

COMMUNICATION METHOD AND APPARATUS

CROSS-REFERENCE TO RELATED APPLICATIONS

~~[0001]~~ This application claims priority to Chinese Patent Application No. 202010437690.2, filed with the China National Intellectual Property Administration on May 21, 2020 and entitled "COMMUNICATION METHOD AND APPARATUS", which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] This application relates to the field of wireless communication technologies, and in particular, to a communication method and apparatus.

BACKGROUND

[0003] To avoid a connection failure caused by improper configuration of a handover parameter of a network device, a mobility robustness optimization (mobility robustness optimization, MRO) mechanism is introduced to a long term evolution (long term evolution, LTE) communication system and a new radio (new radio, NR) communication system. In the MRO mechanism, a terminal device records and reports a parameter in a mobility failure process to a network, so that the network can identify configuration information of a mobility-related parameter, to optimize the mobility-related parameter in time and improve a handover success rate of the terminal device.

[0004] In a conventional technology, when a terminal device performs handover between intra-RAT network devices, because only one communication standard needs to be considered, a coding format used for information in a report reported by the terminal device is consistent with a communication standard of the network device. However, in an inter-RAT or inter-system handover scenario, because at least two communication standards or two communication systems are involved, currently, there is no clear solution to which a specific coding format should be used

aspect, or have a function of implementing the first network device according to any one of the fourth aspect or the possible designs of the fourth aspect, or have a function of implementing the target network device according to any one of the fifth aspect or the possible designs of the fifth aspect. The apparatus may be a network device, or may be a chip included in a network device.

5 **[0051]** The function of the communication apparatus may be implemented by hardware, or may be implemented by hardware executing corresponding software. The hardware or the software includes one or more modules, units, or means (means) corresponding to the foregoing function.

10 **[0052]** In a possible design, a structure of the apparatus includes a processing module and a transceiver module. The processing module is configured to support the apparatus in performing a corresponding function of the terminal device according to any one of the first aspect or the designs of the first aspect, performing a corresponding function of the first network device according to any one of the second aspect or the designs of the second aspect, performing a corresponding function of the terminal device according to any one of the third aspect or the possible designs of the third aspect, performing a corresponding function of the first network device according to any one of the fourth aspect or the possible designs of the fourth aspect, or performing a corresponding function of the target network device according to any one of the fifth aspect or the possible designs of the fifth aspect. The transceiver module is configured to support communication between the apparatus and another communication device. For example, when the apparatus is a terminal device, the apparatus may send a first report to a first network device. The communication apparatus may further include a storage module. The storage module is coupled to the processing module, and stores program instructions and data that are necessary for the apparatus. In an example, the processing module may be a processor, the transceiver
communication module may be a transceiver, and the storage module may be a memory. The memory may be integrated with the processor, or may be disposed separately from the processor.

25 This is not limited in this application.

30 **[0053]** In another possible design, a structure of the apparatus includes a processor, and may further include a memory. The processor is coupled to the memory, and may be configured to execute computer program instructions stored in the memory, so that the apparatus performs the method according to any one of the first aspect or the possible designs of the first aspect, performs the method according to any one of the second aspect or the possible designs of the second aspect, performs the method according to any one of the third aspect or the possible designs of the third

for mobile communication, GSM) system, a code division multiple access (code division multiple access, CDMA) system, a wideband code division multiple access (wideband code division multiple access, WCDMA system), a general packet radio service (general packet radio service, GPRS) system, an LTE system, an LTE frequency division duplex (frequency division duplex, FDD) system, an LTE time division duplex (time division duplex, TDD) system, a universal mobile telecommunication system (universal mobile telecommunication system, UMTS), a worldwide interoperability for microwave access (worldwide interoperability for microwave access, WIMAX) communication system, a 5th generation (5th generation, 5G) system, an NR system, a communication system for future, or another similar communication system.

5 [0075] FIG. 1 is a schematic diagram of a network architecture of a communication system to which an embodiment of this application is applicable. The network architecture includes a core network device 110, a radio access network device 120, and at least one terminal device (for example, a terminal device 130 and a terminal device 140 shown in FIG. 1).

[0076] The terminal device is connected to the radio access network device in a wireless manner, and the radio access network device is connected to the core network device in a wireless or wired manner. The core network device and the radio access network device may be independent and different physical devices, a function of the core network device and a logical function of the radio access network device may be integrated into a same physical device, or a part of functions of the core network device and a part of functions of the radio access network device may be integrated into one physical device.

