

AMENDED CLAIMS

What is claimed is:

1. A communication method, performed by a terminal device or a chip for the terminal device,
comprising:

5 ~~determining, by a terminal device,~~ connection failure information; and

10 ~~sending the connection failure information and an identifier of a first cell to a first network device by using a radio resource control RRC message, wherein the first cell is where a reconfiguration message or a handover command message received by the terminal device comes,~~
~~a handover failure occurs in a procedure in which the terminal device attempts to be handed over~~
~~from the first cell of a source network device to a second cell of a target network device, the first~~
~~cell and the second cell use different radio access technologies, and~~~~the identifier of the first cell~~
~~comprises an identifier of a cell from which a reconfiguration message or a handover command~~
~~message received by the terminal device comes or an identifier of a cell in which a connection~~
~~failure occurs~~
15 a third cell of the first network device to which the terminal device sends the RRC
message and the second cell use a same radio access technology; or, the first cell is where a
connection failure occurs and the terminal device detects a radio link failure, RLF, in the first cell
of the source network device and the third cell of the first network device and the first cell use
different radio access technologies; and wherein

20 the connection failure information is in a form of a container in the RRC message and the
identifier of the first cell is outside the container.

2. ~~The method according to claim 1, further comprising:~~

25 ~~a handover failure occurs in a procedure in which the terminal device attempts to be handed~~
~~over from the first cell of a source network device to a second cell of a target network device,~~
~~wherein the first cell is the cell from which the reconfiguration message or the handover command~~
~~message received by the terminal device comes, and the first cell and the second cell use different~~
~~radio access technologies.~~

3. ~~The method according to claim 2, further comprising:~~

~~accessing, by the terminal device, a~~the ~~third cell of the first network device before sending~~
~~the RRC message, wherein the second cell and the third cell use a same radio access technology.~~

4. ~~The method according to claim 1, further comprising:~~

~~a radio link failure occurs on the terminal device in the first cell of a source network device, wherein the first cell is the cell in which the connection failure occurs.~~

5. ~~The method according to claim 4, further comprising:~~

~~accessing, by the terminal device, a third cell of the first network device before sending the RRC message, wherein the first cell and the third cell use different radio access technologies.~~

~~63. The method according to any one of claims 1 to 5~~claim 1 or 2, wherein a radio access technology used by a cell that is of the first network device and that is accessed by the terminal devicethe third cell of the first network device is new radio NR, and ~~the~~a radio access technology used by the first cell is evolved universal terrestrial radio access E-UTRA.

4. The method according to any one of claims 1 to 3, wherein one of the following is carried in the RRC message and outside the container:

a tracking area code, TAC, of the first cell,

type information of the first cell, or,

the TAC of the first cell and the type information of the first cell;

wherein the type information indicates that the first cell is a long term evolution, LTE, cell, an eLTE cell, or, a new radio, NR, cell.

5. The method according to any one of claims 1 to 4, wherein the identifier of the first cell is a cell global identifier.

6. The method according to any one of claims 1 to 5, wherein the connection failure information indicates the handover failure occurs in the procedure in which the terminal device attempts to be handed over from the first cell of the source network device to the second cell of the target network device, or, the RLF occurs in the first cell of the source network device.

7. A communication method, performed by a first network device or a chip for the first network device, comprising:

receiving, by a first network device, a radio resource control RRC message from a terminal device, wherein the RRC message comprises connection failure information and an identifier of a first cell, and the identifier of the first cell comprises an identifier of a cell from which a reconfiguration message or a handover command message received by the terminal device comes or an identifier of a cell in which a connection failure occurs wherein the first cell is where a reconfiguration message or a handover command message received by the terminal device comes,

a handover failure occurs in a procedure in which the terminal device attempts to be handed over from the first cell of a source network device to a second cell of a target network device, the first cell and the second cell use different radio access technologies, and a third cell of the first network device to which the terminal device sends the RRC message and the second cell use a same radio access technology; or, the first cell is where a connection failure occurs and the terminal device detects a radio link failure, RLF, in the first cell of the source network device and the third cell of the first network device and the first cell use different radio access technologies; and

determining the identifier of the first cell based on the RRC message, wherein the connection failure information is in a form of a container in the RRC message and the identifier of the first cell is outside the container.

