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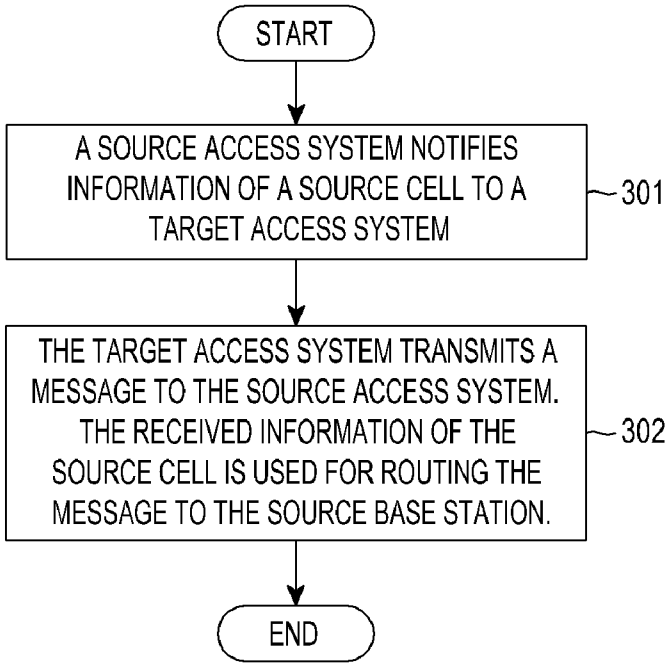
(54) Title: METHOD FOR SUPPORTING INDICATING A FAILURE EVENT TO A SOURCE ACCESS SYSTEM



(57) Abstract: The present invention discloses a method for supporting indicating a failure event to a source access system: notifying, by the source access system, information of a source cell to a target access system; routing, by the target access system, a message to the base station or the base station controller of the source access via a core network by use of the information of the source cell received from the source access system when the target access system needs to transmit a message to the source access system. By use of the method provided by the present invention, a problem of MRO among different RATs may be notified to the source access system, so as to avoid impact for a terminal, reduce operator configuration. Thus, a problem of MRO among different RATs is solved, and system performance is improved.

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Description

Title of Invention: METHOD FOR SUPPORTING INDICATING A FAILURE EVENT TO A SOURCE ACCESS SYSTEM

Technical Field

[1] The present invention relates to mobile communication system field, and more particularly, to a method for supporting indicating a failure event to a source access system.

Background Art

[2] With the development of communication technology, a mobile communication system has developed to a system of System Architecture Evolution (SAE). FIG. 1 is a schematic diagram illustrating a structure of an existing SAE system. As shown in FIG. 1, the system includes an Evolved Universal Terrestrial Radio Access Network (E-UTRAN) 101 and at least includes a Mobility Management Entity (MME) 105 and a core network of a user plane entity (S-GW) 106. The E-UTRAN 101 is used to connect a user equipment (UE) to the core network. Moreover, the E-UTRAN 101 also includes more than one macro base stations (eNB) 102 and home base stations (HeNB) 103, optionally includes a home base station gateway (HeNB GW) 104, the MME 105 and S-GW 106, which may be integrated into one module for implementation, or may be separated to be implemented individually. Herein, inter-connection between eNBs 102 is through an X2 interface. The eNB 102 is connected respectively to MME 105 and S-GW 106 through an S1 interface. Alternatively, the eNB 102 is connected to the optional HeNB GW 104 through the S1 interface, the HeNB GW 104 is connected respectively to the MME 105 and the S-GW 106 through the S1 interface.

[3] In an early state of establishing the SAE system or during a process of operating the SAE system, much manpower and material resources are taken to configure and optimize parameters of the SAE system, especially to configure wireless parameters, so as to ensure good coverage and capacity of the SAE system, mobility robustness, load balancing when moving and speed of accessing user device etc. In order to save the manpower and material resources for configuration during SAE system operation, a method for self-optimizing the SAE system is proposed at present. During a self-optimization process, eNB configuration or HeNB configuration is optimized actually according to a current state of the SAE system. The eNB and HeNB are referred as to eNB hereinafter to instruct the method for self-optimizing the SAE system.

[4] FIG. 2 is schematic diagram illustrating a basic principle for self-optimizing an SAE system. As shown in FIG. 2, after the eNB powers up or accesses SAE, the self-optimization configuration may be performed. The process includes eNB basic con-

