



(51) International Patent Classification:
H04W 36/04 (2009.01)

(21) International Application Number:
PCT/CN2017/086122

(22) International Filing Date:
26 May 2017 (26.05.2017)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
201710296170.2 28 April 2017 (28.04.2017) CN

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(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, 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).

Published:

— with international search report (Art. 21(3))

(54) Title: METHOD AND APPARATUS FOR SECONDARY BASE STATION CHANGE

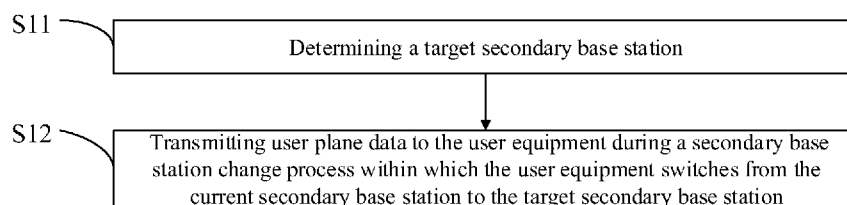


Fig. 1

(57) Abstract: A method for secondary base station change is provided. The method for secondary base station change includes: determining a target secondary base station by a master base station; and transmitting user plane data to a user equipment by the master base station during a secondary base station change process within which the user equipment switches from a current secondary base station to the target secondary base station. An apparatus for secondary base station change is also provided. In this way, the time of a mobility interruption will be shortened.



METHOD AND APPARATUS FOR SECONDARY BASE STATION**CHANGE****TECHNICAL FIELD**

[0001] The present disclosure generally relates to communication technologies, and in particular relate to a method and an apparatus for secondary base station change.

BACKGROUND

[0002] Due to limited bandwidth and coverage of a single base station, wireless resource of a plurality of cells or base stations are concentrated to provide services for users, easily meeting users' capacity and coverage requirements, such as dual connectivity. The dual connectivity may be applied for a heterogeneous network to achieve different types of Radio Access Network (RAN), such as communication and cooperation between a New Radio access technology (NR) and a Long Term Evolution (LTE).

[0003] Only a base station, called as a master base station, manages the control plane data which a user equipment (UE) working in the dual connectivity mode requires in the prior art. Another eNodeB, known as a secondary base station, is configured for providing extra resource. Only the secondary base station is responsible for managing user plane data, which is known as a Secondary Cell Group (SCG) bearer.

[0004] As the UE firstly breaks the connection with a current secondary base station, and then initiates the random access procedure to establish connection with a target secondary base station during a process in which secondary base station changes for the SCG bearer, UE has no connections with any one secondary base station. Therefore, during the process, the UE cannot receive the user plane data, which leads to a mobility interruption.

SUMMARY

[0005] Embodiments of the present disclosure provide a method and an apparatus for secondary base station change, by which the mobility interruption which occurs during a secondary base station change process of secondary base station under the SCG bearer in prior art can be solved.

[0006] In accordance with a first aspect of the present application to solve the above-mentioned problems, a method for secondary base station change is provided, and the method comprising: determining a target secondary base station by a master base station; and transmitting user plane data to a user equipment by the master base station during a secondary base station change process within which the user equipment switches from a current secondary base station to the target secondary base station.

[0007] In accordance with a second aspect of the present application to solve the above-mentioned problems, a method for secondary base station change is provided, the method comprising: determining a target secondary base station by a current secondary base station; and transmitting at least a part of received user plane data of a secondary cell group bearer to a master base station during a secondary base station change process such that the master base station transmits the user plane data to a user equipment during the secondary base station change process.

[0008] In accordance with a third aspect of the present application to solve the above-mentioned problems, a method for secondary base station change is provided, the method comprising: switching from a current secondary base station to a target secondary base station by a user equipment and receiving user plane data from a master base station during the secondary base station change process.

[0009] In accordance with a fourth aspect of the present application to solve the above-mentioned problems, an apparatus for secondary base station change is provided, comprising a processor and a communication circuit connected to the processor, and the processor is configured for executing programs to perform any one method provided in accordance with the first to aspects.

[0010] According to the method and apparatus for secondary base station change, the subsequent advantages may be achieved: the master base station transmits user

plane data to the UE during the secondary base station change process. As the master base station maintains connected with the UE, the UE can still receive user plane data from the master base station when the UE is not in a connection with any one secondary base station, shortening the mobility interruption time.

[0011] Further, the master base station maintains to transmit user plane data to the UE, which will avoid a mobility interruption.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Fig. 1 is a flowchart illustrating a first embodiment of a method for secondary base station change according to the present disclosure.

[0013] Fig. 2 is a flowchart illustrating a second embodiment of a method for secondary base station change according to the present disclosure.

[0014] Fig. 3 is a flowchart illustrating a third embodiment of a method for secondary base station change according to the present disclosure.

[0015] Fig. 4 is a flowchart illustrating a fourth embodiment of a method for secondary base station change according to the present disclosure.

[0016] Fig. 5 is a flowchart illustrating a fifth embodiment of a method for secondary base station change according to the present disclosure.

[0017] Fig. 6 is a schematic view illustrating a transmission path of user plane data during the secondary base station change process according to the fifth embodiment of the present disclosure.

[0018] Fig. 7 is a flowchart illustrating a sixth embodiment of a method for secondary base station change according to the present disclosure.

[0019] Fig. 8 is a flowchart illustrating a seventh embodiment of a method for secondary base station change according to the present disclosure.

[0020] Fig. 9 is a flowchart illustrating an eighth embodiment of a method for secondary base station change according to the present disclosure.

[0021] Fig. 10 is a flowchart illustrating a ninth embodiment of a method for secondary base station change according to the present disclosure.

[0022] Fig. 11 is a flowchart illustrating a tenth embodiment of a method for secondary base station change according to the present disclosure.

[0023] Fig. 12 is a flowchart illustrating an eleventh embodiment of a method for secondary base station change according to the present disclosure.

[0024] Fig. 13 is a flowchart illustrating a twelfth embodiment of a method for secondary base station change according to the present disclosure.

[0025] Fig. 14 is a flowchart illustrating a thirteenth embodiment of a method for secondary base station change according to the present disclosure.

[0026] Fig. 15 is a flowchart illustrating a fourteenth embodiment of a method for secondary base station change according to the present disclosure.

[0027] Fig. 16 is a structural schematic view illustrating a first embodiment of an apparatus for secondary base station change according to the present disclosure.

[0028] Fig. 17 is a structural schematic view illustrating a second embodiment of an apparatus for secondary base station change according to the present disclosure.

[0029] Fig. 18 is a structural diagram illustrating a third embodiment of an apparatus for secondary base station change according to the present disclosure.

[0030] Fig. 19 is a structural diagram illustrating a fourth embodiment of an apparatus for secondary base station change according to the present disclosure.

[0031] Fig. 20 is a structural diagram illustrating a fifth embodiment of an apparatus for secondary base station change according to the present disclosure.

[0032] Fig. 21 is a structural diagram illustrating a sixth embodiment of an apparatus for secondary base station change according to the present disclosure.

[0033] Fig. 22 is a structural diagram illustrating a seventh embodiment of an apparatus for secondary base station change according to the present disclosure.

DETAILED DESCRIPTION

[0034] The technical solution of the embodiments of the present disclosure will be described more clearly and completely with reference to the accompanying drawings.

[0035] The methods in the following embodiments which are non-conflicting with each other may be combined together.

[0036] Fig. 1 is a flowchart illustrating a first embodiment of a method for secondary base station change according to the present disclosure. The execution

subject of the method for secondary base station change in accordance with the first embodiment may a base station, acting as a master base station in the dual connectivity. The base station may be connected to a core network, and has a wireless communication with a user equipment, providing communication coverage of a corresponding region therefor. The base station may be a macro base station, a micro base station, a pico base station or femtocell. In some embodiments, the base station may be called as the wireless base station, access point, B node, long term B node (eNodeB, eNB), gNB or other suitable terms. As is shown in Fig. 1, the method for secondary base station change may include the following blocks.

[0037] In block S11, the master base station may determine a target secondary base station.

[0038] The master base station manages all the radio resource control (RRC) signalings and functions which are what UE requires, such as public wireless resource allocation, dedicated wireless resource allocation, measurement and mobility management, etc. The type of the master base station may be different from, or also same with that of a secondary base station. For example, the master base station may be a LTE master base station and the secondary base station may be a NR secondary base station.

[0039] The secondary base station change may be initiated by the master base station, and may also be initiated by the current secondary base station or the UE. The master base station has many methods to determine the target secondary base station according to different initiators of the secondary base station change, which will be specifically elaborated in the following embodiments.

[0040] When the secondary base station change is initiated by the master base station or the current secondary base station, the master base station generally sends a handover signaling to the UE through a RRC re-allocation message after determining the target secondary base station. The handover signaling may include information of the target secondary base station. The UE breaks the connection with the current secondary base station in response to the handover signaling, and then performs a random access procedure to establish a connection with the target secondary base

station. Thus the UE switches from the current secondary base station to the target secondary base station.

[0041] When the secondary base station change is initiated by the UE, the master base station / current secondary base station previously selects at least one candidate base station for the UE, and the master base station sends the information of the candidate base stations and handover conditions to the UE. The UE determines whether the quality of signals of the candidate base stations is met with the handover conditions. The UE selects the target secondary base station from the candidate base stations met with the handover conditions and switches from the current secondary base station to the target secondary base station when the quality of signals is met with the handover conditions.

[0042] In block S12, the master base station may transmit user plane data to the user equipment during a secondary base station change process within which the user equipment switches from the current secondary base station to the target secondary base station.

[0043] The user plane data transmitted by the master base station to the UE may include user plane data received by the master base station from the core network and/or current secondary base station.

[0044] If the master base station only receives user plane data from the core network, the bearer type of the user plane data changes from a secondary cell group (SCG, a serving cell controlled by a secondary base station) bearer to a master cell group bearer (MCG, a serving cell controlled by the master base station) or a master cell group split (MCG split) bearer. For the MCG bearer, the master base station receives user plane data from the core network and transmits the user plane data to the UE. For the MCG bearer, the master base station receives user plane data from the core network and forwards a part of the received user plane data to the secondary base station, and both the master base station and the secondary base station transmit user plane data to the UE.