[0077] It should be understood that the communication system shown in FIG. 1 is only a schematic diagram. The communication system may further include another type of network device, for example, a wireless relay device or a wireless backhaul device, which is not drawn in FIG. 1. Although FIG. 1 shows only one terminal device, it should be understood that quantities of core network devices, radio access network devices, terminal devices, and wireless backhaul devices included in the communication system are not limited in this embodiment of this application.

[0078] The radio access network device mentioned in this embodiment of this application may correspond to different devices in different communication systems. For example, the radio access network device corresponds to an access network device, for example, a gNB, in 5G in a 5G system, and corresponds to an access network device, for example, an eNB, in 4G in a 4G system.

to the 5G core network also belongs to the inter-system inter-RAT (inter-system inter-RAT) handover scenario.

[0088] As shown in FIG. 2c, an LTE base station connected to the 5G core network and an NR base station connected to the 5G core network are in a same system and different standards. In this way, that a terminal device is handed over from the LTE base station connected to the 5G core network to the NR base station connected to the 5G core network belongs to an intra-system inter-RAT (intra-system inter-RAT) handover scenario. Similarly, that the terminal device is handed over from the NR base station connected to the 5G core network to the LTE base station connected to the 5G core network also belongs to the intra-system inter-RAT (intra-system inter-RAT) handover scenario.

[0089] As shown in FIG. 2d, an NR base station 1 connected to the 5G core network and an NR base station 2 connected to the 5G core network are in a same system and a same standard. In this way, that a terminal device is handed over from the NR base station 1 connected to the 5G core network to the NR base station 2 connected to the 5G core network belongs to an intra-system intra-RAT (intra-system intra-RAT) handover scenario. Similarly, that the terminal device is handed over from the NR base station 2 connected to the 5G core network to the NR base station 1 connected to the 5G core network also belongs to the intra-system intra-RAT (intra-system intra-RAT) handover scenario.

[0090] It should be understood that, in this embodiment of this application, inter-system handover may also be referred to as ~~inter-system handover or inter-communication-system handover~~, and the intra-system handover may also be referred to as ~~intra-system handover or intra-communication-system handover~~. The inter-RAT handover may also be referred to as inter-RAT handover or inter-RAT handover, and the intra-RAT handover may also be referred to as intra-RAT handover. Details are not described below.

[0091] The network architecture and the service scenario described in embodiments of this application are intended to describe the technical solutions in embodiments of this application more clearly, and do not constitute a limitation on the technical solutions provided in embodiments of this application. A person of ordinary skill in the art may know that with evolution of communication network architectures and emergence of new service scenarios, the technical solutions provided in embodiments of this application are also applicable to similar technical problems.

identifier, C-RNTI) allocated by the cell in which the failure occurs for the terminal device.

[00119] When a connection failure type is an HOF, the C-RNTI may include a C-RNTI allocated by a source cell for the terminal device, and/or a C-RNTI allocated by a target cell for the terminal device.

5 **[00120]** 6) Connection failure time (timeConnFailure), where the connection failure time means information about a time period from time when a handover message is received at a previous/last/latest time to time when a connection failure occurs.

[00121] 7) Time (timeSinceFailure) since failure, where the time since failure means a length of time recorded from time when a connection failure occurs, and generally means information
10 about a time period from the time when the connection failure occurs to time when a report (for example, the first report) is reported.

[00122] 8) Information about a time period from time when a connection failure occurs to time when a connection is restored.

[00123] 9) Signal quality of one or more of a source cell, a target cell, and a reestablishment
15 cell (or a cell whose connection is restored).

[00124] It should be understood that the cell information may include at least one of a cell global identifier (cell global identifier, CGI), a physical cell identifier (physical cell identifier, PCI), frequency information, a tracking area code (tracking area code, TAC), and a RAN area code (RAN area code, RAN AC). The CGI may include a public land mobile network identifier– (public land
20 mobile network identifier, PLMN ID) and a cell identifier (cell identifier).

[00125] The signal quality may include at least one of the following: received signal code power (received signal code power, RSCP), reference signal received power (reference signal received power, RSRP), reference signal received quality (reference signal received quality, RSRQ), a signal-to-noise ratio (signal noise ratio, SNR), a signal to interference plus noise ratio (signal to
25 interference plus noise ratio, SINR), and a reference signal strength indication (reference signal strength indication, RSSI). The signal quality may be signal quality of a cell, and/or signal quality of a beam belonging to the cell.

[00126] It should be noted that, in this embodiment, the connection failure type may be the HOF.

