN 306 may have indicated or otherwise

configured UE 302 (such as through previous RRC signaling) that for split SRB1, UE 302 may utilize the SN path in the case of MCG link failure. If SRB3 has been configured, UE 302 may use this bearer as an alternative. If SRB3 is used, SN 304 may encapsulate the message in an X2/Xn message (such as new container or message) and then transmit this to source MN 306.

[0164] In some aspects, the indication of the RLF (such as the MCG failure information message) may carry or convey a measurement report and/or an MCG link failure cause. Examples of the MCG link failure cause may include, but are not limited to, an RLF detection on the MCG link and/or a handover failure (such as expiration of a T304 timer).

[0165] At 318, SN 304 may transmit or otherwise provide an indication of the RLF to source MN 306. At 320, source MN 306 may make a handover decision. In some aspects, source MN 306 may determine or otherwise decide to perform the handover based on the measurement report. Accordingly, source MN 306 may determine to initiate an inter-MN handover procedure of UE 302.

[0166] At 322, source MN 306 may transmit a handover request message to target MN 308. In some aspects, the handover request message may carry or convey UE configuration information for UE 302, such as radio configuration information, quality of service (QoS) requirements, bearer configuration information, and the like. In some aspects, the handover request message may carry or convey an indication of UE 302 context in the source MN 306 and/or SN 304, SN ID (such as an identifier for SN 304), a target cell ID (such as an identifier for target MN 308), and/or an SN UE Xn application protocol (XnAP) ID.

[0167] At 324, target MN 308 may perform admission control for the handover. In some aspects, admission control may be performed by the target MN 308, such as utilizing the QoS and/or bearer information carried or conveyed in the handover request message.

[0168] At 326, target MN 308 may transmit or otherwise provide an SN addition request message to SN 304. In some aspects, this may include target MN 308 requesting SN 304 to provide SCG configuration information using the SN addition request message. The SN addition request message may carry or convey the SN UE XnAP ID as a reference to the UE context with SN 304 that was established by the source MN 306.

[0169] At 328, SN 304 may transmit or otherwise provide an indication of an SN addition request acknowledgment to target MN 308. At 330, target MN 308 may transmit or otherwise provide an indication of a handover request acknowledgment message to source MN 306. In some aspects, the handover request acknowledgment message may include a container, or otherwise be included in a container, along with an RRC handover message to be sent to UE 302. In some aspects, this may include target MN 308 configuring the handover request acknowledge message to carry or convey the handover command message (such as RRCConnectionReconfiguration) to be transmitted by SN 304 to UE 302.

[0170] At 332, source MN 306 may transmit or otherwise provide a handover message to SN 304. In some aspects, the handover message may include a container, or be in a container, along with an RRC message to be sent to the UE 302.

[0171] At 334, source MN 306 may transmit or otherwise provide an indication of an SN release request to SN 304. In some aspects, this may include the SN release request message carrying or conveying an indication that SN 304 shall not release the UE context associated with the target MN 308. At 336, SN 304 may transmit or otherwise provide an indication of an SN release request acknowledgment message to source MN 306.

[0172] At 338, SN 304 may transmit or otherwise provide an indication of an RRCConnectionReconfiguration message to UE 302. In some aspects, the RRCConnectionReconfiguration message may carry or convey an indication of UE MCG and SCG configuration for subsequent communications with target MN 308 and SN 304. In some aspects, the RRCConnectionReconfiguration message may carry or convey an indication of information for UE 302 to use for generating new security keys.

[0173] At 340, UE 302 may perform a RACH procedure on target MN 308. In some aspects, this may include UE 302 obtaining synchronization and access information from the target MN 308.

[0174] At 342, UE 302 may transmit or otherwise provide an indication of an RRCConnectionReconfiguration complete message to target MN 308. In some aspects, the RRCConnectionReconfiguration complete message may carry or convey an indication of a successful handover to target MN 308.

[0175] At 344, target MN 308 may transmit or otherwise provide an indication of an SN reconfiguration complete message to SN 304. In some aspects, this may include target MN 308 indicating success of MCG configuration set up to SN 304 using the SN reconfiguration complete message.

[0176] At 346, source MN 306 may optionally transmit or otherwise provide an indication of an SN status transfer message to target MN 308. In some aspects, for bearers using radio link control (RLC) acknowledgment mode (AM), source MN 306 may provide a PDCP SN status information using the SN status transfer message.

[0177] At 348, UPF 310 may transmit or otherwise perform data forwarding to source MN 306. At 350, source MN 306 a transmit or otherwise perform data forwarding to target MN 308. In some aspects, this may include data transmitted to the source MN 306 being transmitted or otherwise provided to the target MN 308.

[0178] At 352, source MN 306 may transmit or otherwise provide an indication of a PDU session path switch request to AMF 312. At 354, UPF 310 and AMF 312 may perform bearer modifications, such as modify bearer(s) based at least in part on the MCG RLF and subsequent handover. At 356, UPF 310 may optionally transmit or otherwise provide an indication of a new path (such as a split bearer and/or MCG bearer) to target MN 308. At 358, UPF 310 may optionally transmit or otherwise provide an indication of a new path (such as a split bearer and/or MCG bearer) to SN 304. At 360, AMF 312 may transmit or otherwise provide an indication of the PDU session path switch request acknowledgment to target MN 308. In some aspects, this may include a PDU session path switch procedure being carried out in order to switch the data path towards the target MN 308.

[0179] At 362, target MN 308 may transmit or otherwise provide an indication of a UE context release message to source MN 306. In some aspects, this may include target MN 308 initiating the UE context release procedure towards source MN 306.

[0180] At 364, source MN 306 may transmit or otherwise provide an indication of the UE context release message to SN 304. In some aspects, upon reception of the UE context release message from source MN 306, SN 304 may release control plane related resources associated with the UE context towards the source MN 306. In some aspects, the functions performed at 320-364 may be considered an inter-MN handover procedure.

[0181] **FIG. 4** illustrates an example of a process 400 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. In some examples, process 400 may implement aspects of wireless communication systems 100 and/or 200. Aspects of process 400 may be implemented by a UE 402, an SN 404, an MN 406, a mobility management entity (MME) 408, and/or core network (CN) elements 410, which may be examples of the corresponding devices described herein. Aspects of process 400 may be implemented or otherwise triggered when UE 402 detects failure of the MCG link. In some aspects, process 400 illustrates an example case where SN 404 may configure a single connection to itself when an MCG RLF occurs.

[0182] In some aspects, the measurement report provided by UE 402 may indicate that there is no available target node (such as no target MN) for MN 406 to perform a handover of UE 402 to. However, SN 404 may be able to configure a single connection to itself if SN 404 supports a control plane interface to the core network (such as NG-C/S1-C to AMF/MME), with all of the control plane interface functionalities. Accordingly, the RLF fast recovery procedure in this context may include UE 402 transmitting the MCG failure information message (such as RLF indication) to MN 406 via SN 404 over a split SRB1 or SRB3. MN 406 processes the MCG failure information message and determines that there is no available target MNs, and decides whether or not to handover UE 402 to SN 404. Alternatively, SN 404 may process the MCG failure information message from UE 402 and forward a request for handover to MN 406. If MN 406 decides to perform a handover procedure, it may initiate an X2/Xn handover or inter-system handover to SN 404. The type of handover to be performed may depend on the case or configuration. For example, an inter-system handover from MN 406 SN 404 may be performed for E-UTRA-NR dual connectivity (EN-DC), NR-E-UTRA dual connectivity (NE-DC), and NG-RAN – E-UTRA dual connectivity (NGEN-DC) cases or configurations whereas an X2/Xn handover from MN 406 to SN 404 may be performed for NR-DC and LTE-DC changed from EN-DC to the case where an LTE eNB has user plane and control plane connections to the 5G core network. Process 400 generally illustrates a call flow for the EN-DC case.

[0183] At 412, UE 402 may detect an RLF. In some aspects, the RLF may refer to an MCG failure or an MCG RLF for a radio link between UE 402 and MN 406. In some aspects, the RLF may be detected based on one or more channel measurements performed by UE 402.

[0184] At 414, UE 402 may transmit or otherwise provide an indication of the RLF to SN 404. In some aspects, the indication of the RLF may be carried or conveyed in an MCG failure information or notification message. In some aspects, the indication of the RLF may carry or convey an indication of a measurement report and/or an MCG link failure cause to SN 404.

[0185] In some aspects, UE 402 may transmit or otherwise provide the indication of the RLF using a bearer carrying or conveying an RRC MCG failure information or notification message. This may include the message being transmitted over a split SRB1 and/or an SRB3. When a split SRB1 has been established, UE 302 may use this bearer for providing the indication of the RLF. In some aspects, MN 306 may have indicated or otherwise configured UE 402 (such as through previous RRC signaling) that for split SRB1, UE 402 may utilize the SN path in the case of MCG link failure. If SRB3 has been configured, UE 402 may use this bearer as an alternative. If SRB3 is used, SN 404 may encapsulate the message in an X2/Xn message (such as new container or message) and then transmit this to MN 406. In some aspects, the indication of the RLF (such as the MCG failure information message) may carry or convey a measurement report and/or an MCG link failure cause.

[0186] At 416, SN 404 may transmit or otherwise provide an indication of the RLF to MN 406. At 418, MN 406 may make a handover decision. In some aspects, MN 406 may determine or otherwise decide to perform the handover based on the measurement report. In this example, the measure report may indicate that there are no target MNs (or target nodes) available to perform a handover procedure. Accordingly, MN 406 may determine to handover UE 402 to SN 404.

[0187] At 420, MN 406, MME 408, and core network elements 410 may perform a handover procedure. In some aspects, a handover procedure may be from an evolved packet system (EPS) to a 5G system (5GS).

[0188] At 422, MME 408 may transmit a handover command message to MN 406. In some aspects, the handover command message may be container, or be included in a container, to be sent to UE 402 as an SN RRC message.

[0189] At 424, MN 406 may transmit or otherwise provide a handover command message to SN 404. Again, in some aspects the handover command message may be container, or be included in a container, to be sent to UE 402 as an RRC message.

[0190] At 426, SN 404 may transmit or otherwise provide an indication of an RRCConnectionReconfiguration message to UE 402. In some aspects, this may carry or convey configuration information to be used by UE 402 for communications with SN 404 upon handover.

[0191] 428, UE 402 may perform a RACH procedure with SN 404. In some aspects, this may include UE 402 obtaining and synchronization and/or other configuration information from SN 404.

[0192] At 430, UE 402 may transmit or otherwise provide an indication of an RRCConnectionReconfiguration complete message to SN 404. At 432, data forwarding from a source MN (such as MN 406) to SN 404 may be performed by SN 404, MN 406, MME 408, and/or CN elements 410. At 434, handover procedures may be completed by SN 404, MN 406, MME 408, and/or CN elements 410. In some aspects, the handover procedures may be from EPS to 5GS.

[0193] **FIG. 5** illustrates an example of a process 500 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. In some examples, process 500 may implement aspects of wireless communication systems 100 and/or 200. Aspects of process 500 may be implement a by UE 502, an SN 504, an MN 506, an AMF 508, and/or a UPF 510, which may be examples of the corresponding devices described herein. Aspects of process 500 may be implemented or otherwise triggered when UE 502 detects failure of the MCG link. In some aspects, process 500 illustrates an example case where SN 504 may configure a single connection to itself when an MCG RLF occurs.

[0194] In some aspects, the measurement report provided by UE 502 may indicate that there is no available target node (such as no target MN) for MN 506 to perform a handover of UE 502 to. However, SN 504 may be able to configure a single connection to itself if SN 504 supports a control plane interface to the core network (such as NG-C/S1-C to AMF/MME), with all of the control plane interface functionalities. Accordingly, the RLF fast recovery procedure in this context may include UE 502 transmitting the MCG failure information message to MN 506 via SN 504 over a split SRB1 or SRB3. MN 506 processes the MCG failure information message determines that there is no available target MNs, and decides whether or not to handover UE 502 to SN 504. Alternatively, SN 504 may process

the MCG failure information message from UE 502 and forward a request for handover to MN 506. If MN 506 decides to perform a handover procedure, it may initiate an X2/Xn handover or inter-system handover to SN 504. The type of handover to be performed may depend on the case or configuration. For example, an inter-system handover from MN 506 to SN 504 may be performed for EN-DC, NE-DC, and NGEN-DC cases or configurations whereas an X2/Xn handover from MN 506 to SN 504 may be performed for NR-DC and LTE-DC change from NE-DC to the case where an LTE eNB has user plane and control plane connections to the 5G core network. Process 500 generally illustrates a call flow for the NR-DC case.

[0195] At 512, UE 502 may detect an RLF. In some aspects, the RLF may refer to an MCG failure or an MCG RLF for a radio link between UE 502 and MN 506. In some aspects, the RLF may be detected based on one or more channel measurements performed by UE 502.

[0196] At 514, UE 502 may transmit or otherwise provide an indication of the RLF to SN 504. In some aspects, the indication of the RLF may be carried or conveyed in an MCG failure information or notification message. In some aspects, UE 502 may carry or convey an indication of a measurement report and/or an MCG link failure cause to SN 504.

[0197] In some aspects, UE 502 may transmit or otherwise provide the indication of the RLF using a bearer carrying or conveying an RRC MCG failure information or notification message. This may include the message being transmitted over a split SRB1 and/or an SRB3.

[0198] At 516, SN 504 may transmit or otherwise provide an indication of the RLF to MN 506. At 518, MN 506 may make a handover decision. In some aspects, MN 506 may determine or otherwise decide to perform the handover based on the measurement report. In this example, the measure report may indicate that there are no target MNs (or target nodes) available to perform a handover procedure. Accordingly, MN 506 may determine to handover UE 502 to SN 504, where SN 504 transitions to a single-connectivity configuration.

[0199] At 520, MN 506 may transmit or provide an indication of a handover request message to SN 504. At 522, SN 504 may perform admission control procedures for the handover of UE 502. At 524, SN 504 may transmit or otherwise provide an indication of a handover request acknowledgment message to MN 506.

[0200] At 526, MN 506 may transmit or otherwise provide a handover command message to SN 504. In some aspects, the handover command message may be container, or may include a container, to be sent to UE 502 as an RRC message.

[0201] At 528, SN 504 may transmit or otherwise provide an indication of an RRCConnectionReconfiguration message to UE 502. In some aspects, this may carry or convey configuration information to be used by UE 502 for communications with SN 504 upon handover.

[0202] At 530, UE 502 may perform a RACH procedure with SN 504. In some aspects, this may include UE 502 obtaining synchronization and/or other configuration information from SN 504. At 532, UE 502 may transmit or otherwise provide an indication of an RRCConnectionReconfiguration complete message to SN 504. At 534, MN 506 may transmit or otherwise provide an indication of an SN transfer status message to SN 504.

[0203] At 536, data forwarding from a source MN (such as MN 506) to SN 504 may be performed by SN 504, MN 506, AMF 508, and/or UPF 510. At 538, path switch for the PDU session may be completed by SN 504, MN 506, AMF 508, and/or UPF 510. At 540, SN 504 may transmit or otherwise provide an indication of the UE context release message to MN 506.

[0204] **FIGs. 6A and 6B** illustrate an example of a process 600 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. FIG. 6B is generally a continuation of FIG. 6A. In some examples, process 600 may implement aspects of wireless communication systems 100 and/or 200. Aspects of process 600 may be implement a by UE 602, an SN 604, an MN 606, a target SN 608, a UPF 610, and/or an AMF 612, which may be examples of the corresponding devices described herein. Aspects of process 600 may be implemented or otherwise triggered when UE 602 detects failure of the MCG link. In some aspects, process 600 illustrates an example case where a DC configuration can be configured with SN 604 becoming a new MN and a new node (such as target SN 608) added as a new SN for UE 602.

[0205] In some aspects, the measurement report provided by UE 602 may indicate that there is no available target node (such as no target MN) for source MN 606 to perform a handover of UE 602 to. However, SN 604 may be able to be configured as a new MN for UE 602 if SN 604 supports the control plane interface to the core network (such as NG-C/S1-C to

AMF/MME), with all of the control plane interface functionalities. Accordingly, the RLF fast recovery procedure in this context may include UE 602 performing a handover procedure from source MN 606 to SN 604, with SN 604 becoming a new MN for UE 602 and target SN 608 being added as a new SN for UE 602. The type of handover to be performed may depend on the case or configuration. For example, an inter-system handover from MN 606 to SN 604 may be performed for EN-DC to NE-DC or NR-DC and/or for NE-DC to EN-DC or LTE-DC change cases or configurations whereas an X2/Xn handover from MN 606 to SN 604 may be performed for NR-DC to NE-DC or ND-DC change, for NGEN-DC to NE-DC or NR-DC change, and/or for NE-DC to NGEN-DC change cases or configurations. Process 600 generally illustrates a call flow for the case where DC (such as dual-connectivity) can be configured with SN 604 becoming a new MN and a new node (such as target node 608) being added as a new SN for UE 602. It is to be understood that call flows for the other cases or configurations are similar.

[0206] At 614, UE 602 may detect an RLF. In some aspects, the RLF may refer to an MCG failure or an MCG RLF for a radio link between UE 602 and MN 606. In some aspects, the RLF may be detected based on one or more channel measurements performed by UE 602.

[0207] At 616, UE 602 may transmit or otherwise provide an indication of the RLF to SN 604. In some aspects, the indication of the RLF may be carried or conveyed in an MCG failure information or notification message. In some aspects, UE 602 may carry or convey an indication of a measurement report and/or an MCG link failure cause to SN 604.

[0208] In some aspects, UE 602 may transmit or otherwise provide the indication of the RLF using a bearer carrying or conveying an RRC MCG failure information or notification message. This may include the message being transmitted over a split SRB1 and/or an SRB3.

[0209] At 618, SN 604 may transmit or otherwise provide an indication of the RLF to source MN 606. At 620, source MN 606 may make a handover decision. In some aspects, source MN 606 may determine or otherwise decide to perform the handover based on the measurement report. In this example, the measure report may indicate that there are no target MNs (or target nodes) available to perform a handover procedure. Accordingly, MN 606 may determine to handover UE 602 to SN 604, with SN 604 becoming the new MN for UE

602 after the handover. In some aspects, the measurement report may identify target SN 608 (such as the target node in this context) as being available as a new SN for UE 602.

[0210] At 622, source MN 606 may transmit or provide an indication of a handover request message to SN 604. At 624, SN 604 may perform admission control procedures for the handover of UE 602. At 626, SN 604 may transmit or otherwise provide an indication of an SN addition request message to target SN 608. At 628, target SN 608 may transmit or otherwise provide an indication of an SN addition request acknowledgment message to SN 604.

[0211] At 630, SN 604 may transmit or otherwise provide a handover request acknowledgment message to source MN 606. At 632, source MN 606 may transmit or otherwise provide an indication of a handover command message to SN 604. In some aspects, the handover command message may be container, or may include a container, to be sent to UE 602 as an RRC message.

[0212] At 634, SN 604 may transmit or otherwise provide an indication of an RRCConnectionReconfiguration message to UE 602. In some aspects, this may carry or convey configuration information to be used by UE 602 for communications with SN 604 upon handover.

[0213] At 636, UE 602 may perform a RACH procedure with SN 604. In some aspects, this may include UE 602 obtaining synchronization and/or other configuration information from SN 604.

[0214] At 638, UE 602 may transmit or otherwise provide an indication of an RRCConnectionReconfiguration complete message to SN 604. At 640, source MN 606 may transmit or otherwise provide an indication of an SN transfer status message to SN 604.

[0215] At 642, data forwarding from a MN (such as source MN 606) to SN 604 may be performed by SN 604, source MN 606, target SN 608, UPF 610, and/or AMF 612. At 644, UE 602 may perform a RACH procedure with target SN 608. In some aspects, this may include UE 602 obtaining synchronization and/or other configuration information for performing wireless communications with target SN 608 after the handover procedure. At 646, SN 604 may transmit or otherwise provide an indication of an SN reconfiguration complete message to target SN 608.

[0216] At 648, path switch for the PDU session may be completed by SN 604, source MN 606, target SN 608, UPF 610, and/or AMF 612. At 650, SN 604 may transmit or otherwise provide an indication of the UE context release message to source MN 606.

[0217] **FIGs. 7A and 7B** illustrate an example of a process 700 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. FIG. 7B is generally a continuation of FIG. 7A. In some examples, process 700 may implement aspects of wireless communication systems 100 and/or 200. Aspects of process 700 may be implement by UE 702, an SN 704, a source MN-DU 706, a target MN-DU 708, and/or an MN-CU 710, which may be examples of the corresponding devices described herein. Generally, the source MN-DU 706, target MN-DU 708 and/or the MN-CU 710 may be associated with a base station, such as a gNB or MN. Aspects of process 700 may be implemented or otherwise triggered when UE 702 detects failure of the MCG link. In some aspects, process 700 illustrates an example case for a RAN architecture involving a split gNB, such as the source MN-DU 706, target MN-DU 708, and MN-CU 710.

[0218] Broadly, process 700 illustrates an example where UE 702 experiences an RLF on the link to a serving gNB-DU (such as source MN-DU 706). Based on the measure report received in the MCG failure information message, MN-CU 710 may determine that UE 702 should be handed over to another GNB-DU (such as to target MN-DU 708). Process 700 illustrates an example call flow for a NR-DC case, with other cases having similar call flows.

[0219] At 712, UE 702 may detect an RLF. In some aspects, the RLF may refer to an MCG failure or an MCG RLF for a radio link between UE 702 and source MN-DU 706. In some aspects, the RLF may be detected based on one or more channel measurements performed by UE 702.

[0220] At 714, UE 702 may transmit or otherwise provide an indication of the RLF to SN 704. In some aspects, the indication of the RLF may be carried or conveyed in an MCG failure information or notification message. In some aspects, UE 702 may carry or convey an indication of a measurement report and/or an MCG link failure cause to MN-CU 710.

[0221] In some aspects, UE 702 may transmit or otherwise provide the indication of the RLF using a bearer carrying or conveying an RRC MCG failure information or notification message. This may include the message being transmitted over a split SRB1 and/or an SRB3.

[0222] At 716, SN 704 may transmit or otherwise provide an indication of the RLF to source MN-CU 710. At 718, MN-CU 710 may make a handover decision based on the indication of the RLF, such as based on the measurement report, RLF cause, and the like.

[0223] At 720, MN-CU 710 may transmit or otherwise provide a UE context setup request message to target MN-DU 708. At 722, target MN-DU 708 may transmit or otherwise provide an indication of the UE context setup response message to MN-CU 710. At 724, MN-CU 710 may transmit or otherwise provide an indication of a UE context modification request message to source MN-DU 706. At 726, MN-CU 710 may transmit or otherwise provide an indication of an SN addition request message to SN 704. The 728, MN-CU 710 may transmit or otherwise provide an indication of a handover command message to SN 704. Again, the handover command message may be a container, or may include a container, including an indication of an RRC message for UE 702. The 730, SN 704 may transmit or otherwise provides an indication of an RRCConnectionReconfiguration message to UE 702.

[0224] At 732, source MN-DU 706 may transmit or otherwise provide an indication of the downlink data delivery status message to MN-CU 710. At 734, source MN-DU 706 may transmit or otherwise provide an indication of a UE context modification response message to MN-CU 710.

[0225] At 736, UE 702 may perform a RACH procedure with target MN-DU 708. In some aspects, this may include UE 702 obtaining synchronization and/or other configuration information for performing wireless communications with target MN-DU 708 after the handover procedure.

[0226] At 738, UE 702 may transmit or otherwise provide an indication of an RRCConnectionReconfiguration complete message to target MN-DU 708. At 740, MN-CU 710 may transmit or otherwise provide an indication of downlink user data to target MN-DU 708. At 742, target MN-DU 708 may transmit or otherwise provide an uplink RRC transfer message to MN-CU 710. At 744, a data transfer may resume for wireless communications between UE 702 and target MN-DU 708 and/or between UE 702 and SN 704. At 746, UE context release may be performed between source MN-DU 706, target MN-DU 708, and/or MN-CU 710.

[0227] **FIGs. 8A and 8B** illustrate an example of a process 800 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. FIG. 8B is generally a continuation of FIG. 8A. In some examples, process 800 may implement aspects of wireless communication systems 100 and/or 200. Aspects of process 800 may be implement a by UE 802, an SN 804, a source MN-DU 806, a source MN-CU 808, a target MN 810, a UPF 812, and/or an AMF 814, which may be examples of the corresponding devices described herein. Generally, the source MN-DU 806 and/or the source MN-CU 808 may be associated with a base station, such as a gNB or source MN. Aspects of process 800 may be implemented or otherwise triggered when UE 802 detects failure of the MCG link. In some aspects, process 800 illustrates an example case where for a RAN architecture involves a split gNB.

[0228] Broadly, process 800 illustrates an example where UE 802 experiences an RLF on the link to a serving gNB-DU (such as source MN-DU 806). Based on the measure report received in the MCG failure information message, source MN-CU 808 may determine that UE 802 should be handed over to a target node (such as to target MN 810).

[0229] At 816, UE 802 may detect an RLF. In some aspects, the RLF may refer to an MCG failure or an MCG RLF for a radio link between UE 802 and source MN-DU 806. In some aspects, the RLF may be detected based on one or more channel measurements performed by UE 802.

[0230] At 818, UE 802 may transmit or otherwise provide an indication of the RLF to SN 804. In some aspects, the indication of the RLF may be carried or conveyed in an MCG failure information or notification message. In some aspects, UE 802 may carry or convey an indication of a measurement report and/or an MCG link failure cause to source MN-CU 808.

[0231] In some aspects, UE 802 may transmit or otherwise provide the indication of the RLF using a bearer carrying or conveying an RRC MCG failure information or notification message. This may include the message being transmitted over a split SRB1 and/or an SRB3.

[0232] At 820, SN 804 may transmit or otherwise provide an indication of the RLF to source MN-CU 808. At 822, source MN-CU 808 may make a handover decision based on the indication of the RLF, such as based at least in part on the measurement report and/or RLF cause.

[0233] At 824, source MN-CU 808 may transmit or otherwise provide a UE context modification request message to source MN-DU 806. At 826, source MN-CU 808 may transmit or otherwise provide an indication of a handover request message to target MN 810.

[0234] At 828, target MN 810 may transmit or otherwise provide an indication of an SN addition request message to SN 804. At 830, SN 804 may respond by transmitting or otherwise providing an indication of an SN addition request acknowledgment message to target MN 804. At 832, target MN 810 may transmit or otherwise provide an indication of a handover request message to source MN-CU 808. At 832, source MN-CU 808 may transmit or otherwise provide an indication of a handover command message to SN 804. Again, the handover command message may be a container, or carry a container, conveying an indication of an RRC message for UE 802. At 834, source MN-CU 808 may transmit or otherwise provide an indication of a handover command message to SN 804. Again, the handover command message may be a container, or carry a container, including an indication of an RRC message for UE 802. At 836, SN 804 may transmit or otherwise provides an indication of an RRCConnectionReconfiguration message to UE 802.

[0235] At 838, source MN-DU 806 may transmit or otherwise provide an indication of the downlink data delivery status message to source MN-CU 808. At 840, source MN-DU 806 may transmit or otherwise provide an indication of a UE context modification request message to source MN-CU 808.

[0236] At 842, UE 802 may perform a RACH procedure with target MN 810. In some aspects, this may include UE 802 obtaining synchronization and/or other configuration information for performing wireless communications with target MN 810 after the handover procedure.

[0237] At 844, UE 802 may transmit or otherwise provide an indication of an RRCConnectionReconfiguration complete message to target MN 810. At 846, target MN 810 may transmit or otherwise provide an indication of SN reconfiguration complete message to SN 804. At 848, data forwarding may be performed from source MN-CU 808 to target MN 810. In some aspects, data forwarding may be accomplished by source MN-CU 808, target MN 810, UPF 812, and/or the AMF 814. At 850, the PDU path session switch may be performed by source MN-CU 808, target MN 810, UPF 812, and/or AMF 814. At 852, UE

context release may be performed between source MN-DU 806, source MN-CU 808, and/or target MN 810.

[0238] **FIG. 9** illustrates an example of a wireless communication system 900 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. In some examples, wireless communication system 900 may implement aspects of wireless communication systems 100 and/or 200 and/or processes 300, 400, 500, 600, 700, and/or 800. Aspects of wireless communication system 900 may be performed by a UE 905, a source MN 910, a first SN 915, a second SN 920, a core network 925, and/or a target MN 930, which may be examples of corresponding devices described herein. Generally, wireless communication 900 illustrates an example DC with one MN and two or more SNs. In some aspects, the first SN 915 and/or the second SN 920 may be configured for communications with source MN 910 via one or more backhaul links, such as an X2/Xn protocol link.

[0239] As discussed, UE 905 may detect or otherwise determine that an RLF (such as an MCG RLF) has occurred for a radio link between UE 905 and source MN 910. In some aspects, UE 905 may perform one or more channel measurements to detect or otherwise determine that the RLF has occurred. In some aspects, UE 905 may identify target MN 930 during one or more of the channel measurements and determine that target MN 930 would be a suitable candidate for establishing a radio link with.

[0240] Upon detecting the RLF, UE 905 may generally transmit or otherwise provide an indication of the RLF to an SN (such as the first SN 915), for forwarding to the source MN 910. As discussed, the SN may generally transmit the indication by encapsulating it according to an X2/Xn protocol and/or by generating its own message for transmission of the RLF indication to source MN 910. Upon receiving the indication of the RLF, source MN 910 would make a handover decision to perform a handover procedure of UE 905 to target MN 930.

[0241] Broadly, wireless communication system 900 illustrates multiple options for UE 905 to transmit the indication of the RLF (such as the failure report message) to source MN 910.

[0242] In the situation where there is at least one SN through which a split SRB1 is configured, UE 905 may transmit the indication of the RLF to each of the SNs with the

configured SIB1 (such as to both the first SN 915 and the second SN 920). In some aspects, this may improve reliability, but at the cost of increased signaling. In another example, UE 905 may transmit the indication of the RLF to the strongest SN (such as the SN having the most reliable and/or capable radio link). In some aspects, this may improve signaling efficiency, but at the cost of reliability.

[0243] In the situation where there is no split SRB1 configured, but there is at least one SN with SRB3 configured, the UE 905 may transmit the indication of the RLF to each of the SNs with the configured SRB3 (such as to both of the first SN 915 and the second SN 920). Again, this may improve reliability, but at the cost of increased signaling. In another example, UE 905 may transmit the indication of the RLF to the strongest SN. Also, this may improve signaling efficiency, but at the cost of reliability.

[0244] **FIG. 10** shows a block diagram 1000 of a device 1005 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. The device 1005 may be an example of aspects of a UE 115 as described herein. The device 1005 may include a receiver 1010, a communications manager 1015, and a transmitter 1020. The device 1005 also may include a processor. Each of these components may be in communication with one another (such as via one or more buses).

[0245] The receiver 1010 may receive information such as packets, user data, or control information associated with various information channels (such as control channels, data channels, and information related to radio bearers for indication of link failure in dual-connectivity systems, etc.). Information may be passed on to other components of the device 1005. The receiver 1010 may be an example of aspects of the transceiver 1320 described with reference to FIG. 13. The receiver 1010 may utilize a single antenna or a set of antennas.

[0246] The communications manager 1015 may detect a RLF between the UE and a MN of a dual-connectivity configuration, transmit, to a SN in the dual-connectivity configuration, an indication that the RLF has occurred, and perform, based on the RLF indication, a handover procedure from the MN to a target node. The communications manager 1015 may be an example of aspects of the communications manager 1310 described herein.

[0247] The communications manager 1015, or its sub-components, may be implemented in hardware, code (such as software or firmware) executed by a processor, or any

combination thereof. If implemented in code executed by a processor, the functions of the communications manager 1015, or its sub-components may be executed by a general-purpose processor, a DSP, an application-specific integrated circuit (ASIC), a FPGA or other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described in the present disclosure.

[0248] The communications manager 1015, or its sub-components, may be physically located at various positions, including being distributed such that portions of functions are implemented at different physical locations by one or more physical components. In some examples, the communications manager 1015, or its sub-components, may be a separate and distinct component in accordance with various aspects of the present disclosure. In some examples, the communications manager 1015, or its sub-components, may be combined with one or more other hardware components, including but not limited to an input/output (I/O) component, a transceiver, a network server, another computing device, one or more other components described in the present disclosure, or a combination thereof in accordance with various aspects of the present disclosure.

[0249] The transmitter 1020 may transmit signals generated by other components of the device 1005. In some examples, the transmitter 1020 may be collocated with a receiver 1010 in a transceiver module. For example, the transmitter 1020 may be an example of aspects of the transceiver 1320 described with reference to FIG. 13. The transmitter 1020 may utilize a single antenna or a set of antennas.

[0250] **FIG. 11** shows a block diagram 1100 of a device 1105 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. The device 1105 may be an example of aspects of a device 1005, or a UE 115 as described herein. The device 1105 may include a receiver 1110, a communications manager 1115, and a transmitter 1135. The device 1105 also may include a processor. Each of these components may be in communication with one another (such as via one or more buses).

[0251] The receiver 1110 may receive information such as packets, user data, or control information associated with various information channels (such as control channels, data channels, and information related to radio bearers for indication of link failure in dual-

connectivity systems, etc.). Information may be passed on to other components of the device 1105. The receiver 1110 may be an example of aspects of the transceiver 1320 described with reference to FIG. 13. The receiver 1110 may utilize a single antenna or a set of antennas.

[0252] The communications manager 1115 may be an example of aspects of the communications manager 1015 as described herein. The communications manager 1115 may include a RLF detection manager 1120, a RLF indication manager 1125, and a HO manager 1130. The communications manager 1115 may be an example of aspects of the communications manager 1310 described herein.

[0253] The RLF detection manager 1120 may detect a RLF between the UE and a MN of a dual-connectivity configuration.

[0254] The RLF indication manager 1125 may transmit, to a SN in the dual-connectivity configuration, an indication that the RLF has occurred.

[0255] The HO manager 1130 may perform, based on the RLF indication, a handover procedure from the MN to a target node.

[0256] The transmitter 1135 may transmit signals generated by other components of the device 1105. In some examples, the transmitter 1135 may be collocated with a receiver 1110 in a transceiver module. For example, the transmitter 1135 may be an example of aspects of the transceiver 1320 described with reference to FIG. 13. The transmitter 1135 may utilize a single antenna or a set of antennas.

[0257] **FIG. 12** shows a block diagram 1200 of a communications manager 1205 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. The communications manager 1205 may be an example of aspects of a communications manager 1015, a communications manager 1115, or a communications manager 1310 described herein. The communications manager 1205 may include a RLF detection manager 1210, a RLF indication manager 1215, a HO manager 1220, a split SRB manager 1225, a RLF cause manager 1230, a SCG SRB manager 1235, a connectivity configuration manager 1240, a RLF recovery request manager 1245, an RRC reestablishment manager 1250, and a SN handover manager 1255. Each of these

modules may communicate, directly or indirectly, with one another (such as via one or more buses).