[0045] If the master base station only receives user plane data from the current secondary base station, that is to say, the user plane data transmitted during the

secondary base station change process only comes from the current secondary base station, the bearer type of the user plane data changes from a SCG bearer to a SCG split bearer. For the SCG split bearer, the secondary base station receives user plane data from the core network and forwards a part of the received user plane data to the master base station, and both the master base station and the secondary base station transmit user plane data to the UE.

[0046] The master base station keeps transmitting user plane data to the UE during the whole secondary base station change process, avoiding a mobility interruption. And the master base station also stops transmitting after the received user plane data has been transmitted no matter whether the handover is completed.

[0047] The master base station may continue to transmit user plane data to the UE, and may not modify the bearer type at this time, after the handover is completed. The master base station may also stop transmitting user plane data to the UE and may modify the bearer type as the SCG bearer, after the handover is completed.

[0048] With the implementation of the above embodiment, the master base station transmits user plane data to the UE during the secondary base station change process. As the master base station maintains connected with the UE, the UE can still receive user plane data from the master base station when the UE is not in a connection with any one secondary base station, shortening the time of a mobility interruption.

[0049] Referring to Fig. 2, the method for secondary base station change in a second embodiment is based on that in the first embodiment. As shown in Fig. 2, the method may further include the following blocks before the block S12.

[0050] In block S13, the master base station may send a first bearer type reconfiguration instruction to the UE and the current secondary base station respectively.

[0051] The first bearer type reconfiguration instruction may be configured for indicating a bearer type to switch from a SCG bearer to a SCG split bearer. The first bearer type reconfiguration instruction sent to the current secondary base station may include a data-splitting ratio. The data-splitting ratio may be configured for indicating a proportion of user plane data which is transmitted to the master base station by

current secondary base station and occupies user plane data of the secondary cell group bearer received thereby.

[0052] When the master base station / current secondary base station initiates the secondary base station change, the master base station may send a handover signaling to the UE at the same time when sending the first bearer type reconfiguration instruction thereto. And the master base station may also send the handover signaling to the UE before or after sending the first bearer type reconfiguration instruction thereto.

[0053] In block S14, the master base station may receive a bearer type reconfiguration complete message from the UE.

[0054] The UE sends the bearer type reconfiguration complete message to the master base station after changing the bearer type of user plane data from the SCG bearer to the SCG split bearer according to the first bearer type reconfiguration instruction.

[0055] Referring to Fig. 3, the method for secondary base station change in a third embodiment is based on that in the first embodiment. As shown in Fig. 3, the method may further include the following blocks after the block S12.

[0056] In block S15, the master base station may send a second bearer type reconfiguration instruction to the UE after the secondary base station change process is completed.

[0057] The second bearer type reconfiguration instruction may be configured for indicating the bearer type of user plane data to switch from the SCG split bearer to SCG bearer. The basis on which the master base station determines that the secondary base station change process is completed may be an end marker received from the current secondary base station, a path switch confirming message received from a mobility management entity (MME), or also be that the UE completes a random access to the target secondary base station. If the master base station still has un-transmitted user plane data at this time, the master base station may transmit the un-transmitted user plane data to the target secondary base station.

[0058] What can be seen in the present embodiment, the master base station controls

the UE to change the bearer type of user plane data from the SCG split bearer to the SCG bearer after the secondary base station change process is completed, ensuring that the master base station can transmit user plane data to the UE during the whole secondary base station change process, and avoiding a mobility interruption.

[0059] Referring to Fig. 4, a method for secondary base station change according to a fourth embodiment is based on that according to the first embodiment. As shown in Fig. 4, the method in the fourth embodiment may include the following block after the block S12.

[0060] In block S16, the master base station may send the second bearer type reconfiguration instruction to the UE after the user plane data has been transmitted.

[0061] The second bearer type reconfiguration instruction may be configured for indicating the bearer type to switch from the SCG split bearer to the SCG bearer. The secondary base station change process may not be completed when the master base station has transmitted the user plane data. As the UE may still not complete the random access procedure to the target secondary base station when the block S16 is executed, there is a possibility that a mobility interruption occurs. However the time of the mobility interruption is shorter compared with that in the prior art.

[0062] Referring to Fig. 5, a method for secondary base station change according to a fifth embodiment is based on that according to the first embodiment. The master base station initiates the secondary base station change, in which the same part as the above embodiment will not be elaborated herein. As shown in Fig. 5, the method in the fifth embodiment may include the following blocks.

[0063] In block S111, the master base station may send a secondary base station change request to the target secondary base station.

[0064] In block S112, the target secondary base station may send a secondary base station change request acknowledgment to the master base station.

[0065] In block S113, the master base station may send information of the target secondary base station and the first bearer type reconfiguration instruction to the current secondary base station.

[0066] In the present embodiment, the master base station simultaneously sends the

information of the target secondary base station and the first bearer type reconfiguration instruction. In other embodiments, the master base station may firstly send the information of the target secondary base station and then send the first bearer type reconfiguration instruction. Or the master base station may firstly send the first bearer type reconfiguration instruction and then send the information of the target secondary base station. The first bearer type reconfiguration instruction may include a data-splitting ratio.

[0067] In block S114, the master base station may send a handover signaling and the first bearer type reconfiguration instruction to the UE.

[0068] In the present embodiment, the master base station simultaneously sends the handover signaling and the first bearer type reconfiguration instruction. In other embodiments, the master base station may firstly send the handover signaling and then send the first bearer type reconfiguration instruction. Or the master base station may firstly send the first bearer type reconfiguration instruction and then send the handover signaling.

[0069] In block S115, the current secondary base station may split the received user plane data into two parts, one of which is transmitted to the master base station, the other of which is forwarded to the target secondary base station.

[0070] The current secondary base station splits the received user plane data of a secondary cell bearer according to the data-splitting ratio.

[0071] In block S116, the UE may send a connection reconfiguration complete message and a bearer type reconfiguration complete message to the master base station.

[0072] The UE breaks the connection with the current secondary base station, and changes the bearer type for user plane data from the SCG bearer to SCG split bearer in response to the first bearer type reconfiguration instruction, and then the block S116 may be executed.

[0073] In the present embodiment, the UE simultaneously sends the connection reconfiguration complete message and the bearer type reconfiguration complete message. In other embodiments, the UE may respectively send the connection

reconfiguration complete message and the bearer type reconfiguration complete message.

[0074] In block S117, the master base station may send a secondary base station reconfiguration complete message to the target secondary base station.

[0075] In block S118, the UE may complete a random access to the target secondary base station.

[0076] The UE may start to receive data from the target secondary base station as the random access procedure has been completed. If the master base station may still transmit user plane data to the UE, the UE may simultaneously receive user plane data from the target secondary base station and the master base station.

[0077] In block S119, the master base station may send a path secondary base station change request to MME.

[0078] MME is a network element of the core network, responsible for dealing with control plane signalings.

[0079] In block S120, the MME may send a bearer change message to a serving gateway (S-GW).

[0080] The S-GW is a network element of the core network, responsible for forwarding user plane data.

[0081] In block S121, the S-GW may send an end marker to the current secondary base station.

[0082] The end marker may be sent independently. The end marker may also be included in a last packet sent to the current secondary base station.

[0083] In block S122, the current secondary base station may send an end marker to the master base station and the target secondary base station respectively.

[0084] The end marker may be sent independently. The end marker may also be included in a last packet.

[0085] In block S123, the master base station may send a second bearer type reconfiguration instruction to the UE.

[0086] In block S124, the UE sends a bearer type reconfiguration complete message to the master base station.

[0087] The UE changes the bearer type of user plane data from the SCG split bearer to the SCG bearer in response to the bearer type reconfiguration complete message, and then the block S124 may be executed.

[0088] In block S125, the S-GW establishes a new path with the target secondary base station.

[0089] In block S126, the MME sends a path switch acknowledgment to the master base station.

[0090] In block S127, the master base station sends a UE context release message to the current secondary base station.

[0091] The sequence between some blocks in Fig. 5 is only schematic but not restrictive, such as blocks S113 and S114, blocks S115 and S116, blocks S123 and S125, etc.

[0092] The master base station controls the UE to modify the bearer type to SCG bearer (in blocks S123 and S124) in Fig. 5 after receiving the end marker. In other embodiment, The master base station controls the UE to modify the bearer type to SCG bearer after receiving the path switch acknowledgment (in block S126), or after the UE has completed the random access procedure to the target secondary base station (in block S118), or after the master base station has transmitted the received user plane data from the current secondary base station.

[0093] A, B, C and D in Fig. 5 mean four times transmission of user plane data during the secondary base station change process, and transmission path of each time may be different. As shown in Fig. 6, transmission path for user plane data varies during the secondary base station change process, arrows therein indicate transmission paths for user plane data. The bearer type during the A is the SCG bearer, the current secondary base station receives user plane data from the S-GW. The UE only receives user plane data from the current secondary base station before breaking the connection with the current secondary base station. The bearer type during the B is the SCG split bearer, the current secondary base station receives user plane data from the S-GW and forwards to the master base station and the target secondary base station. The UE only receives user plane data from the master base

station, after breaking the connection with the current secondary base station, modifying the bearer type to the SCG split bearer and informing the master base station the modification (in block S116 in the Fig. 5). The bearer type during the C is the SCG split bearer, the current secondary base station receives user plane data from the S-GW and forwards to the master base station and the target secondary base station. The UE receives user plane data from the master base station and the current secondary base station after the random access procedure has been completed (in block S118 in the Fig. 5). The bearer type during the D is the SCG bearer, the target secondary base station receives user plane data from the S-GW. The UE only receives user plane data from the target secondary base station, after the UE modifies the bearer type from the SCG split bearer to the SCG bearer in response to the second bearer type reconfiguration instruction and informing the master base station the modification (in block S123 in the Fig. 5), and the new path has been established between the S-GW and the target secondary base station (in block S125 in the Fig. 5).