[00127] Optionally, the first report may further include first information, and the first
30 information indicates that the first report is a report for an inter-RAT handover scenario. Alternatively, it may be understood as that the first information indicates that current handover

a same network device, that the first network device processes the first report after receiving the first report may include (corresponding to step S404-a in FIG. 4a): determining, based on the information related to the handover failure and other information (for example, time of receiving the first report and a time of sending the handover message) that are in the first report, that the handover is too early handover or handover to a wrong cell, and/or determining that the failure type is the HOF. For specific implementations of step S401 to step S403 in FIG. 4a, refer to descriptions of corresponding steps in FIG. 3.

[00145] Further, the first network device may optimize a mobility-related parameter of the terminal device based on that the handover is too early handover or handover to a wrong cell and the failure type HOF. For example, based on the received information related to the handover failure, the first network device may determine a proper cell/target network device as the target cell/target network device, determine a proper sending occasion for the handover message, or adjust a corresponding parameter (for example, resource configuration information used for the handover) required for the handover corresponding to the target cell/target network device. Therefore, a handover success rate of the terminal device is improved. ~~The handover to a wrong cell may refer to handover to a wrong cell.~~

[00146] In another possible implementation, as shown in FIG. 4b, if the first network device is not the source network device, to be specific, the first network device and the source network device are different network devices, that the first network device processes the first report after receiving the first report may include (corresponding to step S404-b in FIG. 4b): obtaining the handover failure container in the first report, and then sending a second report to the source network device, where the second report includes the handover failure container. To be specific, the first network device may send the second report to a network device to which a cell (for example, a previousPCell) belongs or a network device to which a source cell belongs when the terminal device receives a handover message at a previous time/latest time, to forward the handover failure container to the source network device. Correspondingly, the source network device may receive the second report from the first network device. The second report may also be referred to as a handover report (namely, an HO report), the RLF report, a second message, or another name. This is not limited in this application. For specific implementations of step S401 to step S403 in FIG. 4b, refer to descriptions of corresponding steps in FIG. 3.

[00147] Optionally, after receiving the second report, the source network device may identify,

source network device, the handover may be considered as too early handover. If a cell in which the terminal device attempts to reestablish/restore a connection is different from the source cell and the target cell, the cell and the source cell do not belong to a same network device, or a network device to which the cell belongs and the source network device do not belong to a same communication standard, the handover may be considered as handover to a wrong cell.

[00156] It can be learned that, in an inter-RAT handover scenario in which the terminal device fails to hand over to the target network device, the failure type is the HOF, and the information that is related to the handover failure and that is recorded/stored by the terminal device may be sent to the source network device. In this embodiment of this application, because the coding format of the container in the first report is consistent with the communication standard of the source network device, after receiving the first report, the first network device can send the container to the source network device, so that the source network device can conveniently and quickly parse out the information that is related to the handover failure of the terminal device and that is included in the container. Therefore, implementation complexity of the source network device is reduced, efficiency of optimizing a mobility-related parameter by a network is effectively improved, and the handover success rate of the terminal device is improved.

[00157] Optionally, before step S303 is performed, to be specific, before the terminal device sends the first report to the first network device, a procedure shown in FIG. 5 may further be performed between the terminal device and the first network device.

[00158] Specifically, in step S501, if the terminal device records/stores the at least one piece of information related to the handover failure, or the terminal device records/stores the handover failure container, the terminal device may send first indication information to the first network device, where the first indication information indicates that the terminal device records/stores the first report. Optionally, the first indication information may further specifically indicate that the first report is a report for an inter-RAT handover scenario, and/or the first indication information may further specifically indicate that the first report is a report for an inter-system handover scenario or a report for an intra-system handover scenario.

[00159] Further, in step S502, after receiving the first indication information sent by the terminal device, the first network device may send second indication information to the terminal device, where the second indication information requests the terminal device to report the first report. Subsequently, in step S503, after receiving the second indication information, the terminal

device may send the first report to the first network device.

[00160] In another possible implementation, step S502 may alternatively be: The first network device sends a request message to the terminal device, where the request message requests the terminal device to report the first report, and the request message may be a UEInformationRequest message or another message. This is not limited in this application.

[00161] Correspondingly, step S503 may be: After receiving the request message, the terminal device sends a response message to the first network device. The response message may be a UEInformationResponse message or another message. This is not limited in this application. The response message includes the information that is related to the handover failure and that is recorded by the terminal device. For specific content, refer to the foregoing descriptions of the content included in the first report/container. Optionally, the response message may further include the first information and/or the second information described above. Optionally, the response message may further include information indicating the coding scheme of the information related to the handover failure. It may be understood that the terminal device may send, by using the response message, all or a part of the information included in the first report.