[0258] The RLF detection manager 1210 may detect a RLF between the UE and a MN of a dual-connectivity configuration. In some examples, the RLF detection manager 1210 may determine that a radio link between the UE and the SN satisfies a performance threshold, where the indication of the RLF is transmitted to the SN based on the performance metric satisfying the threshold.

[0259] The RLF indication manager 1215 may transmit, to a SN in the dual-connectivity configuration, an indication that the RLF has occurred. In some examples, the RLF indication manager 1215 may transmit, to each SN of a set of SNs associated with the UE, the indication of the RLF that further indicates a measurement report. In some aspects, the indication of the RLF is transmitted in an RRC master control group link failure notification message, the RRC master control group link failure notification message including a measurement report and a master control group link failure cause.

[0260] The HO manager 1220 may perform, based on the RLF indication, a handover procedure from the MN to a target node. In some examples, the HO manager 1220 may configure the SN as a new MN for the UE in the dual connectivity configuration. In some examples, the HO manager 1220 may establish a new connection with a new SN in the dual connectivity configuration, the new SN being different from the SN. In some aspects, an inter-RAT handover procedure or an inter-RAT handover procedure.

[0261] The split SRB manager 1225 may receive, prior to the detected RLF, a message from the MN designating the SN as a recipient of the indication of the RLF. In some aspects, the indication of the RLF is transmitted to the SN using a split SRB.

[0262] The RLF cause manager 1230 may indicate a cause of the RLF. In some aspects, a cause may include an RLF detection on a master cell group link or a handover failure.

[0263] The SCG SRB manager 1235 may manage one or more aspects of the indication of the RLF being transmitted to the SN using a secondary cell group SRB.

[0264] The connectivity configuration manager 1240 may transition from the dual connectivity configuration to a single connectivity configuration with the SN.

[0265] The RLF recovery request manager 1245 may determine that the handover procedure was unsuccessful. In some examples, the RLF recovery request manager 1245 may transmit a RLF recovery request message to the SN. In some examples, the RLF recovery request manager 1245 may perform a RLF recover procedure, based on the RLF recovery request message, with the MN.

[0266] The RRC reestablishment manager 1250 may detect, after transmitting the indication of the RLF to the SN, a RLF between the UE and the SN. In some examples, the RRC reestablishment manager 1250 may perform an RRC reestablishment procedure. In some examples, the RRC reestablishment manager 1250 may detect, before transmitting the indication of the RLF, a RLF between the UE and the SN. In some examples, the RRC reestablishment manager 1250 may perform an RRC reestablishment procedure.

[0267] The SN handover manager 1255 may detect the RLF during a SN handover procedure from the SN to a new SN. In some examples, the SN handover manager 1255 may transmit the indication of the RLF to the new SN. In some examples, the SN handover manager 1255 may determine, based on a measurement report, that the target node is unavailable for performing the handover procedure. In some examples, the SN handover manager 1255 may perform the handover procedure from the MN to the SN, where the SN becomes a new MN based on the handover procedure.

[0268] **FIG. 13** shows a diagram of a system 1300 including a device 1305 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. The device 1305 may be an example of or include the components of device 1005, device 1105, or a UE 115 as described herein. The device 1305 may include components for bi-directional voice and data communications including components for transmitting and receiving communications, including a communications manager 1310, an I/O controller 1315, a transceiver 1320, an antenna 1325, memory 1330, and a processor 1340. These components may be in electronic communication via one or more buses (such as bus 1345).

[0269] The communications manager 1310 may detect a RLF between the UE and a MN of a dual-connectivity configuration, transmit, to a SN in the dual-connectivity configuration, an indication that the RLF has occurred, and perform, based on the RLF indication, a handover procedure from the MN to a target node.

[0270] The I/O controller 1315 may manage input and output signals for the device 1305. The I/O controller 1315 also may manage peripherals not integrated into the device 1305. In some aspects, the I/O controller 1315 may represent a physical connection or port to an external peripheral. In some aspects, the I/O controller 1315 may utilize an operating system such as iOS®, ANDROID®, MS-DOS®, MS-WINDOWS®, OS/2®, UNIX®, LINUX®, or another known operating system. In other cases, the I/O controller 1315 may represent or interact with a modem, a keyboard, a mouse, a touchscreen, or a similar device. In some aspects, the I/O controller 1315 may be implemented as part of a processor. In some aspects, a user may interact with the device 1305 via the I/O controller 1315 or via hardware components controlled by the I/O controller 1315.

[0271] The transceiver 1320 may communicate bi-directionally, via one or more antennas, wired, or wireless links as described above. For example, the transceiver 1320 may represent a wireless transceiver and may communicate bi-directionally with another wireless transceiver. The transceiver 1320 also may include a modem to modulate the packets and provide the modulated packets to the antennas for transmission, and to demodulate packets received from the antennas.

[0272] In some aspects, the wireless device may include a single antenna 1325. However, in some aspects the device may have more than one antenna 1325, which may be capable of concurrently transmitting or receiving multiple wireless transmissions.

[0273] The memory 1330 may include RAM and ROM. The memory 1330 may store computer-readable, computer-executable code 1335 including instructions that, when executed, cause the processor to perform various functions described herein. In some aspects, the memory 1330 may contain, among other things, a BIOS which may control basic hardware or software operation such as the interaction with peripheral components or devices.

[0274] The processor 1340 may include an intelligent hardware device, (such as a general-purpose processor, a DSP, a CPU, a microcontroller, an ASIC, an FPGA, a programmable logic device, a discrete gate or transistor logic component, a discrete hardware component, or any combination thereof). In some aspects, the processor 1340 may be configured to operate a memory array using a memory controller. In other cases, a memory controller may be integrated into the processor 1340. The processor 1340 may be configured

to execute computer-readable instructions stored in a memory (such as the memory 1330) to cause the device 1305 to perform various functions (such as functions or tasks supporting radio bearers for indication of link failure in dual-connectivity systems).

[0275] The code 1335 may include instructions to implement aspects of the present disclosure, including instructions to support wireless communications. The code 1335 may be stored in a non-transitory computer-readable medium such as system memory or other type of memory. In some aspects, the code 1335 may not be directly executable by the processor 1340 but may cause a computer (such as when compiled and executed) to perform functions described herein.

[0276] **FIG. 14** shows a block diagram 1400 of a device 1405 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. The device 1405 may be an example of aspects of a base station 105 as described herein. The device 1405 may include a receiver 1410, a communications manager 1415, and a transmitter 1420. The device 1405 also may include a processor. Each of these components may be in communication with one another (such as via one or more buses).

[0277] The receiver 1410 may receive information such as packets, user data, or control information associated with various information channels (such as control channels, data channels, and information related to radio bearers for indication of link failure in dual-connectivity systems, etc.). Information may be passed on to other components of the device 1405. The receiver 1410 may be an example of aspects of the transceiver 1720 described with reference to FIG. 17. The receiver 1410 may utilize a single antenna or a set of antennas.

[0278] The communications manager 1415 may receive, from a UE, an indication of a RLF for a radio link between the UE and a MN of a dual-connectivity configuration and transmit an indication of the RLF to the MN of the dual-connectivity configuration. The communications manager 1415 also may receive, from a SN of a dual-connectivity configuration, an indication of a RLF from a UE, the RLF being for a radio link between the UE and the MN, identify, based on the RLF, a target node for the UE, and perform a handover procedure of the UE from the MN to the target node. The communications manager 1415 may be an example of aspects of the communications manager 1710 described herein.

[0279] The communications manager 1415, or its sub-components, may be implemented in hardware, code (such as software or firmware) executed by a processor, or any combination thereof. If implemented in code executed by a processor, the functions of the communications manager 1415, or its sub-components may be executed by a general-purpose processor, a DSP, an application-specific integrated circuit (ASIC), a FPGA or other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described in the present disclosure.

[0280] The communications manager 1415, or its sub-components, may be physically located at various positions, including being distributed such that portions of functions are implemented at different physical locations by one or more physical components. In some examples, the communications manager 1415, or its sub-components, may be a separate and distinct component in accordance with various aspects of the present disclosure. In some examples, the communications manager 1415, or its sub-components, may be combined with one or more other hardware components, including but not limited to an input/output (I/O) component, a transceiver, a network server, another computing device, one or more other components described in the present disclosure, or a combination thereof in accordance with various aspects of the present disclosure.

[0281] The transmitter 1420 may transmit signals generated by other components of the device 1405. In some examples, the transmitter 1420 may be collocated with a receiver 1410 in a transceiver module. For example, the transmitter 1420 may be an example of aspects of the transceiver 1720 described with reference to FIG. 17. The transmitter 1420 may utilize a single antenna or a set of antennas.

[0282] **FIG. 15** shows a block diagram 1500 of a device 1505 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. The device 1505 may be an example of aspects of a device 1405, or a base station 105 as described herein. The device 1505 may include a receiver 1510, a communications manager 1515, and a transmitter 1535. The device 1505 also may include a processor. Each of these components may be in communication with one another (such as via one or more buses).

[0283] The receiver 1510 may receive information such as packets, user data, or control information associated with various information channels (such as control channels, data channels, and information related to radio bearers for indication of link failure in dual-connectivity systems, etc.). Information may be passed on to other components of the device 1505. The receiver 1510 may be an example of aspects of the transceiver 1720 described with reference to FIG. 17. The receiver 1510 may utilize a single antenna or a set of antennas.

[0284] The communications manager 1515 may be an example of aspects of the communications manager 1415 as described herein. The communications manager 1515 may include a RLF indication manager 1520, a target node manager 1525, and a HO manager 1530. The communications manager 1515 may be an example of aspects of the communications manager 1710 described herein.

[0285] The RLF indication manager 1520 may receive, from a UE, an indication of a RLF for a radio link between the UE and a MN of a dual-connectivity configuration and transmit an indication of the RLF to the MN of the dual-connectivity configuration. The RLF indication manager 1520 may receive, from a SN of a dual-connectivity configuration, an indication of a RLF from a UE, the RLF being for a radio link between the UE and the MN.

[0286] The target node manager 1525 may identify, based on the RLF, a target node for the UE.

[0287] The HO manager 1530 may perform a handover procedure of the UE from the MN to the target node.

[0288] The transmitter 1535 may transmit signals generated by other components of the device 1505. In some examples, the transmitter 1535 may be collocated with a receiver 1510 in a transceiver module. For example, the transmitter 1535 may be an example of aspects of the transceiver 1720 described with reference to FIG. 17. The transmitter 1535 may utilize a single antenna or a set of antennas.

[0289] **FIG. 16** shows a block diagram 1600 of a communications manager 1605 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. The communications manager 1605 may be an example of aspects of a communications manager 1415, a communications manager

1515, or a communications manager 1710 described herein. The communications manager 1605 may include a RLF indication manager 1610, a SN handover manager 1615, a connectivity configuration manager 1620, a SRB1 manager 1625, a SRB3 manager 1630, a RLF recovery request manager 1635, a RLF cause manager 1640, a target node manager 1645, a HO manager 1650, and a SN configuration manager 1655. Each of these modules may communicate, directly or indirectly, with one another (such as via one or more buses).

[0290] The RLF indication manager 1610 may receive, from a UE, an indication of a RLF for a radio link between the UE and a MN of a dual-connectivity configuration. In some examples, the RLF indication manager 1610 may transmit an indication of the RLF to the MN of the dual-connectivity configuration. In some examples, the RLF indication manager 1610 may receive, from a SN of a dual-connectivity configuration, an indication of a RLF from a UE, the RLF being for a radio link between the UE and the MN. In some examples, the RLF indication manager 1610 may receive a backhaul container message that is encapsulated according to an Xn or X2 protocol. In some aspects, the indication of the RLF is received using a split SRB. In some aspects, the indication of the RLF is received using a secondary cell group SRB. In some aspects, the indication of the RLF is received in an RRC master control group failure notification message. In some aspects, the indication of the RLF is received over a least one of a wireless transmission, a backhaul link, or a combination thereof. In some aspects, the indication of the RLF is received from the SN using a split SRB.

[0291] The target node manager 1645 may identify, based on the RLF, a target node for the UE. In some examples, the target node manager 1645 may decode a measurement report indicating the RLF, where the target node is identified based on the measurement report.

[0292] The HO manager 1650 may perform a handover procedure of the UE from the MN to the target node. In some examples, the HO manager 1650 may determine that the MN operates using a first radio frequency spectrum band. In some examples, the HO manager 1650 may determine that the target node operates using the first radio frequency spectrum band, where the target node is identified based on the target node operating using the first radio frequency spectrum band. In some examples, the HO manager 1650 may determine that the MN operates using a first radio access technology. In some examples, the HO manager 1650 may determine that the target node operates using the first radio access

technology, where the target node is identified based on the target node operating using the first radio access technology. In some aspects, the target node is different from the MN and the SN. In some aspects, the SN operates using at least one of the first radio frequency spectrum band, a second radio frequency spectrum band that is different from the first radio frequency spectrum band, or a combination thereof. In some aspects, the SN operates using at least one of the first radio access technology, a second radio access technology that is different from the first radio access technology, or a combination thereof. In some aspects, an inter-RAT handover procedure or an inter-RAT handover procedure.

[0293] The SN handover manager 1615 may configure the SN as a new MN for the UE in the dual-connectivity configuration. In some examples, the SN handover manager 1615 may determine that the MN is unavailable for transmitting the indication of the RLF. In some examples, the SN handover manager 1615 may determine that the SN is configured with a control plane interface with a core network. In some examples, the SN handover manager 1615 may perform, based on the control plane interface configuration, a handover procedure of the UE from the MN to the SN, where the SN becomes a new MN of the UE based on the handover procedure. In some examples, the SN handover manager 1615 may determine, based on the indication of the RLF, that a target node is unavailable for performing the handover procedure with the UE.

[0294] The connectivity configuration manager 1620 may transition from the dual-connectivity configuration to a single connectivity configuration with the UE. In some examples, the connectivity configuration manager 1620 may configure the SN as a new MN for the UE in at least one of the dual-connectivity configuration or a single-connectivity configuration. In some aspects, the target node includes a second DU of a dual-DU configuration associated with the MN.

[0295] The SRB1 manager 1625 may receive the indication of the RLF in a first message over a SRB1. In some examples, the SRB1 manager 1625 may decode the first message to determine that the RLF on a master control group radio link has occurred. In some examples, the SRB1 manager 1625 may transmit the indication of the RLF to the MN in a second message.

[0296] The SRB3 manager 1630 may receive the indication of the RLF over a SRB3, where transmitting the indication includes encapsulating the indication of the RLF in a

backhaul container message for transmitting to the MN. In some aspects, the backhaul container message is encapsulated according to an Xn or X2 protocol.

[0297] The RLF recovery request manager 1635 may receive, from the UE, a RLF recovery request message indicating that a handover procedure was unsuccessful. In some examples, the RLF recovery request manager 1635 may transmit, to the MN, an indication of the RLF recovery request message. In some examples, the RLF recovery request manager 1635 may receive, from the SN, an indication of a RLF recovery request message indicating that the handover procedure was unsuccessful. In some examples, the RLF recovery request manager 1635 may perform a RLF recovery procedure with the UE.

[0298] The RLF cause manager 1640 may manage one or more aspects of the indication of the RLF further indicating a cause for the RLF.

[0299] The SN configuration manager 1655 may transmit, prior to receiving the indication of the RLF, a message to the UE designating the SN as a recipient of the indication of the RLF. In some examples, the SN configuration manager 1655 may determine, based on the indication of the RLF, that the target node is unavailable for performing the handover procedure with the UE. In some examples, the SN configuration manager 1655 may determine that the SN is configured with a control plane interface with a core network. In some examples, the SN configuration manager 1655 may perform, based on the control plane interface configuration, a handover procedure of the UE to the SN, where the SN becomes a new MN of the UE based on the handover procedure.

[0300] **FIG. 17** shows a diagram of a system 1700 including a device 1705 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. The device 1705 may be an example of or include the components of device 1405, device 1505, or a base station 105 as described herein. The device 1705 may include components for bi-directional voice and data communications including components for transmitting and receiving communications, including a communications manager 1710, a network communications manager 1715, a transceiver 1720, an antenna 1725, memory 1730, a processor 1740, and an inter-station communications manager 1745. These components may be in electronic communication via one or more buses (such as bus 1750).

[0301] The communications manager 1710 may receive, from a UE, an indication of a RLF for a radio link between the UE and a MN of a dual-connectivity configuration and transmit an indication of the RLF to the MN of the dual-connectivity configuration. The communications manager 1710 also may receive, from a SN of a dual-connectivity configuration, an indication of a RLF from a UE, the RLF being for a radio link between the UE and the MN, identify, based on the RLF, a target node for the UE, and perform a handover procedure of the UE from the MN to the target node.

[0302] The network communications manager 1715 may manage communications with the core network (such as via one or more wired backhaul links). For example, the network communications manager 1715 may manage the transfer of data communications for client devices, such as one or more UEs 115.

[0303] The transceiver 1720 may communicate bi-directionally, via one or more antennas, wired, or wireless links as described above. For example, the transceiver 1720 may represent a wireless transceiver and may communicate bi-directionally with another wireless transceiver. The transceiver 1720 also may include a modem to modulate the packets and provide the modulated packets to the antennas for transmission, and to demodulate packets received from the antennas.

[0304] In some aspects, the wireless device may include a single antenna 1725. However, in some aspects the device may have more than one antenna 1725, which may be capable of concurrently transmitting or receiving multiple wireless transmissions.

[0305] The memory 1730 may include RAM, ROM, or a combination thereof. The memory 1730 may store computer-readable code 1735 including instructions that, when executed by a processor (such as the processor 1740) cause the device to perform various functions described herein. In some aspects, the memory 1730 may contain, among other things, a BIOS which may control basic hardware or software operation such as the interaction with peripheral components or devices.

[0306] The processor 1740 may include an intelligent hardware device, (such as a general-purpose processor, a DSP, a CPU, a microcontroller, an ASIC, an FPGA, a programmable logic device, a discrete gate or transistor logic component, a discrete hardware component, or any combination thereof). In some aspects, the processor 1740 may be configured to operate a memory array using a memory controller. In some aspects, a memory

controller may be integrated into processor 1740. The processor 1740 may be configured to execute computer-readable instructions stored in a memory (such as the memory 1730) to cause the device 1705 to perform various functions (such as functions or tasks supporting radio bearers for indication of link failure in dual-connectivity systems).

[0307] The inter-station communications manager 1745 may manage communications with other base station 105, and may include a controller or scheduler for controlling communications with UEs 115 in cooperation with other base stations 105. For example, the inter-station communications manager 1745 may coordinate scheduling for transmissions to UEs 115 for various interference mitigation techniques such as beamforming or joint transmission. In some examples, the inter-station communications manager 1745 may provide an X2 interface within an LTE/LTE-A wireless communication network technology to provide communication between base stations 105.

[0308] The code 1735 may include instructions to implement aspects of the present disclosure, including instructions to support wireless communications. The code 1735 may be stored in a non-transitory computer-readable medium such as system memory or other type of memory. In some aspects, the code 1735 may not be directly executable by the processor 1740 but may cause a computer (such as when compiled and executed) to perform functions described herein.

[0309] **FIG. 18** shows a flowchart illustrating a method 1800 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. The operations of method 1800 may be implemented by a UE 115 or its components as described herein. For example, the operations of method 1800 may be performed by a communications manager as described with reference to FIGs. 10 through 13. In some examples, a UE may execute a set of instructions to control the functional elements of the UE to perform the functions described below. Additionally, or alternatively, a UE may perform aspects of the functions described below using special-purpose hardware.

[0310] At 1805, the UE may detect a RLF between the UE and a MN of a dual-connectivity configuration. The operations of 1805 may be performed according to the methods described herein. In some examples, aspects of the operations of 1805 may be performed by a RLF detection manager as described with reference to FIGs. 10 through 13.

[0311] At 1810, the UE may transmit, to a SN in the dual-connectivity configuration, an indication that the RLF has occurred. The operations of 1810 may be performed according to the methods described herein. In some examples, aspects of the operations of 1810 may be performed by a RLF indication manager as described with reference to FIGs. 10 through 13.

[0312] At 1815, the UE may perform, based on the RLF indication, a handover procedure from the MN to a target node. The operations of 1815 may be performed according to the methods described herein. In some examples, aspects of the operations of 1815 may be performed by a HO manager as described with reference to FIGs. 10 through 13.

[0313] **FIG. 19** shows a flowchart illustrating a method 1900 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. The operations of method 1900 may be implemented by a base station 105 or its components as described herein. For example, the operations of method 1900 may be performed by a communications manager as described with reference to FIGs. 14 through 17. In some examples, a base station may execute a set of instructions to control the functional elements of the base station to perform the functions described below. Additionally, or alternatively, a base station may perform aspects of the functions described below using special-purpose hardware.

[0314] At 1905, the base station may receive, from a UE, an indication of a RLF for a radio link between the UE and a MN of a dual-connectivity configuration. The operations of 1905 may be performed according to the methods described herein. In some examples, aspects of the operations of 1905 may be performed by a RLF indication manager as described with reference to FIGs. 14 through 17.

[0315] At 1910, the base station may transmit an indication of the RLF to the MN of the dual-connectivity configuration. The operations of 1910 may be performed according to the methods described herein. In some examples, aspects of the operations of 1910 may be performed by a RLF indication manager as described with reference to FIGs. 14 through 17.

[0316] **FIG. 20** shows a flowchart illustrating a method 2000 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. The operations of method 2000 may be implemented by a base station 105 or its components as described herein. For example, the operations of method 2000 may be performed by a communications manager as described with reference to FIGs. 14 through

17. In some examples, a base station may execute a set of instructions to control the functional elements of the base station to perform the functions described below. Additionally, or alternatively, a base station may perform aspects of the functions described below using special-purpose hardware.

[0317] At 2005, the base station may receive, from a SN of a dual-connectivity configuration, an indication of a RLF from a UE, the RLF being for a radio link between the UE and the MN. The operations of 2005 may be performed according to the methods described herein. In some examples, aspects of the operations of 2005 may be performed by a RLF indication manager as described with reference to FIGs. 14 through 17.

[0318] At 2010, the base station may identify, based on the RLF, a target node for the UE. The operations of 2010 may be performed according to the methods described herein. In some examples, aspects of the operations of 2010 may be performed by a target node manager as described with reference to FIGs. 14 through 17.

[0319] At 2015, the base station may perform a handover procedure of the UE from the MN to the target node. The operations of 2015 may be performed according to the methods described herein. In some examples, aspects of the operations of 2015 may be performed by a HO manager as described with reference to FIGs. 14 through 17.

[0320] It should be noted that the methods described herein describe possible implementations, and that the operations and the steps may be rearranged or otherwise modified and that other implementations are possible. Further, aspects from two or more of the methods may be combined.

[0321] **FIG. 21** illustrates an example of a system 2100 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. In some examples, system 2100 may implement aspects of wireless communication systems 100 and/or 200.

[0322] Generally, wireless communication system 2100 may include a UE 2105 that is connected to an MN 2110 and SN 2115 in a dual-connectivity configuration. In some aspects, MN 2110 may be connected to SN 2115 in order to exchange information via a wireless link and/or a wired link, such as a backhaul link 2130 (such as an X2/Xn protocol connection). Generally, UE 2105 may connect to MN 2110 and/or SN 2115 via one or more

physical wireless radio links, such as an MCG link for MN 2110 and an SCG link for SN 2115.

[0323] In some aspects, MN 2110 may be associated with a protocol stack 2120 that includes a physical layer (PHY), medium access control layer (MAC), radio link control layer (RLC), and packet data convergence protocol layer (PDCP). SN 2115 may be associated with a similar protocol stack 2125.

[0324] In some aspects, UE 2105 may be configured to communicate with MN 2110 and/or SN 2115 over the wireless radio links using one or more radio bearers (such as logical channels). UE 2105 may be configured by MN 2110 to use various radio bearers during an RRC connection setup procedure or a handover procedure, for example.

[0325] Such radio bearers may include one or more direct SRBs for communicating control information between UE 2105 and MN 2110 or SN 2115, such as SRB1 2135, SRB2 2140, and SRB3 2150. In some aspects, direct SRBs may be radio bearers that are not shared between MN 2110 and SN 2115. SRB1 2135 may be established by MN 2110 during an RRC connection setup procedure and SRB2 2140 may be established after SRB1 and after security activation, for example. SRB3 2150 may be established by SN 2115. Not all UEs 2105 may support a direct SRB (such as SRB3 2150) with SN 2115, however, due to hardware or software constraints, for example.

[0326] In some aspects, UE 2105 may be configured to communicate control information with MN 2110 and/or SN 2115 via a split SRB that may be shared by MN 2110 and SN 2115, such as split SRB 2145, for example. In some aspects, split SRB 2145 may be a split SRB1 or split SRB2, for example. Split SRB 2145 may include an MN leg 2145-a and an SN leg 2145-b. Communications on the MN leg 2145-a may use a RAN associated with the MN 2110, and communications via the SN leg 2145-b may use a RAN associated with the SN 2115, for example. In some aspects, the same messages or signals may be communicated via both MN leg 2145-and SN leg 2145-b. A split SRB may be split at the PDCP layer, for example.

[0327] In some aspects, UE 2105 may be configured to communicate user data with MN 2110 and/or SN 2115 via data radio bearers. Such data radio bearers may include DRB 2160 and DRB 2165, for example.

[0328] In some aspects, a UE 2105 in a dual-connectivity system may be configured, by MN 2110 and/or by SN 2115, to communicate with MN 2110 and SN 2115 using an active SRB, such as split SRB 2145 and/or direct SRB3 2150. The active SRB may be associated with MN 2110 and SN 2115 because a UE 2105 may communicate with SN 2215 and/or MN 2110 (either directly, or via SN 2215) via the active SRB.

[0329] In some aspects, a UE 2105 having an active SRB (such as a UE 2105 configured to communicate with SN 2115 and/or MN 2110 via the active SRB) may detect an RLF for a radio link associated with the MN 2210 and may transmit an indication of the RLF to the SN 2115 via the active SRB. The SN 2115 may then forward or otherwise transmit the indication of the RLF to MN 2110.

[0330] In some aspects, a UE 2105 may detect an RLF at a time when the UE 2105 does not have an active SRB. That is, a UE 2105 may detect an RLF with MN 2110 before a split SRB 2145 has been established. Thus, in some aspects, a UE 2105 may be configured to communicate with SN 2115 and MN 2110 via a default split radio bearer 2155 under certain circumstances. For example, the UE 2105 may be configured to use default split radio bearer 2155 to communicate an indication of an RLF to SN 2115 if the UE 2105 detects an RLF with the MN 2110 and determines an absence of an active SRB for communicating with the SN 2115; such as if the UE 2105 determines that split SRB 2145 and SRB3 2150 are not active or available for transmitting the indication of the RLF failure to SN 2115. The UE 2105 may determine an absence of an active SRB based on, for example, an absence of configuration information specifying an active SRB, or based on a lack of availability of an active SRB, and/or based on another criteria.

[0331] In some aspects, a UE 2105 may use DRB 2160 to transmit an indication of an RLF to SN 2115 if the UE 2105 detects an RLF with the MN 2110 and determines that UE 2105 has not been configured to communicate with SN 2115 via an SRB, such as via split SRB 2145 or SRB3 2150. In this case, UE 2105 may transmit the indication of the RLF via DRB 2160 within an RRC container, and may include an RLF failure type indicator in a PDCP header or MAC sub-header associated with the RRC container to alert the SN 2115 that the RRC container includes an indication of an RLF.

[0332] Thus, as described above, the default split radio bearer 2155 and/or DRB 2160 may be used, by UE 2105, as an alternative communication channel with SN 2115 in cases

when UE 2105 detects an RLF with the MN 2110 when the UE 2105 is not configured to communicate with SN 2115 via split SRB 2145 or SRB3 2150.

[0333] In some aspects, SN 2115 may receive the indication of the RLF from UE 2105 via default split radio bearer 2155 or DRB 2160, and may forward or otherwise transmit an indication of the RLF to the MN 2110 via backhaul link 2130. MN 2110 may then initiate or perform a handover procedure based on receiving the second indication of the RLF as described with respect to FIGs. 3–20, for example.

[0334] **FIG. 22** illustrates an example of a process 2200 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. In some examples, process 2200 may implement aspects of wireless communication systems 100 and/or 200. Aspects of process 2200 may be implemented by a UE 2205, an SN 2215, and/or an MN 2210 (such as a source MN), which may be examples of the corresponding devices described herein. Aspects of process 2200 may be implemented or otherwise triggered when UE 2205 detects a failure of the MCG link. Aspects of process 2200 may be combined with, performed instead of, or performed in addition to aspects of processes 300, 400, 500, 600, 700, and/or 800.

[0335] At 2220, UE 2205 may receive an indication of a default split radio bearer, such as a default split SRB. In some aspects, UE 2205 may receive the indication of the default split radio bearer via an initial configuration of UE 2205, such as in a factory setting that is stored in UE 2205. In some aspects, UE 2205 may receive the indication of the default split radio bearer from MN 2210 or SN 2215, for example. In some aspects, UE 2205 may receive the indication via RRC signaling, such as during an RRC connection procedure, for example. In some aspects, UE 2205 may receive the indication via a system information block (SIB). For example, the UE 2205 may be associated with a cell, and the MN 2210 may transmit a SIB that includes an indication of a default split radio bearer to one or more additional UEs 2205 in the same cell to reduce signaling overhead in the network.

[0336] At 2225, UE 2205 may detect an RLF. In some aspects, the RLF may refer to an MCG failure or an MCG RLF for a radio link between UE 2205 and MN 2210. In some aspects, the RLF may be detected based on one or more channel measurements performed by UE 2205.

[0337] At 2230, UE 2205 may determine an absence of an active radio bearer. In some aspects, UE 2205 may determine the absence of the active radio bearer by determining whether UE 2205 has been configured to communicate with SN 2215 via a split SRB, such as a split SRB1, for example. That is, UE 2205 may determine the absence of the active radio bearer based on a determination that UE 2205 has not been configured to communicate with SN 2215 via a split SRB. In some aspects, UE 2205 may determine the absence of the active radio bearer by determining whether UE 2205 has been configured to communicate with SN 2215 via a direct SRB, such as SRB3, for example. That is, UE 2205 may determine the absence of the active radio bearer based on a determination that UE 2205 has not been configured to communicate with SN 2215 via a direct SRB. In some aspects, UE may determine the absence of the active radio bearer based on a determination that UE 2205 has not been configured to communicate with SN 2215 via either a split SRB or a direct SRB.

[0338] At 2235, UE 2205 may transmit or otherwise provide an indication of the RLF to SN 2215 via the default split radio bearer. In some aspects, the indication of the RLF may be carried or conveyed in an MCG failure information or notification message. In some aspects, the indication of the RLF (such as the MCG failure information message) may include a measurement report and/or an MCG link failure cause.

[0339] At 2240, SN 2215 may forward or otherwise transmit an indication of the RLF to MN 2210. In some aspects, SN 2215 may transmit an indication of the RLF to MN 2210 via a backhaul link, for example. The indication of the RLF transmitted by the SN 2215 may be essentially the same as the indication of the RLF transmitted by UE 2205, or it may be in a different format or include different information.

[0340] At 2245, MN 2210 may make a handover decision. In some aspects, MN 2210 may determine or otherwise decide to perform the handover based on the measurement report. Accordingly, MN 2210 may determine to initiate an inter-MN handover procedure of UE 2205.

[0341] At 2250, MN 2210 may transmit or otherwise provide a handover message to SN 2215. In some aspects, the handover message may include a container, or be in a container, along with an RRC message to be sent to the UE 2205. In some aspects, the handover message may be a handover request associated with performing a handover procedure to hand over the UE 2205 from the MN 2210 to a target node.

[0342] At 2255, SN 2215 may transmit or otherwise provide an indication of an RRCConnectionReconfiguration message to UE 2205 via the default split radio bearer. In some aspects, the RRCConnectionReconfiguration message may carry or convey an indication of a UE MCG and SCG configuration for subsequent communications with a target MN and SN 2215. In some aspects, the RRCConnectionReconfiguration message may carry or convey an indication of information for UE 2205 to use for generating new security keys. In some aspects, the indication of the RRCConnectionReconfiguration message may provide or include an indication of the handover request (such as the handover message) received from MN 2210 at 2250.

[0343] **FIG. 23** illustrates an example of a process 2300 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. In some examples, process 2300 may implement aspects of wireless communication systems 100 and/or 200. Aspects of process 2300 may be implemented by UE 2305, an SN 2315, and/or an MN 2310 (such as a source MN), which may be examples of the corresponding devices described herein. Aspects of process 2300 may be implemented or otherwise triggered when UE 2305 detects a failure of the MCG link. Aspects of process 2300 may be combined with, performed instead of, and/or performed in addition to aspects of processes 300, 400, 500, 600, 700, and/or 800.

[0344] At 2320, UE 2305 may detect an RLF. In some aspects, the RLF may refer to an MCG failure or an MCG RLF for a radio link between UE 2305 and MN 2310. In some aspects, the RLF may be detected based on one or more channel measurements performed by UE 2305.

[0345] At 2325, UE 2305 may determine whether UE 2305 is configured to communicate with SN 2315 via an SRB, such as a split SRB (such as split SRB1) or a direct SRB (such as SRB3).

[0346] At 2330, UE 2305 may, based on a determination at 2325 that UE 2305 is not configured to communicate with SN 2315 via an SRB, transmit or otherwise provide an indication of the RLF to SN 2315 via a DRB. In some aspects, the indication of the RLF may be carried or conveyed in an MCG failure information or notification message that may be included (such as encapsulated) in an RRC container. In some aspects, the indication of the RLF (such as the MCG failure information message) may include a measurement report

and/or an MCG link failure cause. In some aspects, the RRC container may include or may be associated with a PDCP header and/or a MAC sub-header. The PDCP header and/or MAC sub-header may include an RLF type indicator to indicate that the RRC container includes an indication of an RLF, for example. The RLF type indicator may be a single-bit flag, for example, or may include multiple bits.

[0347] At 2340, SN 2315 may identify the RLF type indicator in the PDCP header or MAC sub-header.

[0348] At 2345, SN 2315 may, based on identifying the RLF type indicator at 2340, forward or otherwise transmit the indication of the RLF to MN 2310. In some aspects, SN 2315 may transmit an indication of the RLF to MN 2310 via a backhaul link, for example. The indication of the RLF transmitted by the SN 2315 may be essentially the same as the indication of the RLF transmitted by UE 2305, or it may be in a different format or include different information. For example, SN 2315 may forward the RRC container that includes the MCG failure information to MN 2310.