[0094] When the UE firstly modifies the bearer type from the SCG bearer to the SCG split bearer and then breaks the connection with the current secondary base station (not shown in Fig. 5), the UE may simultaneously receive user plane data from the current secondary base station and the master base station therebetween.

[0095] As the S-GW and MME connected with the master base station, the current secondary base station and target secondary base station may be the same, the S-GW or MME may not be required to be switched during the secondary base station change process. In other embodiments, the S-GW and MME connected with the master base station, current secondary base station and target secondary base station may be different, then it is probable to switch the S-GW and/or MME during the secondary base station change process.

[0096] Referring to Fig. 7, a method for secondary base station change according to a sixth embodiment is based on that according to the first embodiment. The current secondary base station initiates the secondary base station change and the master base station negotiates with the target secondary base station, in which the same part as the above embodiment will not be elaborated herein. As shown in Fig. 7, the method in

the sixth embodiment may include the following blocks.

[0097] In block S131, the current secondary base station sends a first secondary base station change request to the master base station.

[0098] The first secondary base station change request may include information of the target secondary base station which is the one that the current secondary base station selects. The first secondary base station change request may also not include information of the target secondary base station, and the master base station selects the target secondary base station.

[0099] In block S132, the master base station sends a second secondary base station change request to the target secondary base station in response to the first secondary base station change request.

[00100] In block S133, the target secondary base station sends a second secondary base station change request acknowledgment to the master base station.

[00101] In block S134, the master base station sends a first secondary base station change request acknowledgment and the first bearer type reconfiguration instruction to the current secondary base station.

[00102] In the present embodiment, the master base station simultaneously sends the first secondary base station change request acknowledgment and the first bearer type reconfiguration instruction. In other embodiments, the master base station may also firstly send the first secondary base station change request acknowledgment and then send the first bearer type reconfiguration instruction, or firstly send the first bearer type reconfiguration instruction and then send the first secondary base station change request acknowledgment.

[00103] In block S135, the master base station sends a handover signaling and the first bearer type reconfiguration instruction to the UE.

[00104] In block S136, the current secondary base station may split the received user plane data of the secondary cell group bearer into two parts, one of which is transmitted to the master base station, the other of which is forwarded to the target secondary base station.

[00105] In block S137, the UE may send a connection reconfiguration complete

message and a bearer type reconfiguration complete message to the master base station.

[00106] In block S138, the master base station may send a secondary base station reconfiguration complete message to the target secondary base station.

[00107] In block S139, the UE may complete a random access procedure to the target secondary base station.

[00108] In block S140, the master base station may send a path secondary base station change request to MME.

[00109] In block S141, the MME may send a bearer change message to a S-GW.

[00110] In block S142, the S-GW may send an end marker to the current secondary base station.

[00111] In block S143, the current secondary base station may send an end marker to the master base station and the target secondary base station respectively.

[00112] In block S144, the master base station may send a second bearer type reconfiguration instruction to the UE.

[00113] In block S145, the UE sends a bearer type reconfiguration complete message to the master base station.

[00114] In block S146, the S-GW establishes a new path with the target secondary base station.

[00115] In block S147, the MME sends a path switch acknowledgment to the master base station.

[00116] In block S148, the master base station sends a UE context release message to the current secondary base station.

[00117] The master base station controls the UE to modify the bearer type to SCG bearer (in blocks S144 and S145) in Fig. 7 after receiving the end marker. In other embodiment, The master base station controls the UE to modify the bearer type to SCG bearer after receiving the path switch acknowledgment (in block S147), or after the UE has completed the random access procedure to the target secondary base station (in block S139), or after the master base station has transmitted the received user plane data from the current secondary base station.

[00118] Referring to Fig. 8, a method for secondary base station change according to a seventh embodiment is based on that according to the first embodiment. The current secondary base station initiates the secondary base station change, in which the same part as the above embodiment will not be elaborated herein. As shown in Fig. 8, the method in the seventh embodiment may include the following blocks.

[00119] In block S151, the current secondary base station sends a third secondary base station change request to the target secondary base station.

[00120] In block S152, the target secondary base station sends a third secondary base station change request acknowledgment to the current secondary base station.

[00121] In block S153, the current secondary base station sends a fourth secondary base station change request to the master base station.

[00122] In block S154, the master base station sends a first bearer type reconfiguration instruction to the current secondary base station.

[00123] In block S155, the master base station sends a handover signaling and the first bearer type reconfiguration instruction to the UE.

[00124] In block S156, the current secondary base station may split the received user plane data of the secondary cell group bearer into two parts, one of which is transmitted to the master base station, the other of which is forwarded to the target secondary base station.

[00125] In block S157, the UE may send a connection reconfiguration complete message and a bearer type reconfiguration complete message to the master base station.

[00126] In block S158, the master base station may send a secondary base station reconfiguration complete message to the target secondary base station.

[00127] In block S159, the UE may complete a random access to the target secondary base station.

[00128] In block S160, the master base station may send a path secondary base station change request to MME.

[00129] In block S161, the MME may send a bearer change message to a S-GW.

[00130] In block S162, the S-GW may send an end marker to the current secondary

base station.

[00131] In block S163, the current secondary base station may send an end marker to the master base station and the target secondary base station respectively.

[00132] In block S164, the S-GW establishes a new path with the target secondary base station.

[00133] In block S165, the MME sends a path switch acknowledgment to the master base station.

[00134] In block S166, the master base station sends a second bearer type reconfiguration instruction to the UE.

[00135] In block S167, the UE sends a bearer type reconfiguration complete message to the master base station.

[00136] In block S168, the master base station sends a UE context release message to the current secondary base station.

[00137] The master base station controls the UE to modify the bearer type to SCG bearer (in blocks S166 and S167) in Fig. 8 after receiving the path switch acknowledgment. In other embodiment, The master base station controls the UE to modify the bearer type to SCG bearer after receiving the end marker (in block S163), or after the UE has completed the random access procedure to the target secondary base station (in block S159), or after the master base station has transmitted the received user plane data from the current secondary base station.

[00138] In the present embodiment, the transmission path of user plane data varies during the secondary base station change process, which is still as shown in Fig. 6.

[00139] Referring to Fig. 9, a method for secondary base station change according to an eighth embodiment is based on that according to the first embodiment. The UE initiates the secondary base station change, in which the same part as the above embodiment will not be elaborated herein. As shown in Fig. 9, the method in the eighth embodiment may include the following blocks.

[00140] In block S171, the master base station may send a pre-handover instruction to the UE.

[00141] The pre-handover instruction may include handover conditions and

information of candidate secondary base stations. The master base station may select a candidate secondary base station according to a measurement report from the UE. Except for the measurement report from the UE, the master base station may also select a candidate secondary base station according to at least one of the following: a current position of the UE, movement direction, loads of the candidate secondary base station.

[00142] In block S172, the UE may judge whether the quality of signals of the candidate secondary base station is met with the handover conditions.

[00143] The UE detects the quality of signals of the candidate secondary base stations. The master base station selects the target secondary base station from candidate secondary base stations met with the handover conditions when the quality of signals of the candidate secondary base stations is met with the handover conditions, and then subsequent blocks may be executed.

[00144] The UE may directly select the candidate secondary base station as the target secondary base station when the number of the candidate secondary base station met with the handover conditions is one. The UE may select one candidate secondary base station therefrom according pre-defined criteria, such as optimal signal quality, optimal service quality, minimum load, etc.

[00145] In block S173, the UE may send a handover informing message to the master base station.

[00146] The handover informing message may include information of the target secondary base station. As the master base station is responsible for controlling plane data of the UE, the UE fails to inform the current secondary base station when initiating the secondary base station change thereby, but the UE may inform the master base station firstly and then the master base station informs the current secondary base station. Of course, in some embodiments, the target secondary base station may also send the handover informing message to the master base station and/or the current secondary base station.

[00147] In block S174, the UE may switch from the current secondary base station to the target secondary base station.

[00148] In block S175, the master base station may send a handover informing message to the current secondary base station.

[00149] In block S176, the master base station may transmit user plane data to the UE during the secondary base station change process.

[00150] In specific, what may be referred to that in the previous embodiments.

[00151] The sequences of the blocks S173 and S174, and the blocks S175 and S176 are just schematic, which may be performed in turn or simultaneously.

[00152] Referring to Fig. 10, the execution subject of the method for secondary base station change in a ninth embodiment may be a base station, acting as a current secondary base station during a secondary base station change process. As shown in Fig. 10, the method may include the following blocks.

[00153] In block S21, the current secondary base station may determine a target secondary base station.

[00154] The current secondary base station has a plurality of ways to determine the target secondary base station due to different initiators of secondary base station change, which has been elaborated in specific according to the fifth to eighth embodiments, and will not be described again herein.

[00155] In block S22, the current secondary base station may transmit at least a part of received user plane data of a secondary cell group bearer to the master base station.

[00156] In this way, the master base station may transmit user plane data from the current secondary base station to the UE. The current secondary base station may forward user plane data to the target secondary base station, which has not been transmitted to the master base station thereby.

[00157] Referring to Fig. 11, the method for secondary base station change in a tenth embodiment is based on that in the ninth embodiment. As shown in Fig. 11, the method may further include the following block before the block S22.

[00158] In block S23, the current secondary base station may receive a first bearer type reconfiguration instruction from the master base station.

[00159] The first bearer type reconfiguration instruction may be configured for indicating the bearer type to switch from the SCG bearer to the SCG split bearer. The

first bearer type reconfiguration instruction may include a data-splitting ratio. The data-splitting ratio may be configured for indicating a proportion of the user plane data which is transmitted to the master base station by current secondary base station and occupies user plane data of the secondary cell group bearer received thereby. The current secondary base station may split the received user plane data according the data-splitting ratio and then forward to the master base station and the target base station respectively.

[00160] Fig. 12 is a flowchart illustrating an eleventh embodiment of a method for secondary base station change according to the present disclosure. The execution subject of the method for secondary base station change in accordance with the eleventh embodiment may be a UE. The UE may be fixed and also be mobile. The UE may be a cell phone, a personal digital assistant (PDA), a wireless modern, a plate computer, a laptop, or a radiophone, etc. As shown in Fig. 12, the method for secondary base station change may include the following blocks

[00161] In block S31, the UE may switch from a current secondary base station to a target secondary bases station, and receive user plane data from a master base station during the secondary base station change process.