figuration and initial wireless parameter configuration. Herein the eNB basic configuration includes configuration of an Internet Protocol (IP) protocol address of the eNB, Operation Administration and Maintenance (OA&M), authentication between the eNB and the core network. When the eNB is the HeNB, it is needed to detect the HeNB GW to which the HeNB belongs. Software and operation parameters of the eNB are downloaded to perform self-configuration. Initial wireless parameter configuration is implemented according to experience or simulation. Performance of each eNB in the SAE system may be impacted by environment of region where the eNB locates. Thus, the eNB needs to perform initial configuration of a list of neighbor cells and initial configuration of the load balancing specifically according to initial wireless parameter configuration of the environment of the region where the eNB locates. After the self-configuration process is completed, many parameters configured for the eNB are not optimized. In order to make the performance of the SAE system better, configuration of the eNB is needed to be optimized or adjusted, which is also called self-optimization of the mobile communication system. When the configuration of the eNB is to be optimized or adjust, the eNB may be controlled by the OA&M in a background to execute it. A standard interface may exist between the OA&M and the eNB. The OA&M transmits the parameters to be optimized to the eNB (which may be the eNB or the HeNB) through the interface. And then the eNB optimizes the parameters configured to the eNB itself according to the parameters to be optimized. The process may be executed by the eNB itself. That is, the eNB performs detection to obtain the performance to be optimized, performs optimization and adjustment to corresponding parameters of the eNB itself. Optimization or adjustment of eNB configuration may include: self-optimization of the list of neighbors cells, self-optimization of the coverage and the capacity, self-optimization of mobility robustness, self-optimization of the load balancing and self-optimization of parameters of a random access channel (RACH) etc.

[5] At present, a basic principle of the self-optimization of the mobile robustness in Release 10 is as follows. When a RLF or a handover failure occurs for the UE and the UE returns to a connection mode, the UE indicates that the UE has an available RLF report to the network. The network transmits a message to the UE to request the RLF report. The RLF report transmitted by the UE includes information of an E-UTRAN Cell Global Identifier (ECGI) of a cell serving the UE lastly, an ECGI of a cell to which re-establishment is tried, an ECGI of a cell where a handover process is, triggered lastly, time from handover triggered lastly to a connection failure, whether a reason of the connection failure is a RLF or handover failure, radio measurement. A base station obtaining the RLF report of the UE forwards the RLF report obtained from the UE to a base station of the cell serving the UE lastly. The base station of the cell

serving the UE lastly determines whether the reason is too early handover, too late handover, handover to an error cell or a coverage hole. If the reason is the too early handover or the handover to an error cell, the base station transmits information of the too early handover or the handover to an error cell to the base station which triggers the too early handover or the base station where the UE is handed over to an error cell.

Disclosure of Invention

Technical Problem

[6] For Mobility Robustness Optimization (MRO) between different RATs, e.g., too early handover from 3G or 2G to LTE, an RLF occurs for the UE in eNB1 when the RNC just hands over the UE to eNB1 successfully. When accessing LTE next time, the UE transmits an RLF report to an accessed eNB (e.g., eNB2). The eNB2 transmits a RLF indication message to eNB1. The eNB1 checks the reason of the failure. If the reason is too early inter-RAT handover, the eNB1 transmits a handover report to the RNC. The eNB1 needs to transmit a handover report to a source RNC via the core network. Through the RLF indication message, the eNB1 may know a cell identifier of a source cell. But the eNB1 does not know other location information of the source cell, so that the eNB1 cannot route the handover report to the source RNC.

Solution to Problem

[7] In view of this, the present invention provides a method for supporting indicating a failure event to a source access system to avoid impact for a UE, reduce operator configuration, transmit a handover report to the source access system correctly, and improve performance of a mobile communication system.

[8] In order to achieve an intention above, a technical solution is provided in detail in accordance with embodiments of the present invention:

[9] notifying, by the source access system, information of a source cell to a target access system;

[10] transmitting, by the target access system, a message to the source access system when the target access system needs to transmit the message to the base station to which the source cell belongs. The received information of the source cell is used to routing the message to the source access system.

[11] It should be noted that the source access system notifies the information of the source cell to the target access system through handover preparation.

[12] It should be noted that the information of the source cell comprises one or more of the following information:

[13] a cell identifier of the source cell;

[14] an LAI to which the source cell belongs;

[15] an RAC to which the source cell belongs;

[16] an identifier of the RNC to which the source cell belongs;

[17] an extended identifier of the RNC to which the source cell belongs;

[18] a TAI to which the source cell belongs.

[19] It should be noted that the message includes the cell identifier of the source cell, and/or the LAI and the RAC to which the source cell belongs, and/or the identifier of the RNC to which the source cell belongs, and/or the extended identifier of the RNC to which the source cell belongs, and/or the TAI to which the source cell belongs when the target access system transmits the message to the base station to which the source cell belongs.

[20] It should be noted that a node of a target core network finds a node of a source core network according to the LAI and RAC or TAI to which the source cell belongs.

[21] It should be noted that when the source access system is 3G, the source SGSN finds a source base station (i.e., a source RNC) according to the identifier of the RNC to which the source cell belongs or the extended identifier of the RNC. If the source access system is LTE, the source MME finds a source eNB according to the cell identifier of the source cell.

[22] In summary, in a method for supporting indicating a failure event to a source access system provided by the present invention, the source access notifies information of the source cell to the target access system. When needing to transmit the message to the source access system, the target access system routes the needed message to the base station or a base station controller of the source access system through the core network by use of the information of the source cell received from the source access system. The target access system notifies a problem of MRO between different RATs to the source access system, so as to avoid impact for a UE, reduce operator configuration. Thus, the problem of the MRO between different RATs is solved, and the performance of the mobile communication system is improved.