[0349] At 2345, MN 2310 may make a handover decision. In some aspects, MN 2310 may determine or otherwise decide to perform the handover based on the measurement report. Accordingly, MN 2310 may determine to initiate an inter-MN handover procedure of UE 2305.

[0350] At 2350, MN 2310 may transmit or otherwise provide a handover message to SN 2315. In some aspects, the handover message may include a container, or be in a container, along with an RRC message to be sent to the UE 2305. In some aspects, the handover message may include a type indication that indicates the SN leg. In some aspects, the handover message may be a handover request associated with performing a handover procedure to hand over the UE 2305 from the MN 2310 to a target node.

[0351] At 2355, SN 2215 may transmit or otherwise provide an indication of an RRCConnectionReconfiguration message to UE 2205 via the same DRB on which UE 2305 transmitted the indication of the RLF at 2330. In some aspects, the RRCConnectionReconfiguration message may carry or convey an indication of a UE MCG and SCG configuration for subsequent communications with a target MN and SN 2215. In some aspects, the RRCConnectionReconfiguration message may carry or convey an indication of information for UE 2305 to use for generating new security keys. In some

aspects, the indication of the RRCConnectionReconfiguration message may provide or include an indication of the handover request (such as the handover message) received from MN 2310 at 2350.

[0352] **FIG. 24** shows a block diagram 2400 of a device 2405 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. The device 2405 may be an example of aspects of a UE 115 as described herein. The device 2405 may include a receiver 2410, a communications manager 2415, and a transmitter 2420. The device 2405 also may include a processor. Each of these components may be in communication with one another (such as via one or more buses).

[0353] The receiver 2410 may receive information such as packets, user data, or control information associated with various information channels (such as control channels, data channels, and information related to radio bearers for indication of link failure in dual-connectivity systems, etc.). Information may be passed on to other components of the device 2405. The receiver 2410 may be an example of aspects of the transceiver 2720 described with reference to FIG. 27. The receiver 2410 may utilize a single antenna or a set of antennas.

[0354] The communications manager 2415 may detect a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration, identify, based on the detection of the radio link failure and on an absence of an active radio bearer associated with the master node and a secondary node, a default split radio bearer associated with the master node and the secondary node, and transmit an indication of the radio link failure to the secondary node via the default split radio bearer. The communications manager 2415 also may detect a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration, determine, based on the detection of the radio link failure, whether the UE is configured to communicate with a secondary node in the dual-connectivity configuration via a signaling radio bearer, and transmit, based on a determination that the UE is not configured to communicate with the secondary node via the signaling radio bearer, an indication of the radio link failure to the secondary node via a data radio bearer. The communications manager 2415 may be an example of aspects of the communications manager 2710 described herein.

[0355] The communications manager 2415, or its sub-components, may be implemented in hardware, code (such as software or firmware) executed by a processor, or any combination thereof. If implemented in code executed by a processor, the functions of the communications manager 2415, or its sub-components may be executed by a general-purpose processor, a DSP, an application-specific integrated circuit (ASIC), a FPGA or other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described in the present disclosure.

[0356] The communications manager 2415, or its sub-components, may be physically located at various positions, including being distributed such that portions of functions are implemented at different physical locations by one or more physical components. In some examples, the communications manager 2415, or its sub-components, may be a separate and distinct component in accordance with various aspects of the present disclosure. In some examples, the communications manager 2415, or its sub-components, may be combined with one or more other hardware components, including but not limited to an input/output (I/O) component, a transceiver, a network server, another computing device, one or more other components described in the present disclosure, or a combination thereof in accordance with various aspects of the present disclosure.

[0357] The transmitter 2420 may transmit signals generated by other components of the device 2405. In some examples, the transmitter 2420 may be collocated with a receiver 2410 in a transceiver manager. For example, the transmitter 2420 may be an example of aspects of the transceiver 2720 described with reference to FIG. 27. The transmitter 2420 may utilize a single antenna or a set of antennas.

[0358] **FIG. 25** shows a block diagram 2500 of a device 2505 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. The device 2505 may be an example of aspects of a device 2405, or a UE 115 as described herein. The device 2505 may include a receiver 2510, a communications manager 2515, and a transmitter 2535. The device 2505 also may include a processor. Each of these components may be in communication with one another (such as via one or more buses).

[0359] The receiver 2510 may receive information such as packets, user data, or control information associated with various information channels (such as control channels, data channels, and information related to radio bearers for indication of link failure in dual-connectivity systems, etc.). Information may be passed on to other components of the device 2505. The receiver 2510 may be an example of aspects of the transceiver 2720 described with reference to FIG. 27. The receiver 2510 may utilize a single antenna or a set of antennas.

[0360] The communications manager 2515 may be an example of aspects of the communications manager 2415 as described herein. The communications manager 2515 may include a link failure detection manager 2520, a bearer identification manager 2525, and a link failure notification manager 2530. The communications manager 2515 may be an example of aspects of the communications manager 2710 described herein.

[0361] The link failure detection manager 2520 may detect a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration.

[0362] The bearer identification manager 2525 may identify, based on the detection of the radio link failure and on an absence of an active radio bearer associated with the master node and a secondary node, a default split radio bearer associated with the master node and the secondary node. The bearer identification manager 2525 also may determine, based on the detection of the radio link failure, whether the UE is configured to communicate with a secondary node in the dual-connectivity configuration via a signaling radio bearer.

[0363] The link failure notification manager 2530 may transmit an indication of the radio link failure to the secondary node via the default split radio bearer. The link failure notification manager 2530 also may transmit, based on a determination that the UE is not configured to communicate with the secondary node via the signaling radio bearer, an indication of the radio link failure to the secondary node via a data radio bearer.

[0364] The link failure detection manager 2520 may detect a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration.

[0365] The transmitter 2535 may transmit signals generated by other components of the device 2505. In some examples, the transmitter 2535 may be collocated with a receiver 2510 in a transceiver manager. For example, the transmitter 2535 may be an example of aspects of

the transceiver 2720 described with reference to FIG. 27. The transmitter 2535 may utilize a single antenna or a set of antennas.

[0366] **FIG. 26** shows a block diagram 2600 of a communications manager 2605 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. The communications manager 2605 may be an example of aspects of a communications manager 2415, a communications manager 2515, or a communications manager 2710 described herein. The communications manager 2605 may include a link failure detection manager 2610, a bearer identification manager 2615, a link failure notification manager 2620, and a handover manager 2625. Each of these managers may communicate, directly or indirectly, with one another (such as via one or more buses).

[0367] The link failure detection manager 2610 may detect a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration.

[0368] The bearer identification manager 2615 may identify, based on the detection of the radio link failure and on an absence of an active radio bearer associated with the master node and a secondary node, a default split radio bearer associated with the master node and the secondary node. In some aspects, the default split radio bearer includes an SRB1 split signaling radio bearer.

[0369] In some examples, the bearer identification manager 2615 may receive an indication of the default split radio bearer, where the default split radio bearer is identified based on the indication of the default split radio bearer. In some aspects, the indication of the default split radio bearer is received from the master node before detecting the radio link failure. In some aspects, the indication of the default split radio bearer is received via RRC signaling or within a SIB.

[0370] In some examples, the bearer identification manager 2615 may determine the absence of the active radio bearer. In some examples, determining the absence of the active radio bearer includes determining whether the UE is configured to communicate with the secondary node via an SRB1 split signaling radio bearer. In some examples, determining the absence of the active radio bearer includes determining whether the UE is configured to communicate with the secondary node via an SRB3 direct signaling radio bearer.

[0371] In some examples, the bearer identification manager 2615 may determine, based on the detection of the radio link failure, whether the UE is configured to communicate with a secondary node in the dual-connectivity configuration via a signaling radio bearer. In some examples, determining whether the UE is configured to communicate with the secondary node via the signaling radio bearer includes determining whether the UE is configured to communicate with the secondary node via an SRB1 split signaling radio bearer. In some examples, determining whether the UE is configured to communicate with the secondary node via the signaling radio bearer includes determining whether the UE is configured to communicate with the secondary node via an SRB3 direct signaling radio bearer.

[0372] The link failure notification manager 2620 may transmit an indication of the radio link failure to the secondary node via the default split radio bearer.

[0373] In some examples, the link failure notification manager 2620 may transmit, based on a determination that the UE is not configured to communicate with the secondary node via the signaling radio bearer, an indication of the radio link failure to the secondary node via a data radio bearer. In some examples, transmitting the indication of the radio link failure includes transmitting a measurement report including measurements associated with the target node. In some examples, transmitting the indication of the radio link failure to the secondary node includes transmitting the indication of the radio link failure to the secondary node in an RRC container.

[0374] In some examples, transmitting the indication of the radio link failure to the secondary node includes transmitting a radio link failure type indicator in a packet data convergence protocol (PDCP) header associated with the RRC container. In some examples, transmitting the indication of the radio link failure to the secondary node includes transmitting a radio link failure type indicator in a medium access control (MAC) sub-header associated with the RRC container.

[0375] The handover manager 2625 may perform, based on detecting the radio link failure, a handover procedure from the master node to a target node.

[0376] In some examples, the handover manager 2625 may receive, from the secondary node via the default split radio bearer, a reconfiguration message after transmitting the indication of the radio link failure, where the handover procedure is performed based on the reconfiguration message.

[0377] In some examples, the handover manager 2625 may receive, from the secondary node via the data radio bearer, a reconfiguration message after transmitting the indication of the radio link failure, where the handover procedure is performed based on the reconfiguration message.

[0378] **FIG. 27** shows a diagram of a system 2700 including a device 2705 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. The device 2705 may be an example of or include the components of device 2405, device 2505, or a UE 115 as described herein. The device 2705 may include components for bi-directional voice and data communications including components for transmitting and receiving communications, including a communications manager 2710, an I/O controller 2715, a transceiver 2720, an antenna 2725, memory 2730, and a processor 2740. These components may be in electronic communication via one or more buses (such as bus 2745).

[0379] The communications manager 2710 may detect a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration, identify, based on the detection of the radio link failure and on an absence of an active radio bearer associated with the master node and a secondary node, a default split radio bearer associated with the master node and the secondary node, and transmit an indication of the radio link failure to the secondary node via the default split radio bearer. The communications manager 2710 also may detect a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration, determine, based on the detection of the radio link failure, whether the UE is configured to communicate with a secondary node in the dual-connectivity configuration via a signaling radio bearer, and transmit, based on a determination that the UE is not configured to communicate with the secondary node via the signaling radio bearer, an indication of the radio link failure to the secondary node via a data radio bearer.

[0380] The I/O controller 2715 may manage input and output signals for the device 2705. The I/O controller 2715 also may manage peripherals not integrated into the device 2705. In some aspects, the I/O controller 2715 may represent a physical connection or port to an external peripheral. In some aspects, the I/O controller 2715 may utilize an operating system such as iOS®, ANDROID®, MS-DOS®, MS-WINDOWS®, OS/2®, UNIX®, LINUX®, or another known operating system. In other cases, the I/O controller 2715 may represent or

interact with a modem, a keyboard, a mouse, a touchscreen, or a similar device. In some aspects, the I/O controller 2715 may be implemented as part of a processor. In some aspects, a user may interact with the device 2705 via the I/O controller 2715 or via hardware components controlled by the I/O controller 2715.

[0381] The transceiver 2720 may communicate bi-directionally, via one or more antennas, wired, or wireless links as described above. For example, the transceiver 2720 may represent a wireless transceiver and may communicate bi-directionally with another wireless transceiver. The transceiver 2720 also may include a modem to modulate the packets and provide the modulated packets to the antennas for transmission, and to demodulate packets received from the antennas.

[0382] In some aspects, the wireless device may include a single antenna 2725. However, in some aspects the device may have more than one antenna 2725, which may be capable of concurrently transmitting or receiving multiple wireless transmissions.

[0383] The memory 2730 may include RAM and ROM. The memory 2730 may store computer-readable, computer-executable code 2735 including instructions that, when executed, cause the processor to perform various functions described herein. In some aspects, the memory 2730 may contain, among other things, a BIOS which may control basic hardware or software operation such as the interaction with peripheral components or devices.

[0384] The processor 2740 may include an intelligent hardware device, (such as a general-purpose processor, a DSP, a CPU, a microcontroller, an ASIC, an FPGA, a programmable logic device, a discrete gate or transistor logic component, a discrete hardware component, or any combination thereof). In some aspects, the processor 2740 may be configured to operate a memory array using a memory controller. In other cases, a memory controller may be integrated into the processor 2740. The processor 2740 may be configured to execute computer-readable instructions stored in a memory (such as the memory 2730) to cause the device 2705 to perform various functions (such as functions or tasks supporting radio bearers for indication of link failure in dual-connectivity systems).

[0385] The code 2735 may include instructions to implement aspects of the present disclosure, including instructions to support wireless communications. The code 2735 may be stored in a non-transitory computer-readable medium such as system memory or other

type of memory. In some aspects, the code 2735 may not be directly executable by the processor 2740 but may cause a computer (such as when compiled and executed) to perform functions described herein.

[0386] **FIG. 28** shows a block diagram 2800 of a device 2805 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. The device 2805 may be an example of aspects of a base station 105 as described herein. The device 2805 may include a receiver 2810, a communications manager 2815, and a transmitter 2820. The device 2805 also may include a processor. Each of these components may be in communication with one another (such as via one or more buses).

[0387] The receiver 2810 may receive information such as packets, user data, or control information associated with various information channels (such as control channels, data channels, and information related to radio bearers for indication of link failure in dual-connectivity systems, etc.). Information may be passed on to other components of the device 2805. The receiver 2810 may be an example of aspects of the transceiver 3120 described with reference to FIG. 31. The receiver 2810 may utilize a single antenna or a set of antennas.

[0388] The communications manager 2815 may receive, from a UE via a data radio bearer, a first indication of a radio link failure of a radio link between the UE and a master node of the dual-connectivity configuration and transmit a second indication of the radio link failure to the master node.

[0389] The communications manager 2815 also may transmit, to a UE, an indication of a default split radio bearer for communicating an indication of a radio link failure of a radio link between the UE and the master node, receive, from a secondary node of the dual-connectivity configuration, the indication of the radio link failure for the UE, identify, based on the indication of the radio link failure, a target node for the UE, and transmit, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node.

[0390] The communications manager 2815 also may receive, from a secondary node of the dual-connectivity configuration, an RRC container including an indication of a radio link failure of a radio link between the master node and a UE, identify, based on the indication of the radio link failure, a target node for the UE, and transmit, to the secondary node, a

handover request associated with performing a handover procedure to hand over the UE from the master node to the target node. The communications manager 2815 may be an example of aspects of the communications manager 3110 described herein.

[0391] The communications manager 2815, or its sub-components, may be implemented in hardware, code (such as software or firmware) executed by a processor, or any combination thereof. If implemented in code executed by a processor, the functions of the communications manager 2815, or its sub-components may be executed by a general-purpose processor, a DSP, an application-specific integrated circuit (ASIC), a FPGA or other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described in the present disclosure.

[0392] The communications manager 2815, or its sub-components, may be physically located at various positions, including being distributed such that portions of functions are implemented at different physical locations by one or more physical components. In some examples, the communications manager 2815, or its sub-components, may be a separate and distinct component in accordance with various aspects of the present disclosure. In some examples, the communications manager 2815, or its sub-components, may be combined with one or more other hardware components, including but not limited to an input/output (I/O) component, a transceiver, a network server, another computing device, one or more other components described in the present disclosure, or a combination thereof in accordance with various aspects of the present disclosure.

[0393] The transmitter 2820 may transmit signals generated by other components of the device 2805. In some examples, the transmitter 2820 may be collocated with a receiver 2810 in a transceiver manager. For example, the transmitter 2820 may be an example of aspects of the transceiver 3120 described with reference to FIG. 31. The transmitter 2820 may utilize a single antenna or a set of antennas.

[0394] **FIG. 29** shows a block diagram 2900 of a device 2905 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. The device 2905 may be an example of aspects of a device 2805, or a base station 105 as described herein. The device 2905 may include a receiver 2910, a communications manager 2915, and a transmitter 2945. The device 2905 also may include a

processor. Each of these components may be in communication with one another (such as via one or more buses).

[0395] The receiver 2910 may receive information such as packets, user data, or control information associated with various information channels (such as control channels, data channels, and information related to radio bearers for indication of link failure in dual-connectivity systems, etc.). Information may be passed on to other components of the device 2905. The receiver 2910 may be an example of aspects of the transceiver 3120 described with reference to FIG. 31. The receiver 2910 may utilize a single antenna or a set of antennas.

[0396] The communications manager 2915 may be an example of aspects of the communications manager 2815 as described herein. The communications manager 2915 may include a link failure reception manager 2920, a link failure transmission manager 2925, a default bearer manager 2930, a node identification manager 2935, and a handover transmission manager 2940. The communications manager 2915 may be an example of aspects of the communications manager 3110 described herein.

[0397] The link failure reception manager 2920 may receive, from a UE via a data radio bearer, a first indication of a radio link failure of a radio link between the UE and a master node of the dual-connectivity configuration.

[0398] The link failure reception manager 2920 also may receive, from a secondary node of the dual-connectivity configuration, the indication of the radio link failure for the UE.

[0399] The link failure reception manager 2920 also may receive, from a secondary node of the dual-connectivity configuration, an RRC container including an indication of a radio link failure of a radio link between the master node and a UE.

[0400] The link failure transmission manager 2925 may transmit a second indication of the radio link failure to the master node.

[0401] The default bearer manager 2930 may transmit, to a UE, an indication of a default split radio bearer for communicating an indication of a radio link failure of a radio link between the UE and the master node.

[0402] The node identification manager 2935 may identify, based on the indication of the radio link failure, a target node for the UE.

[0403] The handover transmission manager 2940 may transmit, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node.

[0404] The transmitter 2945 may transmit signals generated by other components of the device 2905. In some examples, the transmitter 2945 may be collocated with a receiver 2910 in a transceiver manager. For example, the transmitter 2945 may be an example of aspects of the transceiver 3120 described with reference to FIG. 31. The transmitter 2945 may utilize a single antenna or a set of antennas.

[0405] **FIG. 30** shows a block diagram 3000 of a communications manager 3005 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. The communications manager 3005 may be an example of aspects of a communications manager 2815, a communications manager 2915, or a communications manager 3110 described herein. The communications manager 3005 may include a link failure reception manager 3010, a link failure transmission manager 3015, a type identification manager 3020, a handover reception manager 3025, a handover transmission manager 3030, a node management manager 3035, a default bearer manager 3040, a node identification manager 3045, and a handover manager 3050. Each of these managers may communicate, directly or indirectly, with one another (such as via one or more buses).

[0406] The link failure reception manager 3010 may receive, from a UE via a data radio bearer, a first indication of a radio link failure of a radio link between the UE and a master node of the dual-connectivity configuration. In some aspects, the first indication of the radio link failure is received within an RRC container.

[0407] In some examples, the link failure reception manager 3010 may receive, from a secondary node of the dual-connectivity configuration, the indication of the radio link failure for the UE.

[0408] In some aspects, the indication of the radio link failure includes a measurement report.

[0409] In some examples, the link failure reception manager 3010 may receive, from a secondary node of the dual-connectivity configuration, an RRC container including an

indication of a radio link failure of a radio link between the master node and a UE. In some examples, the link failure reception manager 3010 may receive a backhaul container message that is encapsulated according to an Xn or X2 protocol.

[0410] The link failure transmission manager 3015 may transmit a second indication of the radio link failure to the master node.

[0411] The handover transmission manager 3030 may transmit, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node.

[0412] In some examples, the handover transmission manager 3030 may transmit, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node.

[0413] In some examples, the handover transmission manager 3030 may transmit, to the UE via the data radio bearer, an indication of the handover request.

[0414] The default bearer manager 3040 may transmit, to a UE, an indication of a default split radio bearer for communicating an indication of a radio link failure of a radio link between the UE and the master node. In some aspects, the indication of the default split radio bearer is transmitted to the UE via RRC signaling. In some examples, UE is associated with a cell, and the default bearer manager 3040 may transmit the indication of the default split radio bearer to at least one additional UE associated with the cell. In some aspects, the indication of the default split radio bearer is transmitted to the UE and the at least one additional UE within a SIB.

[0415] The node identification manager 3045 may identify, based on the indication of the radio link failure, a target node for the UE. In some examples, the node identification manager 3045 may decode the measurement report, where the target node is identified based on the measurement report. In some aspects, the target node is different from the master node and the secondary node.

[0416] The type identification manager 3020 may identify a radio link failure type indicator in a packet data convergence protocol (PDCP) header associated with the RRC container, where the second indication of the radio link failure is transmitted to the master node based on identifying the radio link failure type indicator.

[0417] In some examples, the type identification manager 3020 may identify a radio link failure type indicator in a medium access control (MAC) sub-header associated with the RRC container, where the second indication of the radio link failure is transmitted to the master node based on identifying the radio link failure type indicator.

[0418] The handover reception manager 3025 may receive a handover request from the master node after transmitting the indication of the radio link failure to the master node.

[0419] The node management manager 3035 may transition, based on the handover request, from the dual-connectivity configuration to a single-connectivity configuration with the UE.

[0420] The handover manager 3050 may perform the handover procedure.

[0421] **FIG. 31** shows a diagram of a system 3100 including a device 3105 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. The device 3105 may be an example of or include the components of device 2805, device 2905, or a base station 105 as described herein. The device 3105 may include components for bi-directional voice and data communications including components for transmitting and receiving communications, including a communications manager 3110, a network communications manager 3115, a transceiver 3120, an antenna 3125, memory 3130, a processor 3140, and an inter-station communications manager 3145. These components may be in electronic communication via one or more buses (such as bus 3150).

[0422] The communications manager 3110 may receive, from a UE via a data radio bearer, a first indication of a radio link failure of a radio link between the UE and a master node of the dual-connectivity configuration and transmit a second indication of the radio link failure to the master node. The communications manager 3110 also may transmit, to a UE, an indication of a default split radio bearer for communicating an indication of a radio link failure of a radio link between the UE and the master node, receive, from a secondary node of the dual-connectivity configuration, the indication of the radio link failure for the UE, identify, based on the indication of the radio link failure, a target node for the UE, and transmit, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node. The communications manager 3110 also may receive, from a secondary node of the dual-connectivity

configuration, an RRC container including an indication of a radio link failure of a radio link between the master node and a UE, identify, based on the indication of the radio link failure, a target node for the UE, and transmit, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node.

[0423] The network communications manager 3115 may manage communications with the core network (such as via one or more wired backhaul links). For example, the network communications manager 3115 may manage the transfer of data communications for client devices, such as one or more UEs 115.

[0424] The transceiver 3120 may communicate bi-directionally, via one or more antennas, wired, or wireless links as described above. For example, the transceiver 3120 may represent a wireless transceiver and may communicate bi-directionally with another wireless transceiver. The transceiver 3120 also may include a modem to modulate the packets and provide the modulated packets to the antennas for transmission, and to demodulate packets received from the antennas.

[0425] In some aspects, the wireless device may include a single antenna 3125. However, in some aspects the device may have more than one antenna 3125, which may be capable of concurrently transmitting or receiving multiple wireless transmissions.

[0426] The memory 3130 may include RAM, ROM, or a combination thereof. The memory 3130 may store computer-readable code 3135 including instructions that, when executed by a processor (such as the processor 3140) cause the device to perform various functions described herein. In some aspects, the memory 3130 may contain, among other things, a BIOS which may control basic hardware or software operation such as the interaction with peripheral components or devices.

[0427] The processor 3140 may include an intelligent hardware device, (such as a general-purpose processor, a DSP, a CPU, a microcontroller, an ASIC, an FPGA, a programmable logic device, a discrete gate or transistor logic component, a discrete hardware component, or any combination thereof). In some aspects, the processor 3140 may be configured to operate a memory array using a memory controller. In some aspects, a memory controller may be integrated into processor 3140. The processor 3140 may be configured to execute computer-readable instructions stored in a memory (such as the memory 3130) to

cause the device 3105 to perform various functions (such as functions or tasks supporting radio bearers for indication of link failure in dual-connectivity systems).

[0428] The inter-station communications manager 3145 may manage communications with other base station 105, and may include a controller or scheduler for controlling communications with UEs 115 in cooperation with other base stations 105. For example, the inter-station communications manager 3145 may coordinate scheduling for transmissions to UEs 115 for various interference mitigation techniques such as beamforming or joint transmission. In some examples, the inter-station communications manager 3145 may provide an X2 interface within an LTE/LTE-A wireless communication network technology to provide communication between base stations 105.

[0429] The code 3135 may include instructions to implement aspects of the present disclosure, including instructions to support wireless communications. The code 3135 may be stored in a non-transitory computer-readable medium such as system memory or other type of memory. In some aspects, the code 3135 may not be directly executable by the processor 3140 but may cause a computer (such as when compiled and executed) to perform functions described herein.

[0430] **FIG. 32** shows a flowchart illustrating a method 3200 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. The operations of method 3200 may be implemented by a UE 115 or its components as described herein. For example, the operations of method 3200 may be performed by a communications manager as described with reference to FIGs. 24 through 27. In some examples, a UE may execute a set of instructions to control the functional elements of the UE to perform the functions described below. Additionally, or alternatively, a UE may perform aspects of the functions described below using special-purpose hardware.

[0431] At 3205, the UE may detect a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration. The operations of 3205 may be performed according to the methods described herein. In some examples, aspects of the operations of 3205 may be performed by a link failure detection manager as described with reference to FIGs. 24 through 27.

[0432] At 3210, the UE may identify, based on the detection of the radio link failure and on an absence of an active radio bearer associated with the master node and a secondary

node, a default split radio bearer associated with the master node and the secondary node. The operations of 3210 may be performed according to the methods described herein. In some examples, aspects of the operations of 3210 may be performed by a bearer identification manager as described with reference to FIGs. 24 through 27.

[0433] At 3215, the UE may transmit an indication of the radio link failure to the secondary node via the default split radio bearer. The operations of 3215 may be performed according to the methods described herein. In some examples, aspects of the operations of 3215 may be performed by a link failure notification manager as described with reference to FIGs. 24 through 27.

[0434] **FIG. 33** shows a flowchart illustrating a method 3300 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. The operations of method 3300 may be implemented by a UE 115 or its components as described herein. For example, the operations of method 3300 may be performed by a communications manager as described with reference to FIGs. 24 through 27. In some examples, a UE may execute a set of instructions to control the functional elements of the UE to perform the functions described below. Additionally, or alternatively, a UE may perform aspects of the functions described below using special-purpose hardware.

[0435] At 3305, the UE may detect a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration. The operations of 3305 may be performed according to the methods described herein. In some examples, aspects of the operations of 3305 may be performed by a link failure detection manager as described with reference to FIGs. 24 through 27.

[0436] At 3310, the UE may determine, based on the detection of the radio link failure, whether the UE is configured to communicate with a secondary node in the dual-connectivity configuration via a signaling radio bearer. The operations of 3310 may be performed according to the methods described herein. In some examples, aspects of the operations of 3310 may be performed by a bearer identification manager as described with reference to FIGs. 24 through 27.

[0437] At 3315, the UE may transmit, based on a determination that the UE is not configured to communicate with the secondary node via the signaling radio bearer, an indication of the radio link failure to the secondary node via a data radio bearer. The

operations of 3315 may be performed according to the methods described herein. In some examples, aspects of the operations of 3315 may be performed by a link failure notification manager as described with reference to FIGs. 24 through 27.

[0438] **FIG. 34** shows a flowchart illustrating a method 3400 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. The operations of method 3400 may be implemented by a base station 105 or its components as described herein. For example, the operations of method 3400 may be performed by a communications manager as described with reference to FIGs. 28 through 31. In some examples, a base station may execute a set of instructions to control the functional elements of the base station to perform the functions described below. Additionally, or alternatively, a base station may perform aspects of the functions described below using special-purpose hardware.

[0439] At 3405, the base station may receive, from a UE via a data radio bearer, a first indication of a radio link failure of a radio link between the UE and a master node of the dual-connectivity configuration. The operations of 3405 may be performed according to the methods described herein. In some examples, aspects of the operations of 3405 may be performed by a link failure reception manager as described with reference to FIGs. 28 through 31.

[0440] At 3410, the base station may transmit a second indication of the radio link failure to the master node. The operations of 3410 may be performed according to the methods described herein. In some examples, aspects of the operations of 3410 may be performed by a link failure transmission manager as described with reference to FIGs. 28 through 31.

[0441] **FIG. 35** shows a flowchart illustrating a method 3500 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. The operations of method 3500 may be implemented by a base station 105 or its components as described herein. For example, the operations of method 3500 may be performed by a communications manager as described with reference to FIGs. 28 through 31. In some examples, a base station may execute a set of instructions to control the functional elements of the base station to perform the functions described below. Additionally, or alternatively, a base station may perform aspects of the functions described below using special-purpose hardware.

[0442] At 3505, the base station may transmit, to a UE, an indication of a default split radio bearer for communicating an indication of a radio link failure of a radio link between the UE and the master node. The operations of 3505 may be performed according to the methods described herein. In some examples, aspects of the operations of 3505 may be performed by a default bearer manager as described with reference to FIGs. 28 through 31.

[0443] At 3510, the base station may receive, from a secondary node of the dual-connectivity configuration, the indication of the radio link failure for the UE. The operations of 3510 may be performed according to the methods described herein. In some examples, aspects of the operations of 3510 may be performed by a link failure reception manager as described with reference to FIGs. 28 through 31.

[0444] At 3515, the base station may identify, based on the indication of the radio link failure, a target node for the UE. The operations of 3515 may be performed according to the methods described herein. In some examples, aspects of the operations of 3515 may be performed by a node identification manager as described with reference to FIGs. 28 through 31.

[0445] At 3520, the base station may transmit, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node. The operations of 3520 may be performed according to the methods described herein. In some examples, aspects of the operations of 3520 may be performed by a handover transmission manager as described with reference to FIGs. 28 through 31.

[0446] **FIG. 36** shows a flowchart illustrating a method 3600 that supports radio bearers for indication of link failure in dual-connectivity systems in accordance with aspects of the present disclosure. The operations of method 3600 may be implemented by a base station 105 or its components as described herein. For example, the operations of method 3600 may be performed by a communications manager as described with reference to FIGs. 28 through 31. In some examples, a base station may execute a set of instructions to control the functional elements of the base station to perform the functions described below. Additionally, or alternatively, a base station may perform aspects of the functions described below using special-purpose hardware.

[0447] At 3605, the base station may receive, from a secondary node of the dual-connectivity configuration, an RRC container including an indication of a radio link failure of

a radio link between the master node and a UE. The operations of 3605 may be performed according to the methods described herein. In some examples, aspects of the operations of 3605 may be performed by a link failure reception manager as described with reference to FIGs. 28 through 31.

[0448] At 3610, the base station may identify, based on the indication of the radio link failure, a target node for the UE. The operations of 3610 may be performed according to the methods described herein. In some examples, aspects of the operations of 3610 may be performed by a node identification manager as described with reference to FIGs. 28 through 31.

[0449] At 3615, the base station may transmit, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node. The operations of 3615 may be performed according to the methods described herein. In some examples, aspects of the operations of 3615 may be performed by a handover transmission manager as described with reference to FIGs. 28 through 31.

[0450] It should be noted that the methods described herein describe possible implementations, and that the operations and the steps may be rearranged or otherwise modified and that other implementations are possible. Further, aspects from two or more of the methods may be combined.

[0451] Techniques described herein may be used for various wireless communications systems such as code division multiple access (CDMA), time division multiple access (TDMA), frequency division multiple access (FDMA), orthogonal frequency division multiple access (OFDMA), single carrier frequency division multiple access (SC-FDMA), and other systems. A CDMA system may implement a radio technology such as CDMA2000, Universal Terrestrial Radio Access (UTRA), etc. CDMA2000 covers IS-2000, IS-95, and IS-856 standards. IS-2000 Releases may be commonly referred to as CDMA2000 1X, 1X, etc. IS-856 (TIA-856) is commonly referred to as CDMA2000 1xEV-DO, High Rate Packet Data (HRPD), etc. UTRA includes Wideband CDMA (WCDMA) and other variants of CDMA. A TDMA system may implement a radio technology such as Global System for Mobile Communications (GSM).

[0452] An OFDMA system may implement a radio technology such as Ultra Mobile Broadband (UMB), Evolved UTRA (E-UTRA), Institute of Electrical and Electronics

Engineers (IEEE) 802.11 (Wi-Fi), IEEE 802.16 (WiMAX), IEEE 802.20, Flash-OFDM, etc. UTRA and E-UTRA are part of Universal Mobile Telecommunications System (UMTS). LTE, LTE-A, and LTE-A Pro are releases of UMTS that use E-UTRA. UTRA, E-UTRA, UMTS, LTE, LTE-A, LTE-A Pro, NR, and GSM are described in documents from the organization named "3rd Generation Partnership Project" (3GPP). CDMA2000 and UMB are described in documents from an organization named "3rd Generation Partnership Project 2" (3GPP2). The techniques described herein may be used for the systems and radio technologies mentioned herein as well as other systems and radio technologies. While aspects of an LTE, LTE-A, LTE-A Pro, or NR system may be described for purposes of example, and LTE, LTE-A, LTE-A Pro, or NR terminology may be used in much of the description, the techniques described herein are applicable beyond LTE, LTE-A, LTE-A Pro, or NR applications.

[0453] A macro cell generally covers a relatively large geographic area (such as several kilometers in radius) and may allow unrestricted access by UEs with service subscriptions with the network provider. A small cell may be associated with a lower-powered base station, as compared with a macro cell, and a small cell may operate in the same or different (such as licensed, unlicensed, etc.) frequency bands as macro cells. Small cells may include pico cells, femto cells, and micro cells according to various examples. A pico cell, for example, may cover a small geographic area and may allow unrestricted access by UEs with service subscriptions with the network provider. A femto cell also may cover a small geographic area (such as a home) and may provide restricted access by UEs having an association with the femto cell (such as UEs in a closed subscriber group (CSG), UEs for users in the home, and the like). An eNB for a macro cell may be referred to as a macro eNB. An eNB for a small cell may be referred to as a small cell eNB, a pico eNB, a femto eNB, or a home eNB. An eNB may support one or multiple (such as two, three, four, and the like) cells, and also may support communications using one or multiple component carriers.

[0454] The wireless communications systems described herein may support synchronous or asynchronous operation. For synchronous operation, the base stations may have similar frame timing, and transmissions from different base stations may be approximately aligned in time. For asynchronous operation, the base stations may have different frame timing, and transmissions from different base stations may not be aligned in time. The techniques described herein may be used for either synchronous or asynchronous operations.

[0455] Information and signals described herein may be represented using any of a variety of different technologies and techniques. For example, data, instructions, commands, information, signals, bits, symbols, and chips that may be referenced throughout the description may be represented by voltages, currents, electromagnetic waves, magnetic fields or particles, optical fields or particles, or any combination thereof.