8. The method according to claim 7, further comprising:

sending, ~~by the first network device to a second network device through an interface between the first network device and the second network device, the connection failure information and information indicating a radio access technology of an RRC format that is used by the connection failure information, wherein the second network device~~ is the source network device manages the first cell.

9. The method according to claim 7, further comprising:

sending, ~~by the first network device to a second network device by using~~ through a core network device, the connection failure information and information indicating a radio access technology of an RRC format that is used by the connection failure information, wherein the second network device is the source network device manages the first cell.

10. The method according to any one of claims 7 to 9, wherein a radio access technology used by the third cell of the first network device is new radio NR, and a radio access technology used by the first cell is evolved universal terrestrial radio access E-UTRA ~~a cell managed by the first network device is a cell of a first radio access technology, and the first cell uses a second radio access technology.~~

11. The method according to any one of claims 7 to 10, wherein one of the following is carried in the RRC message and outside the container:

a tracking area code, TAC, of the first cell,

type information of the first cell, or,

the TAC of the first cell and the type information of the first cell;

wherein the type information indicates that the first cell is a long term evolution, LTE, cell, an eLTE cell, or, a new radio, NR, cell.

12. The method according to any one of claims 7 to 11, wherein the identifier of the first cell is a cell global identifier.

5 13. The method according to any one of claims 7 to 12, wherein the connection failure information indicates the handover failure occurs in the procedure in which the terminal device attempts to be handed over from the first cell of the source network device to the second cell of the target network device, or, the RLF occurs in the first cell of the source network device.

10 ~~44~~14. A communication method, performed by a second network device or a chip for the second network device, comprising:

receiving, ~~by a second network device~~ from a first network device through an interface between the second network device and the first network device or by using a core network device, connection failure information and information indicating a radio access technology of an RRC format that is used by the connection failure information; and

15 determining, ~~by the second network device~~ based on the information indicating the radio access technology of the RRC format that is used by the connection failure information, the radio access technology of the RRC format that is used by the connection failure information.

~~42~~15. The method according to claim ~~44~~14, wherein the first network device and the second network device use different radio access technologies.

20 ~~43~~16. An apparatus, wherein the apparatus is a terminal device or a chip or a circuit disposed in the terminal device, and the apparatus comprises a unit or a module configured to perform the method according to any one of claims 1 to 6.

25 ~~44~~17. An apparatus, wherein the apparatus is a terminal device or a chip or a circuit disposed in the terminal device, and comprises a processor and a memory, wherein the memory is configured to store a computer program, the computer program comprises program instructions, and when the processor runs the program instructions, the apparatus is enabled to perform the method according to any one of claims 1 to 6.

30 ~~45~~18. An apparatus, wherein the apparatus is a network device or a chip or a circuit disposed in the network device, and the apparatus comprises a unit or a module configured to perform the method according to any one of claims 7 to ~~40~~15.

~~46~~19. An apparatus, wherein the apparatus is a network device or a chip or a circuit disposed

in the network device, and comprises a processor and a memory, wherein the memory is configured to store a computer program, the computer program comprises program instructions, and when the processor runs the program instructions, the apparatus is enabled to perform the method according to any one of claims 11 or 12 to 15.