Brief Description of Drawings

[23] FIG. 1 is a schematic diagram illustrating a structure of an existing SAE system;

[24] FIG. 2 is a schematic diagram illustrating a basic principle of self-optimizing an existing SAE system;

[25] FIG. 3 is a flowchart illustrating a method for supporting indicating a failure event to a source access system in accordance with an embodiment of the present invention;

[26] FIG. 4 is a schematic diagram illustrating a method for supporting indicating a failure event to a source access system in accordance with a first embodiment of the present invention;

[27] FIG. 5 is a schematic diagram illustrating a method for indicating a failure event to a source access system in accordance with a first embodiment of the present invention;

[28] FIG. 6 is a schematic diagram illustrating a method for supporting indicating a failure event to a source access system in accordance with a second embodiment of the present invention;

[29] FIG. 7 is a schematic diagram illustrating a method for indicating a failure event to a source access system in accordance with a second embodiment of the present invention.

Mode for the Invention

[30] In order to solve an existing problem in prior art, the present invention provides a method for supporting indicating a failure event to a source access system, i.e.,

[31] notifying, by the source access system, information of a source cell to a target access system;

[32] transmitting, by the target access system, a message to the source access system when the target access system needs to transmit the message to the base station to which the source cell belongs.

[33] By applying the method provided by the present invention, a problem of MRO among different RATs may be notified to source access systems, impact for a terminal is avoided, operator configuration is reduced. Thus, the problem of the MRO among different RATs are solved, system performance is improved.

[34] In order to make the technical scheme and advantages of the present invention clearer, the present invention is described in further detail hereinafter with reference to accompanying drawings and examples.

[35] FIG. 3 is a flowchart illustrating a method for supporting indicating a failure event to a source access system. As shown in FIG. 3, the process includes:

[36] In step 301, the source access system notifies information of a source cell to a target access system. The information of the source cell includes one or more information as follows:

[37] a cell identifier of the source cell;

[38] a LAI to which the source cell belongs;

[39] a RAC to which the source cell belongs;

[40] an identifier of the RNC to which the source cell belongs;

[41] an extended identifier of the RNC to which the source cell belongs;

[42] a TAI to which the source cell belongs.

[43] The source access system notifies the information above of a base station to which the source cell belongs to a target cell through a relocation required message, a handover required message, a forwarding relocation request message, a relocation request message or a handover request message. Alternatively, the source access system may transmit the information to the base station to which the target cell belongs

through a transparent container in the messages from a source to a target.

[44] In step 302, when needing to transmit a message to the base station to which the source cell belongs, the target access system transmits the message to the source access system. The target access system knows the source base station information according to the received information of the source cell. The information of the source cell is used for routing the message from the target base station to the source base station.

[45] Specifically, when the target access system detects that the source cell triggers unsuitable inter-RAT handover to the target cell, the target access system transmits a message to the base station to which the source cell belongs, notifies the unsuitable inter-RAT handover to the base station to which the source cell belongs, e.g., too early inter-RAT handover or handover to an wrong RAT. The message includes the cell identifier of the source cell, and/or the LAI to which the source cell belongs, and/or the RAC to which the source cell belongs, and/or the identifier of the RNC to which the source cell belongs, and/or the extended identifier of the RNC to which the source cell belongs, and/or the TAI to which the source cell belongs.

[46] According to the LAI and RAC or TAI to which the source cell belongs, a node of a target core network (e.g., an MME or a SGSN or an MSC) finds a node of a source core network (e.g., an MME or a SGSN or an MSC). If the source access system is 3G, the node of the target core network finds a source SGSN according to the LAI and/or the RAC. If the source access system is LTE, the node of the target core network finds a source MME according to the TAI. If the source access system is 3G, the source SGSN finds a source base station (i.e., a source RNC) according to the identifier of the RNC to which the source cell belongs or the extended identifier of the RNC. If the source access system is LTE, the source MME finds a source eNB according to the cell identifier of the source cell.

[47] So far, the whole process of the method for supporting indicating a failure event to a source access system provided by the present invention ends.

[48] FIG. 4 is a schematic diagram illustrating a method for supporting indicating a failure event to a source access system in accordance with a first embodiment of the present invention. Herein, detail description of steps not related to the present invention is omitted. As shown in FIG. 4, the process includes:

[49] In step 401, a RNC determines handover. The RNC transmits a relocation required message to an SGSN. The message includes information of a source cell. The information of the source cell includes one or more kinds of the following information:

[50] a cell identifier of the source cell;

[51] a LAI to which the source cell belongs;

[52] a RAC to which the source cell belongs;

[53] an identifier of the RNC to which the source cell belongs;

[54] an extended identifier of the RNC to which the source cell belongs;

[55] In step 402, the SGSN transmits a forwarding relocation request message to an MME. The message includes information of the source cell. The information of the source cell is same as that in step 401, which is not described repeatedly herein.

[56] In step 403, the MME transmits a handover request message to an eNB. The message includes the information of the source cell. The information of the source cell is same as that in step 401, which is not described repeatedly herein. The eNB saves the information of the source cell.

[57] In step 404, the eNB transmits a handover request confirmation message to the MME.

[58] In step 405, the MME transmits a forwarding relocation response message to the SGSN.

[59] In step 406, the SGSN transmits a relocation command message to the RNC.