[0456] The various illustrative blocks and modules described in connection with the disclosure herein may be implemented or performed with a general-purpose processor, a DSP, an ASIC, an FPGA, or other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described herein. A general-purpose processor may be a microprocessor, but in the alternative, the processor may be any conventional processor, controller, microcontroller, or state machine. A processor also may be implemented as a combination of computing devices (such as a combination of a DSP and a microprocessor, multiple microprocessors, one or more microprocessors in conjunction with a DSP core, or any other such configuration).

[0457] The functions described herein may be implemented in hardware, software executed by a processor, firmware, or any combination thereof. If implemented in software executed by a processor, the functions may be stored on or transmitted over as one or more instructions or code on a computer-readable medium. Other examples and implementations are within the scope of the disclosure and appended claims. For example, due to the nature of software, functions described herein can be implemented using software executed by a processor, hardware, firmware, hardwiring, or combinations of any of these. Features implementing functions also may be physically located at various positions, including being distributed such that portions of functions are implemented at different physical locations.

[0458] Computer-readable media includes both non-transitory computer storage media and communication media including any medium that facilitates transfer of a computer program from one place to another. A non-transitory storage medium may be any available medium that can be accessed by a general purpose or special purpose computer. By way of example, and not limitation, non-transitory computer-readable media may include random-access memory (RAM), read-only memory (ROM), electrically erasable programmable ROM (EEPROM), flash memory, compact disk (CD) ROM or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other non-transitory medium that can

be used to carry or store desired program code means in the form of instructions or data structures and that can be accessed by a general-purpose or special-purpose computer, or a general-purpose or special-purpose processor. Also, any connection is properly termed a computer-readable medium. For example, if the software is transmitted from a website, server, or other remote source using a coaxial cable, fiber optic cable, twisted pair, digital subscriber line (DSL), or wireless technologies such as infrared, radio, and microwave, then the coaxial cable, fiber optic cable, twisted pair, DSL, or wireless technologies such as infrared, radio, and microwave are included in the definition of medium. Disk and disc, as used herein, include CD, laser disc, optical disc, digital versatile disc (DVD), floppy disk and Blu-ray disc where disks usually reproduce data magnetically, while discs reproduce data optically with lasers. Combinations of the above are also included within the scope of computer-readable media.

[0459] As used herein, including in the claims, "or" as used in a list of items (such as a list of items prefaced by a phrase such as "at least one of" or "one or more of") indicates an inclusive list such that, for example, a list of at least one of A, B, or C means A or B or C or AB or AC or BC or ABC (i.e., A and B and C). Also, as used herein, the phrase "based on" shall not be construed as a reference to a closed set of conditions. For example, an exemplary step that is described as "based on condition A" may be based on both a condition A and a condition B without departing from the scope of the present disclosure. In other words, as used herein, the phrase "based on" shall be construed in the same manner as the phrase "based at least in part on."

[0460] In the appended figures, similar components or features may have the same reference label. Further, various components of the same type may be distinguished by following the reference label by a dash and a second label that distinguishes among the similar components. If just the first reference label is used in the specification, the description is applicable to any one of the similar components having the same first reference label irrespective of the second reference label, or other subsequent reference label.

[0461] The description set forth herein, in connection with the appended drawings, describes example configurations and does not represent all the examples that may be implemented or that are within the scope of the claims. The term "exemplary" used herein means "serving as an example, instance, or illustration," and not "preferred" or

"advantageous over other examples." The detailed description includes specific details for the purpose of providing an understanding of the described techniques. These techniques, however, may be practiced without these specific details. In some instances, well-known structures and devices are shown in block diagram form in order to avoid obscuring the concepts of the described examples.

[0462] The description herein is provided to enable a person skilled in the art to make or use the disclosure. Various modifications to the disclosure will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other variations without departing from the scope of the disclosure. Thus, the disclosure is not limited to the examples and designs described herein, but is to be accorded the broadest scope consistent with the principles and novel features disclosed herein.

CLAIMS

What is claimed is:

1. A method for wireless communications at a user equipment (UE), comprising:

detecting a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration;

identifying, based at least in part on the detection of the radio link failure and on an absence of an active radio bearer associated with the master node and a secondary node, a default split radio bearer associated with the master node and the secondary node; and

transmitting an indication of the radio link failure to the secondary node via the default split radio bearer.

2. The method of claim 1, further comprising:

performing, based at least in part on detecting the radio link failure, a handover procedure from the master node to a target node.

3. The method of claim 2, wherein:

transmitting the indication of the radio link failure comprises transmitting a measurement report comprising measurements associated with the target node.

4. The method of claim 2, further comprising:

receiving, from the secondary node via the default split radio bearer, a reconfiguration message after transmitting the indication of the radio link failure, wherein the handover procedure is performed based at least in part on the reconfiguration message.

5. The method of claim 1, further comprising:

receiving an indication of the default split radio bearer, wherein the default split radio bearer is identified based at least in part on the indication of the default split radio bearer.

6. The method of claim 5, wherein the indication of the default split radio bearer is received from the master node before detecting the radio link failure.

7. The method of claim 5, wherein the indication of the default split radio bearer is received via radio resource control (RRC) signaling or within a system information block (SIB).

8. The method of claim 1, wherein the default split radio bearer comprises an SRB1 split signaling radio bearer.

9. The method of claim 1, further comprising:

determining the absence of the active radio bearer.

10. The method of claim 9, wherein:

determining the absence of the active radio bearer comprises determining whether the UE is configured to communicate with the secondary node via an SRB1 split signaling radio bearer.

11. The method of claim 9, wherein:

determining the absence of the active radio bearer comprises determining whether the UE is configured to communicate with the secondary node via an SRB3 direct signaling radio bearer.

12. A method for wireless communications at a user equipment (UE), comprising:

detecting a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration;

determining, based at least in part on the detection of the radio link failure, whether the UE is configured to communicate with a secondary node in the dual-connectivity configuration via a signaling radio bearer; and

transmitting, based on a determination that the UE is not configured to communicate with the secondary node via the signaling radio bearer, an indication of the radio link failure to the secondary node via a data radio bearer.

13. The method of claim 12, further comprising:

performing, based at least in part on detecting the radio link failure, a handover procedure from the master node to a target node.

14. The method of claim 13, wherein:

transmitting the indication of the radio link failure comprises transmitting a measurement report comprising measurements associated with the target node.

15. The method of claim 13, further comprising:

receiving, from the secondary node via the data radio bearer, a reconfiguration message after transmitting the indication of the radio link failure, wherein the handover procedure is performed based at least in part on the reconfiguration message.

16. The method of claim 12, wherein:

transmitting the indication of the radio link failure to the secondary node comprises transmitting the indication of the radio link failure to the secondary node in a radio resource control (RRC) container.

17. The method of claim 16, wherein:

transmitting the indication of the radio link failure to the secondary node comprises transmitting a radio link failure type indicator in a packet data convergence protocol (PDCP) header associated with the RRC container.

18. The method of claim 16, wherein:

transmitting the indication of the radio link failure to the secondary node comprises transmitting a radio link failure type indicator in a medium access control (MAC) sub-header associated with the RRC container.

19. The method of claim 12, wherein:

determining whether the UE is configured to communicate with the secondary node via the signaling radio bearer comprises determining whether the UE is configured to communicate with the secondary node via an SRB1 split signaling radio bearer.

20. The method of claim 12, wherein:

determining whether the UE is configured to communicate with the secondary node via the signaling radio bearer comprises determining whether the UE is configured to communicate with the secondary node via an SRB3 direct signaling radio bearer.

21. A method for wireless communications at a secondary node of a dual-connectivity configuration, comprising:

receiving, from a user equipment (UE) via a data radio bearer, a first indication of a radio link failure of a radio link between the UE and a master node of the dual-connectivity configuration; and

transmitting a second indication of the radio link failure to the master node.

22. The method of claim 21, wherein the first indication of the radio link failure is received within a radio resource control (RRC) container.

23. The method of claim 22, further comprising:

identifying a radio link failure type indicator in a packet data convergence protocol (PDCP) header associated with the RRC container, wherein the second indication of the radio link failure is transmitted to the master node based at least in part on identifying the radio link failure type indicator.

24. The method of claim 22, further comprising:

identifying a radio link failure type indicator in a medium access control (MAC) sub-header associated with the RRC container, wherein the second indication of the radio link failure is transmitted to the master node based at least in part on identifying the radio link failure type indicator.

25. The method of claim 21, further comprising:

receiving a handover request from the master node after transmitting the indication of the radio link failure to the master node; and

transmitting, to the UE via the data radio bearer, an indication of the handover request.

26. The method of claim 25, further comprising:

transitioning, based at least in part on the handover request, from the dual-connectivity configuration to a single-connectivity configuration with the UE.

27. A method for wireless communication at a master node of a dual-connectivity configuration, comprising:

transmitting, to a user equipment (UE), an indication of a default split radio bearer for communicating an indication of a radio link failure of a radio link between the UE and the master node;

receiving, from a secondary node of the dual-connectivity configuration, the indication of the radio link failure for the UE;

identifying, based at least in part on the indication of the radio link failure, a target node for the UE; and

transmitting, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node.

28. The method of claim 27, further comprising:

performing the handover procedure.

29. The method of claim 27, wherein the indication of the default split radio bearer is transmitted to the UE via radio resource control (RRC) signaling.

30. The method of claim 27, wherein the UE is associated with a cell, further comprising:

transmitting the indication of the default split radio bearer to at least one additional UE associated with the cell.

31. The method of claim 30, wherein the indication of the default split radio bearer is transmitted to the UE and the at least one additional UE within a system information block (SIB).

32. The method of claim 31, wherein the target node is different from the master node and the secondary node.

33. The method of claim 27, wherein the indication of the radio link failure comprises a measurement report.

34. The method of claim 33, further comprising:

decoding the measurement report, wherein the target node is identified based at least in part on the measurement report.

35. The method of claim 27, wherein receiving the indication of the radio link failure comprises:

receiving a backhaul container message that is encapsulated according to an Xn or X2 protocol.

36. A method for wireless communication at a master node of a dual-connectivity configuration, comprising:

receiving, from a secondary node of the dual-connectivity configuration, a radio resource control (RRC) container comprising an indication of a radio link failure of a radio link between the master node and a user equipment (UE);

identifying, based at least in part on the indication of the radio link failure, a target node for the UE; and

transmitting, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node.

37. The method of claim 36, further comprising:

performing the handover procedure.

38. The method of claim 36, wherein the target node is different from the master node and the secondary node.

39. The method of claim 36, wherein the indication of the radio link failure comprises a measurement report.

40. The method of claim 39, further comprising:

decoding the measurement report, wherein the target node is identified based at least in part on the measurement report.

41. An apparatus for wireless communications at a user equipment (UE), comprising:

a processor,

memory in electronic communication with the processor; and

instructions stored in the memory and executable by the processor to cause the apparatus to:

detect a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration;

identify, based at least in part on the detection of the radio link failure and on an absence of an active radio bearer associated with the master node and a secondary node, a default split radio bearer associated with the master node and the secondary node; and

transmit an indication of the radio link failure to the secondary node via the default split radio bearer.

42. The apparatus of claim 41, wherein the instructions are further executable by the processor to cause the apparatus to:

perform, based at least in part on detecting the radio link failure, a handover procedure from the master node to a target node.

43. The apparatus of claim 42, wherein the instructions to transmit the indication of the radio link failure are executable by the processor to cause the apparatus to transmit a measurement report comprising measurements associated with the target node.

44. The apparatus of claim 42, wherein the instructions are further executable by the processor to cause the apparatus to:

receive, from the secondary node via the default split radio bearer, a reconfiguration message after transmitting the indication of the radio link failure, wherein the handover procedure is performed based at least in part on the reconfiguration message.

45. The apparatus of claim 41, wherein the instructions are further executable by the processor to cause the apparatus to:

receive an indication of the default split radio bearer, wherein the default split radio bearer is identified based at least in part on the indication of the default split radio bearer.

46. The apparatus of claim 45, wherein the indication of the default split radio bearer is received from the master node before detecting the radio link failure.

47. The apparatus of claim 45, wherein the indication of the default split radio bearer is received via radio resource control (RRC) signaling or within a system information block (SIB).

48. The apparatus of claim 41, wherein the default split radio bearer comprises an SRB1 split signaling radio bearer.

49. The apparatus of claim 41, wherein the instructions are further executable by the processor to cause the apparatus to:

determine the absence of the active radio bearer.

50. The apparatus of claim 49, wherein the instructions to determine the absence of the active radio bearer are executable by the processor to cause the apparatus to determine whether the UE is configured to communicate with the secondary node via an SRB1 split signaling radio bearer.

51. The apparatus of claim 49, wherein the instructions to determine the absence of the active radio bearer are executable by the processor to cause the apparatus to determine whether the UE is configured to communicate with the secondary node via an SRB3 direct signaling radio bearer.

52. An apparatus for wireless communications at a user equipment (UE), comprising:

a processor,

memory in electronic communication with the processor; and

instructions stored in the memory and executable by the processor to cause the apparatus to:

detect a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration;

determine, based at least in part on the detection of the radio link failure, whether the UE is configured to communicate with a secondary node in the dual-connectivity configuration via a signaling radio bearer; and

transmit, based on a determination that the UE is not configured to communicate with the secondary node via the signaling radio bearer, an indication of the radio link failure to the secondary node via a data radio bearer.

53. The apparatus of claim 52, wherein the instructions are further executable by the processor to cause the apparatus to:

perform, based at least in part on detecting the radio link failure, a handover procedure from the master node to a target node.

54. The apparatus of claim 53, wherein the instructions to transmit the indication of the radio link failure are executable by the processor to cause the apparatus to transmit a measurement report comprising measurements associated with the target node.

55. The apparatus of claim 53, wherein the instructions are further executable by the processor to cause the apparatus to:

receive, from the secondary node via the data radio bearer, a reconfiguration message after transmitting the indication of the radio link failure, wherein the handover procedure is performed based at least in part on the reconfiguration message.

56. The apparatus of claim 52, wherein the instructions to transmit the indication of the radio link failure to the secondary node are executable by the processor to cause the apparatus to transmit the indication of the radio link failure to the secondary node in a radio resource control (RRC) container.

57. The apparatus of claim 56, wherein the instructions to transmit the indication of the radio link failure to the secondary node are executable by the processor to cause the apparatus to transmit a radio link failure type indicator in a packet data convergence protocol (PDCP) header associated with the RRC container.

58. The apparatus of claim 56, wherein the instructions to transmit the indication of the radio link failure to the secondary node are executable by the processor to cause the apparatus to transmit a radio link failure type indicator in a medium access control (MAC) sub-header associated with the RRC container.

59. The apparatus of claim 52, wherein the instructions to determine whether the UE is configured to communicate with the secondary node via the signaling radio

bearer are executable by the processor to cause the apparatus to determine whether the UE is configured to communicate with the secondary node via an SRB1 split signaling radio bearer.

60. The apparatus of claim 52, wherein the instructions to determine whether the UE is configured to communicate with the secondary node via the signaling radio bearer are executable by the processor to cause the apparatus to determine whether the UE is configured to communicate with the secondary node via an SRB3 direct signaling radio bearer.

61. An apparatus for wireless communications at a secondary node of a dual-connectivity configuration, comprising:

a processor,

memory in electronic communication with the processor; and

instructions stored in the memory and executable by the processor to cause the apparatus to:

receive, from a user equipment (UE) via a data radio bearer, a first indication of a radio link failure of a radio link between the UE and a master node of the dual-connectivity configuration; and

transmit a second indication of the radio link failure to the master node.

62. The apparatus of claim 61, wherein the first indication of the radio link failure is received within a radio resource control (RRC) container.

63. The apparatus of claim 62, wherein the instructions are further executable by the processor to cause the apparatus to:

identify a radio link failure type indicator in a packet data convergence protocol (PDCP) header associated with the RRC container, wherein the second indication of the radio link failure is transmitted to the master node based at least in part on identifying the radio link failure type indicator.

64. The apparatus of claim 62, wherein the instructions are further executable by the processor to cause the apparatus to:

identify a radio link failure type indicator in a medium access control (MAC) sub-header associated with the RRC container, wherein the second indication of the radio link

failure is transmitted to the master node based at least in part on identifying the radio link failure type indicator.

65. The apparatus of claim 61, wherein the instructions are further executable by the processor to cause the apparatus to:

receive a handover request from the master node after transmitting the indication of the radio link failure to the master node; and

transmit, to the UE via the data radio bearer, an indication of the handover request.

66. The apparatus of claim 65, wherein the instructions are further executable by the processor to cause the apparatus to:

transition, based at least in part on the handover request, from the dual-connectivity configuration to a single-connectivity configuration with the UE.

67. An apparatus for wireless communication at a master node of a dual-connectivity configuration, comprising:

a processor,

memory in electronic communication with the processor; and

instructions stored in the memory and executable by the processor to cause the apparatus to:

transmit, to a user equipment (UE), an indication of a default split radio bearer for communicating an indication of a radio link failure of a radio link between the UE and the master node;

receive, from a secondary node of the dual-connectivity configuration, the indication of the radio link failure for the UE;

identify, based at least in part on the indication of the radio link failure, a target node for the UE; and

transmit, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node.

68. The apparatus of claim 67, wherein the instructions are further executable by the processor to cause the apparatus to:

perform the handover procedure.

69. The apparatus of claim 67, wherein the indication of the default split radio bearer is transmitted to the UE via radio resource control (RRC) signaling.

70. The apparatus of claim 67, wherein the UE is associated with a cell, wherein the instructions are further executable by the processor to cause the apparatus to transmit the indication of the default split radio bearer to at least one additional UE associated with the cell.

71. The apparatus of claim 70, wherein the indication of the default split radio bearer is transmitted to the UE and the at least one additional UE within a system information block (SIB).

72. The apparatus of claim 71, wherein the target node is different from the master node and the secondary node.

73. The apparatus of claim 67, wherein the indication of the radio link failure comprises a measurement report.

74. The apparatus of claim 73, wherein the instructions are further executable by the processor to cause the apparatus to:

decode the measurement report, wherein the target node is identified based at least in part on the measurement report.

75. The apparatus of claim 67, wherein the instructions to receive the indication of the radio link failure are executable by the processor to cause the apparatus to:

receive a backhaul container message that is encapsulated according to an Xn or X2 protocol.

76. An apparatus for wireless communication at a master node of a dual-connectivity configuration, comprising:

a processor,

memory in electronic communication with the processor; and

instructions stored in the memory and executable by the processor to cause the apparatus to:

receive, from a secondary node of the dual-connectivity configuration, a radio resource control (RRC) container comprising an indication of a radio link failure of a radio link between the master node and a user equipment (UE);

identify, based at least in part on the indication of the radio link failure, a target node for the UE; and

transmit, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node.

77. The apparatus of claim 76, wherein the instructions are further executable by the processor to cause the apparatus to:

perform the handover procedure.

78. The apparatus of claim 76, wherein the target node is different from the master node and the secondary node.

79. The apparatus of claim 76, wherein the indication of the radio link failure comprises a measurement report.

80. The apparatus of claim 79, wherein the instructions are further executable by the processor to cause the apparatus to:

decode the measurement report, wherein the target node is identified based at least in part on the measurement report.

81. An apparatus for wireless communications at a user equipment (UE), comprising:

means for detecting a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration;

means for identifying, based at least in part on the detection of the radio link failure and on an absence of an active radio bearer associated with the master node and a secondary node, a default split radio bearer associated with the master node and the secondary node; and

means for transmitting an indication of the radio link failure to the secondary node via the default split radio bearer.

82. The apparatus of claim 81, further comprising:

means for performing, based at least in part on detecting the radio link failure, a handover procedure from the master node to a target node.

83. The apparatus of claim 82, wherein the means for transmitting the indication of the radio link failure comprises means for transmitting a measurement report comprising measurements associated with the target node.

84. The apparatus of claim 82, further comprising:

means for receiving, from the secondary node via the default split radio bearer, a reconfiguration message after transmitting the indication of the radio link failure, wherein the handover procedure is performed based at least in part on the reconfiguration message.

85. The apparatus of claim 81, further comprising:

means for receiving an indication of the default split radio bearer, wherein the default split radio bearer is identified based at least in part on the indication of the default split radio bearer.

86. The apparatus of claim 85, wherein the indication of the default split radio bearer is received from the master node before detecting the radio link failure.

87. The apparatus of claim 85, wherein the indication of the default split radio bearer is received via radio resource control (RRC) signaling or within a system information block (SIB).

88. The apparatus of claim 81, wherein the default split radio bearer comprises an SRB1 split signaling radio bearer.

89. The apparatus of claim 81, further comprising:

means for determining the absence of the active radio bearer.

90. The apparatus of claim 89, wherein the means for determining the absence of the active radio bearer comprises means for determining whether the UE is configured to communicate with the secondary node via an SRB1 split signaling radio bearer.

91. The apparatus of claim 89, wherein the means for determining the absence of the active radio bearer comprises means for determining whether the UE is configured to communicate with the secondary node via an SRB3 direct signaling radio bearer.

92. An apparatus for wireless communications at a user equipment (UE), comprising:

means for detecting a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration;

means for determining, based at least in part on the detection of the radio link failure, whether the UE is configured to communicate with a secondary node in the dual-connectivity configuration via a signaling radio bearer; and

means for transmitting, based on a determination that the UE is not configured to communicate with the secondary node via the signaling radio bearer, an indication of the radio link failure to the secondary node via a data radio bearer.

93. The apparatus of claim 92, further comprising:

means for performing, based at least in part on detecting the radio link failure, a handover procedure from the master node to a target node.

94. The apparatus of claim 93, wherein the means for transmitting the indication of the radio link failure comprises means for transmitting a measurement report comprising measurements associated with the target node.

95. The apparatus of claim 93, further comprising:

means for receiving, from the secondary node via the data radio bearer, a reconfiguration message after transmitting the indication of the radio link failure, wherein the handover procedure is performed based at least in part on the reconfiguration message.

96. The apparatus of claim 92, wherein the means for transmitting the indication of the radio link failure to the secondary node comprises means for transmitting the indication of the radio link failure to the secondary node in a radio resource control (RRC) container.

97. The apparatus of claim 96, wherein the means for transmitting the indication of the radio link failure to the secondary node comprises means for transmitting a radio link failure type indicator in a packet data convergence protocol (PDCP) header associated with the RRC container.

98. The apparatus of claim 96, wherein the means for transmitting the indication of the radio link failure to the secondary node comprises means for transmitting a radio link failure type indicator in a medium access control (MAC) sub-header associated with the RRC container.

99. The apparatus of claim 92, wherein the means for determining whether the UE is configured to communicate with the secondary node via the signaling radio bearer comprises means for determining whether the UE is configured to communicate with the secondary node via an SRB1 split signaling radio bearer.

100. The apparatus of claim 92, wherein the means for determining whether the UE is configured to communicate with the secondary node via the signaling radio bearer comprises means for determining whether the UE is configured to communicate with the secondary node via an SRB3 direct signaling radio bearer.

101. An apparatus for wireless communications at a secondary node of a dual-connectivity configuration, comprising:

means for receiving, from a user equipment (UE) via a data radio bearer, a first indication of a radio link failure of a radio link between the UE and a master node of the dual-connectivity configuration; and

means for transmitting a second indication of the radio link failure to the master node.

102. The apparatus of claim 101, wherein the first indication of the radio link failure is received within a radio resource control (RRC) container.

103. The apparatus of claim 102, further comprising:

means for identifying a radio link failure type indicator in a packet data convergence protocol (PDCP) header associated with the RRC container, wherein the second

indication of the radio link failure is transmitted to the master node based at least in part on identifying the radio link failure type indicator.

104. The apparatus of claim 102, further comprising:

means for identifying a radio link failure type indicator in a medium access control (MAC) sub-header associated with the RRC container, wherein the second indication of the radio link failure is transmitted to the master node based at least in part on identifying the radio link failure type indicator.

105. The apparatus of claim 101, further comprising:

means for receiving a handover request from the master node after transmitting the indication of the radio link failure to the master node; and

means for transmitting, to the UE via the data radio bearer, an indication of the handover request.

106. The apparatus of claim 105, further comprising:

means for transitioning, based at least in part on the handover request, from the dual-connectivity configuration to a single-connectivity configuration with the UE.

107. An apparatus for wireless communication at a master node of a dual-connectivity configuration, comprising:

means for transmitting, to a user equipment (UE), an indication of a default split radio bearer for communicating an indication of a radio link failure of a radio link between the UE and the master node;

means for receiving, from a secondary node of the dual-connectivity configuration, the indication of the radio link failure for the UE;

means for identifying, based at least in part on the indication of the radio link failure, a target node for the UE; and

means for transmitting, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node.

108. The apparatus of claim 107, further comprising:

means for performing the handover procedure.

109. The apparatus of claim 107, wherein the indication of the default split radio bearer is transmitted to the UE via radio resource control (RRC) signaling.

110. The apparatus of claim 107, wherein the UE is associated with a cell, further comprising:

means for transmitting the indication of the default split radio bearer to at least one additional UE associated with the cell.

111. The apparatus of claim 110, wherein the indication of the default split radio bearer is transmitted to the UE and the at least one additional UE within a system information block (SIB).

112. The apparatus of claim 111, wherein the target node is different from the master node and the secondary node.

113. The apparatus of claim 107, wherein the indication of the radio link failure comprises a measurement report.

114. The apparatus of claim 113, further comprising:

means for decoding the measurement report, wherein the target node is identified based at least in part on the measurement report.

115. The apparatus of claim 107, wherein the means for receiving the indication of the radio link failure comprises:

means for receiving a backhaul container message that is encapsulated according to an Xn or X2 protocol.

116. An apparatus for wireless communication at a master node of a dual-connectivity configuration, comprising:

means for receiving, from a secondary node of the dual-connectivity configuration, a radio resource control (RRC) container comprising an indication of a radio link failure of a radio link between the master node and a user equipment (UE);

means for identifying, based at least in part on the indication of the radio link failure, a target node for the UE; and

means for transmitting, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node.

117. The apparatus of claim 116, further comprising:

means for performing the handover procedure.

118. The apparatus of claim 116, wherein the target node is different from the master node and the secondary node.

119. The apparatus of claim 116, wherein the indication of the radio link failure comprises a measurement report.

120. The apparatus of claim 119, further comprising:

means for decoding the measurement report, wherein the target node is identified based at least in part on the measurement report.

121. A non-transitory computer-readable medium storing code for wireless communications at a user equipment (UE), the code comprising instructions executable by a processor to:

detect a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration;

identify, based at least in part on the detection of the radio link failure and on an absence of an active radio bearer associated with the master node and a secondary node, a default split radio bearer associated with the master node and the secondary node; and

transmit an indication of the radio link failure to the secondary node via the default split radio bearer.

122. The non-transitory computer-readable medium of claim 121, wherein the instructions are further executable to:

perform, based at least in part on detecting the radio link failure, a handover procedure from the master node to a target node.

123. The non-transitory computer-readable medium of claim 122, wherein the instructions to transmit the indication of the radio link failure are executable by the

processor to transmit a measurement report comprising measurements associated with the target node.

124. The non-transitory computer-readable medium of claim 122, wherein the instructions are further executable to:

receive, from the secondary node via the default split radio bearer, a reconfiguration message after transmitting the indication of the radio link failure, wherein the handover procedure is performed based at least in part on the reconfiguration message.

125. The non-transitory computer-readable medium of claim 121, wherein the instructions are further executable to:

receive an indication of the default split radio bearer, wherein the default split radio bearer is identified based at least in part on the indication of the default split radio bearer.

126. The non-transitory computer-readable medium of claim 125, wherein the indication of the default split radio bearer is received from the master node before detecting the radio link failure.

127. The non-transitory computer-readable medium of claim 125, wherein the indication of the default split radio bearer is received via radio resource control (RRC) signaling or within a system information block (SIB).

128. The non-transitory computer-readable medium of claim 121, wherein the default split radio bearer comprises an SRB1 split signaling radio bearer.

129. The non-transitory computer-readable medium of claim 121, wherein the instructions are further executable to:

determine the absence of the active radio bearer.

130. The non-transitory computer-readable medium of claim 129, wherein the instructions to determine the absence of the active radio bearer are executable by the processor to determine whether the UE is configured to communicate with the secondary node via an SRB1 split signaling radio bearer.

131. The non-transitory computer-readable medium of claim 129, wherein the instructions to determine the absence of the active radio bearer are executable by the processor to determine whether the UE is configured to communicate with the secondary node via an SRB3 direct signaling radio bearer.

132. A non-transitory computer-readable medium storing code for wireless communications at a user equipment (UE), the code comprising instructions executable by a processor to:

detect a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration;

determine, based at least in part on the detection of the radio link failure, whether the UE is configured to communicate with a secondary node in the dual-connectivity configuration via a signaling radio bearer; and

transmit, based on a determination that the UE is not configured to communicate with the secondary node via the signaling radio bearer, an indication of the radio link failure to the secondary node via a data radio bearer.

133. The non-transitory computer-readable medium of claim 132, wherein the instructions are further executable to:

perform, based at least in part on detecting the radio link failure, a handover procedure from the master node to a target node.

134. The non-transitory computer-readable medium of claim 133, wherein the instructions to transmit the indication of the radio link failure are executable by the processor to transmit a measurement report comprising measurements associated with the target node.

135. The non-transitory computer-readable medium of claim 133, wherein the instructions are further executable to:

receive, from the secondary node via the data radio bearer, a reconfiguration message after transmitting the indication of the radio link failure, wherein the handover procedure is performed based at least in part on the reconfiguration message.

136. The non-transitory computer-readable medium of claim 132, wherein the instructions to transmit the indication of the radio link failure to the secondary node are executable by the processor to transmit the indication of the radio link failure to the secondary node in a radio resource control (RRC) container.

137. The non-transitory computer-readable medium of claim 136, wherein the instructions to transmit the indication of the radio link failure to the secondary node are executable by the processor to transmit a radio link failure type indicator in a packet data convergence protocol (PDCP) header associated with the RRC container.

138. The non-transitory computer-readable medium of claim 136, wherein the instructions to transmit the indication of the radio link failure to the secondary node are executable by the processor to transmit a radio link failure type indicator in a medium access control (MAC) sub-header associated with the RRC container.

139. The non-transitory computer-readable medium of claim 132, wherein the instructions to determine whether the UE is configured to communicate with the secondary node via the signaling radio bearer are executable by the processor to determine whether the UE is configured to communicate with the secondary node via an SRB1 split signaling radio bearer.

140. The non-transitory computer-readable medium of claim 132, wherein the instructions to determine whether the UE is configured to communicate with the secondary node via the signaling radio bearer are executable by the processor to determine whether the UE is configured to communicate with the secondary node via an SRB3 direct signaling radio bearer.

141. A non-transitory computer-readable medium storing code for wireless communications at a secondary node of a dual-connectivity configuration, the code comprising instructions executable by a processor to:

receive, from a user equipment (UE) via a data radio bearer, a first indication of a radio link failure of a radio link between the UE and a master node of the dual-connectivity configuration; and

transmit a second indication of the radio link failure to the master node.

142. The non-transitory computer-readable medium of claim 141, wherein the first indication of the radio link failure is received within a radio resource control (RRC) container.

143. The non-transitory computer-readable medium of claim 142, wherein the instructions are further executable to:

identify a radio link failure type indicator in a packet data convergence protocol (PDCP) header associated with the RRC container, wherein the second indication of the radio link failure is transmitted to the master node based at least in part on identifying the radio link failure type indicator.

144. The non-transitory computer-readable medium of claim 142, wherein the instructions are further executable to:

identify a radio link failure type indicator in a medium access control (MAC) sub-header associated with the RRC container, wherein the second indication of the radio link failure is transmitted to the master node based at least in part on identifying the radio link failure type indicator.

145. The non-transitory computer-readable medium of claim 141, wherein the instructions are further executable to:

receive a handover request from the master node after transmitting the indication of the radio link failure to the master node; and

transmit, to the UE via the data radio bearer, an indication of the handover request.

146. The non-transitory computer-readable medium of claim 145, wherein the instructions are further executable to:

transition, based at least in part on the handover request, from the dual-connectivity configuration to a single-connectivity configuration with the UE.

147. A non-transitory computer-readable medium storing code for wireless communication at a master node of a dual-connectivity configuration, the code comprising instructions executable by a processor to:

transmit, to a user equipment (UE), an indication of a default split radio bearer for communicating an indication of a radio link failure of a radio link between the UE and the master node;

receive, from a secondary node of the dual-connectivity configuration, the indication of the radio link failure for the UE;

identify, based at least in part on the indication of the radio link failure, a target node for the UE; and

transmit, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node.

148. The non-transitory computer-readable medium of claim 147, wherein the instructions are further executable to:

perform the handover procedure.

149. The non-transitory computer-readable medium of claim 147, wherein the indication of the default split radio bearer is transmitted to the UE via radio resource control (RRC) signaling.

150. The non-transitory computer-readable medium of claim 147, wherein the UE is associated with a cell, further comprising transmitting the indication of the default split radio bearer to at least one additional UE associated with the cell.

151. The non-transitory computer-readable medium of claim 150, wherein the indication of the default split radio bearer is transmitted to the UE and the at least one additional UE within a system information block (SIB).

152. The non-transitory computer-readable medium of claim 151, wherein the target node is different from the master node and the secondary node.

153. The non-transitory computer-readable medium of claim 147, wherein the indication of the radio link failure comprises a measurement report.

154. The non-transitory computer-readable medium of claim 153, wherein the instructions are further executable to:

decode the measurement report, wherein the target node is identified based at least in part on the measurement report.

155. The non-transitory computer-readable medium of claim 147, wherein the instructions to receive the indication of the radio link failure are executable to:

receive a backhaul container message that is encapsulated according to an Xn or X2 protocol.

156. A non-transitory computer-readable medium storing code for wireless communication at a master node of a dual-connectivity configuration, the code comprising instructions executable by a processor to:

receive, from a secondary node of the dual-connectivity configuration, a radio resource control (RRC) container comprising an indication of a radio link failure of a radio link between the master node and a user equipment (UE);

identify, based at least in part on the indication of the radio link failure, a target node for the UE; and

transmit, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node.

157. The non-transitory computer-readable medium of claim 156, wherein the instructions are further executable to:

perform the handover procedure.

158. The non-transitory computer-readable medium of claim 156, wherein the target node is different from the master node and the secondary node.

159. The non-transitory computer-readable medium of claim 156, wherein the indication of the radio link failure comprises a measurement report.

160. The non-transitory computer-readable medium of claim 159, wherein the instructions are further executable to:

decode the measurement report, wherein the target node is identified based at least in part on the measurement report.