[00162] The following describes a specific example of this embodiment of this application: Example 1.

[00163] In this example, a source base station is an LTE base station, and a target base station is an NR base station. The LTE base station used as the source base station may be a base station connected to a core network in a 4G system, or may be a base station connected to a core network in a 5G system. This is not limited. The NR base station used as the target base station is a base station connected to the core network in the 5G system.

[00164] A handover failure occurs in a process in which UE is handed over from the source base station to the target base station, and ~~a terminal device~~ the UE attempts to reestablish/restore a connection to the LTE base station. The LTE base station to which the UE attempts to reestablish/restore the connection and the LTE base station used as the source base station may be a same base station, or may be different base stations. This is not limited. A cell in which the terminal device attempts to reestablish/restore a connection may be a source cell, a cell different from a source cell but belonging to a same base station (namely, the source base station) as the source cell, a cell different from a source cell but belonging to a same communication standard (namely, an LTE standard) as the source base station, or a cell different from a source cell and a

report for an intra-system handover scenario. Alternatively, it may be understood as that the second information indicates that current handover belongs to an inter-system handover scenario or an intra-system handover scenario. If the first report is the report for the inter-system handover scenario, it indicates that the handover scenario is inter-system inter-RAT handover. If the first report is the report for the intra-system handover scenario, it indicates that the handover scenario is intra-system inter-RAT handover. For example, the second information may be an information element "Inter-system HO". When the first report includes the second information, it indicates that the first report is the report for the inter-system handover scenario; or when the first report does not include the second information, it indicates that the first report is the report for the intra-system handover scenario. For another example, the second information may be an information element "Intra-system HO". When the first report includes the second information, it indicates that the first report is the report for the intra-system handover scenario; or when the first report does not include the second information, it indicates that the first report is the report for the inter-system handover scenario. It should be noted that, in this embodiment, inter-system is measured from a dimension of a core network.

[00182] The first information and the second information may be considered as information that indicates a type of the first report or a handover scenario corresponding to the first report. It may be understood that the first information may be included in the first container in the first report, or may be included outside the first container in the first report. This is not limited in this application. Similarly, the second information may be included in the first container in the first report, or may be included outside the first container in the first report. This is also not limited in this application.

[00183] In a possible design, the first report may include a copy of the first information, and a coding scheme of the copy is consistent with a communication standard of a first network device. In other words, the copy uses a coding scheme corresponding to the communication standard of the first network device. Optionally, the copy may be located outside the radio link handover failure container in the first report. In another possible design, the first report may include two copies of the first information, and a coding scheme of one copy is consistent with a communication standard of a first network device. If a radio link failure occurs on the target network device shortly after the terminal device is successfully handed over from the source network device to the target network device, a coding scheme of the other copy is consistent with a coding scheme of the target network device. In other words, one of the two copies of the first information uses a coding scheme

corresponding to the communication standard of the first network device, and the other copy uses a coding scheme corresponding to the communication standard of the target network device. Optionally, the copy whose coding format is consistent with the communication standard of the first network device may be located outside the radio linkhandover failure container in the first report; and the copy whose coding format is consistent with the communication standard of the target network device may be located outside the radio linkhandover failure container in the first report, or may be located in the radio linkhandover failure container in the first report. If a radio link failure occurs after the terminal device is connected to the source network device for a period of time, a coding scheme of the other copy is consistent with a coding scheme of the source network device. To be specific, one of the two copies of the first information uses a coding scheme corresponding to the communication standard of the first network device, and the other copy uses a coding scheme corresponding to a communication standard of the source network device. Optionally, the copy whose coding format is consistent with the communication standard of the first network device may be located outside the radio linkhandover failure container in the first report; and the copy whose coding format is consistent with the communication standard of the source network device may be located outside the radio linkhandover failure container in the first report, or may be located in the radio linkhandover failure container in the first report.

[00184] Similarly, in a possible design, the first report may include a copy of the second information, and a coding scheme of the copy is consistent with a communication standard of a first network device.