[00162] The UE may switch in response to a handover signaling from the master base station, and may also detect whether the quality of signals of candidate secondary base stations is met with handover conditions after receiving a pre-handover instruction (which may include handover conditions and information of candidate secondary base stations). The UE may select a target secondary base station from the candidate secondary base stations met with the handover conditions when the quality of signals of candidate secondary base stations is met with handover conditions, which may specifically be referred to that in the previous embodiments.

[00163] The UE breaks the connection with the current secondary base station and performs random access procedure to establish a connection with the target secondary base station. Thus the UE switches from the current secondary base station to the target secondary base station, and receives user plane data from the master base station during the secondary base station change process.

[00164] Referring to Fig. 13, the method for secondary base station change in a twelfth embodiment is based on that in the eleventh embodiment. As shown in Fig. 13, the method may further include the following blocks before receiving user plane data from the master base station during the secondary base station change process.

[00165] In block S32, the UE may receive a first bearer type reconfiguration instruction from the master base station.

[00166] The first bearer type reconfiguration instruction may be configured for indicating a bearer type to switch from the SCG bearer to the SCG split bearer. The sequence for sending the first bearer type reconfiguration instruction and the handover signaling is not restrictive.

[00167] In block S33, the UE may modify the bearer type according to the first bearer type reconfiguration instruction.

[00168] The UE changes the bearer type of user plane data from the SCG bearer to the SCG split bearer.

[00169] In block S34, the UE may send a bearer type reconfiguration complete message to the master base station.

[00170] Referring to Fig. 14, the method for secondary base station change in a thirteenth embodiment is based on that in the eleventh embodiment. As shown in Fig. 14, the method may further include the following blocks after the block S31.

[00171] In block S35, the UE may receive a second bearer type reconfiguration instruction sent by the master base station after the secondary base station change process has been completed.

[00172] The second bearer type reconfiguration instruction may be configured for indicating a bearer type to switch from the SCG split bearer to the SCG bearer.

[00173] In block S36, the UE may modify the bearer type according to the second bearer type reconfiguration instruction and send a bearer type reconfiguration complete message to the master base station.

[00174] The bearer type of user plane data changes from the SCG split bearer to the SCG bearer after the secondary base station change process is completed, ensuring that the master base station may always transmit user plane data to the UE during the

secondary base station change process, and avoiding a mobility interruption.

[00175] Referring to Fig. 15, the method for secondary base station change in a fourteenth embodiment is based on that in the eleventh embodiment. As shown in Fig. 15, the method may further include the following blocks after the block S31.

[00176] In block S37, the UE may receive a second bearer type reconfiguration instruction sent by the master base station after user plane data has been transmitted thereby.

[00177] The second bearer type reconfiguration instruction may be configured for indicating the bearer type to switch from the SCG split bearer to the SCG bearer.

[00178] In block S38, the UE may modify the bearer type according to the second bearer type reconfiguration instruction and send a bearer type reconfiguration complete message to the master base station.

[00179] Fig. 16 is illustrating an apparatus for secondary base station change in a first embodiment. As shown in Fig. 16, the apparatus may include a processor 110 and a communication circuit 120. The processor is connected to the communication circuit 120.

[00180] The communication circuit 120 may be configured for transmitting and receiving data, which is an interface for communication between the apparatus and other communication devices.

[00181] The processor 110 controls operations of the apparatus for secondary base station change. The processor 110 may also be called as CPU (Central Processing Unit). The processor 110 may be an integrated circuit chip with an ability to process signals. The processor 110 may also be a common processor, a Digital Signal Processor (DSP), an Application Specific Integrated Circuits (ASIC), a Field Programmable Gate Array (FPGA) or another programmable logical device, a discrete gate or transistor logic component, a discrete hardware component. The common processor may be a micro-processor, or also be any one of conventional processors, etc.

[00182] The processor 110 may be configured for performing programs to achieve any one of the methods for secondary base station change in accordance with the first

to tenth embodiment or a method provided in any one arbitrary and non-conflicting combination of the embodiments therein.

[00183] The apparatus in the present embodiment may be a base station, and also be a separate component integrated in a base station, such as a base band board.

[00184] Referring to FIG. 17, a beam communication apparatus according to a second embodiment may include a processor 210 and a communication circuit 220. The processor 210 may be connected to the communication circuit 220.

[00185] The communication circuit 220 may be configured for transmitting and receiving data, which is an interface for communication between the beam communication apparatus and other communication devices.

[00186] The processor 210 controls operations of the apparatus for secondary base station. The processor 210 may also be called as CPU (Central Processing Unit). The processor 210 may be an integrated circuit chip with an ability to process signals. The processor 210 may also be a common processor, a Digital Signal Processor (DSP), an Application Specific Integrated Circuits (ASIC), a Field Programmable Gate Array (FPGA) or another programmable logical device, a discrete gate or transistor logic component, a discrete hardware component. The common processor may be a micro-processor, or also be any one of conventional processors, etc.

[00187] The processor 210 may be configured for performing programs to achieve any one of the beam communication methods in accordance with the eleventh to fourteenth embodiment or a method provided in any one arbitrary and non-conflicting combination of the embodiments therein.

[00188] The apparatus in the present embodiment may be a user equipment, and also be a separate component integrated in a user equipment, such as a base band chip.

[00189] Referring to FIG. 18, an apparatus for secondary base station change according to a third embodiment may include a memory 310. The memory 310 is used to store programs therein. When the programs is performed, any one of the methods for secondary base station change in accordance with the first to tenth embodiment or a method provided with arbitrary and non-conflicting combination of the embodiments therein may be achieved.

[00190] The memory 310 may include a Read-Only Memory (ROM), a Random Access Memory (RAM), a Flash Memory, hard disk, optical disk, etc.

[00191] The apparatus for secondary base station change in the present embodiment may be a base station, and also be a separate component integrated in a base station, such as a base band board.

[00192] Referring to Fig. 19, an apparatus for secondary base station according to a fourth embodiment may include a memory 410. The memory 410 is used to store programs therein. When the programs is performed, any one of the methods for secondary base station in accordance with the eleventh to fourteenth embodiment or a method provided with arbitrary and non-conflicting combination of the embodiments therein may be achieved.

[00193] The memory 410 may include a Read-Only Memory (ROM), a Random Access Memory (RAM), a Flash Memory, hard disk, optical disk, etc.

[00194] The apparatus for secondary base station change in the present embodiment may be a user equipment, and also be a separate component integrated in a user equipment, such as a base band chip.

[00195] As shown in Fig. 20, which illustrates an apparatus for secondary base station change according to a fifth embodiment of the present disclosure, the apparatus may include a determining module 51 and a transmission module 52. The determining module 51 is used for determining a switched secondary base station. The transmission module 52 is configured for transmitting user plane data to the UE when the UE switches from a current secondary base station to the target secondary base station.

[00196] The apparatus for secondary base station change in the present embodiment may be a base station, and also be a separate component integrated in a base station, such as a base band board.

[00197] As shown in Fig. 21, which illustrates an apparatus for secondary base station change according to a sixth embodiment of the present disclosure, the apparatus may include a determining module 61 and a transmission module 62. The determining module 61 is used for determining a switched secondary base station. The

transmission module 62 is configured for receiving at least a part of received user plane data of the bearer type bearer to the master base station during the secondary base station change process such that the master base station transmits user plane data to the UE during the secondary base station change process.

[00198] The apparatus for secondary base station change in the present embodiment may be a base station, and also be a separate component integrated in a base station, such as a base band board.

[00199] As shown in Fig. 22, which illustrates an apparatus for secondary base station change according to a seventh embodiment of the present disclosure, the apparatus may include a handover module 71. The handover module 71 is configured for switching from the current secondary base station to the target secondary base station and receiving user plane data from the master base station during the secondary base station change process.

[00200] The apparatus for secondary base station change in the present embodiment may be a UE, and also be a separate component integrated in a UE, such as a base band board.

[00201] The functions of each part of each apparatus for secondary base station change and the feasible expansion can be referred to the description of the corresponding methods for secondary base station change according to embodiments of the present disclosure, and be no longer repeated to describe herein.

[00202] The above description depicts merely some exemplary embodiments of the disclosure, but does not mean to limit the scope of the disclosure. Any equivalent structure or flow transformations made to the disclosure, or any direct or indirect applications of the disclosure on other related fields, shall all be covered within the protection of the disclosure.

What is claimed is:

1. A method for secondary base station change, comprising:
determining a target secondary base station by a master base station; and
transmitting user plane data to a user equipment by the master base station during a secondary base station change process within which the user equipment switches from a current secondary base station to the target secondary base station.
2. The method according to claim 1, wherein the transmitting user plane data to the user equipment by the master base station during the secondary base station change process within which the user equipment switches from the current secondary base station to the target secondary base station comprises:
receiving the user plane data from the current secondary base station during the secondary base station change process and then transmitting the user plane data to the user equipment by the master base station.
3. The method according to claim 2, wherein the user plane data transmitted during the secondary base station change process by the master base station only comes from the current secondary base station.
4. The method according to claim 2, wherein the method further comprises the following step before the transmitting the user plane data to the user equipment by the master base station during the secondary base station change process within which the user equipment switches from the current secondary base station to the target secondary base station:
sending a first bearer type reconfiguration instruction to the user equipment and the current secondary base station respectively, wherein the bearer type reconfiguration instruction is configured for indicating a bearer type to switch from a secondary cell group bearer to a secondary cell group split bearer.
5. The method according to claim 4, wherein the first bearer type reconfiguration instruction sent by the master base station to the current secondary base station comprises a data-splitting ratio, wherein the data-splitting ratio is configured for indicating a proportion of user plane data which is transmitted to the master base

station by current secondary base station and occupies user plane data of the secondary cell group bearer received thereby.

6. The method according to claim 4, wherein the method further comprises the following step after the transmitting the first bearer type reconfiguration instruction to the user equipment:

receiving a bearer type reconfiguration complete message from the user equipment by the master base station.