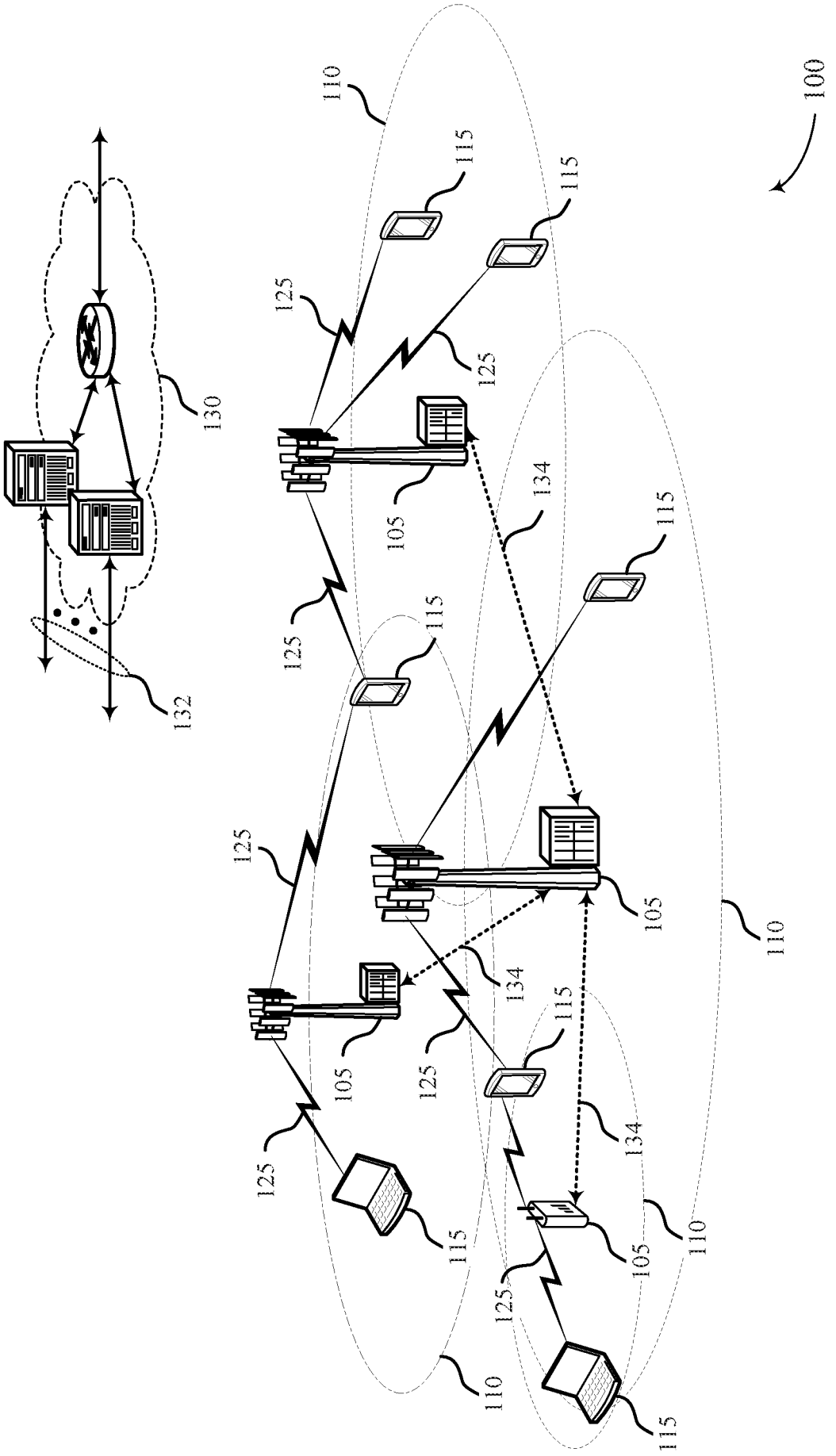


FIG. 1

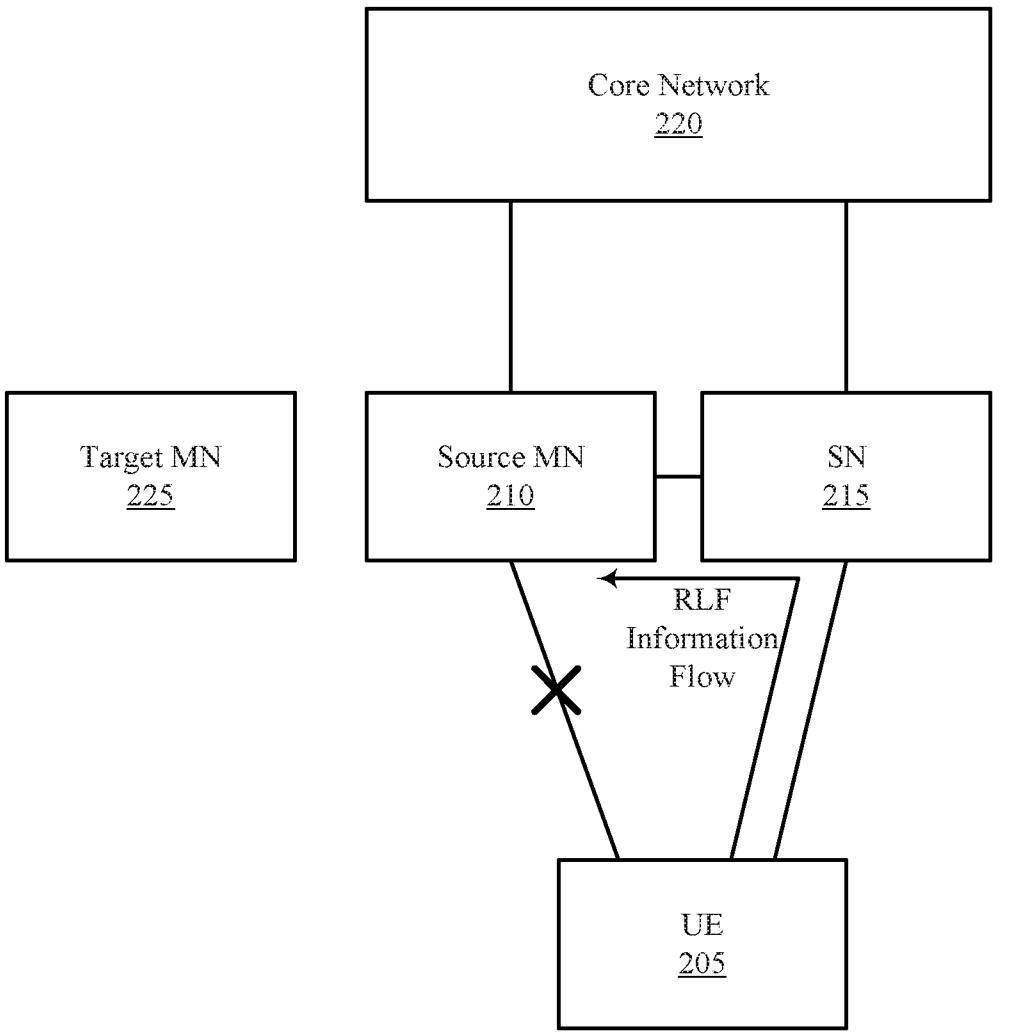

Core Network
220
Target MN
225
Source MN
210
SN
215
RLF
Information
Flow
UE
205
200

FIG. 2

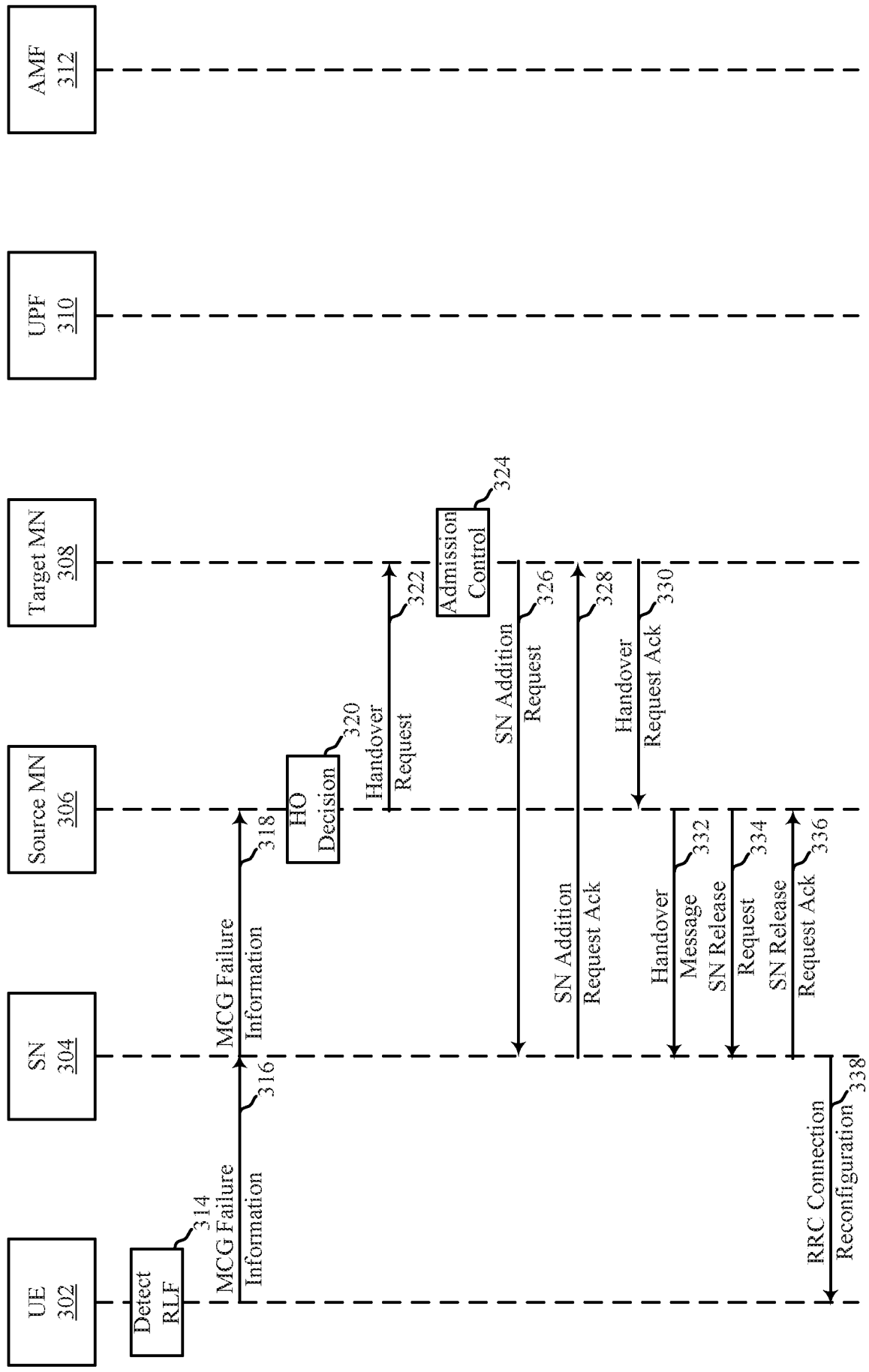

UE 302
SN 304
Source MN 306
Target MN 308
UPF 310
AMF 312
300
Detect RLF
314
MCG Failure Information
316
MCG Failure Information
318
HO Decision
320
Handover Request
322
Admission Control
324
SN Addition Request
326
SN Addition Request Ack
328
Handover Request Ack
330
Handover Message
332
SN Release Request
334
SN Release Request Ack
336
RRC Connection Reconfiguration
338

FIG. 3A

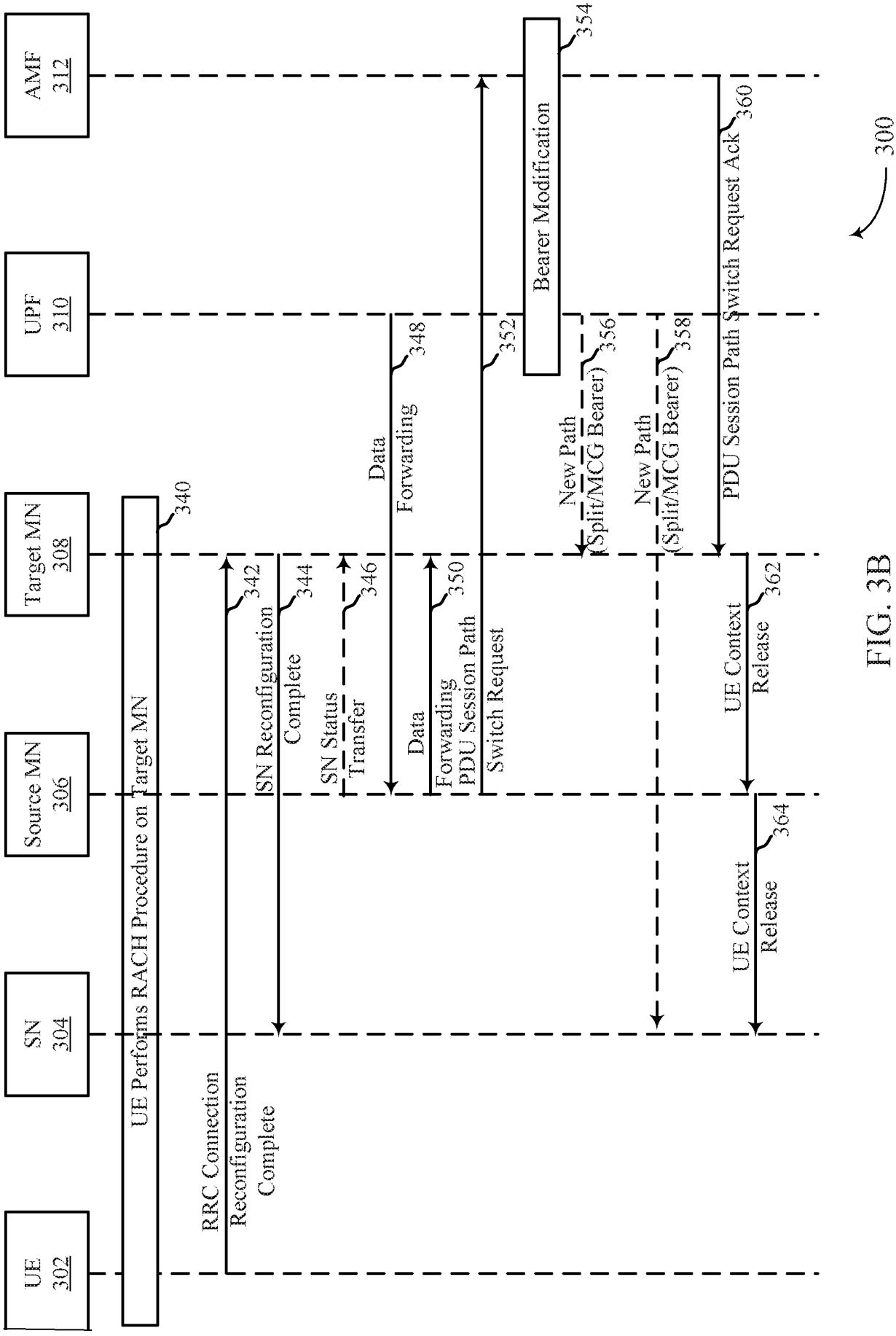

UE 302
SN 304
Source MN 306
Target MN 308
UPF 310
AMF 312
300
340
UE Performs RACH Procedure on Target MN
342
RRC Connection Reconfiguration Complete
344
SN Reconfiguration Complete
346
SN Status Transfer
348
Data Forwarding
350
Data Forwarding PDU Session Path
352
Switch Request
354
Bearer Modification
356
New Path (Split/MCG Bearer)
358
New Path (Split/MCG Bearer)
360
PDU Session Path Switch Request Ack
362
UE Context Release
364
UE Context Release

FIG. 3B

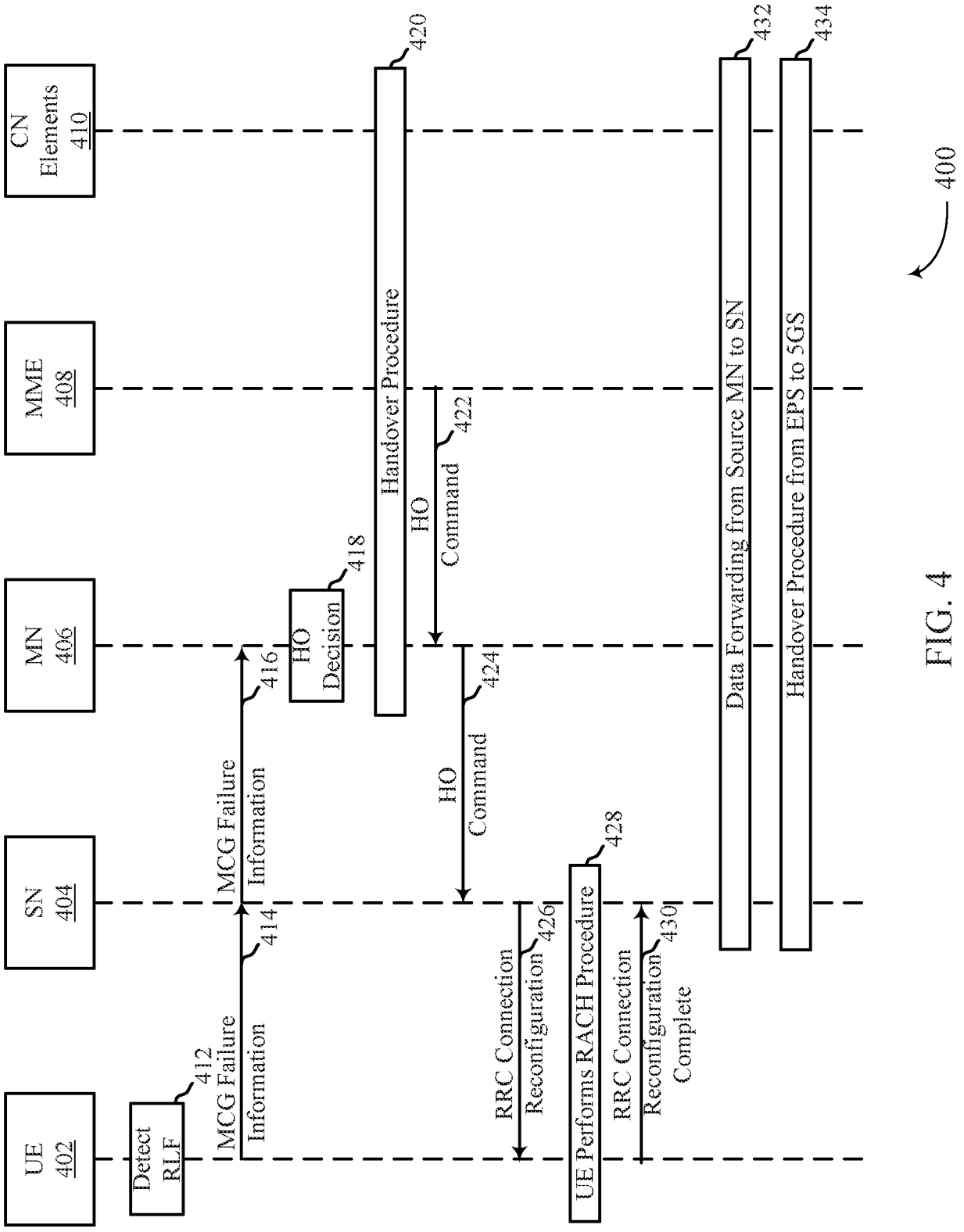

UE 402
SN 404
MN 406
MME 408
CN Elements 410
Detect RLF
412
MCG Failure Information
414
MCG Failure Information
416
HO Decision
418
Handover Procedure
420
HO Command
422
HO Command
424
RRC Connection Reconfiguration
426
UE Performs RACH Procedure
428
RRC Connection Reconfiguration Complete
430
Data Forwarding from Source MN to SN
432
Handover Procedure from EPS to 5GS
434
400

FIG. 4

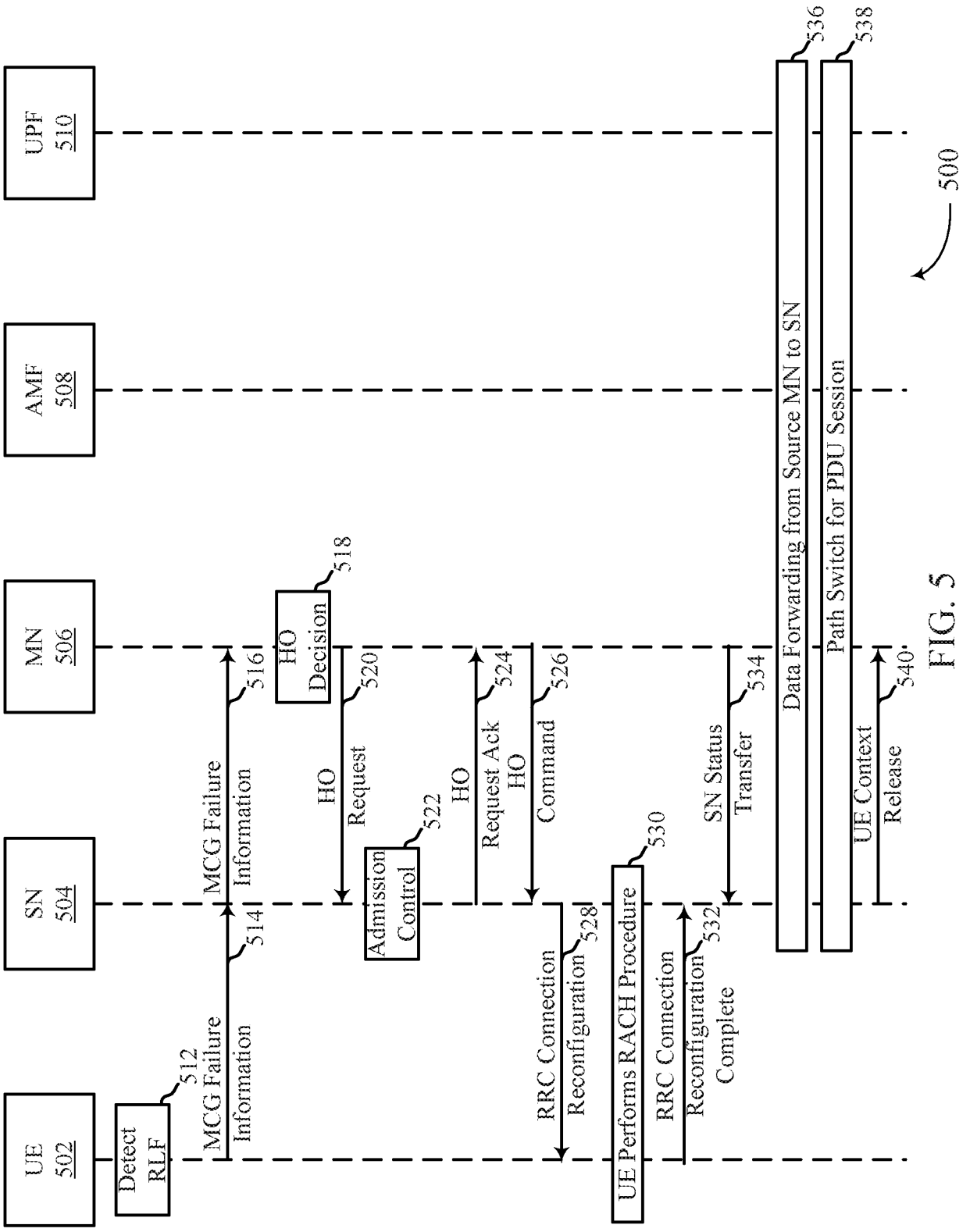

UE 502
SN 504
MN 506
AMF 508
UPF 510
500
Detect RLF
512
MCG Failure Information
514
MCG Failure Information
516
HO Decision
518
HO Request
520
Admission Control
522
HO Request Ack
524
HO Command
526
RRC Connection Reconfiguration
528
UE Performs RACH Procedure
530
RRC Connection Reconfiguration Complete
532
SN Status Transfer
534
Data Forwarding from Source MN to SN
536
Path Switch for PDU Session
538
UE Context Release
540

FIG. 5

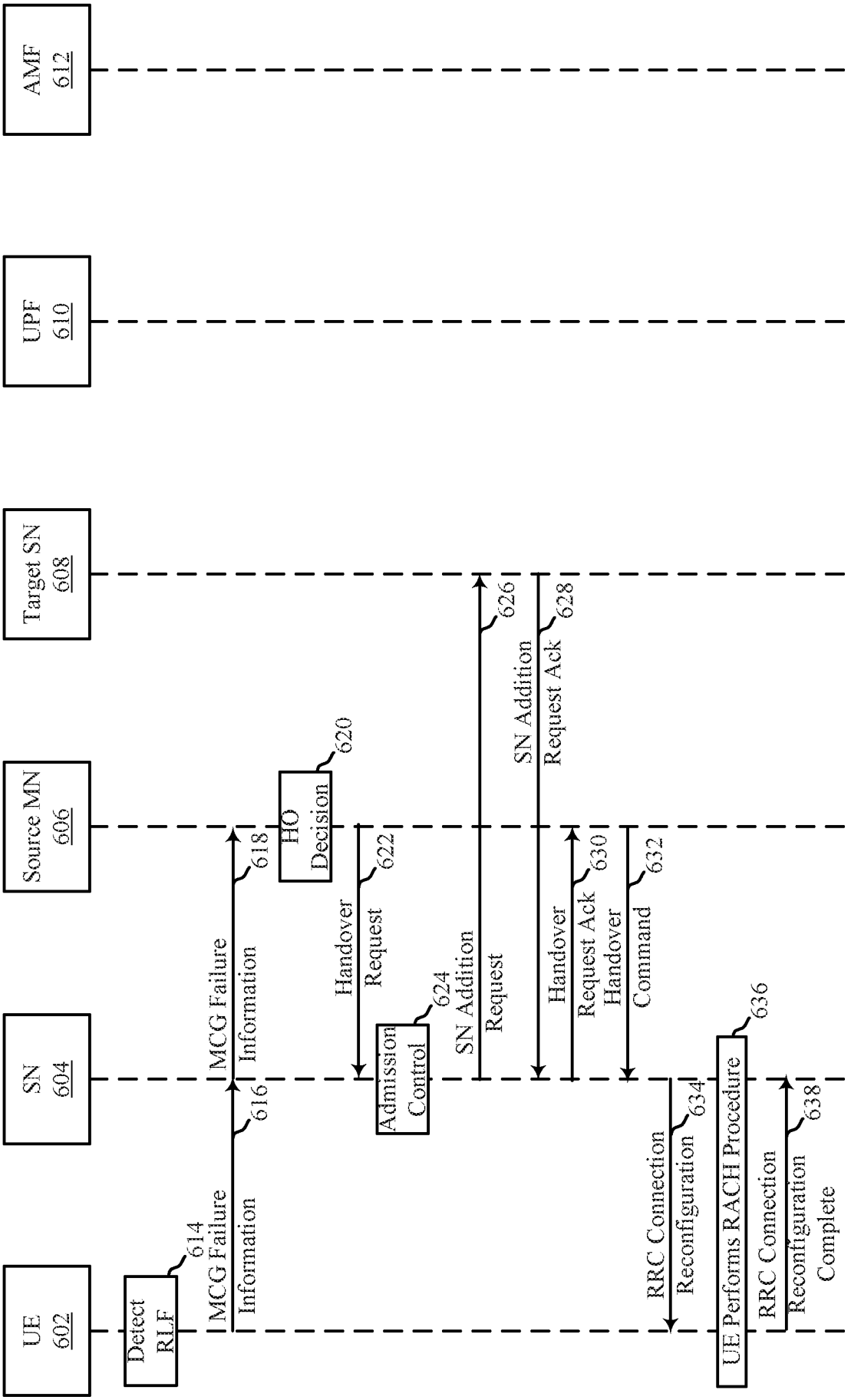

UE 602
SN 604
Source MN 606
Target SN 608
UPF 610
AMF 612
600
Detect RLF
614
MCG Failure Information
616
MCG Failure Information
618
HO Decision
620
Handover Request
622
Admission Control
624
SN Addition Request
626
SN Addition Request Ack
628
Handover Request Ack
630
Handover Command
632
RRC Connection Reconfiguration
634
UE Performs RACH Procedure
636
RRC Connection Reconfiguration Complete
638

FIG. 6A

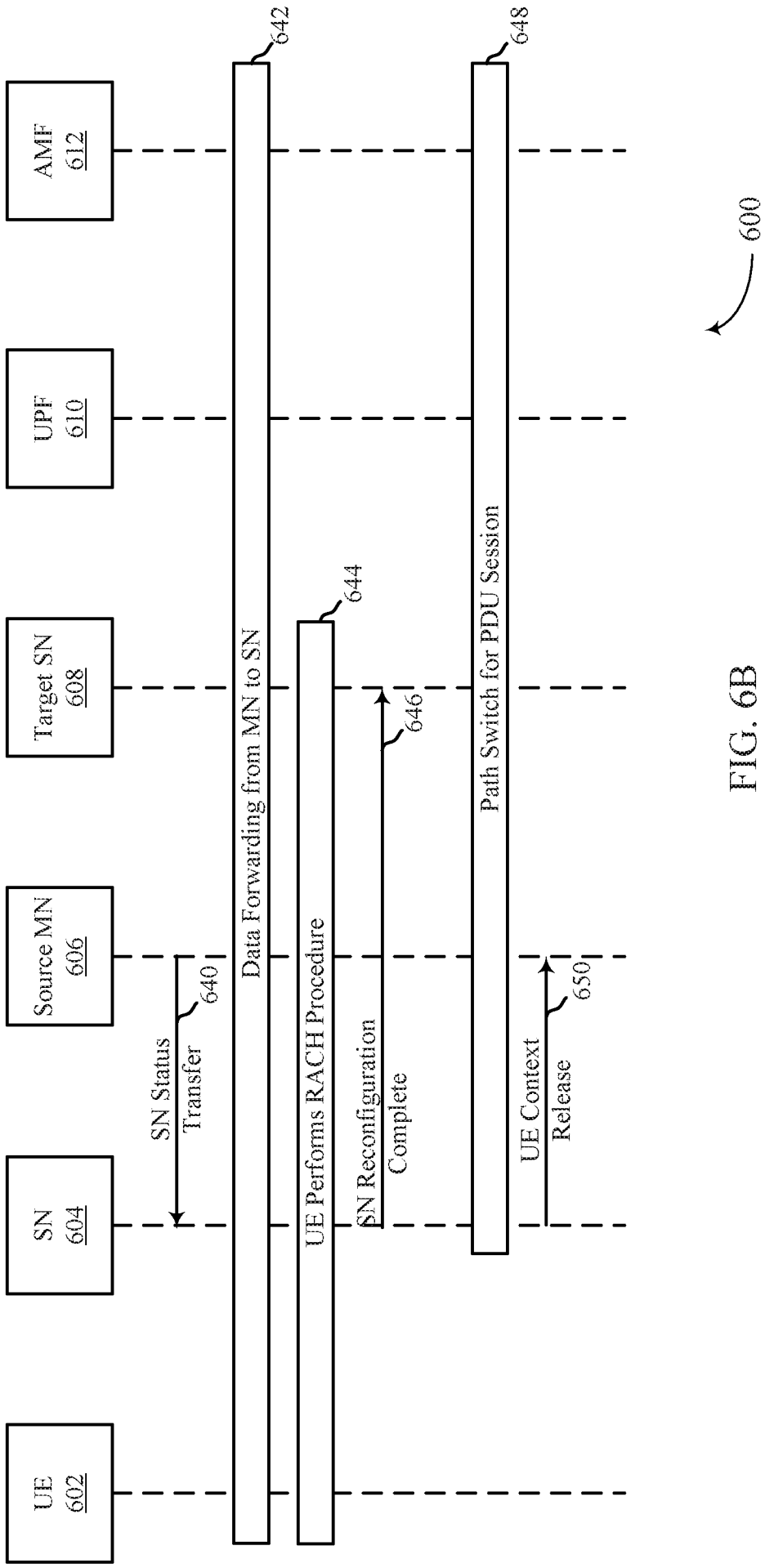

UE 602
SN 604
Source MN 606
Target SN 608
UPF 610
AMF 612
600
642
Data Forwarding from MN to SN
644
UE Performs RACH Procedure
646
SN Reconfiguration Complete
648
Path Switch for PDU Session
640
SN Status Transfer
650
UE Context Release

FIG. 6B

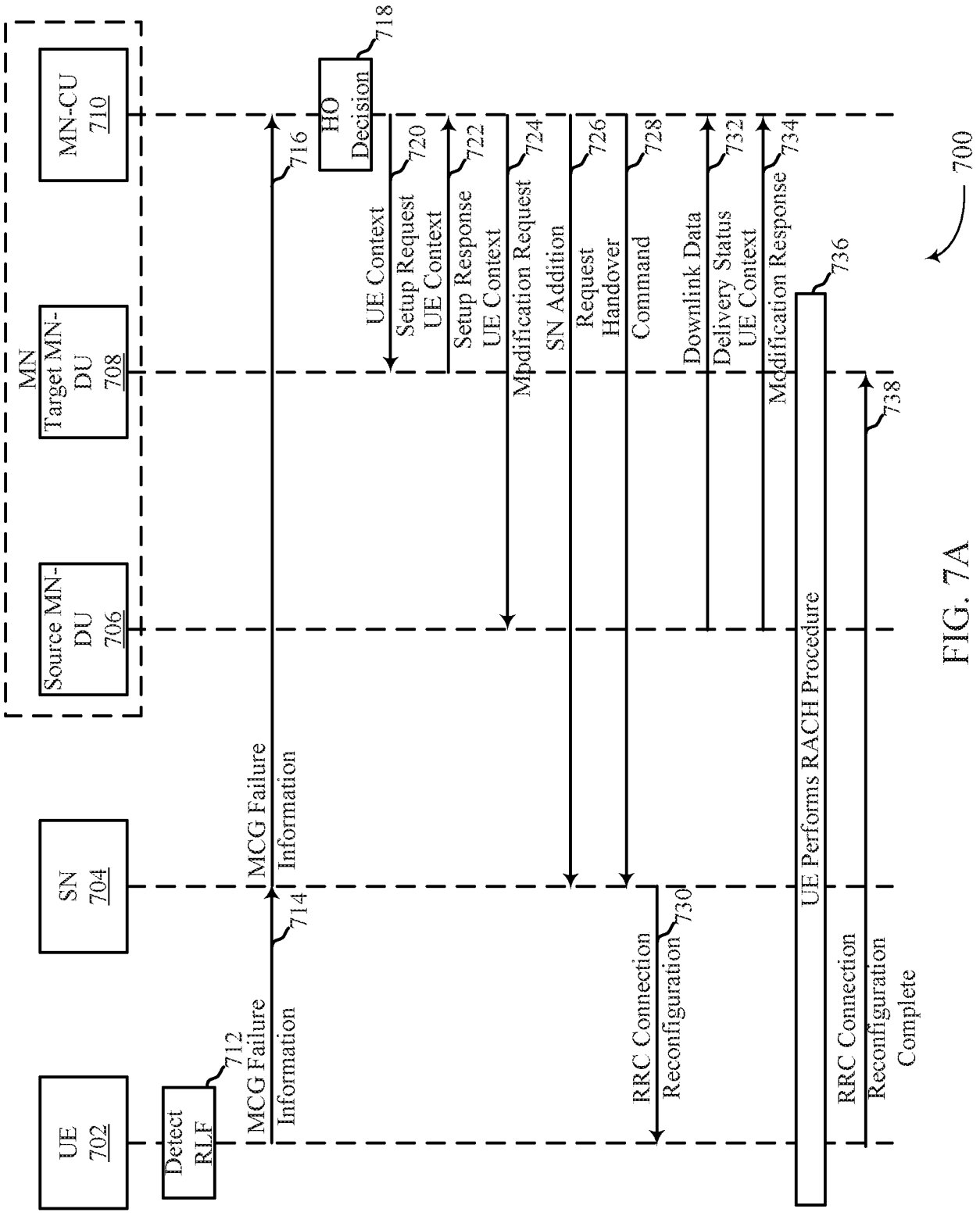

UE 702
SN 704
MN
Source MN-DU 706
Target MN-DU 708
MN-CU 710
Detect RLF
712
MCG Failure Information
714
MCG Failure Information
716
HO Decision
718
UE Context Setup Request
720
UE Context Setup Response
722
UE Context Modification Request
724
SN Addition Request
726
Handover Command
728
RRC Connection Reconfiguration
730
Downlink Data Delivery Status
732
UE Context Modification Response
734
UE Performs RACH Procedure
736
RRC Connection Reconfiguration Complete
738
700