5 ~~17. An apparatus, wherein the apparatus is a network device or a chip or a circuit disposed in the network device, and the apparatus comprises a unit or a module configured to perform the method according to any one of claims 7 to 10.~~

10 ~~18. An apparatus, wherein the apparatus is a network device or a chip or a circuit disposed in the network device, and comprises a processor and a memory, wherein the memory is configured to store a computer program, the computer program comprises program instructions, and when the processor runs the program instructions, the apparatus is enabled to perform the method according to claim 11 or 12.~~

15 ~~19. A communications system, comprising the apparatus according to claim 15-17 or 16 and the apparatus according to claim 17-19 or 18.~~

20 ~~20. The system according to claim 19, further comprising the apparatus according to claim 13 or 14.~~

25 ~~21. A readable storage medium or a program product, wherein the readable storage medium or the program product stores program instructions, and when the program instructions are run, the method according to any one of claims 1 to 6, any one of claims 7 to 10, 13, or claim 11-14 or 12-15 is performed.~~

30 ~~22. A communication method, comprising:
receiving, by a third network device, connection failure information from a terminal device, wherein the connection failure information indicates that the terminal device detects a radio link failure RLF in a second cell of a second network device after the terminal device is successfully handed over from a first cell of a first network device to the second cell; and
sending, by the third network device to the second network device, the connection failure information and information indicating a radio access technology of a radio resource control RRC format that is used by the connection failure information.~~

35 ~~23. The method according to claim 22, wherein the connection failure information received from the terminal device is in a form of a container in an RRC message.~~

40 ~~24. The method according to claim 22 or 23, further comprising:~~

~~sending, by the third network device to the second network device through an interface between the third network device and the second network device, the connection failure information and the information indicating the radio access technology of the RRC format that is used by the connection failure information.~~

5 ~~25. The method according to claim 22 or 23, further comprising:~~

~~sending, by the third network device to the second network device by using a core network device, the connection failure information and the information indicating the radio access technology of the RRC format that is used by the connection failure information.~~

10 ~~26. The method according to any one of claims 22 to 25, wherein the first cell of the first network device uses a first radio access technology, and the second cell of the second network device and a cell of the third network device use a second radio access technology.~~

~~27. A communication method, comprising:~~

15 ~~receiving, by a second network device from a third network device through an interface between the second network device and the third network device or by using a core network device, connection failure information and information indicating a radio access technology of an RRC format that is used by the connection failure information, wherein the connection failure information is received by the third network device from a terminal device and indicates that the terminal device detects a radio link failure RLF in a second cell of the second network device after the terminal device is successfully handed over from a first cell of a first network device to the~~
20 ~~second cell; and~~

~~determining, by the second network device based on the information indicating the radio access technology of the RRC format that is used by the connection failure information, the radio access technology of the RRC format that is used by the connection failure information.~~

25 ~~28. The method according to claim 27, wherein the first cell of the first network device uses a first radio access technology, and the second cell of the second network device and a cell of the third network device use a second radio access technology.~~

~~29. An apparatus, wherein the apparatus is a network device or a chip or a circuit disposed in the network device, and the apparatus comprises a unit or a module configured to perform the method according to any one of claims 22 to 26.~~

30 ~~30. An apparatus, wherein the apparatus is a network device or a chip or a circuit disposed in the network device, and comprises a processor and a memory, wherein the memory is configured~~

to store a computer program, the computer program comprises program instructions, and when the processor runs the program instructions, the apparatus is enabled to perform the method according to any one of claims 22 to 26.

31. ~~An apparatus, wherein the apparatus is a network device or a chip or a circuit disposed in the network device, and the apparatus comprises a unit or a module configured to perform the method according to claim 27 or 28.~~

32. ~~An apparatus, wherein the apparatus is a network device or a chip or a circuit disposed in the network device, and comprises a processor and a memory, wherein the memory is configured to store a computer program, the computer program comprises program instructions, and when the processor runs the program instructions, the apparatus is enabled to perform the method according to claim 27 or 28.~~

33. ~~A communications system, comprising the apparatus according to claim 29 or 30 and the apparatus according to claim 31 or 32.~~