[60] In step 407, the RNC transmit a handover command message from a UTRAN to the UE.

[61] In step 408, a UE transmit a completion of handover to an E-UTRAN to the RNC.

[62] So far, the whole process of the method for supporting indicating a failure event to a source access system in accordance with a first embodiment of the present invention ends.

[63] Based on a method above, FIG. 5 is a flowchart illustrating a method for indicating a failure event to a source access system in accordance with a first embodiment of the present invention. For example, the embodiment may be used in the following scenario: an RNC just hand over a UE to eNB1 successfully in the first embodiment. A RLF occurs for the UE in the cell of the eNB1. When the UE re-accesses to a LTE cell, e.g., accessing cell2 (a cell controlled by eNB2) or is handed over the cell2, the UE transmits a saved RLF report to a base station to which the cell2 belongs. Herein, after RLF in cell1, the UE may access a 3G cell, e.g., cell3 firstly, and then returns to the cell2 of LTE or is handed to the cell2 of LTE. As shown in FIG. 5, the process includes:

[64] In step 501, the RLF occurs in the cell of the eNB1 for the UE.

[65] In step 502, when the UE returns to a LTE cell, e.g., the UE establishes an RRC connection or executes an RRC connection re-establishment in the cell2 controlled by the eNB2 or is handed over to the cell2 of LTE, the UE indicates to the base station that the UE has information of the RLF report in an RRC connection setup request or an RRC connection setup completion or an RRC connection re-establishment request or an RRC connection re-establishment completion or a handover completion or an RRC connection re-configuration completion or other RRC messages transmitted by the UE.

[66] In step 503, the eNB2 requests the UE to report the information of the RLF report. The UE transmits the saved RLF report to the eNB2. The RLF report of the UE includes a cell identifier of a cell serving the UE lastly before a failure occurs. Content of the RLF report of the UE is not emphasis in the present invention, which is not described herein.

[67] In step 504, the eNB2 transmits a RLF indication message to a base station serving the UE lastly before the failure occurs. The RLF report of the UE includes the cell identifier of the cell serving the UE lastly before the failure occurs. The eNB2 transmits the RLF indication to the base station of the cell where the failure occurs according to the cell identifier. The RLF indication message includes the information the RLF report received from the UE.

[68] In step 505, the eNB 1 determines a failure reason. A detail determination method is not the emphasis of the present invention, which is not described herein.

[69] In step 506, the eNB1 transmits the failure reason to the base station triggering the handover, e.g., too early inter-RAT handover, handover to an wrong RAT. The eNB1 transmits a handover report to an MME. The ENB1 may transmits the handover report to the MME through an eNB direct transfer message or other S1 messages. The message includes a LAI to which the cell triggering the handover belongs and an identifier of the RNC to which the cell triggering the handover belongs, may further include a RAC to which the cell triggering the handover belongs or an extended identifier of the RNC to which the cell triggering the handover belongs. The message may further include a cell identifier of the source cell triggering the handover, and/or a cell identifier of the target cell of the last handover before failure , and/or the failure reason e.g., too early inter-RAT handover or handover to an wrong RAT or a cell. During a handover process, information such as the LAI of the source cell, the identifier of the RNC, and/or the RAC, and/or the extended identifier of the RNC etc has already been saved.

[70] In step 507, the MME transmits a handover report to the SGSN. The MME finds the SGSN according to the LAI and/or the RAC in the received message.

[71] In step 508, the SGSN transmits the received handover report to the RNC. The SGSN finds the RNC according to the identifier of the RNC or the extended identifier of the RNC. The RNC counts problems of MRO according to the failure reason and the cell identifier of the source cell and the target cell of the handover at the last time before the failure occurs.

[72] So far, the whole process of the method for indicating a failure event to a source access system in accordance with an embodiment of the present invention ends.

[73] FIG. 6 is a schematic diagram illustrating a method for supporting indicating a failure event to a source access system in accordance with a second embodiment of the

present invention. Herein, detail instruction of steps not related to the present invention is omitted. As shown in FIG. 6, the process includes:

[74] In step 601, an eNB determines handover. The eNB transmits a handover required message to an MME. The message includes information of a source cell. The information of the source cell includes one or more kinds as follows:

[75] an identifier of the source cell;

[76] a TAI to which the source cell belongs;

[77] In step 602, the MME transmits a forwarding relocation request message to an SGSN. The message includes the information of the source cell. The information of the source is same as in step 601, which is not described repeatedly herein.

[78] In step 603, the SGSN transmits a relocation request message to an RNC. The message includes the information of the source cell. The information of the source is same as in step 601, which is not described repeatedly herein.

[79] In step 604, the RNC transmits a relocation request confirmation message to the SGSN.

[80] In step 605, the SGSN transmits a forwarding relocation response message to the MME.

[81] In step 606, the MME transmits a handover command message to the eNB.

[82] In step 607, the eNB transmits a handover command message to the UE.

[83] In step 608, the UE transmits a handover completion from a UTRAN to the RNC.

[84] So far, the whole process of the method for supporting indicating a failure event to a source access system in accordance with a second embodiment of the present invention ends.