In other words, the copy uses a coding scheme corresponding to the communication standard of the first network device. Optionally, the copy may be located outside the radio linkhandover failure container in the first report. In another possible design, the first report may include two copies of the second information, and a coding scheme of one copy is consistent with a communication standard of a first network device. If a radio link failure occurs on the target network device shortly after the terminal device is successfully handed over from the source network device to the target network device, a coding scheme of the other copy is consistent with a coding scheme of the target network device. To be specific, one of the two copies of the second information uses a coding scheme corresponding to the communication standard of the first network device, and the other copy uses a coding scheme corresponding to the communication standard of the target network device. Optionally, the copy whose coding format is consistent with the communication standard of the first network device may be located outside the radio linkhandover

failure container in the first report; and the copy whose coding format is consistent with the communication standard of the target network device may be located outside the radio linkhandover failure container in the first report, or may be located in the radio linkhandover failure container in the first report. If a radio link failure occurs after the terminal device is connected to the source network device for a period of time, a coding scheme of the other copy is consistent with a coding scheme of the source network device. To be specific, one of the two copies of the first information uses a coding scheme corresponding to the communication standard of the first network device, and the other copy uses a coding scheme corresponding to a communication standard of the source network device. Optionally, the copy whose coding format is consistent with the communication standard of the first network device may be located outside the radio linkhandover failure container in the first report; and the copy whose coding format is consistent with the communication standard of the source network device may be located outside the radio linkhandover failure container in the first report, or may be located in the radio linkhandover failure container in the first report.

[00185] Optionally, the first report may further include information indicating a coding format used by the first container, in other words, information indicating a coding format of information that is related to the radio link failure and that is included in the first report. The information may be included in the first container in the first report, or may be included outside the first container in the first report. This is not limited in this application.

[00186] In a possible design, the first report may include a copy of the information indicating the coding format used by the first container. A coding scheme of the copy is consistent with the communication standard of the first network device. In other words, the copy uses a coding scheme corresponding to the communication standard of the first network device. Optionally, the copy may be located outside the radio linkhandover failure container in the first report. In another possible design, the first report may include two copies of the information indicating the coding format used by the first container. A coding scheme of one of the two copies is consistent with the communication standard of the first network device. If a radio link failure occurs after the terminal device is connected to the source network device for a period of time, a coding scheme of the other copy is consistent with a coding scheme of the source network device. To be specific, one of the two copies of the information indicating the coding format used by the first container uses the coding scheme corresponding to the communication standard of the first network device, and the other copy uses a coding scheme corresponding to the communication standard of the source network device.

Optionally, the copy whose coding format is consistent with the communication standard of the first network device may be located outside the radio link~~handover~~ failure container in the first report; and the copy whose coding format is consistent with the communication standard of the source network device may be located outside the radio link~~handover~~ failure container in the first report, or may be located in the radio link~~handover~~ failure container in the first report. If a radio link failure occurs on the target network device shortly after the terminal device is successfully handed over from the source network device to the target network device, a coding scheme of the other copy is consistent with a coding scheme of the target network device. To be specific, one of the two copies of the information indicating the coding format used by the first container uses the coding scheme corresponding to the communication standard of the first network device, and the other copy uses the coding scheme corresponding to the communication standard of the target network device. Optionally, the copy whose coding format is consistent with the communication standard of the first network device may be located outside the radio link~~handover~~ failure container in the first report; and the copy whose coding format is consistent with the communication standard of the target network device may be located outside the radio link~~handover~~ failure container in the first report, or may be located in the radio link~~handover~~ failure container in the first report.

[00187] Step S603: The terminal device sends the first report to the first network device, where the first report includes the first container.

[00188] The first network device may be the source network device, may be the target network device, may be another network device different from the source network device or the target network device, or may be a network device that restores or reestablishes a connection after the handover failure. This is not limited in this application.

[00189] Optionally, the first report may use the coding format corresponding to the communication standard of the first network device, so that the first network device can correctly read the information included in the first report. It should be noted that, in this embodiment of this application, the coding format of the first report and the coding format of the first container in the first report may be different concepts. To be specific, when both the first report and the first container use a coding format corresponding to a communication standard, the coding format of the first report may still be the same as or different from the coding format of the first container.

This is not limited.

[00190] Optionally, the first report may include a fourth container, and the fourth container uses

the coding format corresponding to the communication standard of the first network device. The fourth container may be considered as a set of the at least one piece of information that is related to the handover failure and that is included in the first report. For content included in the fourth container, refer to the content included in the radio link~~handover~~ failure container or the first container. Details are not described again.

[00191] Optionally, before step S603 is performed, to be specific, before the terminal device sends the first report to the first network device, a procedure shown in FIG. 5 may further be performed between the terminal device and the first network device. For detailed descriptions of FIG. 5, refer to the foregoing descriptions. Details are not described herein again.

[00192] Correspondingly, the first network device receives the first report from the terminal device.

[00193] Optionally, if a radio link failure occurs on the target network device shortly after the terminal device is successfully handed over from the source network device to the target network device, after receiving the first report, the first network device may determine, based on the first report, that the handover is too early handover or handover to a wrong cell, and/or determine that a failure type is the RLF.