34. ~~A readable storage medium or a program product, wherein the readable storage medium or the program product stores program instructions, and when the program instructions are run, the method according to any one of claims 22 to 26 or claim 27 or 28 is performed.~~

35. ~~A mobility optimization method, comprising:~~

~~receiving, by a first network device, connection failure information from a terminal device, wherein the connection failure information is used to indicate that the terminal device detects a radio link failure RLF in a first cell or fails to be handed over to the first cell, there is a wireless connection between the terminal device and a second cell in a procedure of handover from the second cell to the first cell, and the second cell is a cell managed by the first network device; and determining, by the first network device, a connection failure type of the terminal device.~~

36. ~~The method according to claim 35, wherein the first cell is a target cell, and the second cell is a source cell; and~~

~~the determining, by the first network device, a connection failure type of the terminal device comprises one or both of the following:~~

~~if the first network device determines that the terminal device keeps the wireless connection to the second cell after the terminal device detects the RLF in the first cell or fails to be handed over to the first cell, determining, by the first network device, that the connection failure type of the terminal device is too early handover; or~~

if the first network device determines that a third cell is a cell to be accessed by the terminal device, determining, by the first network device, that the connection failure type of the terminal device is handover to a wrong cell, wherein the third cell is different from the first cell and the second cell.

37. The method according to claim 36, wherein the first cell is a candidate cell that is in at least one candidate cell of the terminal device and that satisfies a conditional inter-cell handover CHO trigger condition, and the third cell is different from the second cell and any one of the at least one candidate cell.

38. The method according to claim 37, wherein before the receiving, by a first network device, connection failure information from a terminal device, the method further comprises:

sending, by the first network device, first indication information to the terminal device, wherein the first indication information is used to indicate the terminal device to access the second cell when the terminal device fails to be handed over to the first cell.

39. A mobility optimization method, comprising:

receiving, by a first network device, connection failure information, wherein the connection failure information is used to indicate that a terminal device detects an RLF in a first cell in a procedure of handover from the first cell to a second cell, and the first cell is a cell managed by the first network device; and

determining, by the first network device, a connection failure type of the terminal device.

40. The method according to claim 39, wherein the determining, by the first network device, a connection failure type of the terminal device comprises:

if the first network device determines that time for which the terminal device camps on the first cell is greater than a second threshold and the terminal device successfully accesses the second cell, determining, by the first network device, that the connection failure type of the terminal device is too late handover.

41. The method according to claim 40, wherein the second cell is a candidate cell that is in at least one candidate cell of the terminal device and that satisfies a CHO trigger condition.

42. A mobility optimization method, comprising:

receiving, by a first network device, connection failure information from a second network device, wherein the connection failure information is used to indicate that a terminal device detects an RLF in a master cell group MCG managed by the first network device; and

determining, by the first network device, a connection failure type of the terminal device.

43. A mobility optimization method, comprising:

receiving, by a first network device, connection failure information, wherein the connection failure information is used to indicate that a terminal device detects an RLF in a first cell or fails to be handed over from the first cell to a second cell; and

determining, by the first network device, a connection failure type of the terminal device.

44. An apparatus, wherein the apparatus is a network device or a chip or a circuit disposed in the network device, and the apparatus comprises a unit or a module configured to perform the method according to any one of claims 35 to 38, any one of claims 39 to 41, claim 42, or claim 43.

45. An apparatus, wherein the apparatus is a network device or a chip or a circuit disposed in the network device, and comprises a processor, a transceiver, and a memory, wherein the memory is configured to store a computer program, the transceiver is configured to receive and send information, the computer program comprises program instructions, and when the processor runs the program instructions, the apparatus is enabled to perform the method according to any one of claims 35 to 38, any one of claims 39 to 41, claim 42, or claim 43.

46. A readable storage medium or a program product, storing program instructions, wherein when the program instructions are run, the method according to any one of claims 35 to 38, any one of claims 39 to 41, claim 42, or claim 43 is performed.