[85] Based on a method above, FIG. 7 is a flowchart illustrating a method for indicating a failure event to a source access system in accordance with a second embodiment of the present invention. For example, the embodiment may be used in the follow scenario: in an embodiment in FIG. 6, an eNB just hands over a UE to RNC1 successfully. A RLF occurs for the UE in a cell of the RNC1. When the UE re-accesses a 3G cell, e.g., accessing cell 2 (a cell controlled by RNC2) or is handed over to the cell 2, the UE transmits information of a saved RLF report to the RNC of the cell 2. Herein, after a failure occurs when the UE accesses the cell 1, the UE may access a LTE cell such as cell 3 firstly, and then returns to the cell 2 of 3G or is handed over to the cell 2 of 3G. As shown in FIG. 7, the process includes:

[86] In step 701, the RLF occurs in the cell of the RNC1 for the UE.

[87] In step 702, when the UE returns to a cell of 3G, e.g., the UE sets up an RRC connection in the cell 2 controlled by the RNC2 or is handed over to the cell 2 of 3G, the UE indicates to the RNC2 that the UE has information of the RLF report in an RRC connection setup request or an RRC connection setup completion or an RRC

connection re-establishment request or an RRC connection re-establishment completion or a handover completion or an RRC connection re-configuration completion or other RRC messages transmitted by the UE.

[88] In step 703, the RNC2 requests the UE to report the information of the RLF report. The UE transmits the saved RLF report to the RNC2. The RLF report of the UE includes a cell identifier of a cell serving the UE lastly before the failure occurs. Content of the RLF report of the UE is not emphasis of the present invention, which is not described herein.

[89] In step 704, the RNC2 transmits a RLF indication message to the RNC1 serving the UE lastly before the failure occurs. The message may be transmitted to the RNC1 through an Iur interface or an Iu interface via a core network. The RLF report of the UE includes the cell identifier of the cell serving the UE lastly before the failure occurs. The RNC2 transmits the RLF indication message to the RNC to which the cell where the RLF occurs belongs according to the cell identifier. The RLF indication message includes the information of the RLF report of the UE received from the UE.

[90] In step 705, the RNC1 determines a failure reason. A detail determination method is not the emphasis of the present invention, which is not described herein.

[91] In step 706, the RNC1 transmits the failure reason to the base station triggering the handover, e.g., too early inter-RAT handover, handover to an wrong RAT. The RNC1 transmits a handover report to a SGSN. The RNC1 may transmit the handover report to the SGSN through a way of a RAN information management (RIM) or other Iu messages. The message includes a TAI to which the cell triggering the handover belongs. The message also includes a cell identifier of the source cell triggering the handover, and/or a cell identifier of the target cell of the last handover , and/or the failure reason e.g., too early inter-RAT handover or handover to an wrong RAT or cell. The identifier of the TAI of the source cell and the cell identifier of the source cell have already been saved during a handover process.

[92] In step 707, the SGSN transmits the handover report to the MME. The SGSN finds the MME according to the TAI in the received message.

[93] In step 708, the MME transmits the received handover report to the eNB. The MME finds the eNB according to the cell identifier of the source cell in the received message. The eNB counts problems of MRO according to the failure reason and the identifier of the source cell and the target cell of the handover at the last time before the failure occurs in the received handover report.

[94] So far, the whole process of the method for indicating a failure event to a source access system in accordance with a second embodiment of the present invention ends.

[95] In summary, in a method for supporting indicating a failure event to a source access system provided by the present invention, the source access transmits information of a

source cell to a target base station through handover. When a handover problem is detected by a cell of a target base station, the target base station may transmit an event of a handover failure to a base station of the source cell according to the information of the source cell. Thus, correct self-optimization may be performed for a mobile communication system according to a detected reason, to improve performance of the mobile communication system.

[96] What has been described and illustrated herein is an example of the disclosure along with some of its variations. The terms, descriptions and figures used herein are set forth by way of illustration. Many variations are possible within the spirit and scope of the disclosure, which is intended to be defined by the following claims and their equivalents.

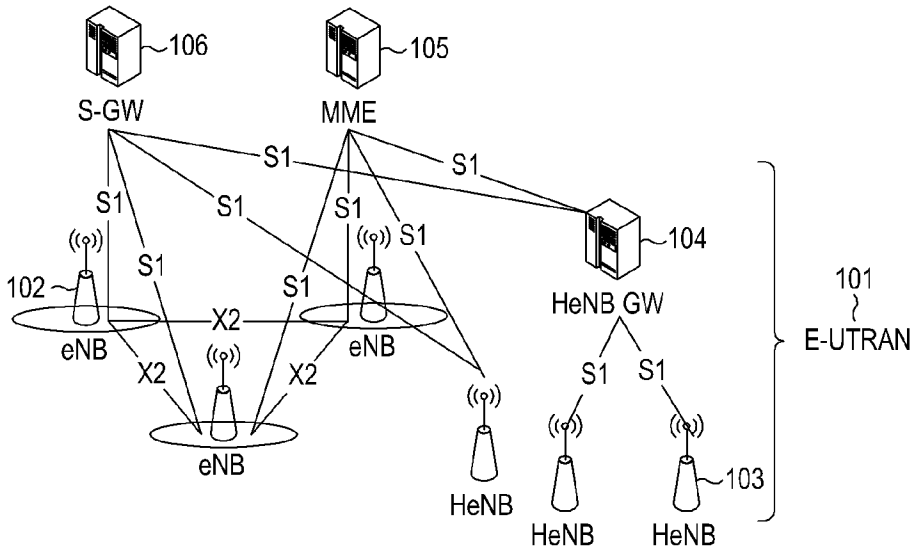
Claims

[Claim 1] A method for supporting indicating a failure event to a source access system, comprising:notifying, by the source access system, information of a source cell to a target access system;transmitting, by the target access system, a message to the source access system when the target access system needs to transmit the message to a base station to which the source cell belongs.