7. The method according to claim 4, wherein the method further comprises the following step after the transmitting the user plane data to the user equipment by the master base station during the secondary base station change process within which the user equipment switches from a current secondary base station to the target secondary base station:

sending a second bearer type reconfiguration instruction by the master base station to the user equipment after the secondary base station change process is completed, wherein the second bearer type reconfiguration instruction is configured for indicating the bearer type to switch from the secondary cell group split bearer to the secondary cell group bearer.

8. The method according to claim 7, wherein the sending the second bearer type reconfiguration instruction by the master base station to the user equipment after the secondary base station change process is completed comprises:

sending the second bearer type reconfiguration instruction to the user equipment by the master base station after receiving an end marker from the current secondary base station.

9. The method according to claim 7, wherein the sending the second bearer type reconfiguration instruction to the user equipment by the master base station after the secondary base station change process is completed comprises:

sending the second bearer type reconfiguration instruction to the user equipment by the master base station after receiving a path switch acknowledgment from a mobility management entity.

10. The method according to claim 4, wherein the method further comprises the following step after the transmitting user plane data to the user equipment by the master base station during the secondary base station change process within which the user equipment switches from the current secondary base station to the target secondary base station:

sending a second bearer type reconfiguration instruction to the user equipment by the master base station after the user plane data from the current secondary base station has been transmitted thereby to the user equipment, wherein the second bearer type reconfiguration instruction is configured for indicating the bearer type to switch from the secondary cell group split bearer to the secondary cell group bearer.

11. The method according to claim 1, wherein the method further comprises the following step after the determining the target secondary base station by the master base station:

sending a handover signaling to the user equipment by the master base station such that the user equipment switches from the current secondary base station to the target secondary base station.

12. The method according to claim 11, wherein the determining the target secondary base station by the master base station comprises:

sending a secondary base station change request to the target secondary base station;

receiving a secondary base station change request acknowledgment from the target secondary base station; and

transmitting information of the target secondary base station to the current secondary base station.

13. The method according to claim 12, wherein the master base station sends the first bearer type reconfiguration instruction at the same time as transmitting the information of the target secondary base station, or before or after transmitting the information of the target secondary base station.

14. The method according to claim 11, wherein the determining the target secondary base station by the master base station comprises:

receiving a first secondary base station change request from the current secondary base station;

sending a second secondary base station change request to the target secondary base station in response to the first secondary base station change request;

receiving a second secondary base station change request acknowledgment from the target secondary base station; and

sending a first secondary base station change request acknowledgment to the current secondary base station.

15. The method according to claim 14, wherein the master base station sends the first bearer type reconfiguration instruction at the same time as sending the first secondary base station change request acknowledgment, or before or after sending the first secondary base station change request acknowledgment.

16. The method according to claim 15, wherein the determining the target secondary base station by the master base station comprises:

receiving a fourth secondary base station change request from the current secondary base station, wherein the fourth secondary base station change request is transmitted by the current secondary base station after the target secondary base station responds to a third secondary base station change request sent to the target secondary base station by the current secondary base station.

17. The method according to claim 16, wherein the method further comprises the following the step after receiving the fourth secondary base station change request from the current secondary base station:

sending the first bearer type reconfiguration instruction to the current secondary base station.

18. The method according to claim 11, wherein the method further comprises the following the step before determining the target secondary base station by the master base station:

sending a pre-handover instruction to the user equipment, wherein the pre-handover instruction comprises handover conditions and information of candidate secondary base stations such that the user equipment selects the target secondary base

station from the candidate secondary base stations when meeting with the handover conditions and then switches from the current secondary base station to the target secondary base station; and

the determining the target secondary base station by the master base station comprises:

receiving a handover informing message from the user equipment or the target secondary base station.

19. A method for secondary base station change, comprising:

determining a target secondary base station by a current secondary base station; and

transmitting at least a part of received user plane data of a secondary cell group bearer to a master base station during a secondary base station change process such that the master base station transmits the user plane data to a user equipment during the secondary base station change process.

20. The method according to claim 19, wherein the method comprises the following step before transmitting at least a part of received user plane data of the secondary cell group bearer to the master base station during the secondary base station change process:

receiving a first bearer type reconfiguration instruction from the master base station, wherein the first bearer type reconfiguration instruction is configured for indicating a bearer type to switch from a secondary cell group bearer to a secondary cell group split bearer.

21. The method according to claim 20, wherein the first bearer type reconfiguration instruction sent by the master base station to the current secondary base station comprises a data-splitting ratio, wherein the data-splitting ratio is configured for indicating a proportion of user plane data which is transmitted by current secondary base station to the master base station and occupies user plane data of the secondary cell group bearer received thereby.

22. The method according to claim 19, wherein the method comprises the following step after transmitting at least a part of received user plane data of the

secondary cell group bearer to a master base station during the secondary base station change process:

receiving an end marker from a serving gateway; and

transmitting the end marker to the master base station.

23. The method according to claim 19, wherein the determining the target secondary base station by the current secondary base station comprises:

receiving information of the target secondary base station from the master base station.

24. The method according to claim 19, wherein the determining the target secondary base station by the current secondary base station comprises:

sending a first secondary base station change request to the master base station such that the master base station sends a second secondary base station change request to the target secondary base station in response to the first secondary base station change request, and receives a second secondary base station change request acknowledgment from the target secondary base station; and

receiving a first secondary base station change request acknowledgment from the master base station.

25. The method according to claim 19, wherein the determining the target secondary base station by the current secondary base station comprises:

sending a third secondary base station change request to the target secondary base station; and

receiving a third secondary base station change request acknowledgment from the target secondary base station.

26. The method according to claim 25, wherein the method further comprises the following step after receiving the third secondary base station change request acknowledgment from the target secondary base station:

sending a fourth secondary base station change request to the master base station, wherein the fourth secondary base station change request comprises information of the target secondary base station.

27. The method according to claim 19, wherein the determining the target secondary base station by the current secondary base station comprises:

receiving a handover informing message from the master base station and/or the target secondary base station.

28. A method for secondary base station change, comprising:

switching from a current secondary base station to a target secondary base station by a user equipment and receiving user plane data from a master base station during the secondary base station change process.

29. The method according to claim 28, wherein the method further comprises the following step before receiving user plane data from the master base station during the secondary base station change process:

receiving a first bearer type reconfiguration instruction from the master base station, wherein the first bearer type reconfiguration instruction is configured for indicating a bearer type to switch from a secondary cell group bearer to a secondary cell group split bearer.

30. The method according to claim 29, wherein the method further comprises the following step after receiving the first bearer type reconfiguration instruction from the master base station:

modifying the bearer type according to the first bearer type reconfiguration instruction and then transmitting a bearer type reconfiguration complete message to the master base station.

31. The method according to claim 28, wherein the method further comprises the following step after receiving the first bearer type reconfiguration instruction from the master base station:

receiving a second bearer type reconfiguration instruction transmitted by the master base station after the secondary base station change process is completed, wherein the second bearer type reconfiguration instruction is configured for indicating a bearer type to switch from the secondary cell group split bearer to the secondary cell group bearer.

32. The method according to claim 31, wherein the method further comprises the following step after receiving the second bearer type reconfiguration instruction from the master base station:

modifying the bearer type according to the second bearer type reconfiguration instruction and then sending a bearer type reconfiguration complete message to the master base station.

33. The method according to claim 28, wherein the method further comprises the following step after receiving the first bearer type reconfiguration instruction from the master base station:

receiving a second bearer type reconfiguration instruction sent by the master base station after the user plane data from the current secondary base station has been transmitted thereby to the user equipment, wherein the second bearer type reconfiguration instruction is configured for indicating a bearer type to switch from the secondary cell group split bearer to the secondary cell group bearer.

34. The method according to claim 33, wherein the method further comprises the following step after receiving the second bearer type reconfiguration instruction transmitted by the master base station after the user plane data from the current secondary base station has been transmitted thereby to the user equipment:

modifying the bearer type according to the second bearer type reconfiguration instruction and then sending a bearer type reconfiguration complete message to the master base station.

35. The method according to claim 28, wherein the switching from the current secondary base station to the target secondary base station comprises:

receiving a handover signaling from the master base station, wherein the handover signaling comprises information of the target secondary base station; and

switching from the current secondary base station to the target secondary base station in response to the handover signaling.

36. The method according to claim 28, wherein the switching from the current secondary base station to the target secondary base station comprises:

receiving a pre-handover instruction from the master base station, wherein the pre-handover instruction comprises handover conditions and information of candidate secondary base stations;

judging whether the quality of signals of the candidate secondary base stations is met with the handover conditions;

selecting the target secondary base station from candidate secondary base stations met with the handover conditions, and switching from the current secondary base station to the target secondary base station when the quality of signals of the candidate secondary base station is met with the handover conditions.

37. A apparatus for secondary base station change, comprising a processor and a communication circuit connected to the processor, wherein the processor is configured for executing programs to perform the method in any one of claims 1-36.