FIG. 7A

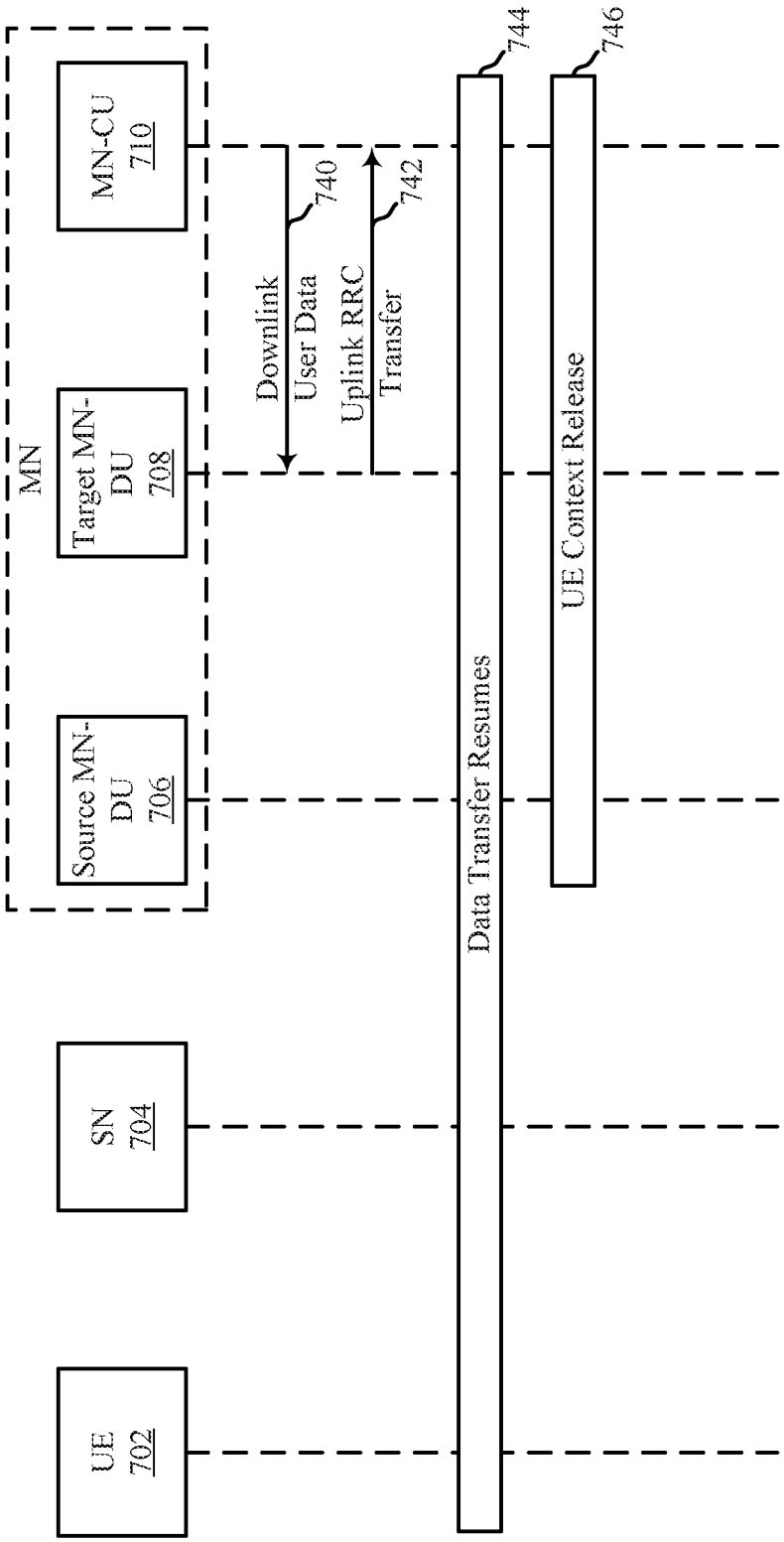

MN
MN-CU 710
Target MN-DU 708
Source MN-DU 706
SN 704
UE 702
Downlink User Data 740
Uplink RRC Transfer 742
Data Transfer Resumes 744
UE Context Release 746
700

FIG. 7B

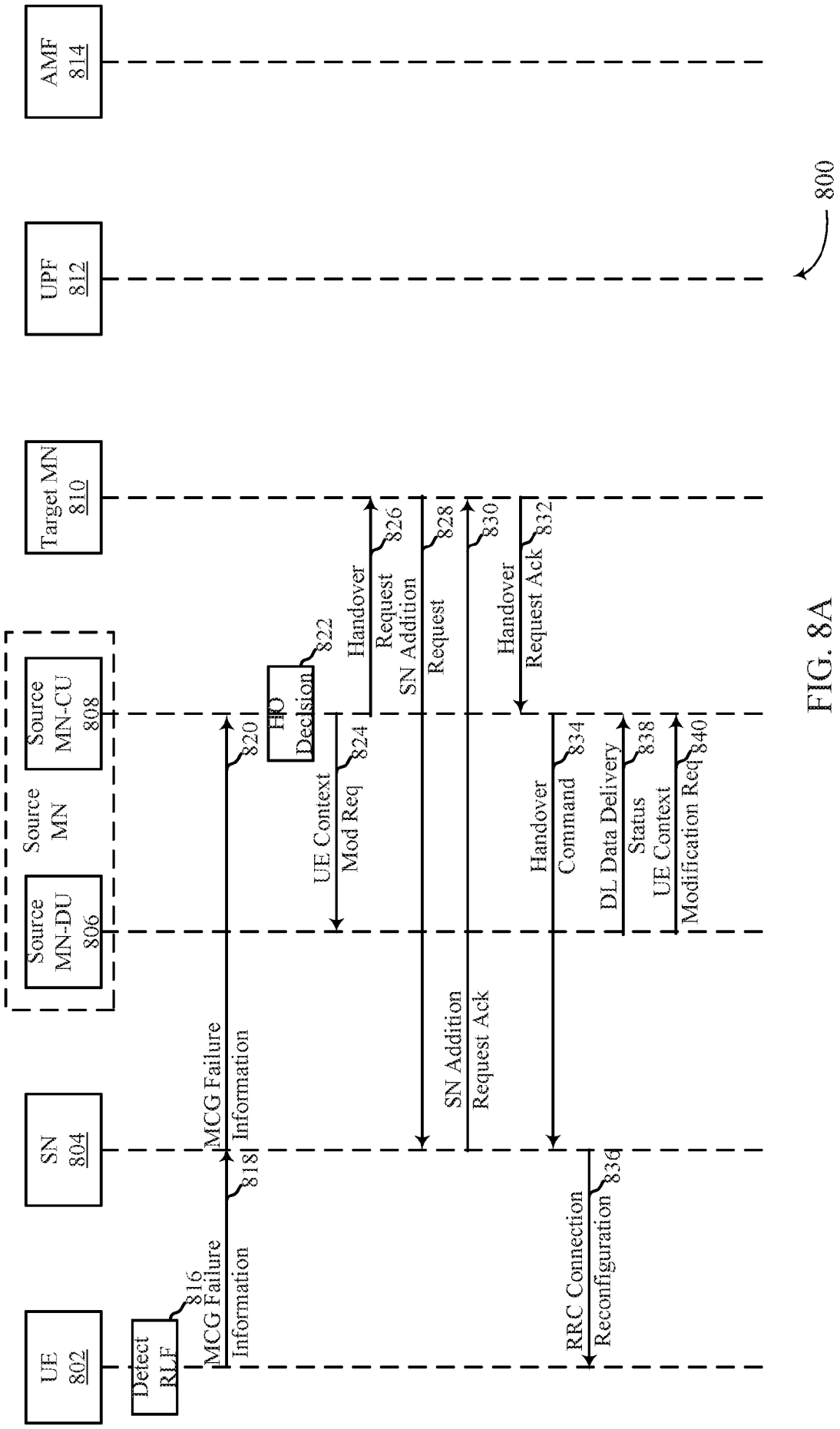

UE 802
SN 804
Source MN
Source MN-DU 806
Source MN-CU 808
Target MN 810
UPF 812
AMF 814
800
Detect RLF
816
MCG Failure Information
818
MCG Failure Information
820
HO Decision
822
UE Context Mod Req
824
Handover Request SN Addition Request
826
SN Addition Request Ack
828
Handover Request Ack
830
Handover Command
832
DL Data Delivery Status
834
UE Context Modification Req
838
RRC Connection Reconfiguration
836
840

FIG. 8A

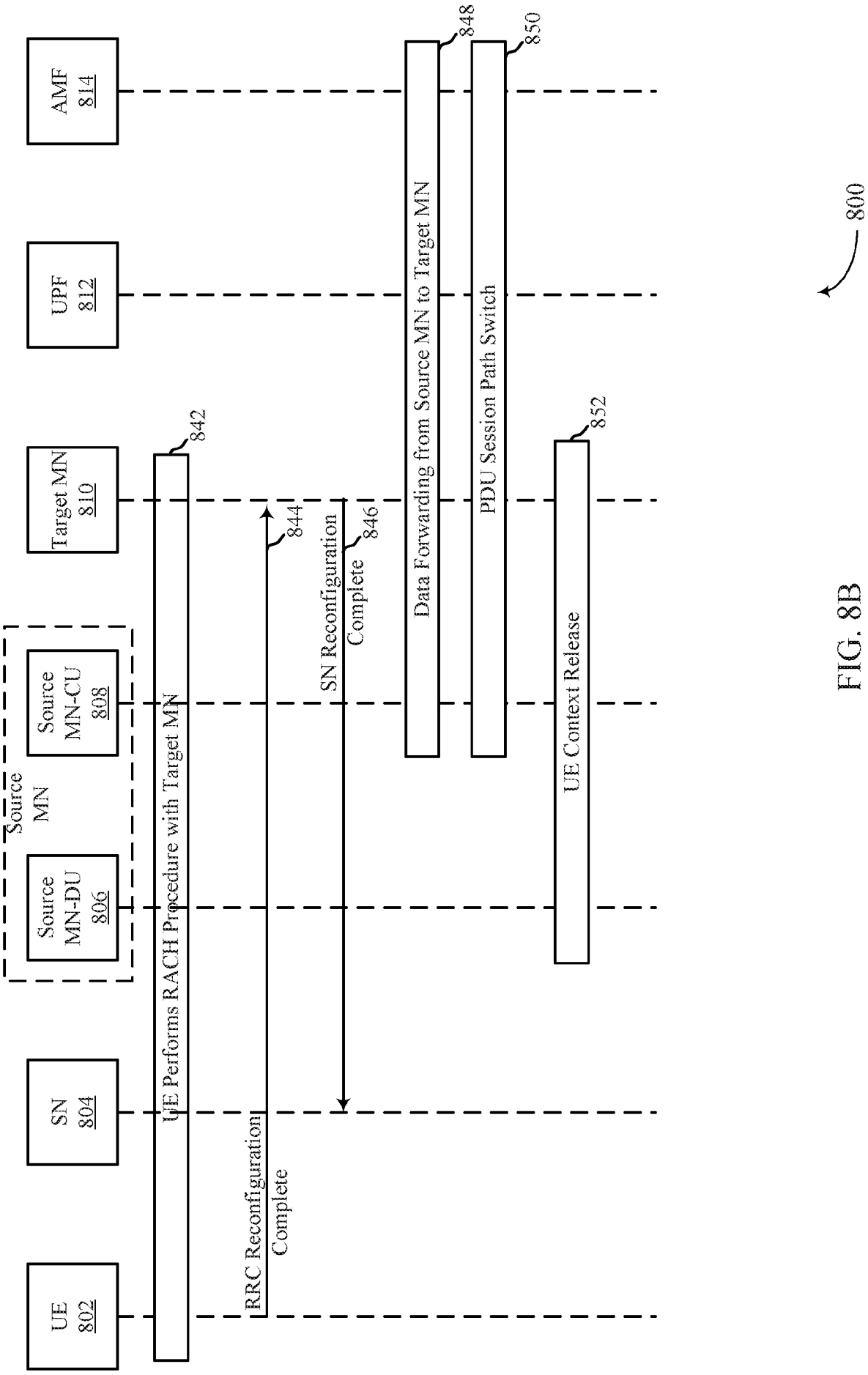

UE 802
SN 804
Source MN
Source MN-DU 806
Source MN-CU 808
Target MN 810
UPF 812
AMF 814
800
842
844
846
848
850
852
UE Performs RACH Procedure with Target MN
RRC Reconfiguration Complete
SN Reconfiguration Complete
Data Forwarding from Source MN to Target MN
PDU Session Path Switch
UE Context Release

FIG. 8B

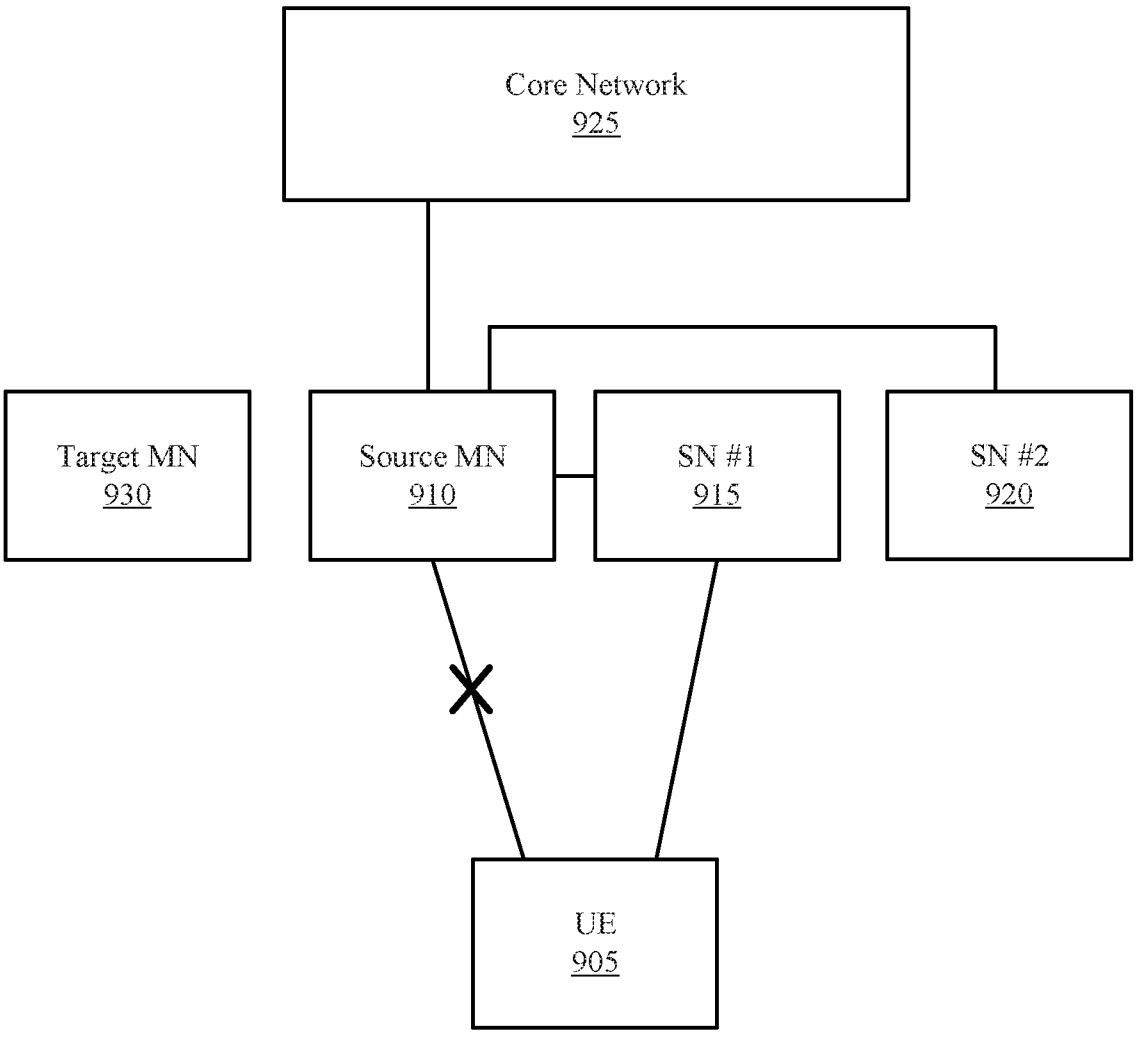

Core Network
925
Target MN
930
Source MN
910
SN #1
915
SN #2
920
UE
905
900

FIG. 9

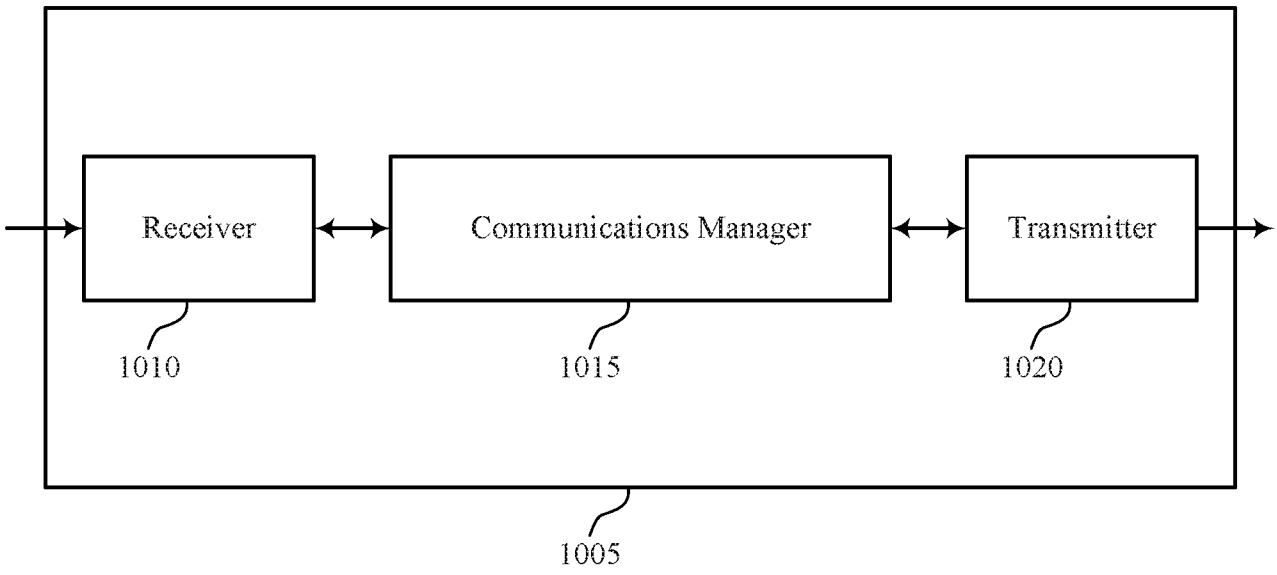

Receiver
Communications Manager
Transmitter
1010
1015
1020
1005
1000

FIG. 10

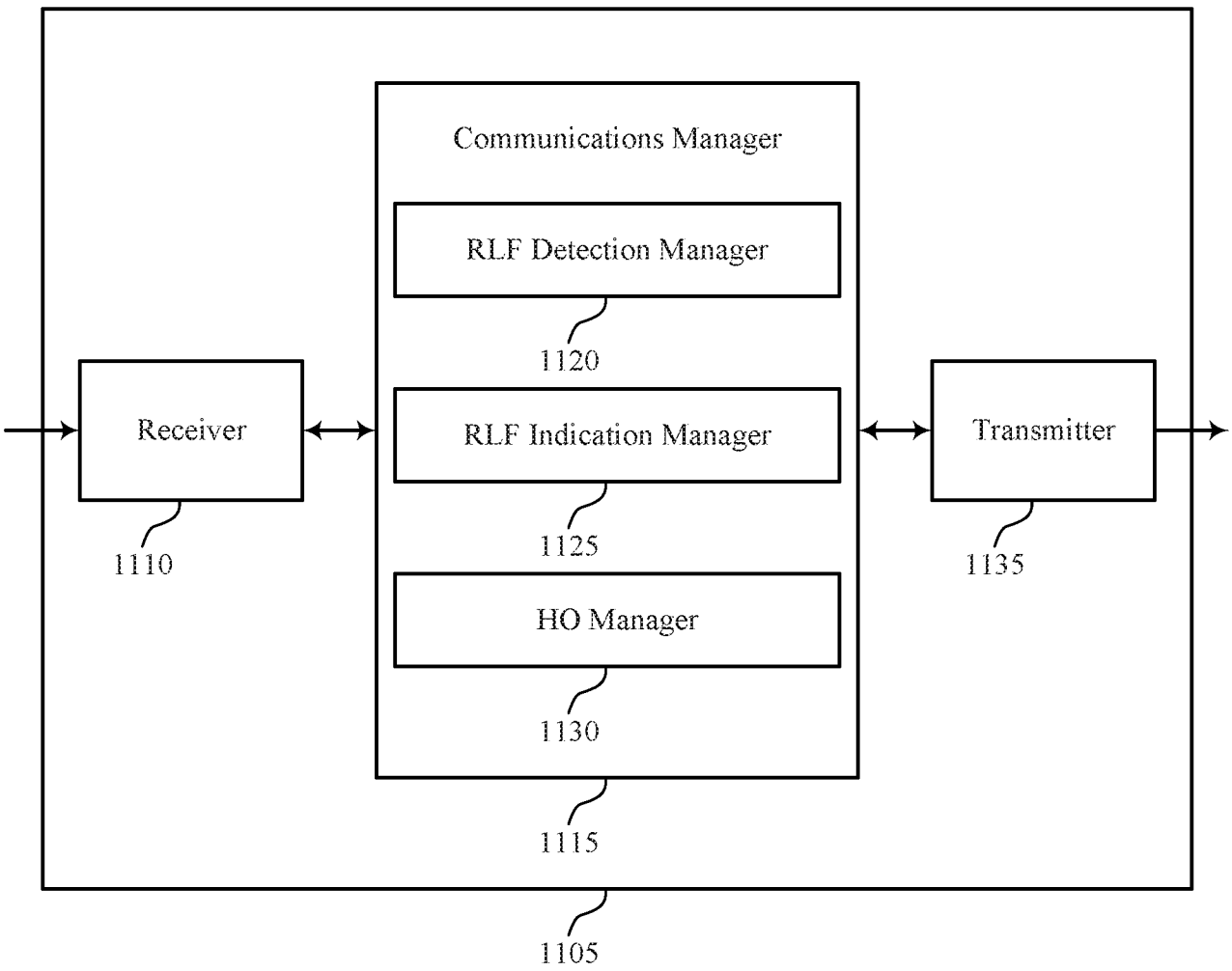

Communications Manager
RLF Detection Manager
1120
Receiver
RLF Indication Manager
Transmitter
1110
1125
1135
HO Manager
1130
1115
1105
1100

FIG. 11

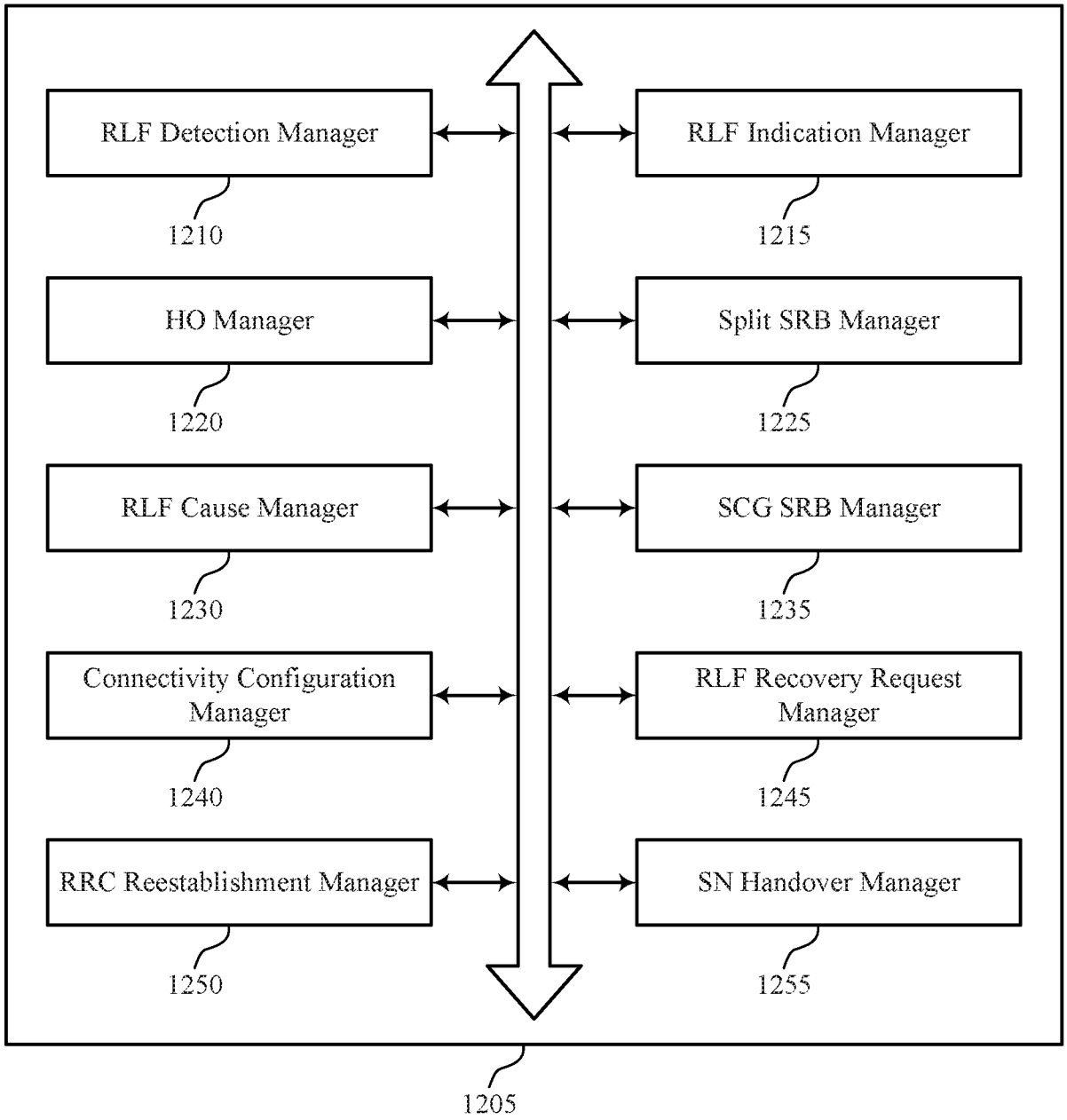

RLF Detection Manager
1210
RLF Indication Manager
1215
HO Manager
1220
Split SRB Manager
1225
RLF Cause Manager
1230
SCG SRB Manager
1235
Connectivity Configuration Manager
1240
RLF Recovery Request Manager
1245
RRC Reestablishment Manager
1250
SN Handover Manager
1255
1205
1200

FIG. 12

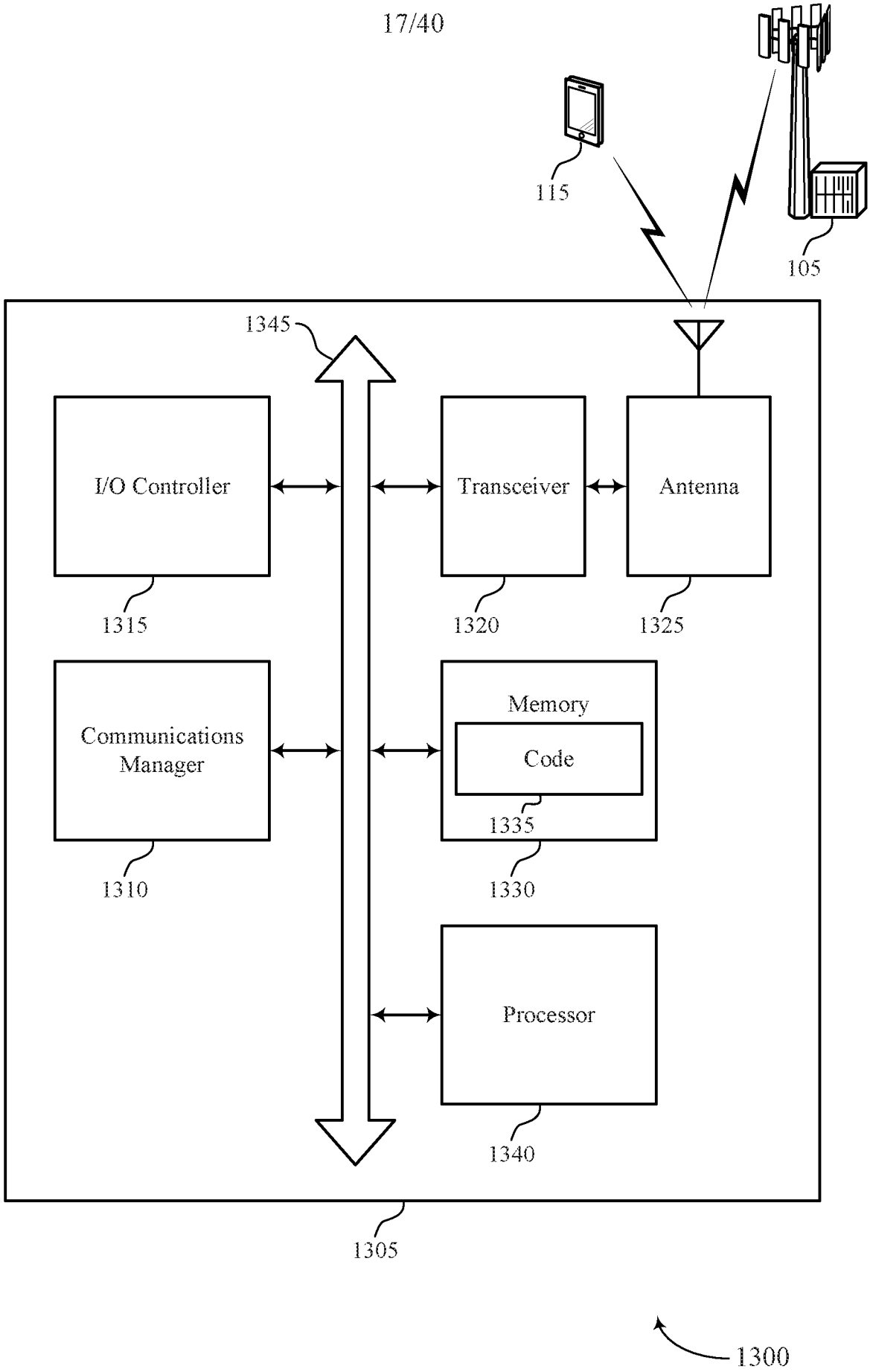

115
105
1345
I/O Controller
Transceiver
Antenna
1315
1320
1325
Communications Manager
Memory
Code
1335
1310
1330
Processor
1340
1305
1300