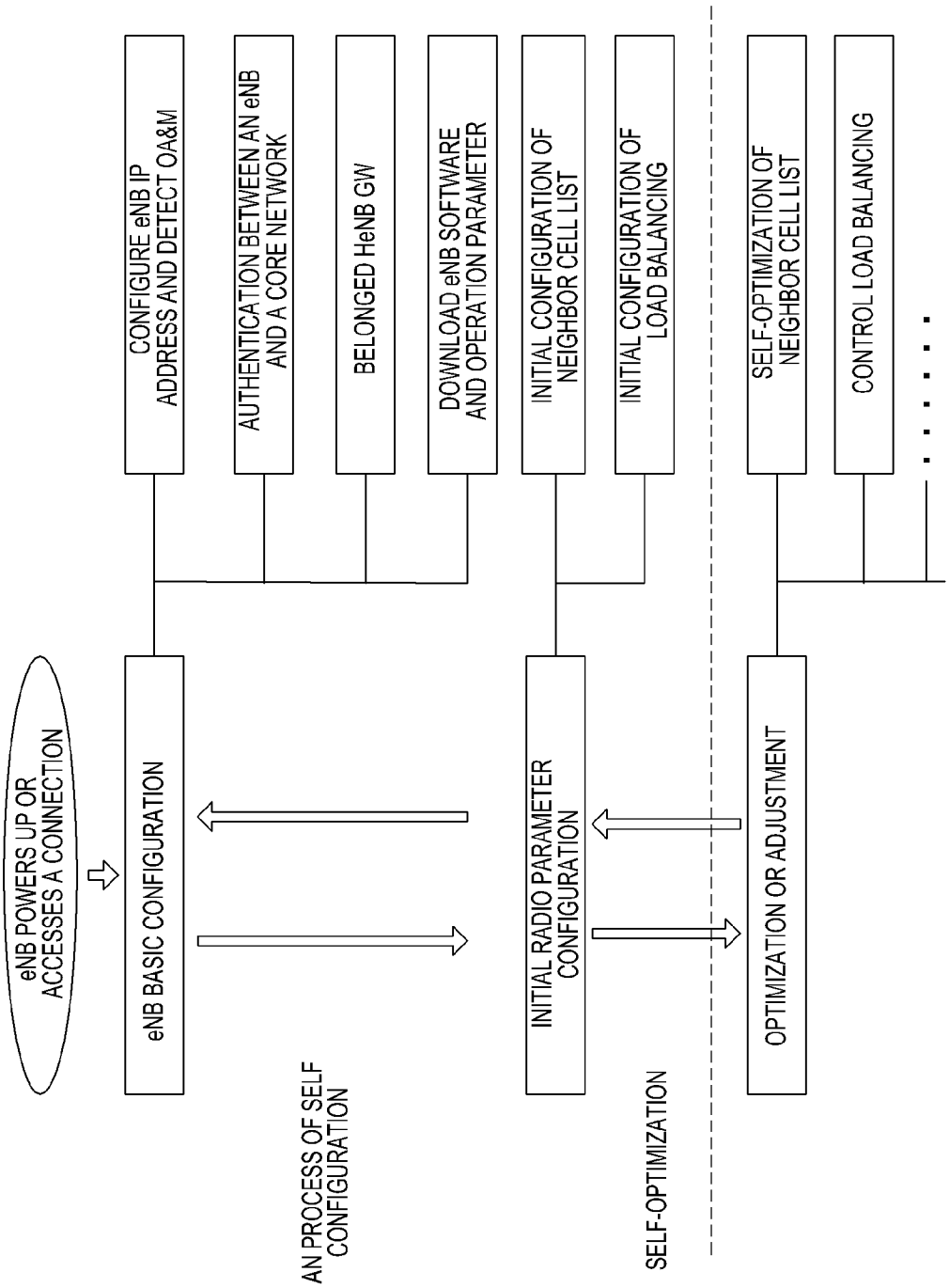
[Claim 2] The method according to claim 1, further comprising:notifying, by the source access system, the information of the source cell to the target access system through handover preparation.

[Claim 3] The method according to claim 1, wherein the information of the source cell comprises one or more kinds of the following information:a cell identifier of the source cell;an LAI to which the source cell belongs;an RAC to which the source cell belongs;an identifier of an RNC to which the source cell belongs;an extended identifier of the RNC to which the source cell belongs;a TAI to which the source cell belongs.