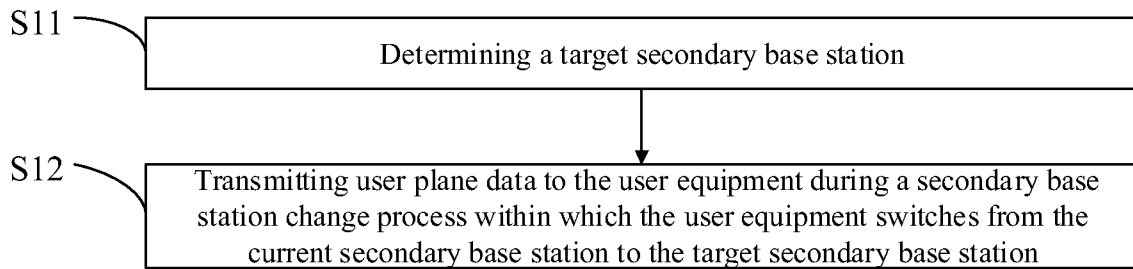


Fig. 1

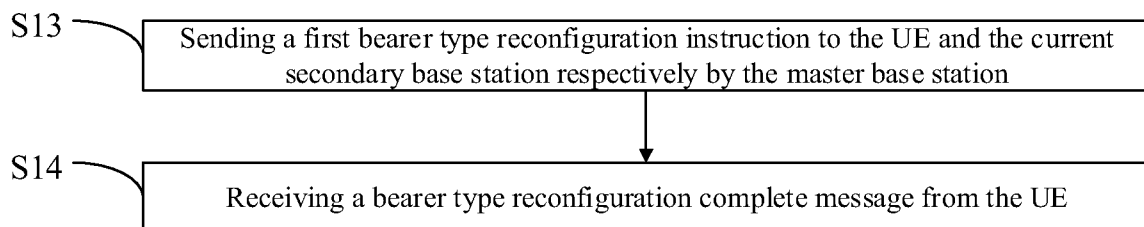


Fig. 2

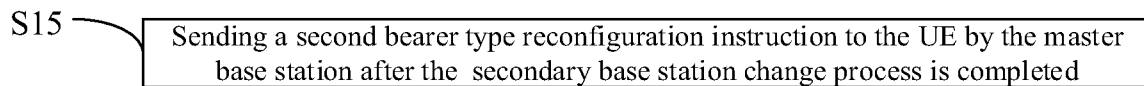


Fig. 3

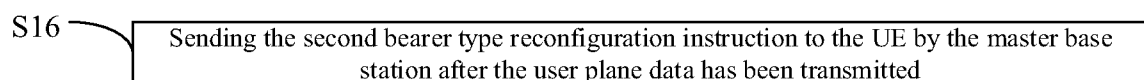


Fig. 4

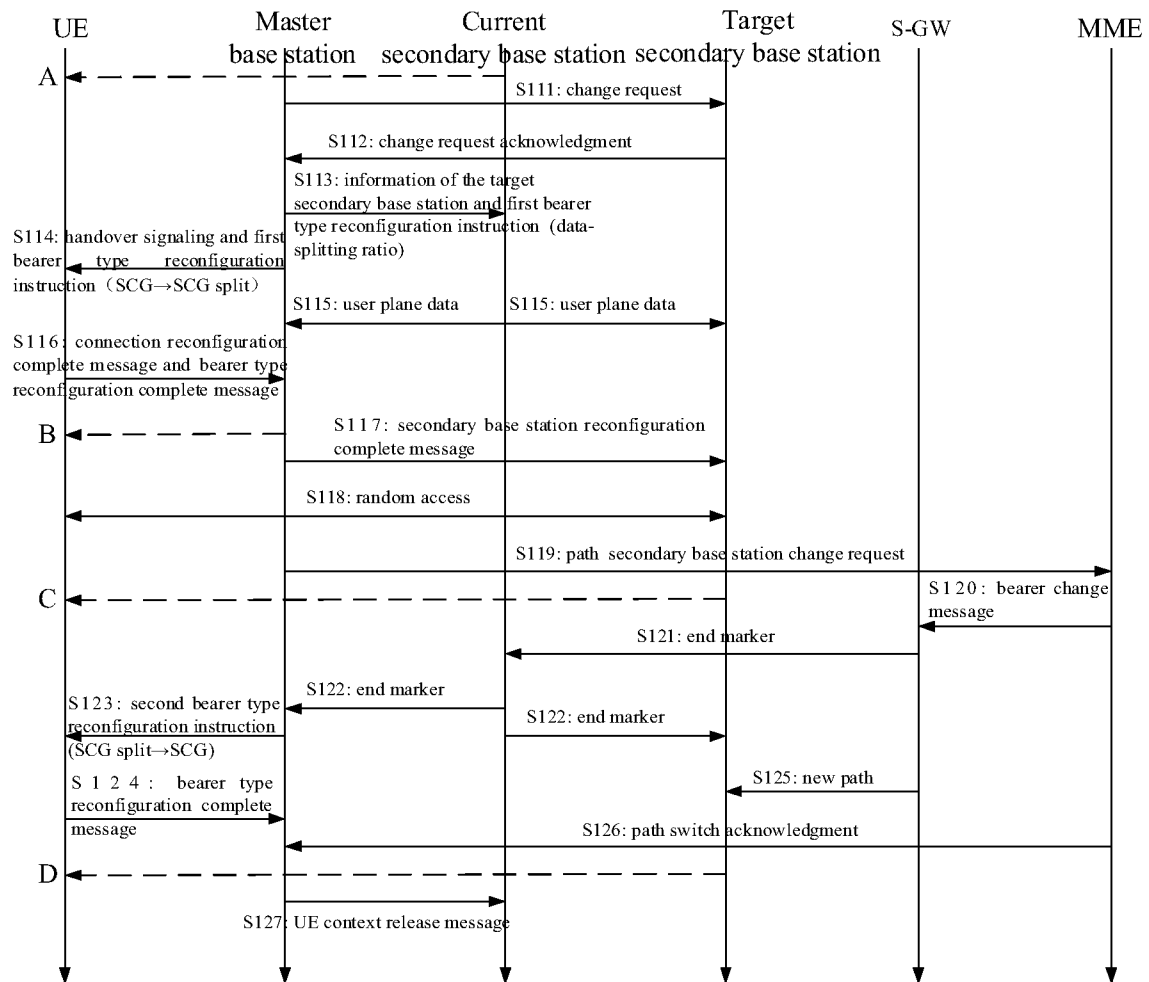


Fig. 5

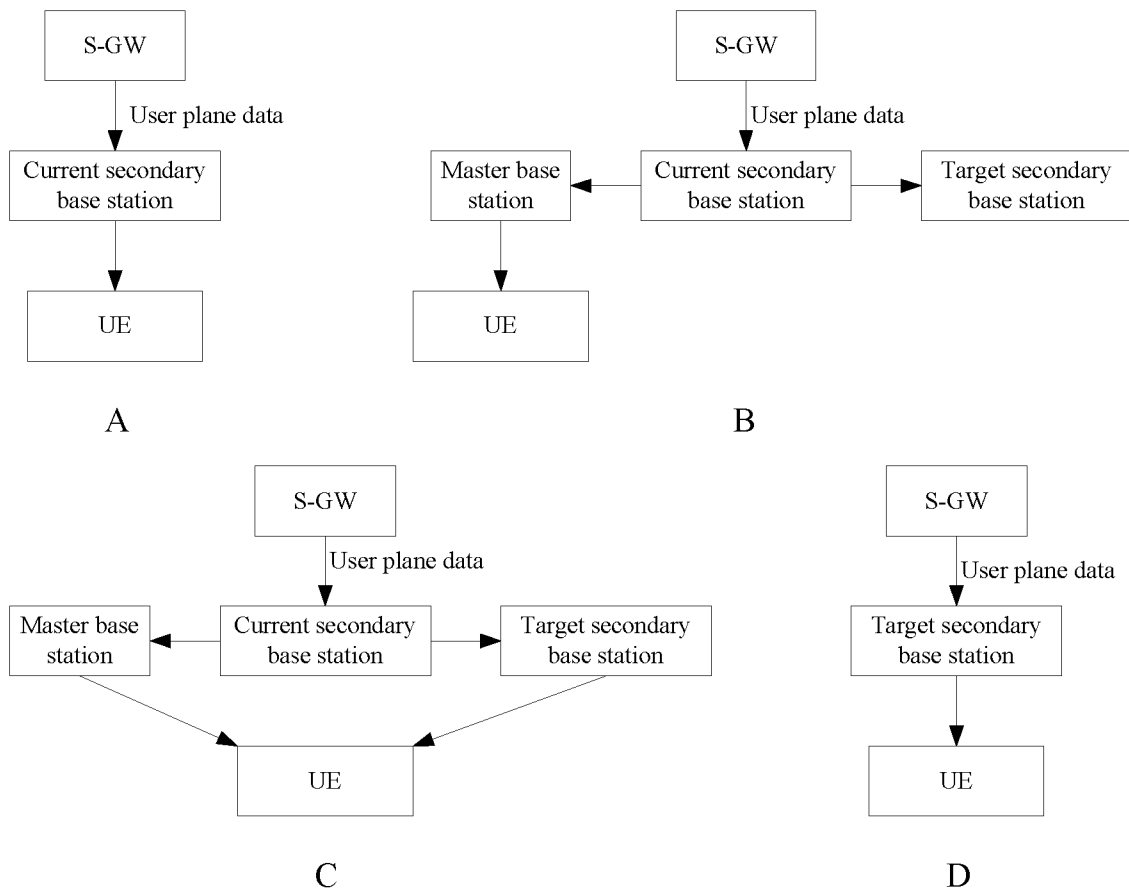


Fig. 6

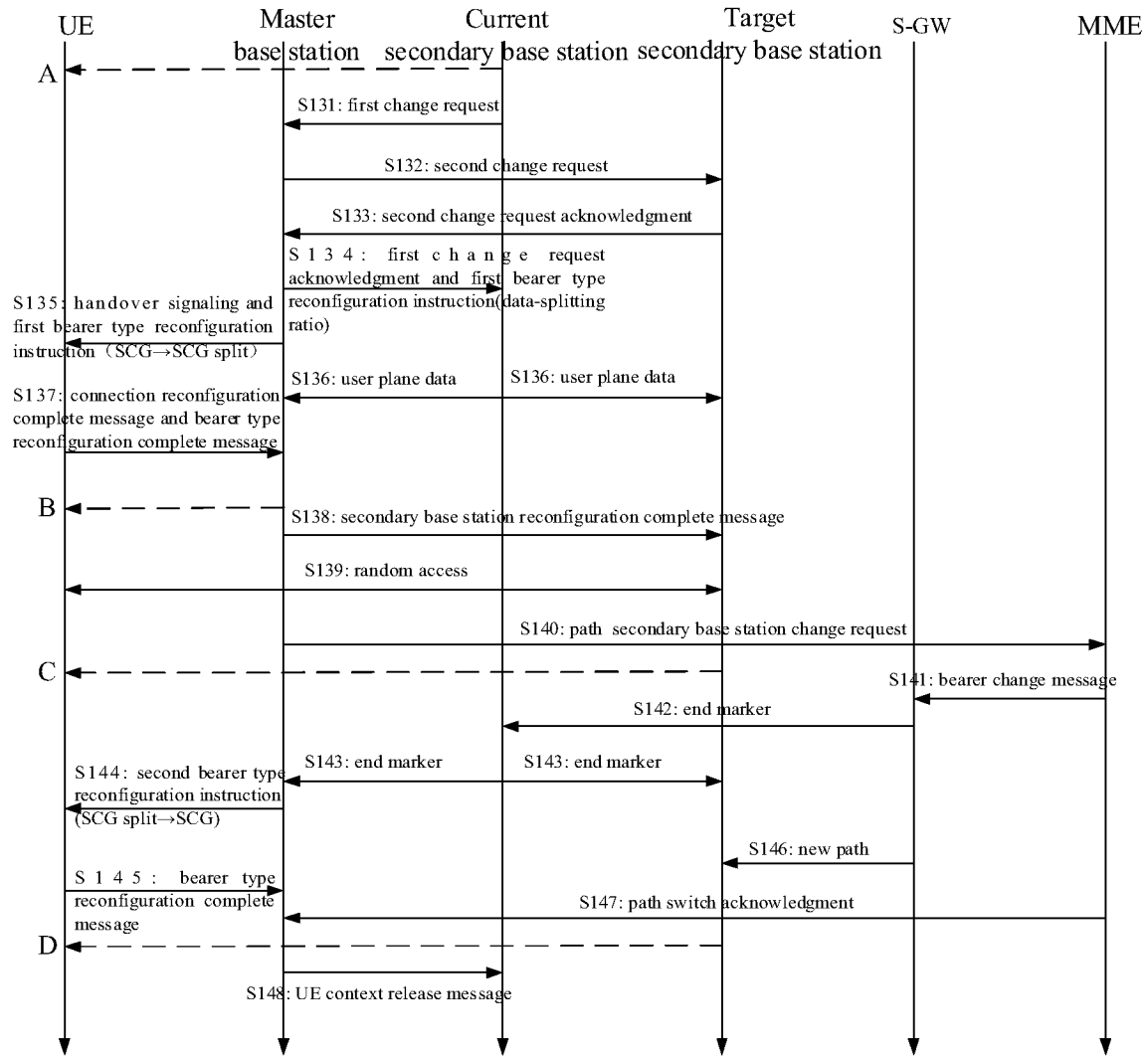


Fig. 7

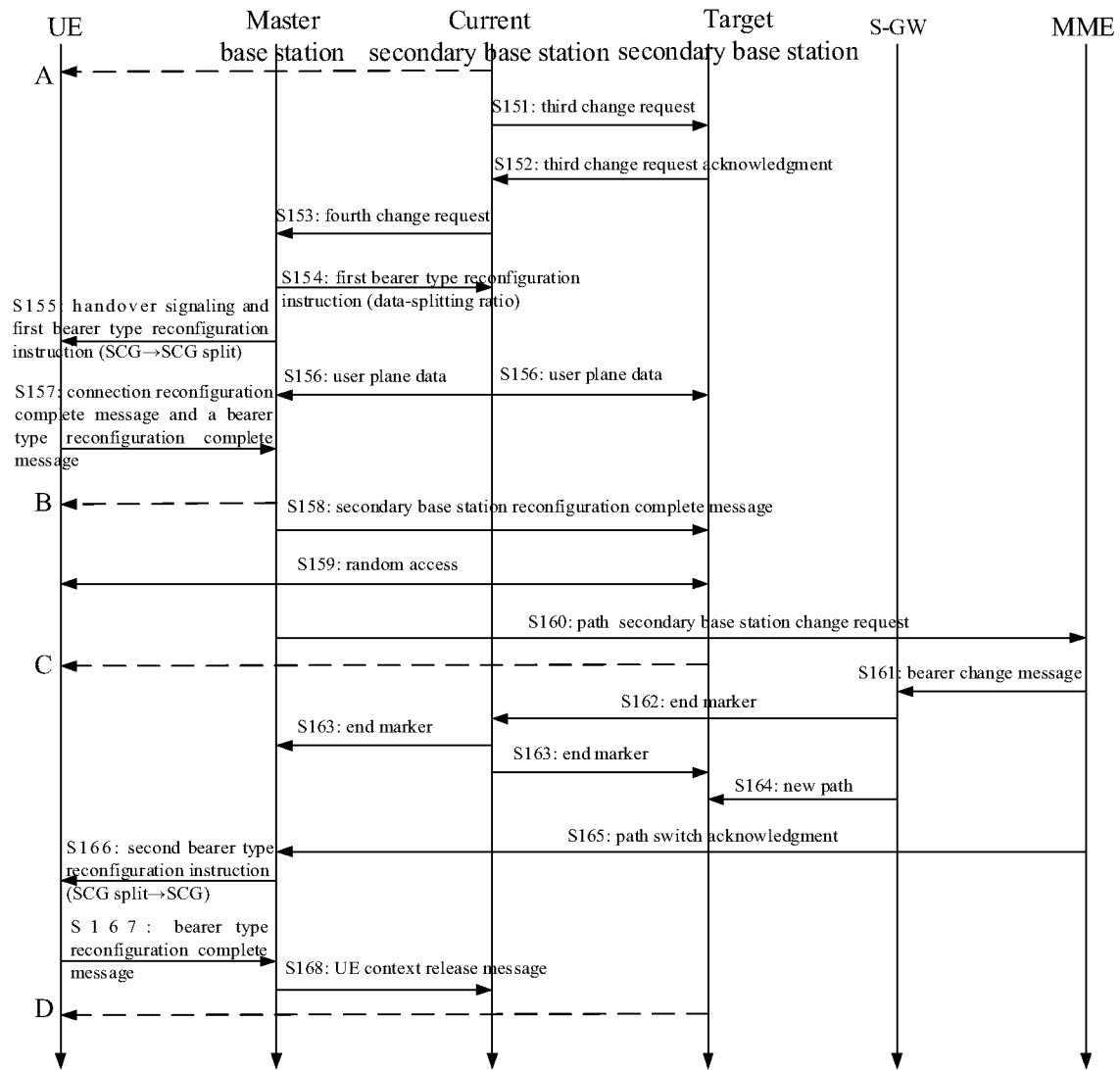


Fig. 8

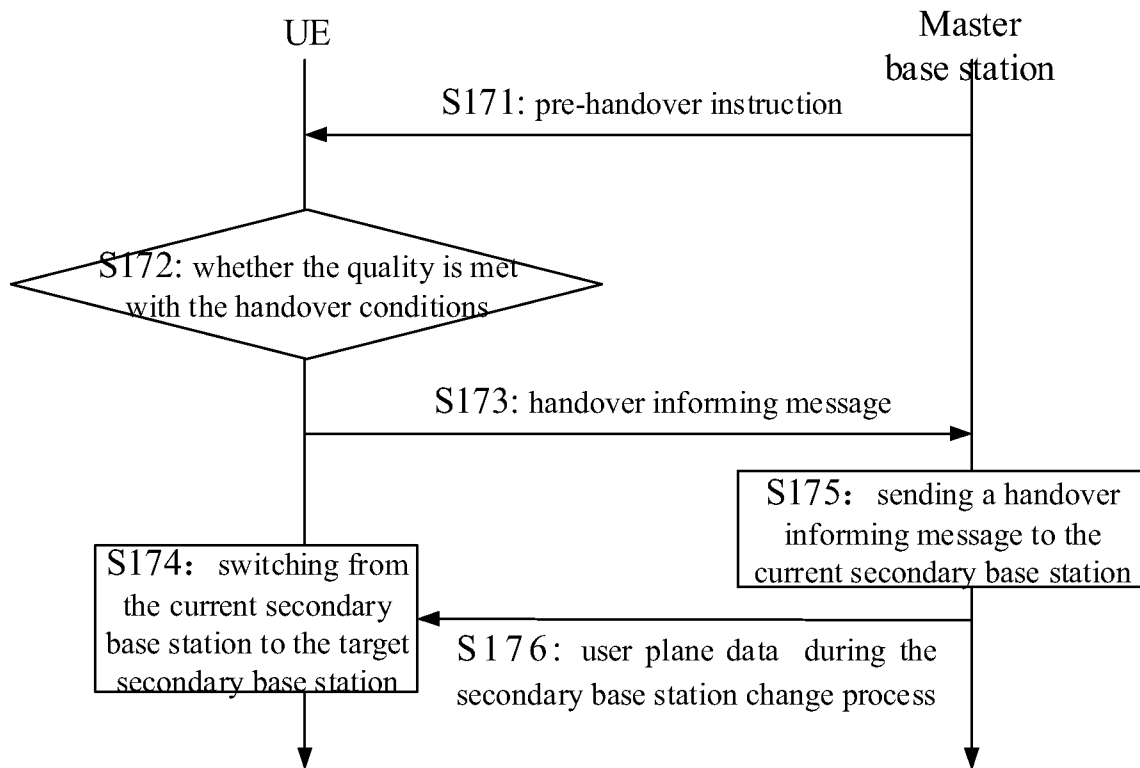


Fig. 9

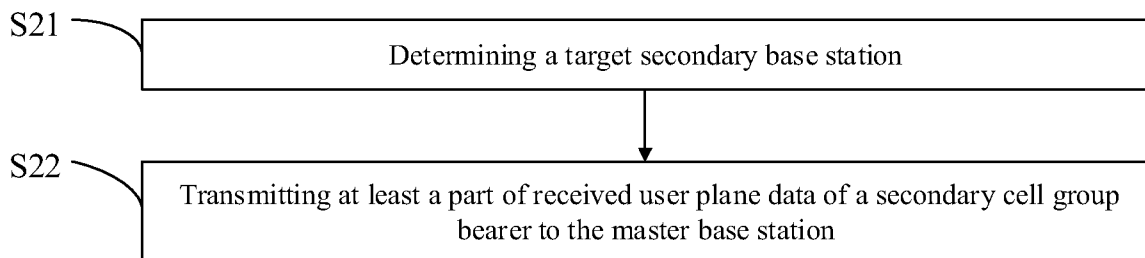


Fig. 10

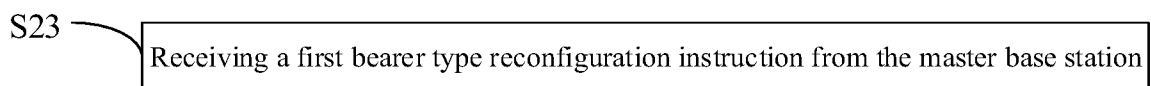


Fig. 11

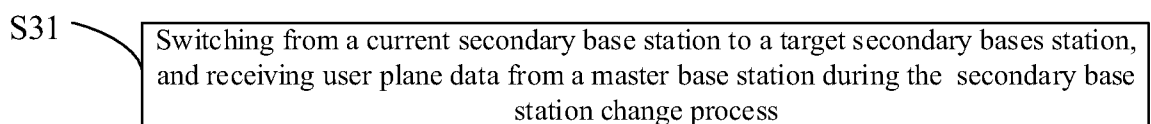


Fig. 12

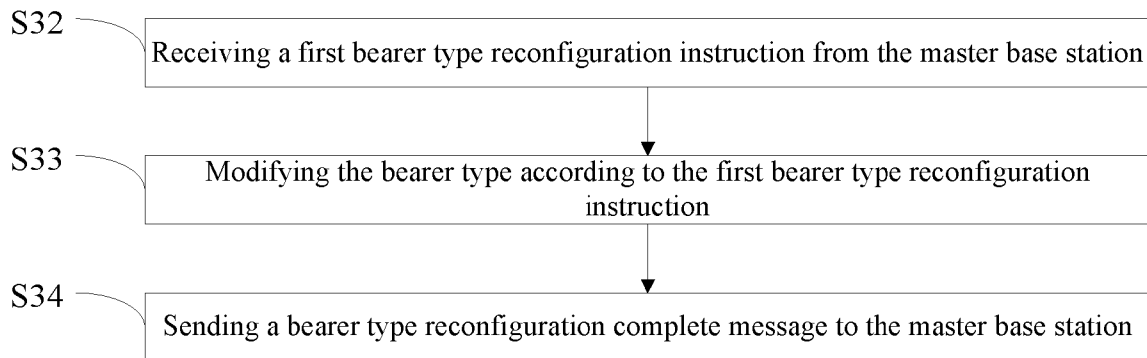


Fig. 13

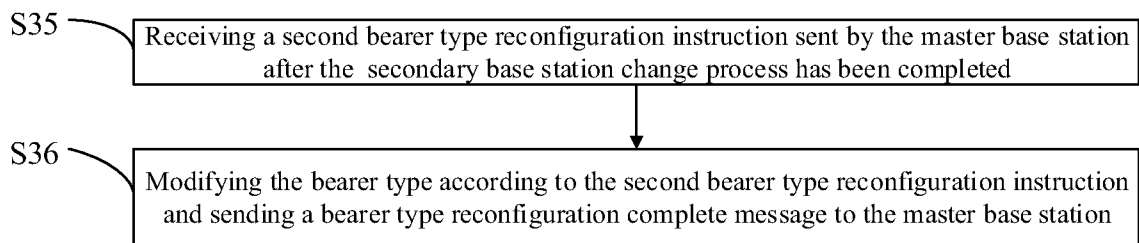


Fig. 14

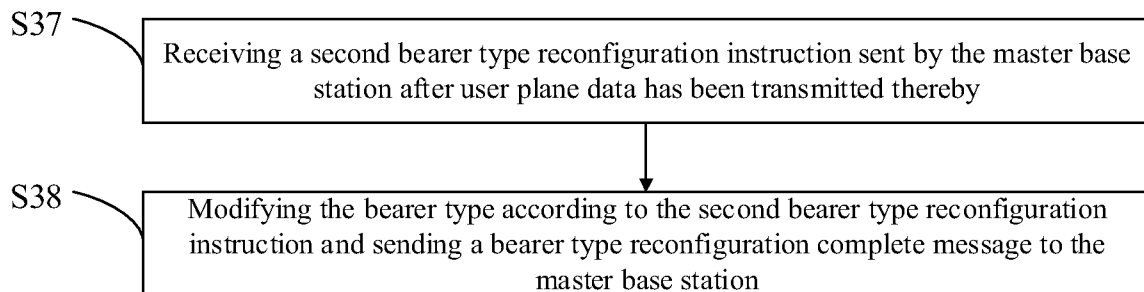


Fig. 15

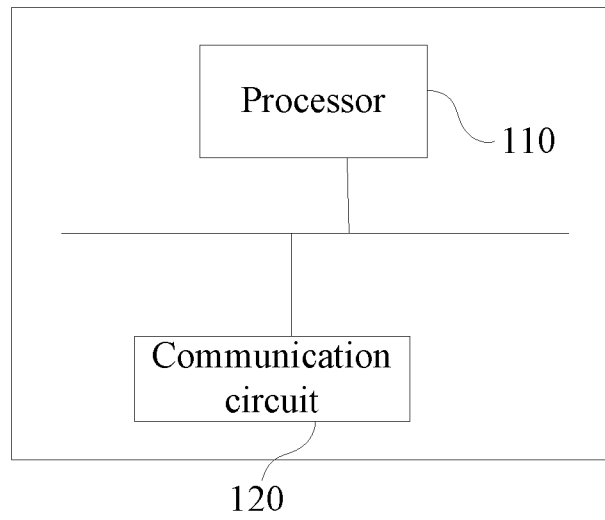


Fig. 16

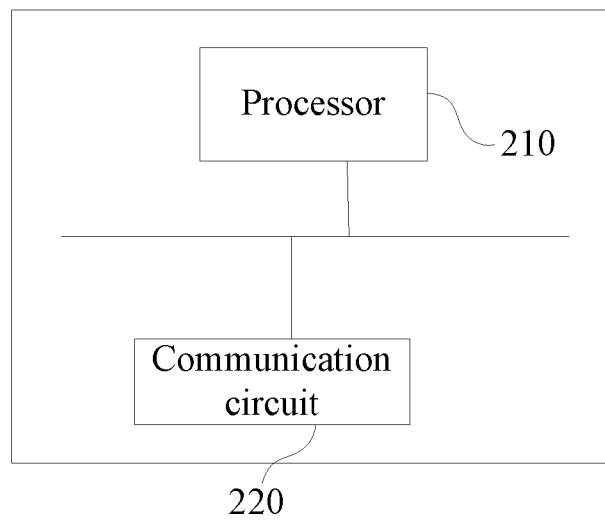


Fig. 17

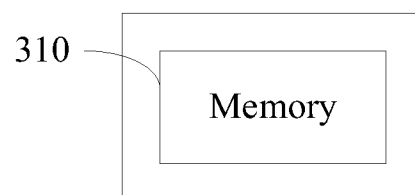


Fig. 18

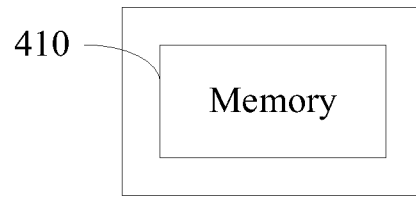


Fig. 19

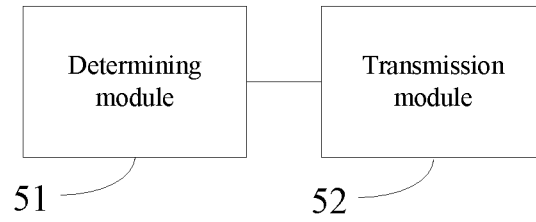


Fig. 20

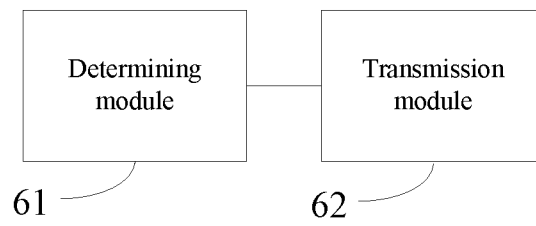


Fig. 21

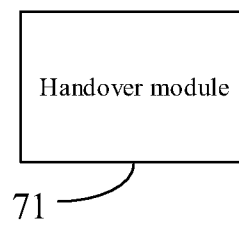


Fig. 22

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2017/086122