FIG. 13

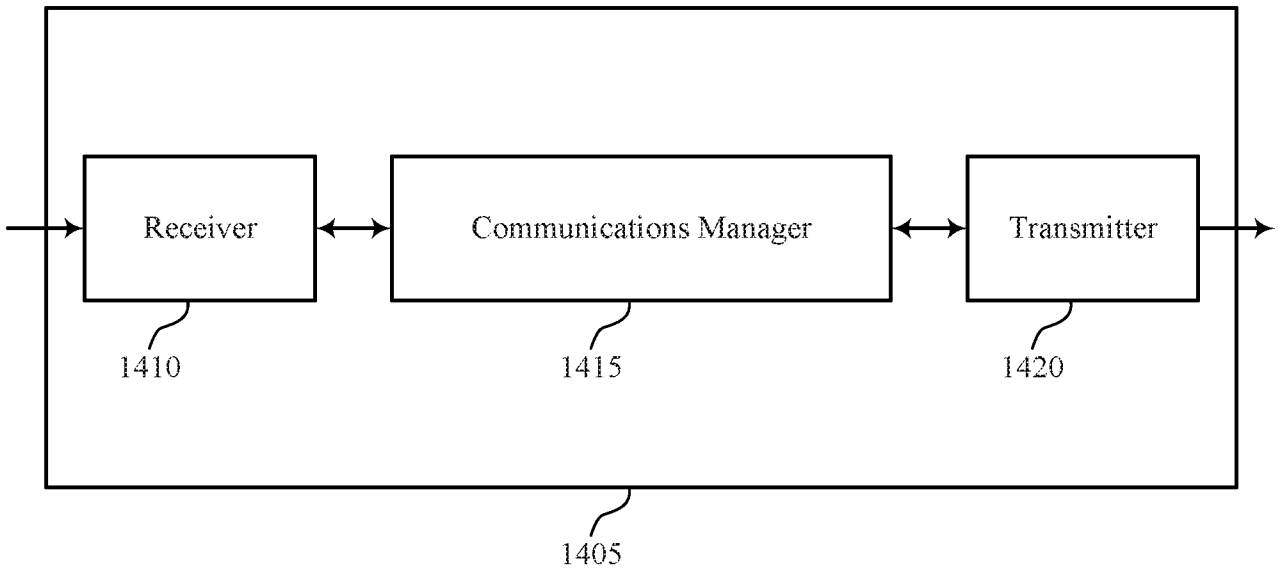

Receiver
Communications Manager
Transmitter
1410
1415
1420
1405
1400

FIG. 14

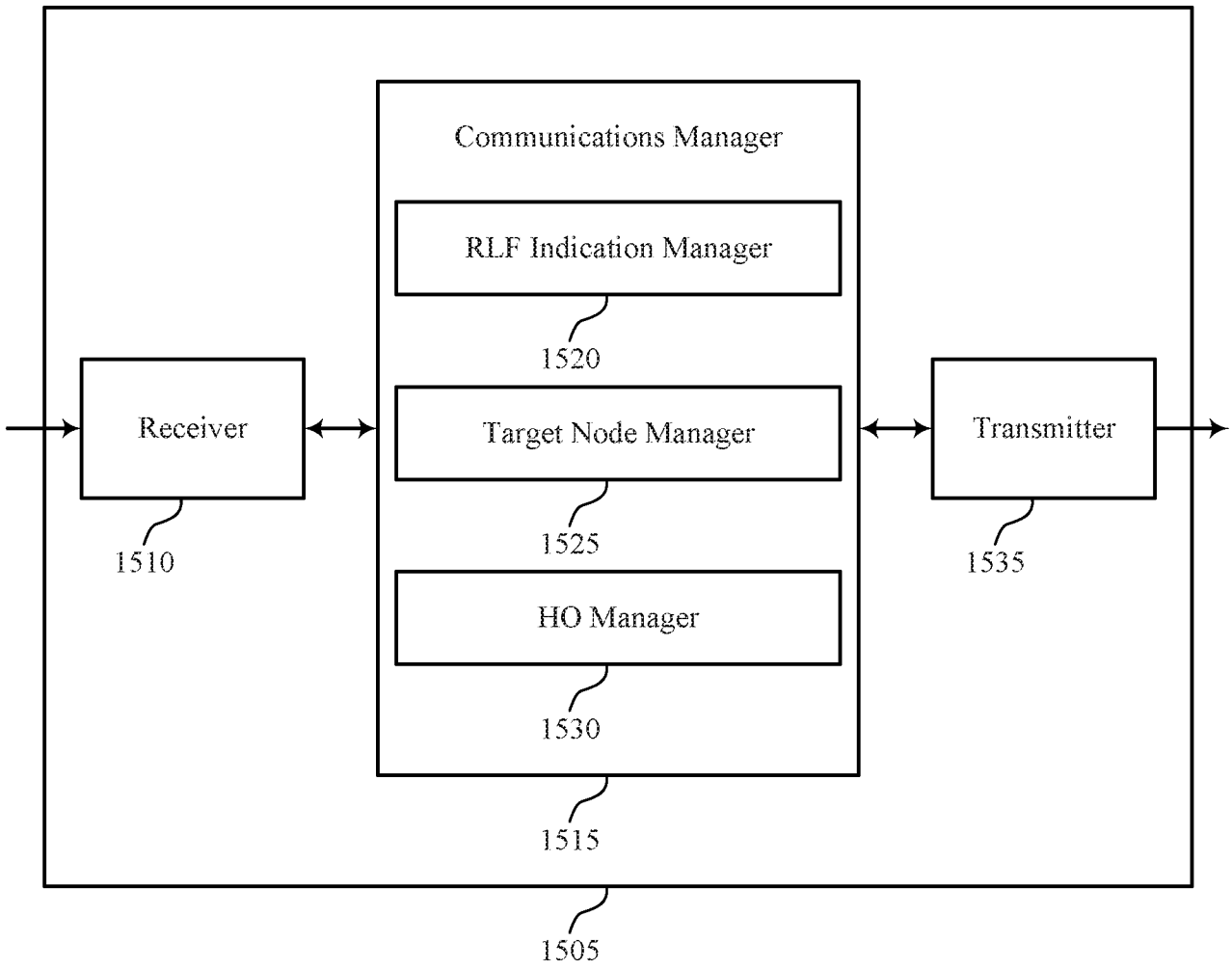

Communications Manager
RLF Indication Manager
1520
Receiver
Target Node Manager
Transmitter
1510
1525
1535
HO Manager
1530
1515
1505
1500

FIG. 15

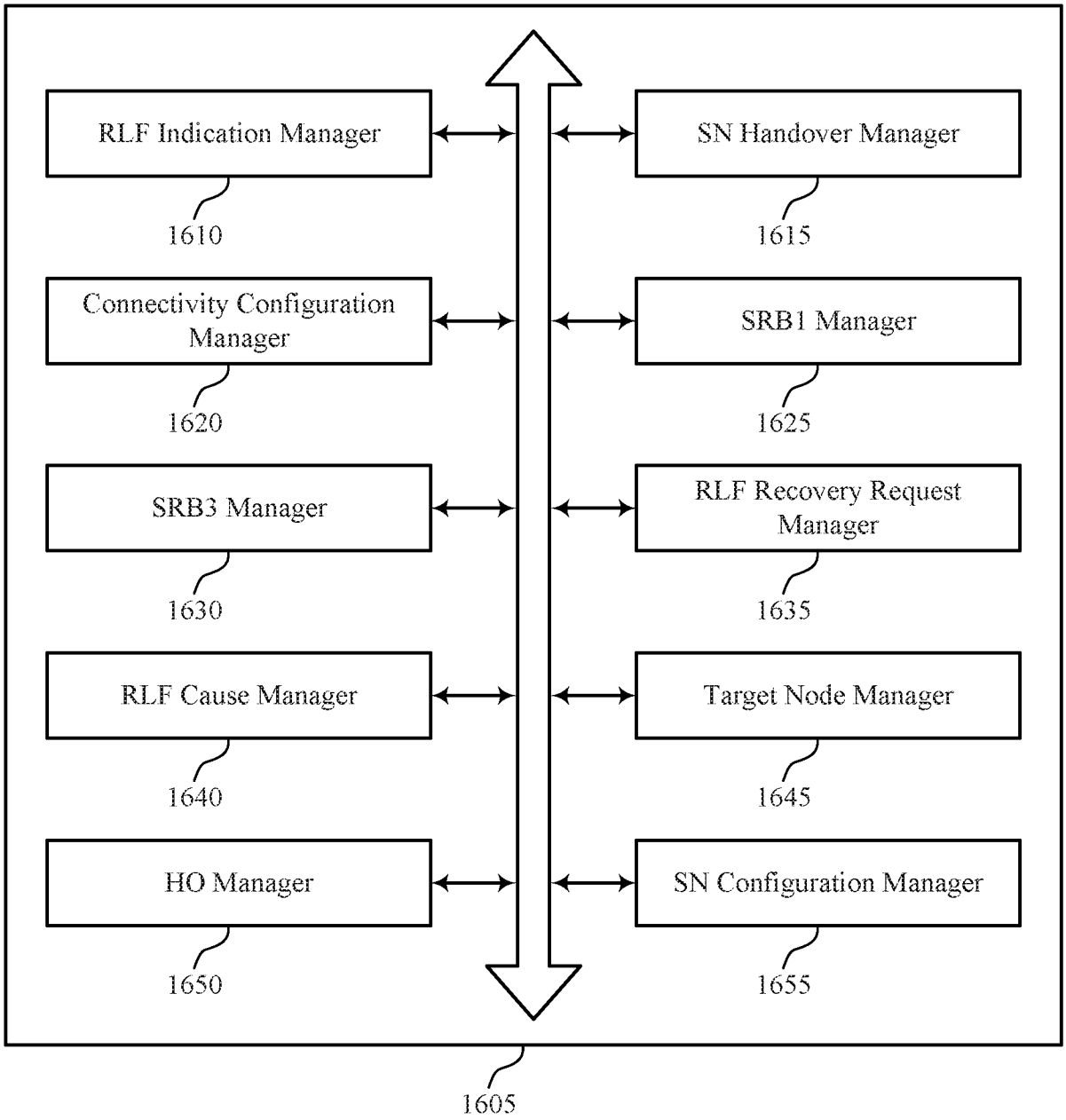

RLF Indication Manager
1610
SN Handover Manager
1615
Connectivity Configuration Manager
1620
SRB1 Manager
1625
SRB3 Manager
1630
RLF Recovery Request Manager
1635
RLF Cause Manager
1640
Target Node Manager
1645
HO Manager
1650
SN Configuration Manager
1655
1605
1600

FIG. 16

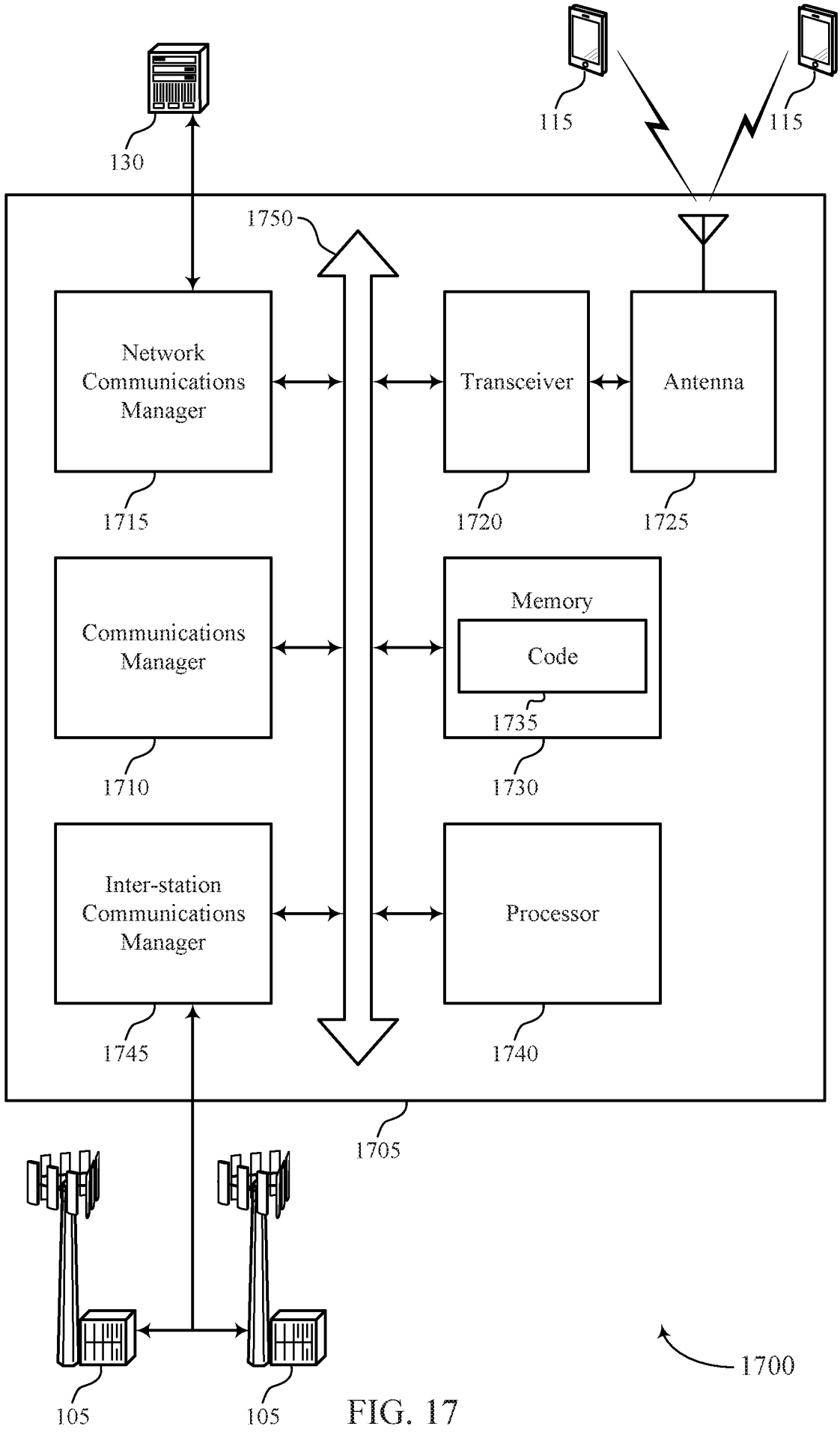

130
115
115
1750
Network Communications Manager
Transceiver
Antenna
1715
1720
1725
Communications Manager
Memory
Code
1735
1710
1730
Inter-station Communications Manager
Processor
1745
1740
1705
105
105
1700

FIG. 17

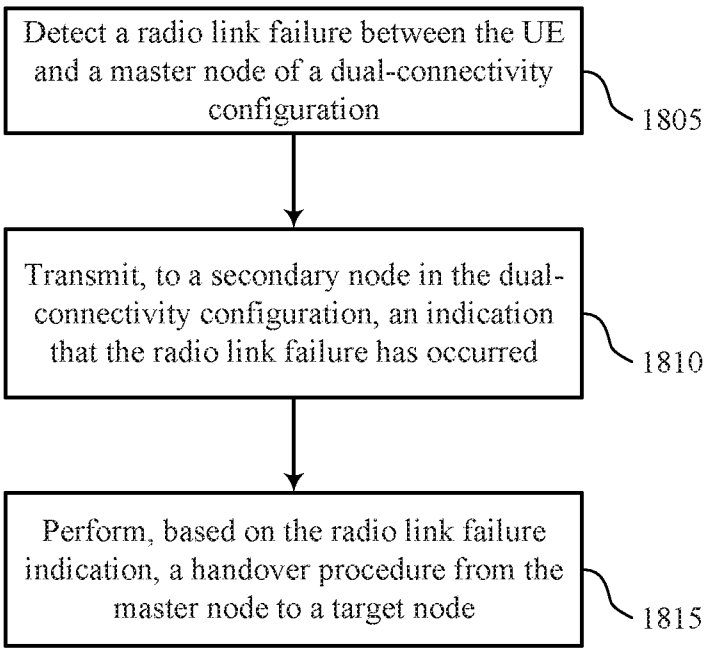

Detect a radio link failure between the UE and a master node of a dual-connectivity configuration
1805
Transmit, to a secondary node in the dual-connectivity configuration, an indication that the radio link failure has occurred
1810
Perform, based on the radio link failure indication, a handover procedure from the master node to a target node
1815
1800

FIG. 18

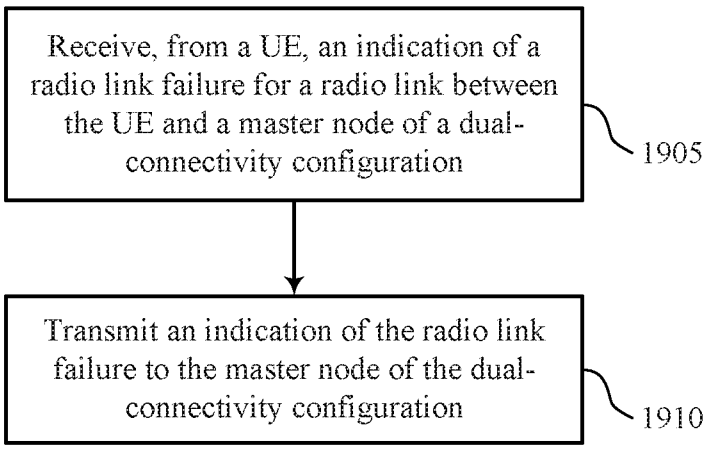

Receive, from a UE, an indication of a radio link failure for a radio link between the UE and a master node of a dual-connectivity configuration
1905
Transmit an indication of the radio link failure to the master node of the dual-connectivity configuration
1910
1900

FIG. 19

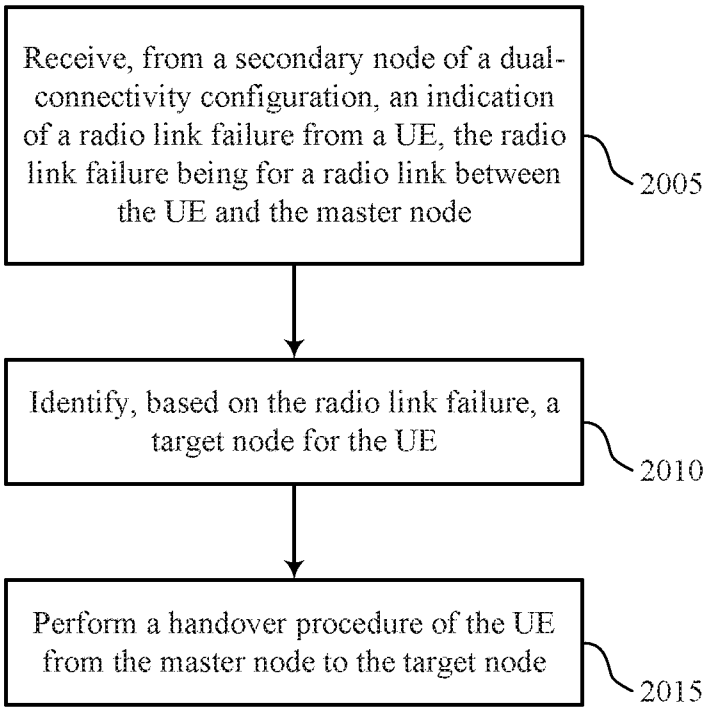

Receive, from a secondary node of a dual-connectivity configuration, an indication of a radio link failure from a UE, the radio link failure being for a radio link between the UE and the master node
2005
Identify, based on the radio link failure, a target node for the UE
2010
Perform a handover procedure of the UE from the master node to the target node
2015
2000

FIG. 20

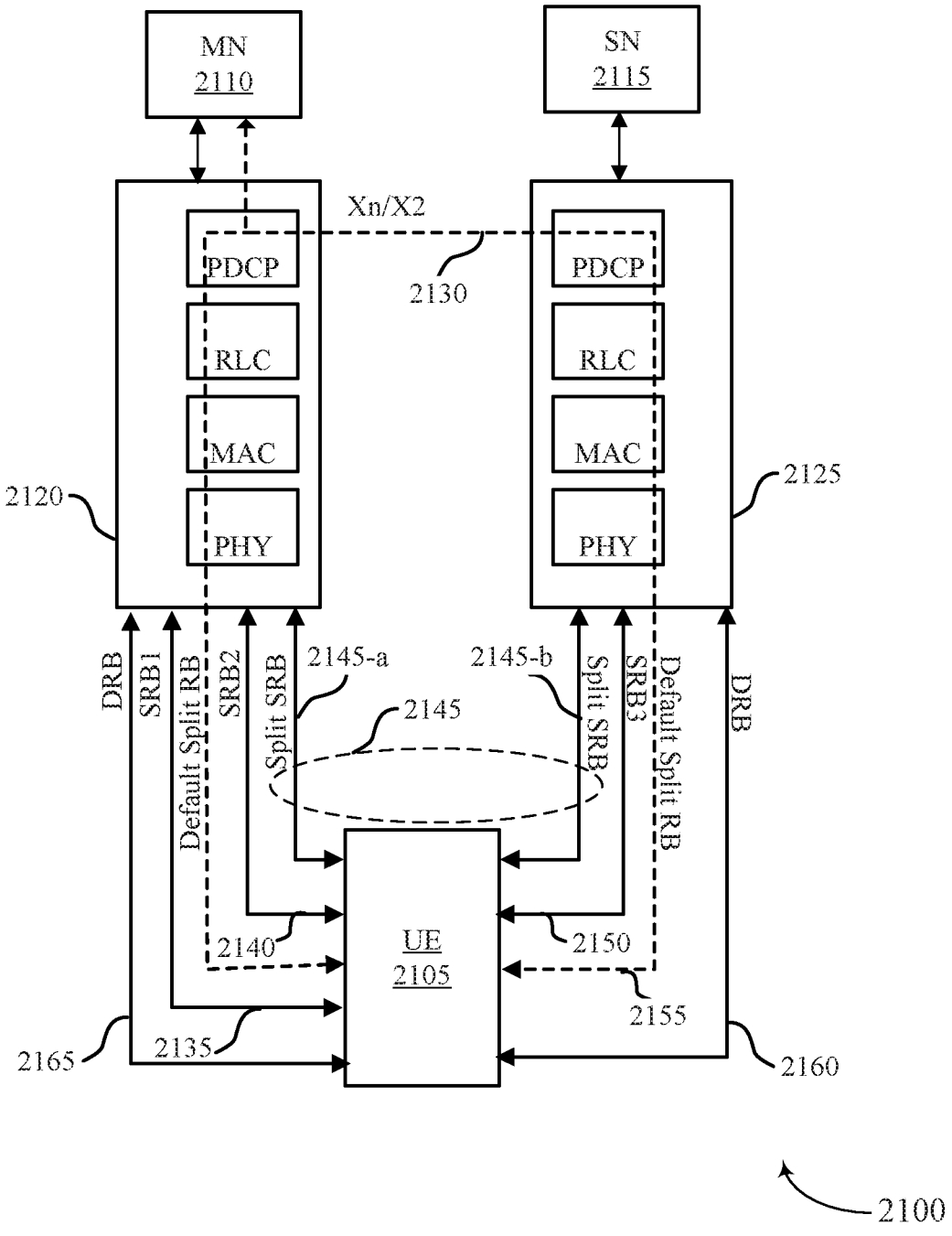

MN
2110
SN
2115
Xn/X2
2130
PDCP
RLC
MAC
PHY
PDCP
RLC
MAC
PHY
2120
2125
DRB
SRB1
Default Split RB
SRB2
Split SRB
2145-a
2145
2145-b
Split SRB
SRB3
Default Split RB
DRB
UE
2105
2140
2150
2155
2165
2135
2160
2100

FIG. 21

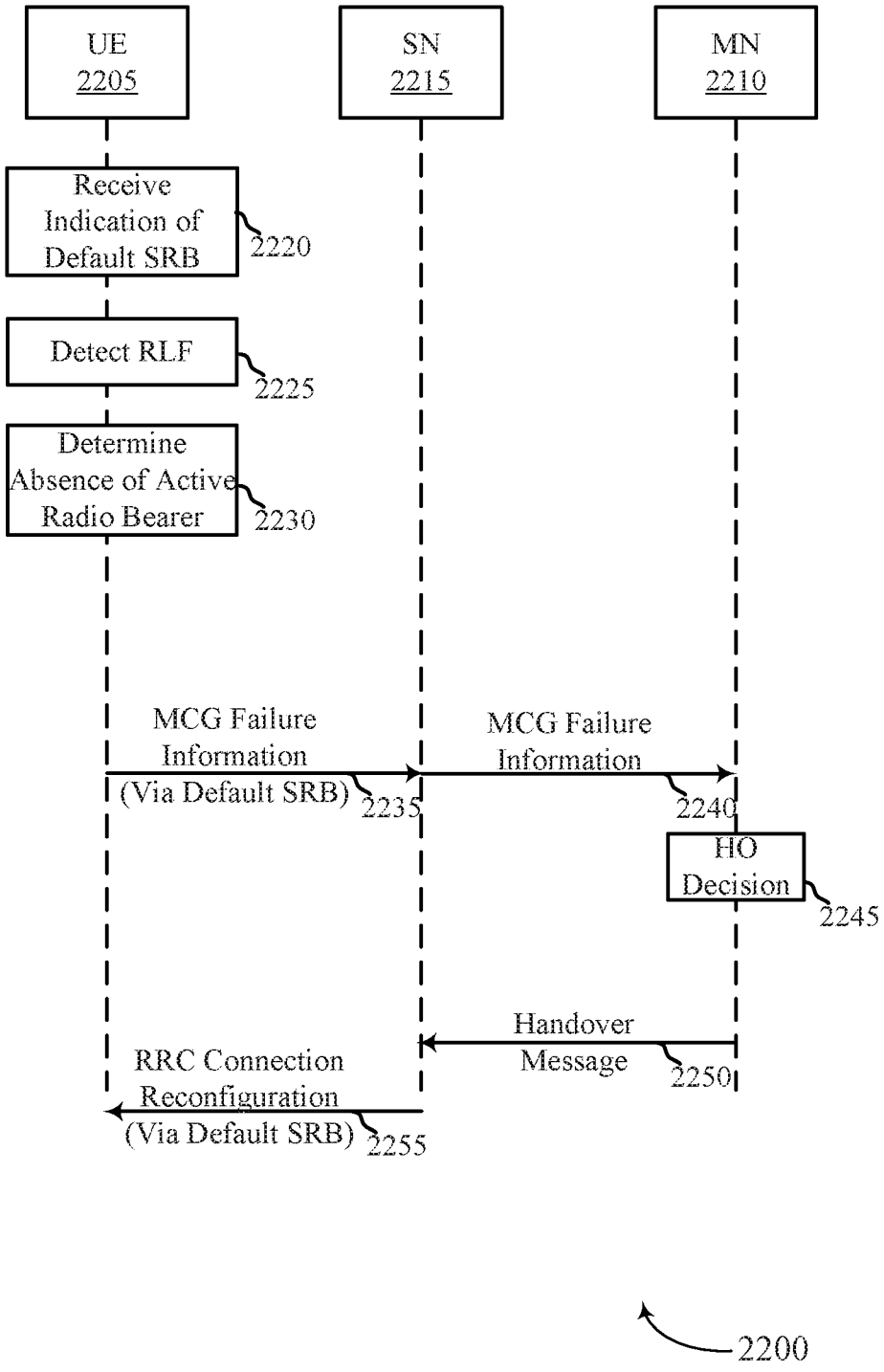

UE
2205
SN
2215
MN
2210
Receive Indication of Default SRB
2220
Detect RLF
2225
Determine Absence of Active Radio Bearer
2230
MCG Failure Information (Via Default SRB)
2235
MCG Failure Information
2240
HO Decision
2245
Handover Message
2250
RRC Connection Reconfiguration (Via Default SRB)
2255
2200

FIG. 22

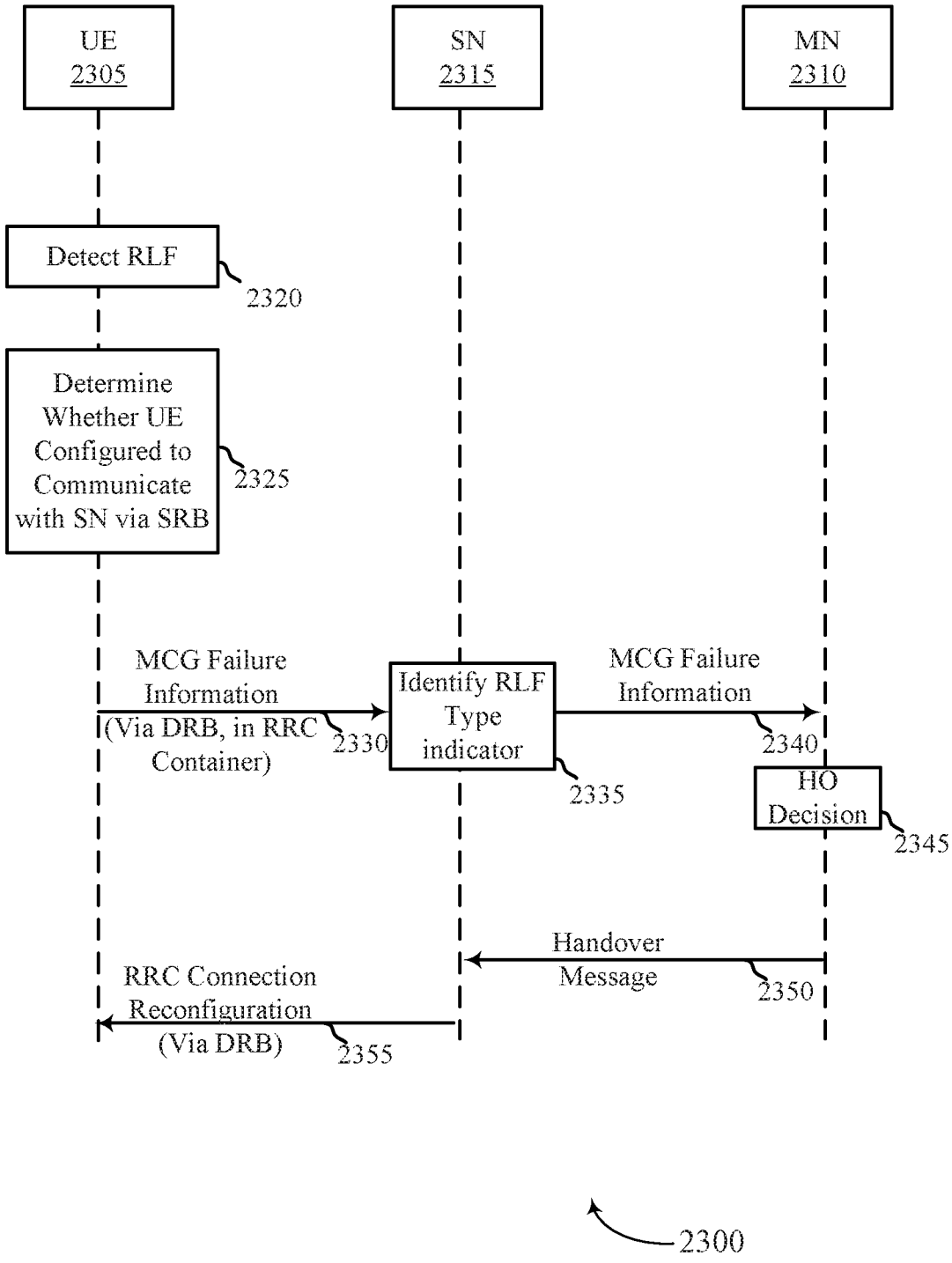

UE
2305
SN
2315
MN
2310
Detect RLF
2320
Determine Whether UE Configured to Communicate with SN via SRB
2325
MCG Failure Information
(Via DRB, in RRC Container)
2330
Identify RLF Type indicator
2335
MCG Failure Information
2340
HO Decision
2345
Handover Message
2350
RRC Connection Reconfiguration
(Via DRB)
2355
2300

FIG. 23

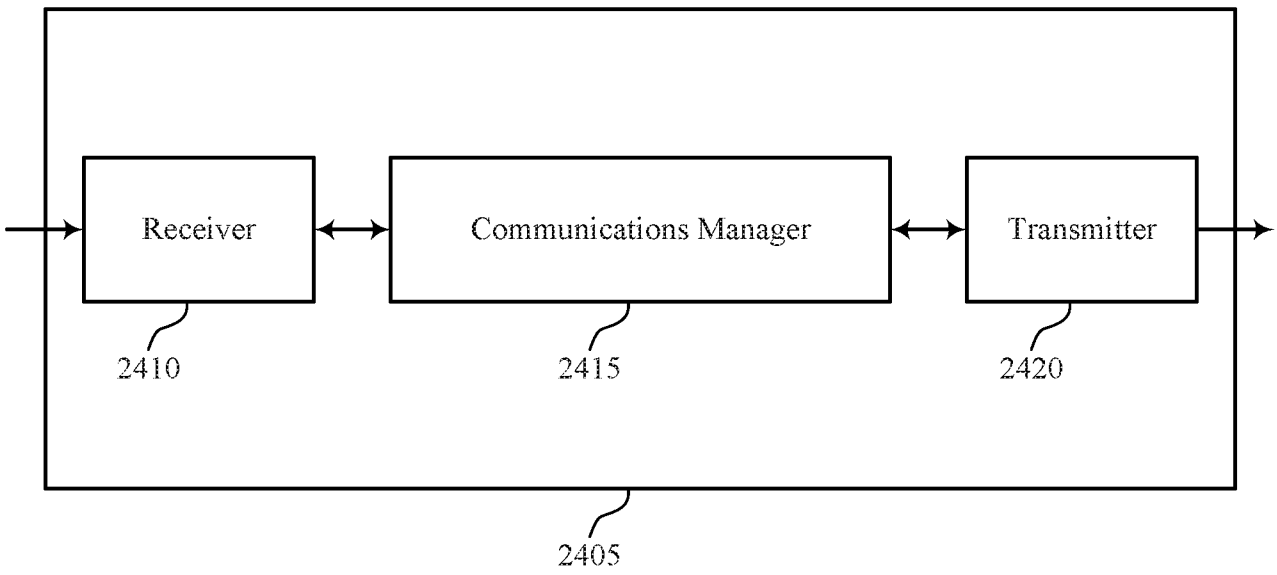

Receiver
Communications Manager
Transmitter
2410
2415
2420
2405
2400

FIG. 24

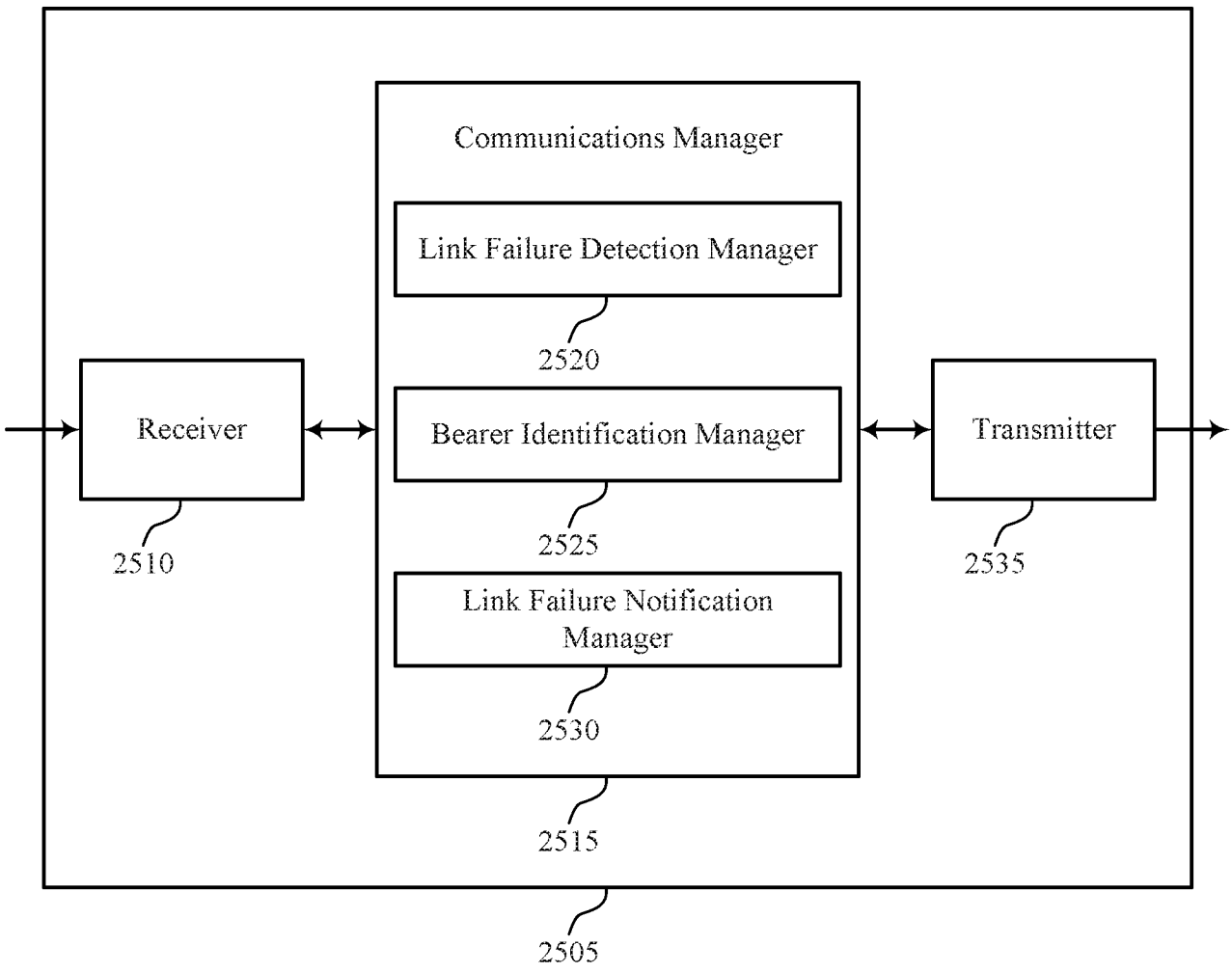

Communications Manager
Link Failure Detection Manager
2520
Receiver
Bearer Identification Manager
Transmitter
2510
2525
2535
Link Failure Notification Manager
2530
2515
2505
2500