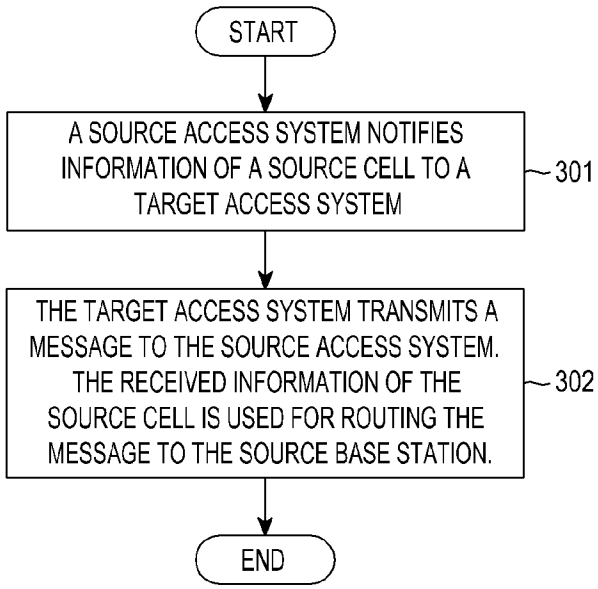
[Fig. 1]


106
S-GW
105
MME
S1
S1
S1
S1
S1
S1
S1
S1
104
HeNB GW
101
E-UTRAN
102
eNB
X2
eNB
X2
X2
eNB
HeNB
S1
S1
HeNB
HeNB
103

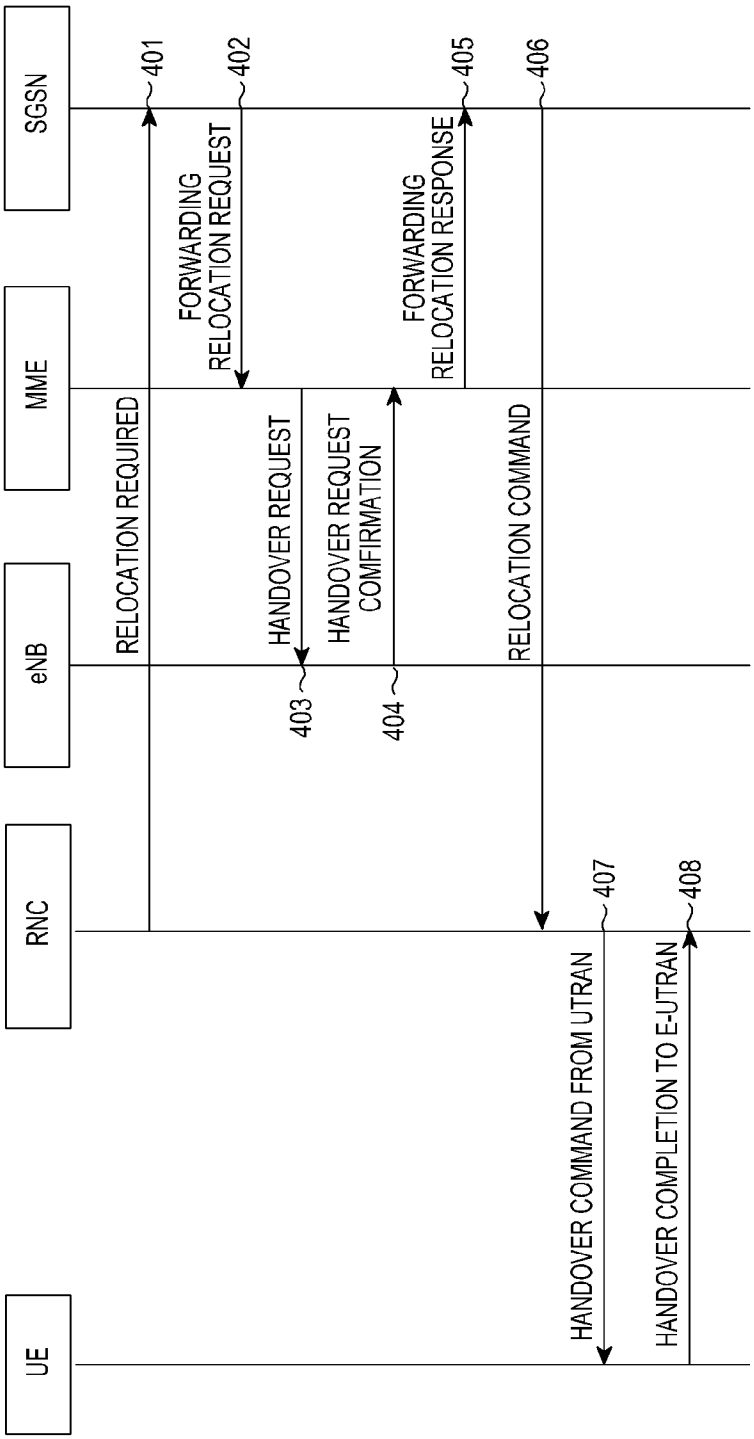
[Fig. 2]


eNB POWERS UP OR ACCESSES A CONNECTION
eNB BASIC CONFIGURATION
CONFIGURE eNB IP ADDRESS AND DETECT OA&M
AUTHENTICATION BETWEEN AN eNB AND A CORE NETWORK
BELONGED HeNB GW
DOWNLOAD eNB SOFTWARE AND OPERATION PARAMETER
AN PROCESS OF SELF CONFIGURATION
INITIAL RADIO PARAMETER CONFIGURATION
INITIAL CONFIGURATION OF NEIGHBOR CELL LIST
INITIAL CONFIGURATION OF LOAD BALANCING
SELF-OPTIMIZATION
OPTIMIZATION OR ADJUSTMENT
SELF-OPTIMIZATION OF NEIGHBOR CELL LIST
CONTROL LOAD BALANCING
. . . . . .