[00194] Optionally, if a radio link failure occurs after the terminal device is connected to the source network device for a period of time, the first network device may determine, based on the first report, that the handover is too late handover, and/or determine that a failure type is an RLF.

[00195] Step S604: The first network device sends a second report to the network device to which the cell in which the radio link failure occurs belongs, where the second report includes the first container.

[00196] Optionally, the second report may further include third information, and the third information indicates that the second report is a report for an inter-RAT handover scenario.

Alternatively, it may be understood as that the third information indicates that the current handover belongs to an inter-system handover scenario.

[00197] Optionally, the second report may further include fourth information, and the fourth information indicates that the second report is a report for an inter-system handover scenario or a report for an intra-system handover scenario. Alternatively, it may be understood as that the fourth information indicates that the current handover belongs to an inter-system handover scenario or an intra-system handover scenario. For descriptions of the fourth information, refer to the foregoing

details are not described herein again. Optionally, the communication apparatus may further include a storage module. The storage module may be configured to store data and/or instructions. The transceiver module ~~1010~~1110 and/or the processing module ~~1020~~1120 may read the data and/or the instructions in the storage module, to enable the communication apparatus to implement a corresponding method. The storage module may be implemented, for example, by using at least one memory.

[00282] The storage module, the processing module, and the transceiver module may exist separately, or all or some of the modules may be integrated. For example, the storage module and the processing module are integrated, or the processing module and the transceiver module are integrated.

[00283] FIG. 12 is a schematic diagram of another structure of a communication apparatus according to an embodiment of this application. The communication apparatus may be specifically a network device, for example, a base station, and is configured to implement a function of the network device (for example, the first network device or the target network device) according to any one of the foregoing method embodiments.

[00284] The network device 1200 includes one or more radio frequency units, such as a remote radio unit (remote radio unit, RRU) 1201 and one or more baseband units (baseband unit, BBU) (which may also be referred to as a digital unit, ~~digital unit~~, DU) 1202. The RRU 1201 may be referred to as a transceiver unit, a transceiver machine, a transceiver circuit, a transceiver, or the like, and may include at least one antenna 12011 and a radio frequency unit 12012. The RRU 1201 is partially configured to: perform radio frequency signal sending and receiving and perform conversion between a radio frequency signal and a baseband signal. The BBU 1202 is mainly configured to: perform baseband processing, control a base station, and the like. The RRU 1201 and the BBU 1202 may be physically disposed together, or may be physically disposed separately, that is, the base station is a distributed base station.

[00285] The BBU 1202 is a control center of the base station, may also be referred to as a processing unit, and is mainly configured to complete baseband processing functions such as channel encoding, multiplexing, modulation, and spectrum spreading. For example, the BBU (the processing unit) 1202 may be configured to control the base station to execute the operation procedure related to the network device in the foregoing method embodiments.

[00286] In an example, the BBU 1202 may include one or more boards. A plurality of boards

CLAIMS

1. A communication method, wherein the method comprises:

failing to hand over in a process of attempting to hand over from a source network device to a target network device, wherein the source network device and the target network device are network devices using different communication standards;

generating a first report, wherein the first report comprises a container that comprises at least one piece of information related to the handover failure, and the container uses a coding format corresponding to a communication standard of the source network device; or a radio link failure occurs on a target network device shortly after a successful handover from a source network device to a target network device, or after a connection to a source network device for a period of time, a radio link failure occurs, wherein the source network device and the target network device are network devices using different communication standards, generating a first report, wherein the first report comprises a first container that comprises at least one piece of information related to the radio link failure, and the first container uses a coding format corresponding to a communication standard of a network device to which a cell in which the radio link failure occurs belongs; and

sending the first report to a first network device.

2. The method according to claim 1, wherein the first report further comprises first information, and the first information indicates that the first report is a report for an inter-RAT handover scenario.

3. The method according to claim 1 or 2, wherein the first report further comprises second information, and the second information indicates that the first report is a report for an inter-system handover scenario or a report for an intra-system handover scenario.

4. The method according to any one of claims 1 to 3, wherein the method further comprises: sending first indication information to the first network device, wherein the first indication information indicates that a terminal device records the first report; and

receiving second indication information from the first network device, wherein the second indication information indicates the terminal device to report the first report.

15. The method according to claim 101, wherein when the radio link failure occurs on the target network device shortly after the successful handover from the source network device to the

target network device, and the network device to which the cell in which the radio link failure occurs belongs is the target network device; and

the first report further comprises a second container that comprises the at least one piece of information related to the radio link failure, wherein the second container uses a coding format corresponding to a communication standard of the source network device.