FIG. 25

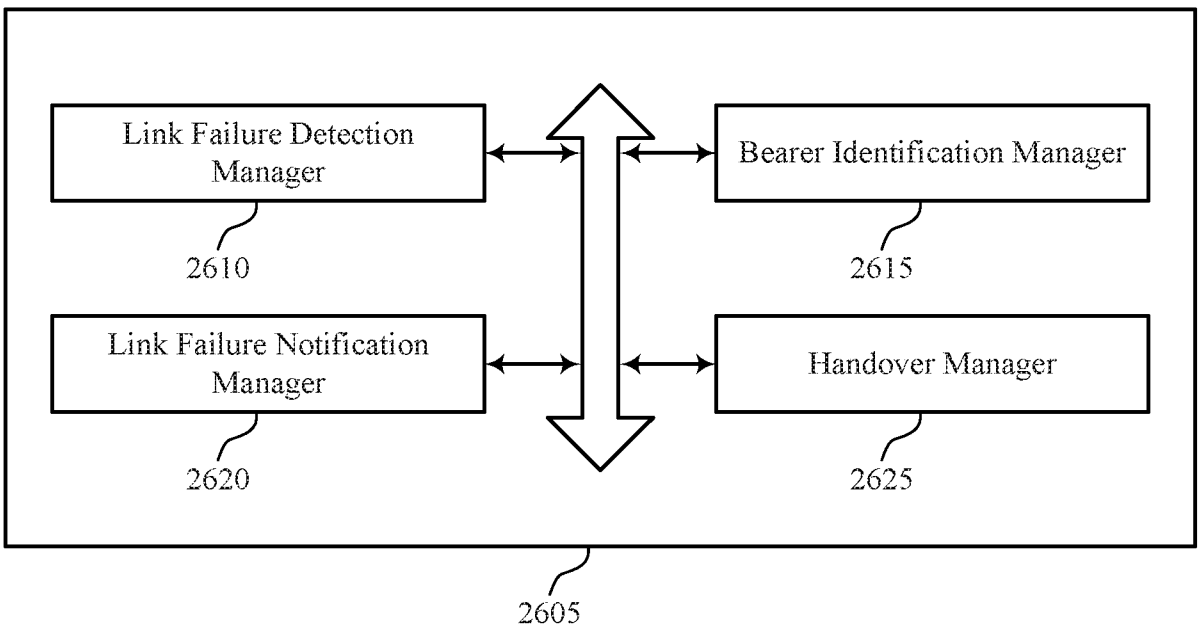

Link Failure Detection Manager
2610
Bearer Identification Manager
2615
Link Failure Notification Manager
2620
Handover Manager
2625
2605
2600

FIG. 26

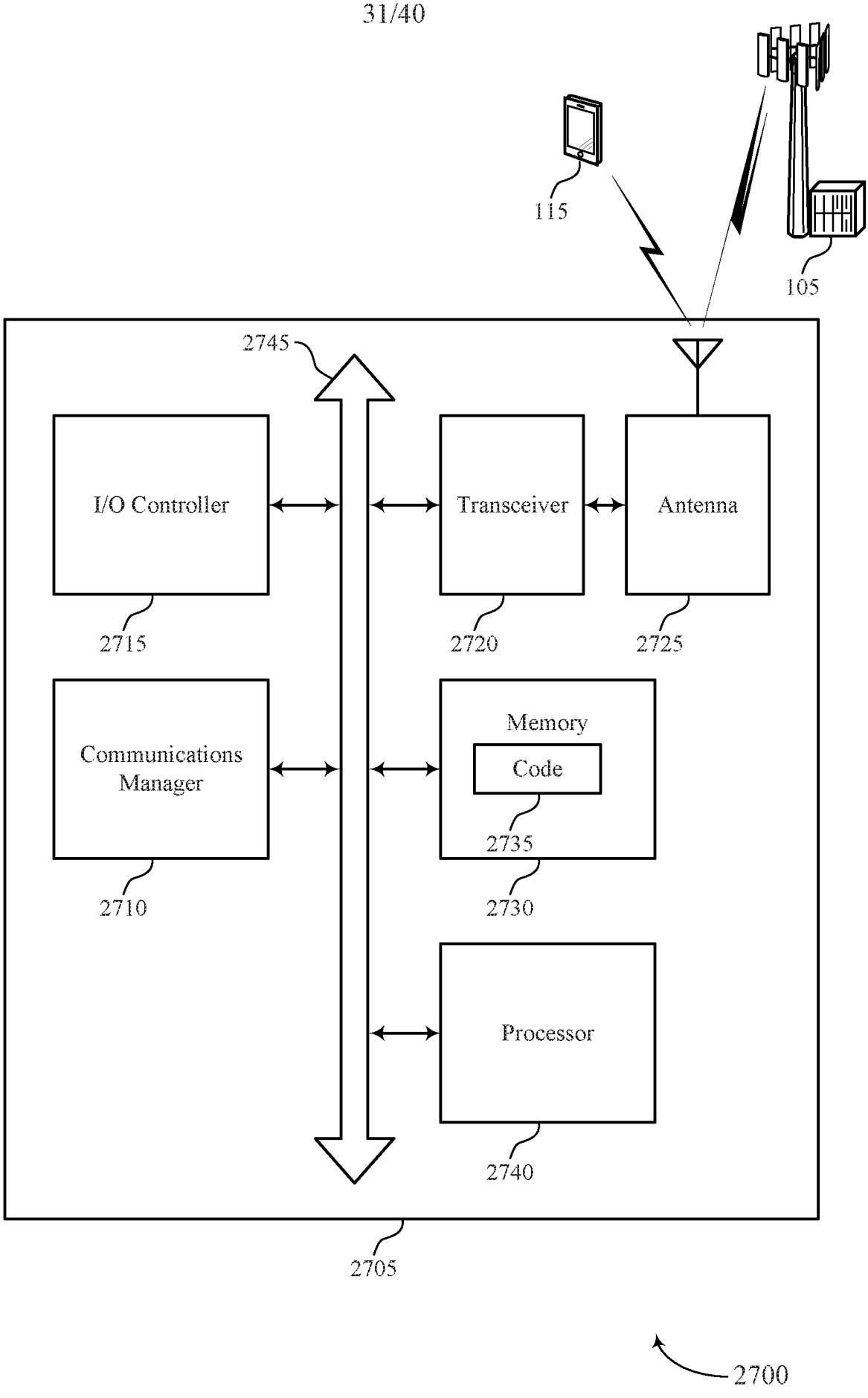

115
105
2745
I/O Controller
Transceiver
Antenna
2715
2720
2725
Communications Manager
Memory
Code
2735
2710
2730
Processor
2740
2705
2700

FIG. 27

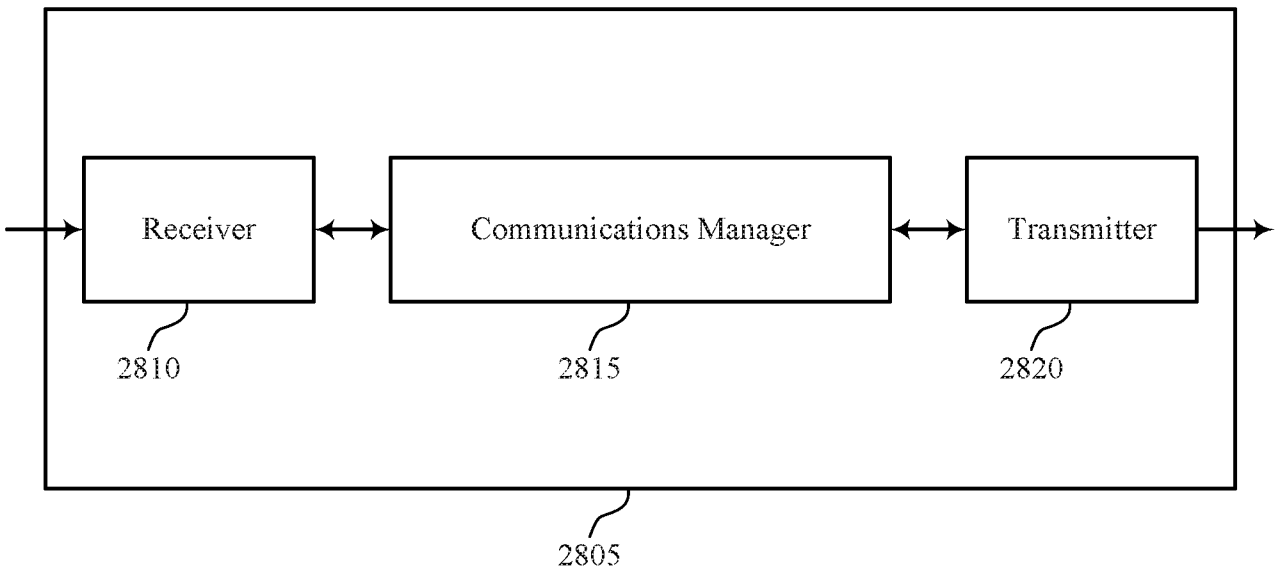

Receiver
Communications Manager
Transmitter
2810
2815
2820
2805
2800

FIG. 28

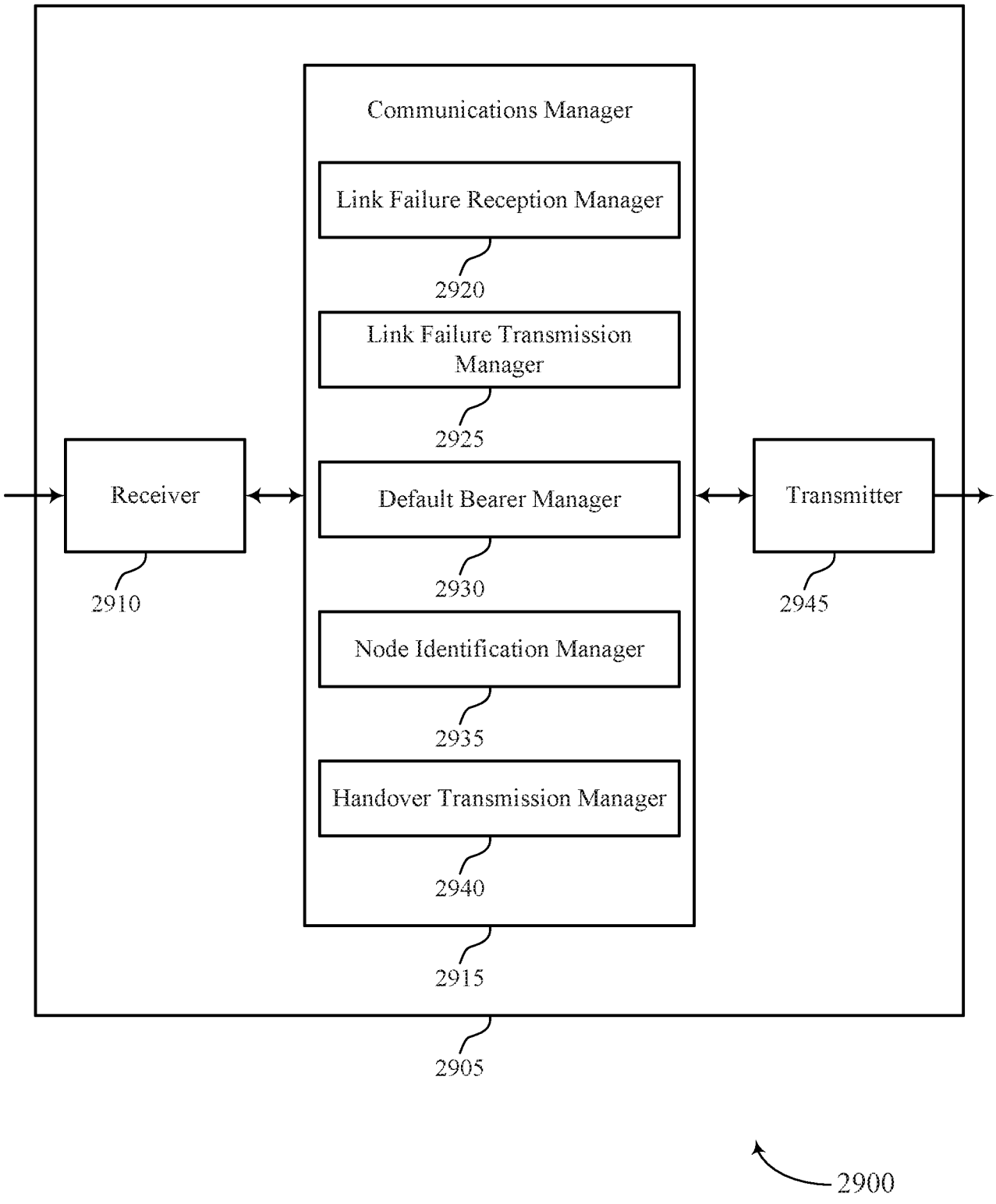

Communications Manager
Link Failure Reception Manager
2920
Link Failure Transmission Manager
2925
Receiver
Default Bearer Manager
Transmitter
2910
2930
2945
Node Identification Manager
2935
Handover Transmission Manager
2940
2915
2905
2900

FIG. 29

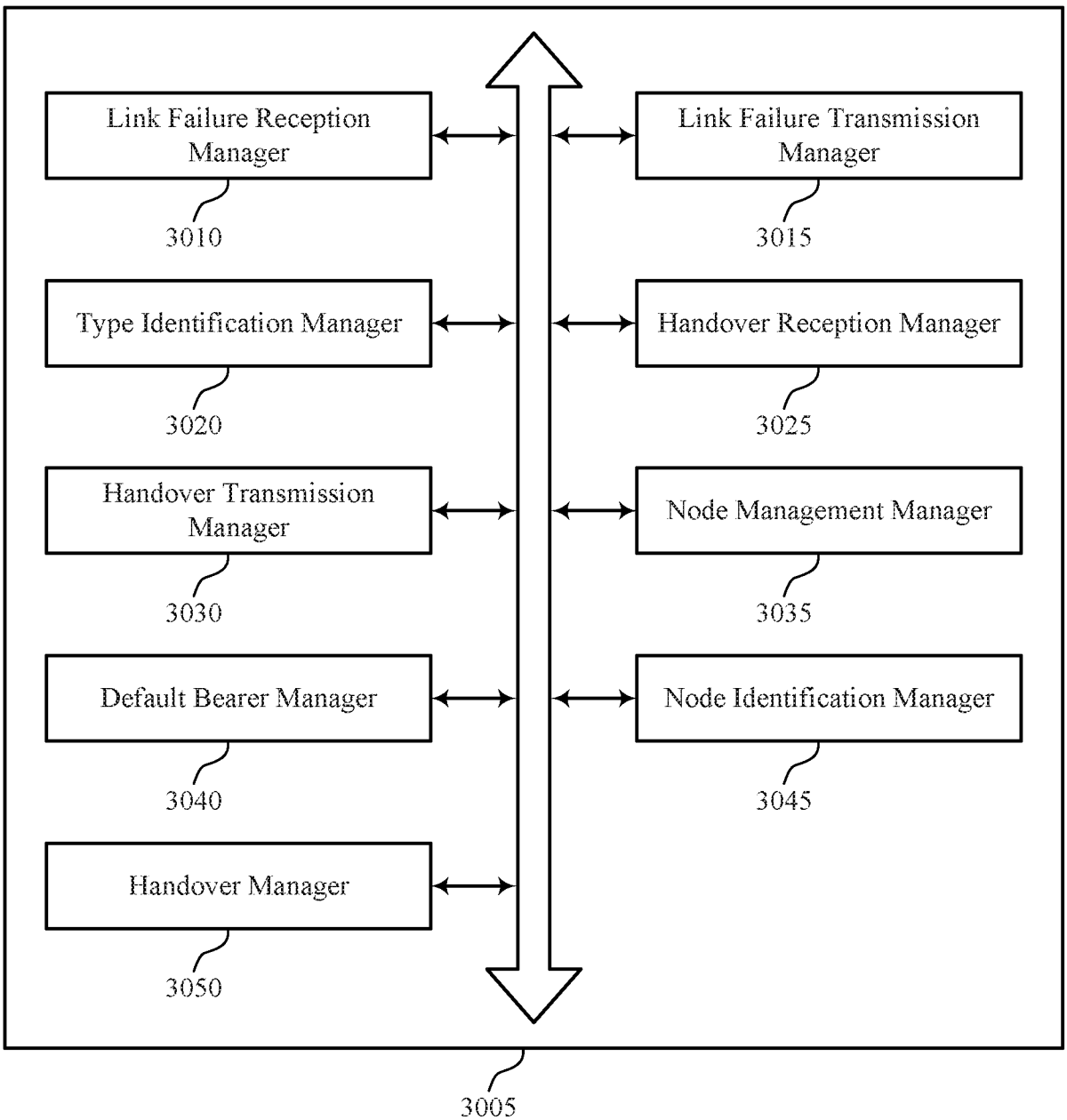

Link Failure Reception Manager
3010
Link Failure Transmission Manager
3015
Type Identification Manager
3020
Handover Reception Manager
3025
Handover Transmission Manager
3030
Node Management Manager
3035
Default Bearer Manager
3040
Node Identification Manager
3045
Handover Manager
3050
3005
3000

FIG. 30

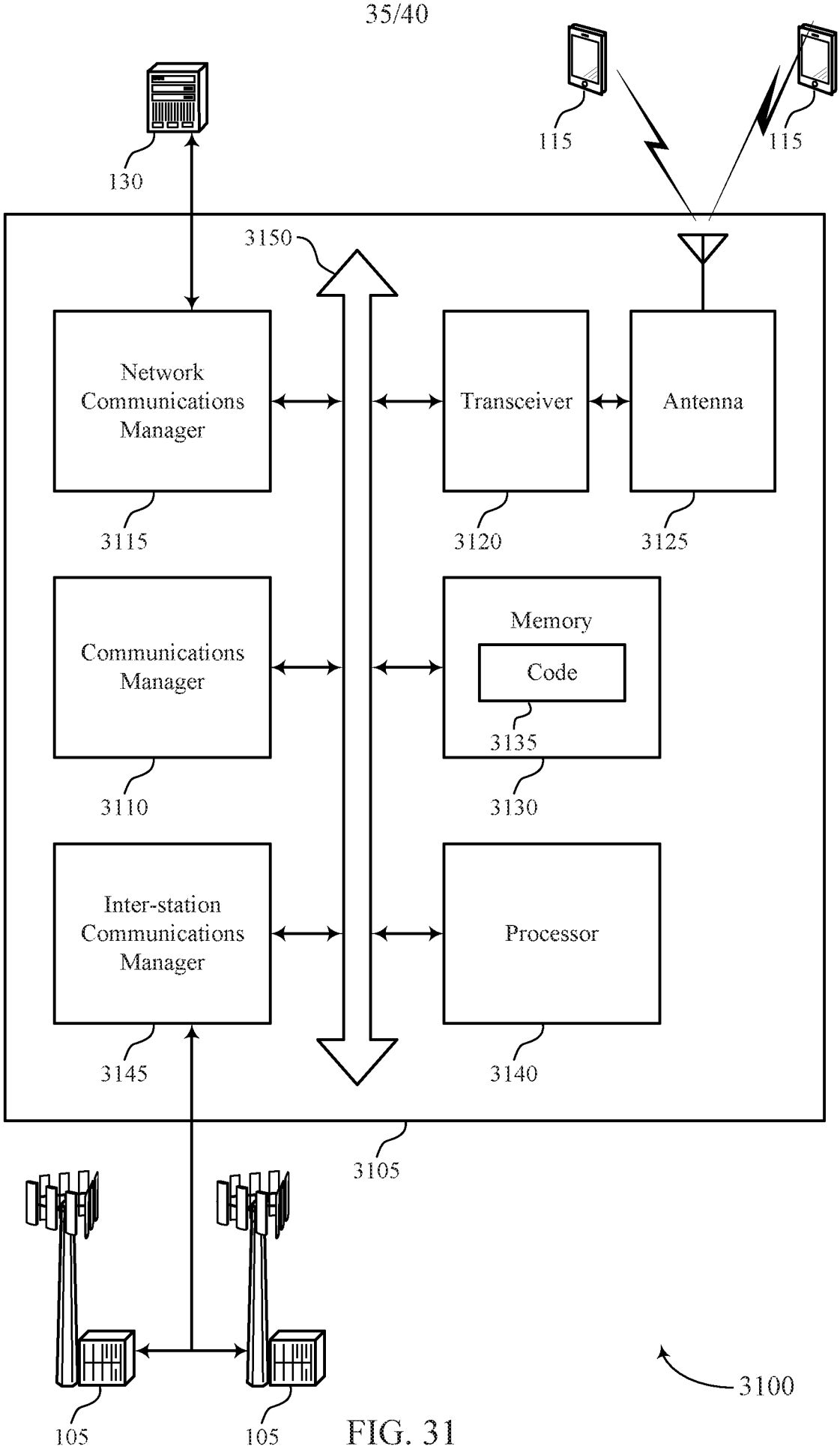

130
115
115
3150
Network Communications Manager
Transceiver
Antenna
3115
3120
3125
Communications Manager
Memory
Code
3135
3110
3130
Inter-station Communications Manager
Processor
3145
3140
3105
105
105
3100

FIG. 31

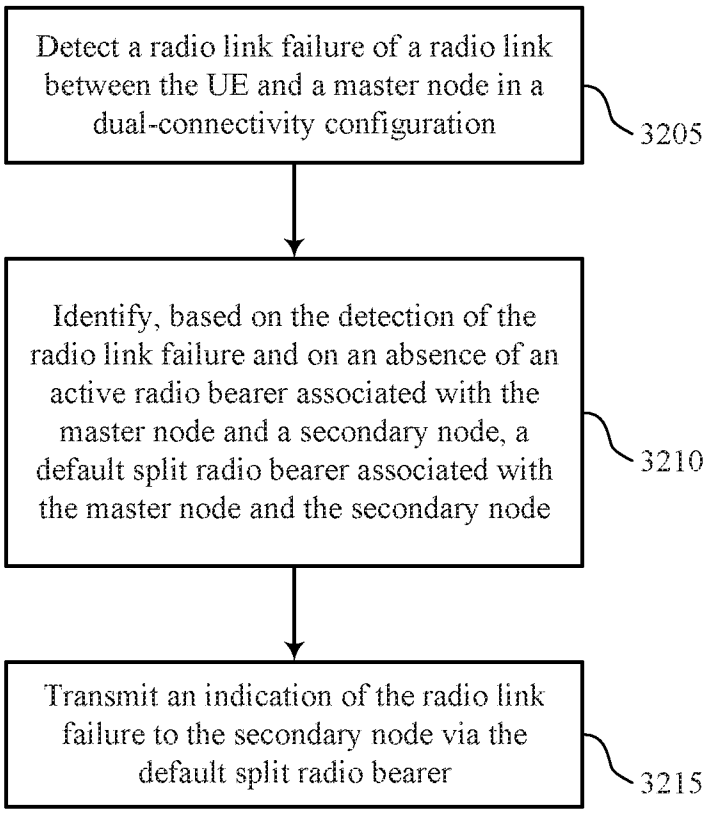

Detect a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration
3205
Identify, based on the detection of the radio link failure and on an absence of an active radio bearer associated with the master node and a secondary node, a default split radio bearer associated with the master node and the secondary node
3210
Transmit an indication of the radio link failure to the secondary node via the default split radio bearer
3215
3200

FIG. 32

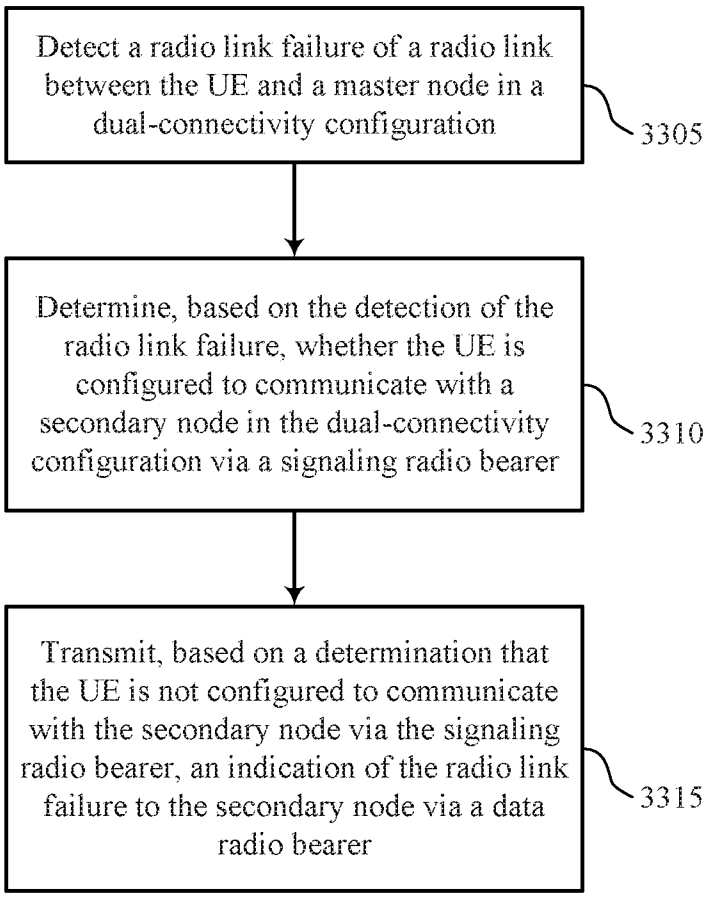

Detect a radio link failure of a radio link between the UE and a master node in a dual-connectivity configuration
3305
Determine, based on the detection of the radio link failure, whether the UE is configured to communicate with a secondary node in the dual-connectivity configuration via a signaling radio bearer
3310
Transmit, based on a determination that the UE is not configured to communicate with the secondary node via the signaling radio bearer, an indication of the radio link failure to the secondary node via a data radio bearer
3315
3300

FIG. 33

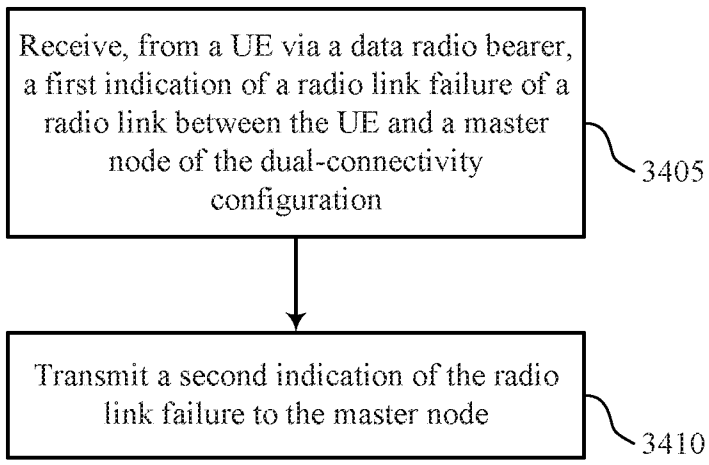

Receive, from a UE via a data radio bearer, a first indication of a radio link failure of a radio link between the UE and a master node of the dual-connectivity configuration
3405
Transmit a second indication of the radio link failure to the master node
3410
3400

FIG. 34

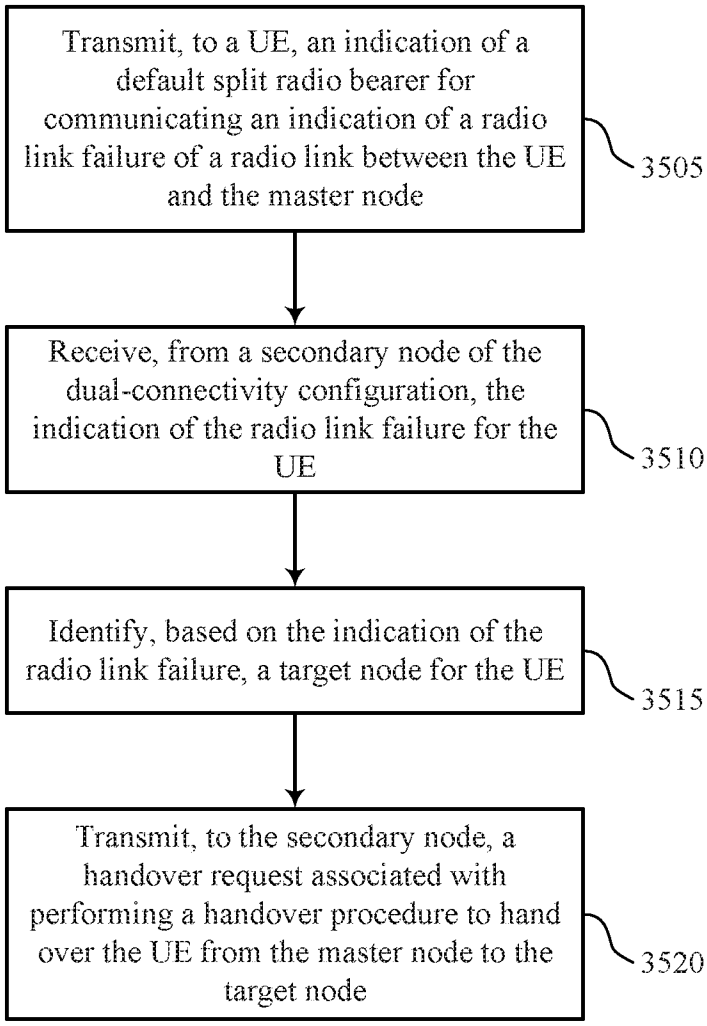

Transmit, to a UE, an indication of a default split radio bearer for communicating an indication of a radio link failure of a radio link between the UE and the master node
3505
Receive, from a secondary node of the dual-connectivity configuration, the indication of the radio link failure for the UE
3510
Identify, based on the indication of the radio link failure, a target node for the UE
3515
Transmit, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node
3520
3500

FIG. 35

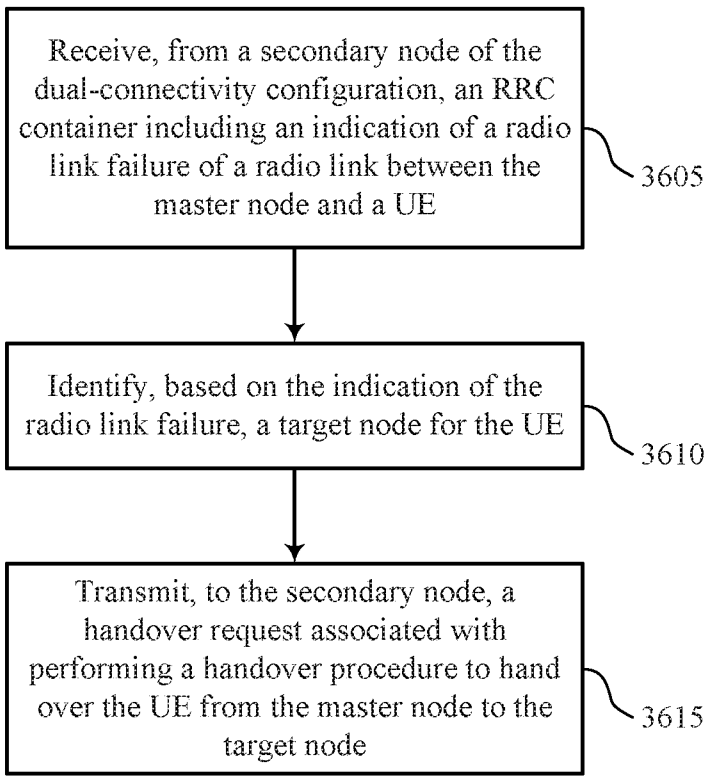

Receive, from a secondary node of the dual-connectivity configuration, an RRC container including an indication of a radio link failure of a radio link between the master node and a UE
3605
Identify, based on the indication of the radio link failure, a target node for the UE
3610
Transmit, to the secondary node, a handover request associated with performing a handover procedure to hand over the UE from the master node to the target node
3615
3600

FIG. 36

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/075222

A. CLASSIFICATION OF SUBJECT MATTER

H04W 76/18(2018.01)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)

H04W; H04Q

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)

CNPAT,WPI,EPODOC,CNKI,3GPP:master,dual,connectivity,RLF,handover,switchover, MeNB,secondary,srb,x2,inter, backhaul,spectrum,access,measurement report,split

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2016242226 A1 (KDDI CORPORATION) 18 August 2016 (2016-08-18) description, paragraphs [0032], [0033], [0036]-[0039], [0053], [0057] and [0058]	1-160
A	CN 103945408 A (CHINA ACADEMY OF TELECOMMUNICATIONS TECHNOLOGY) 23 July 2014 (2014-07-23) the whole document	1-160
A	US 2016242224 A1 (CHINA MOBILE COMMUNICATIONS CORPORATION) 18 August 2016 (2016-08-18) the whole document	1-160

☐ 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

"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
06 August 2019	**28 August 2019**

Name and mailing address of the ISA/CN	Authorized officer
National Intellectual Property Administration, PRC **6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing 100088** **China**	**TIAN,Tao**
Facsimile No. **(86-10)62019451**	Telephone No. **86-(10)-53961637**

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2019/075222

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
US 2016242226 A1	18 August 2016	WO 2015059899 A1	30 April 2015
		EP 3062550 A1	31 August 2016
		JP 2015082766 A	27 April 2015
		CN 105745957 A	06 July 2016
CN 103945408 A	23 July 2014	None	
US 2016242224 A1	18 August 2016	WO 2015039597 A1	26 March 2015
		CN 104468029 A	25 March 2015
		EP 3048748 A1	27 July 2016
		JP 2016536930 A	24 November 2016