A. CLASSIFICATION OF SUBJECT MATTER H04W 36/04(2009.01)i According to International Patent Classification (IPC) or to both national classification and IPC				
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) H04W; H04Q; H04B 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) CNABS;CNKI;VEN;WOTXT: master, user plane data, secondary base station, SeNB, MeNB, dual connect+, Secondary Cell Group, UE,target seNB, handover				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
X	CN 104469869 A (ZTE CORP) 25 March 2015 (2015-03-25) description, paragraphs [0062]-[0151], claims 1-5	1-3, 11-19, 22-28, 35-37		
A	CN 105992295 A (ZTE CORP) 05 October 2016 (2016-10-05) the whole document	1-37		
A	CN 104955064 A (ALCATEL LUCENT SHANGHAI BELLET AL.) 30 September 2015 (2015-09-30) the whole document	1-37		
A	CN 104812008 A (BEIJING SAMSUNG TELECOM R&D CTET AL.) 29 July 2015 (2015-07-29) the whole document	1-37		
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.				
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> * 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 </td> <td style="width: 50%; vertical-align: top;"> "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 </td> </tr> </table>			* 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
* 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 26 January 2018		Date of mailing of the international search report 01 February 2018		
Name and mailing address of the ISA/CN STATE INTELLECTUAL PROPERTY OFFICE OF THE P.R.CHINA 6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing 100088 China Facsimile No. (86-10)62019451		Authorized officer FU,Haiwang Telephone No. (86-10)62411393		

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2017/086122

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
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CN	105992295	A	05 October 2016	EP	3267724	A1	10 January 2018
				WO	2016138749	A1	09 September 2016
				EP	3267724	A4	10 January 2018
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				WO	2015145255	A3	19 November 2015
				TW	201539995	A	16 October 2015
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				EP	3123777	A2	01 February 2017
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				WO	2015115761	A1	06 August 2015
				KR	20160114631	A	05 October 2016
				EP	3100515	A1	07 December 2016
				EP	3100515	A4	28 June 2017