65. A communication method, wherein the method comprises:

receiving a first report from a terminal device, wherein the first report comprises a container that comprises at least one piece of information related to a handover failure, the container uses a coding format corresponding to a communication standard of a source network device, the handover failure is a handover failure from the source network device to a target network device, and the source network device and the target network device are network devices using different communication standards, or receiving a first report from a terminal device, wherein the first report comprises a first container that comprises at least one piece of information related to a radio link failure, and the first container uses a coding format corresponding to a communication standard of a network device to which a cell in which the radio link failure occurs belongs;; and

processing the first report.

67. The method according to claim 56, wherein the processing the first report comprises:

obtaining the container in the first report; and

sending a second report to the source network device, wherein the second report comprises the container.

78. The method according to claim 67, wherein the first report further comprises first information, and the first information indicates that the first report is a report for an inter-RAT handover scenario; and/or

the second report further comprises third information, and the third information indicates that the second report is a report for an inter-RAT handover scenario.

89. The method according to claim 67 or 78, wherein the first report further comprises second information, and the second information indicates that the first report is a report for an inter-system handover scenario or a report for an intra-system handover scenario; and/or

the second report further comprises fourth information, and the fourth information indicates that the second report is a report for an inter-system handover scenario or a report for an intra-

system handover scenario.

910. The method according to any one of claims 5-6 to 89, wherein the method further comprises:

receiving first indication information from the terminal device, wherein the first indication information indicates that the terminal device records the first report; and

sending second indication information to the terminal device, wherein the second indication information indicates the terminal device to report the first report.

~~10. A communication method, wherein the method comprises:~~

~~a radio link failure occurs on a target network device shortly after a successful handover from a source network device to a target network device, or after a connection to a source network device for a period of time, a radio link failure occurs, wherein the source network device and the target network device are network devices using different communication standards;~~

~~generating a first report, wherein the first report comprises a first container that comprises at least one piece of information related to the radio link failure, and the first container uses a coding format corresponding to a communication standard of a network device to which a cell in which the radio link failure occurs belongs; and~~

~~sending the first report to a first network device.~~

~~11. The method according to claim 10, wherein when the radio link failure occurs on the target network device shortly after the successful handover from the source network device to the target network device, and the network device to which the cell in which the radio link failure occurs belongs is the target network device; and~~

~~the first report further comprises a second container that comprises the at least one piece of information related to the radio link failure, wherein the second container uses a coding format corresponding to a communication standard of the source network device.~~

~~12. The method according to claim 10 or 11, wherein the first report further comprises first information, and the first information indicates that the first report is a report for an inter RAT handover scenario.~~

~~13. The method according to any one of claims 10 to 12, wherein the first report further comprises second information, and the second information indicates that the first report is a report for an inter-system handover scenario or a report for an intra-system handover scenario.~~

~~14. The method according to any one of claims 10 to 13, wherein the method further~~

comprises:

~~sending first indication information to the first network device, wherein the first indication information indicates that a terminal device records the first report; and~~

~~receiving second indication information from the first network device, wherein the second indication information indicates the terminal device to report the first report.~~

~~15. A communication method, wherein the method comprises:~~

~~receiving a first report from a terminal device, wherein the first report comprises a first container that comprises at least one piece of information related to a radio link failure, and the first container uses a coding format corresponding to a communication standard of a network device to which a cell in which the radio link failure occurs belongs; and~~

~~sending a second report to the network device to which the cell in which the radio link failure occurs belongs, wherein the second report comprises the first container.~~

~~16. The method according to claim 15, wherein when the network device to which the cell in which the radio link failure occurs belongs is the target network device,~~

~~the first report further comprises a second container that comprises the at least one piece of information related to the radio link failure, wherein the second container uses a coding format corresponding to a communication standard of the source network device; and~~

~~the method further comprises:~~

~~sending the second container to the target network device.~~

~~17. The method according to claim 15 or 16, wherein the first report further comprises first information, and the first information indicates that the first report is a report for an inter-RAT handover scenario; and/or~~

~~the second report further comprises third information, and the third information indicates that the second report is a report for an inter-RAT handover scenario.~~

~~18. The method according to any one of claims 15 to 17, wherein the first report further comprises second information, and the second information indicates that the first report is a report for an inter-system handover scenario or a report for an intra-system handover scenario; and/or~~

~~the second report further comprises fourth information, and the fourth information indicates that the second report is a report for an inter-system handover scenario or a report for an intra-system handover scenario.~~

~~19. The method according to any one of claims 15 to 18, wherein the method further~~

comprises:

~~receiving first indication information from the terminal device, wherein the first indication information indicates that the terminal device records the first report; and~~

~~sending second indication information to the terminal device, wherein the second indication information indicates the terminal device to report the first report.~~

~~20. A communication method, wherein the method comprises:~~

~~receiving a second report from a first network device, wherein the second report comprises a first container that comprises at least one piece of information related to a radio link failure, and the first container uses a coding format corresponding to a communication standard of a target network device;~~

~~determining, based on the second report, that handover is too early handover or handover to a wrong cell, and/or determining that a failure type is the radio link failure; and~~

~~sending a third report to a source network device, wherein the third report comprises a second container that comprises the at least one piece of information related to the radio link failure, the second container uses a coding format corresponding to a communication standard of the source network device, and the source network device and the target network device are network devices using different communication standards.~~

~~21. The method according to claim 20, wherein the method further comprises:~~

~~receiving the second container from the first network device; or~~

~~processing, based on the coding format corresponding to the communication standard of the source network device, the at least one piece of information that is related to the radio link failure and that is comprised in the first container, to obtain the second container.~~

~~22. The method according to claim 20 or 21, wherein the second report further comprises third information, and the third information indicates that the second report is a report for an inter-RAT handover scenario; and/or~~

~~the third report further comprises fifth information, and the fifth information indicates that the third report is a report for an inter-RAT handover scenario.~~

~~23. The method according to any one of claims 20 to 22, wherein the second report further comprises fourth information, and the fourth information indicates that the second report is a report for an inter-system handover scenario or a report for an intra-system handover scenario; and/or~~

~~the third report further comprises sixth information, and the sixth information indicates that~~

the third report is a report for an inter-system handover scenario or a report for an intra-system handover scenario.

24. The method according to any one of claims 20 to 23, wherein the third report further comprises information indicating that the handover is too early handover or handover to a wrong cell.

~~25~~11. A communication apparatus, wherein the apparatus comprises units configured to perform the steps of the method according to any one of claims 1 to 4~~5~~, comprises units configured to perform the steps of the method according to any one of claims 5 to 9, comprises units configured to perform the steps of the method according to any one of claims 10 to 14, comprises units configured to perform the steps of the method according to any one of claims 15 to 19, or comprises units configured to perform the steps of the method according to any one of claims 20 to 24.

12. A communication apparatus, wherein the apparatus comprises units configured to perform the steps of the method according to any one of claims 6-10.

~~26. A communication apparatus, wherein the apparatus comprises at least one processor, and the at least one processor is coupled to at least one memory; and~~

~~the at least one processor is configured to execute a computer program or instructions stored in the at least one memory, so that the apparatus performs the method according to any one of claims 1 to 4, the apparatus performs the method according to any one of claims 5 to 9, the apparatus performs the method according to any one of claims 10 to 14, the apparatus performs the method according to any one of claims 15 to 19, or the apparatus performs the method according to any one of claims 20 to 24.~~

~~27~~13. A computer-readable storage medium, configured to store instructions, wherein when the instructions are executed, the method according to any one of claims 1 to 4~~5~~ is implemented, or the method according to any one of claims 5-6 to 9-10 is implemented, the method according to any one of claims 10 to 14 is implemented, the method according to any one of claims 15 to 19 is implemented, or the method according to any one of claims 20 to 24 is implemented.

~~28. A communication apparatus, comprising a processor and an interface circuit, wherein the interface circuit is configured to exchange code instructions with the processor; and the processor is configured to run the code instructions to perform the method according to any one of claims 1 to 4, the processor is configured to run the code instructions to perform the~~

method according to any one of claims 5 to 9, the processor is configured to run the code instructions to perform the method according to any one of claims 10 to 14, the processor is configured to run the code instructions to perform the method according to any one of claims 15 to 19, or the processor is configured to run the code instructions to perform the method according to any one of claims 20 to 24.

~~29~~14. A computer program product, wherein when a computer reads and executes the computer program product, the computer is enabled to perform the method according to any one of claims 1 to 4~~5~~, or perform the method according to any one of claims 5-6 to 9~~10~~, ~~perform the method according to any one of claims 10 to 14, perform the method according to any one of claims 15 to 19, or perform the method according to any one of claims 20 to 24.~~

15. A communication system, comprising a first network device and a second network device, wherein the first network device is configured to implement the method according to any one of claims 6 to 10, and the second network device is configured to communicate with the first network device.