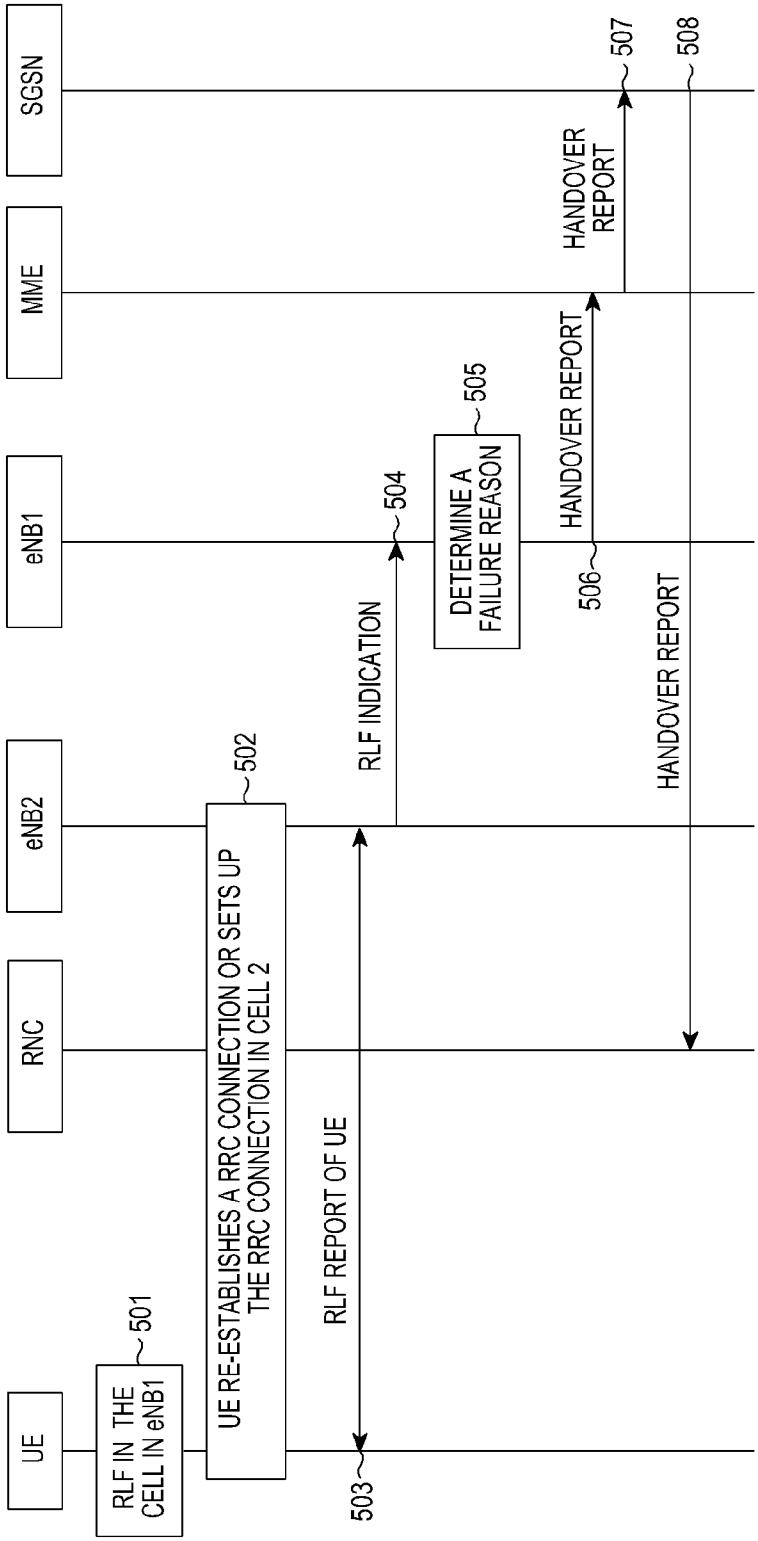
[Fig. 3]


START
A SOURCE ACCESS SYSTEM NOTIFIES INFORMATION OF A SOURCE CELL TO A TARGET ACCESS SYSTEM
301
THE TARGET ACCESS SYSTEM TRANSMITS A MESSAGE TO THE SOURCE ACCESS SYSTEM. THE RECEIVED INFORMATION OF THE SOURCE CELL IS USED FOR ROUTING THE MESSAGE TO THE SOURCE BASE STATION.
302
END

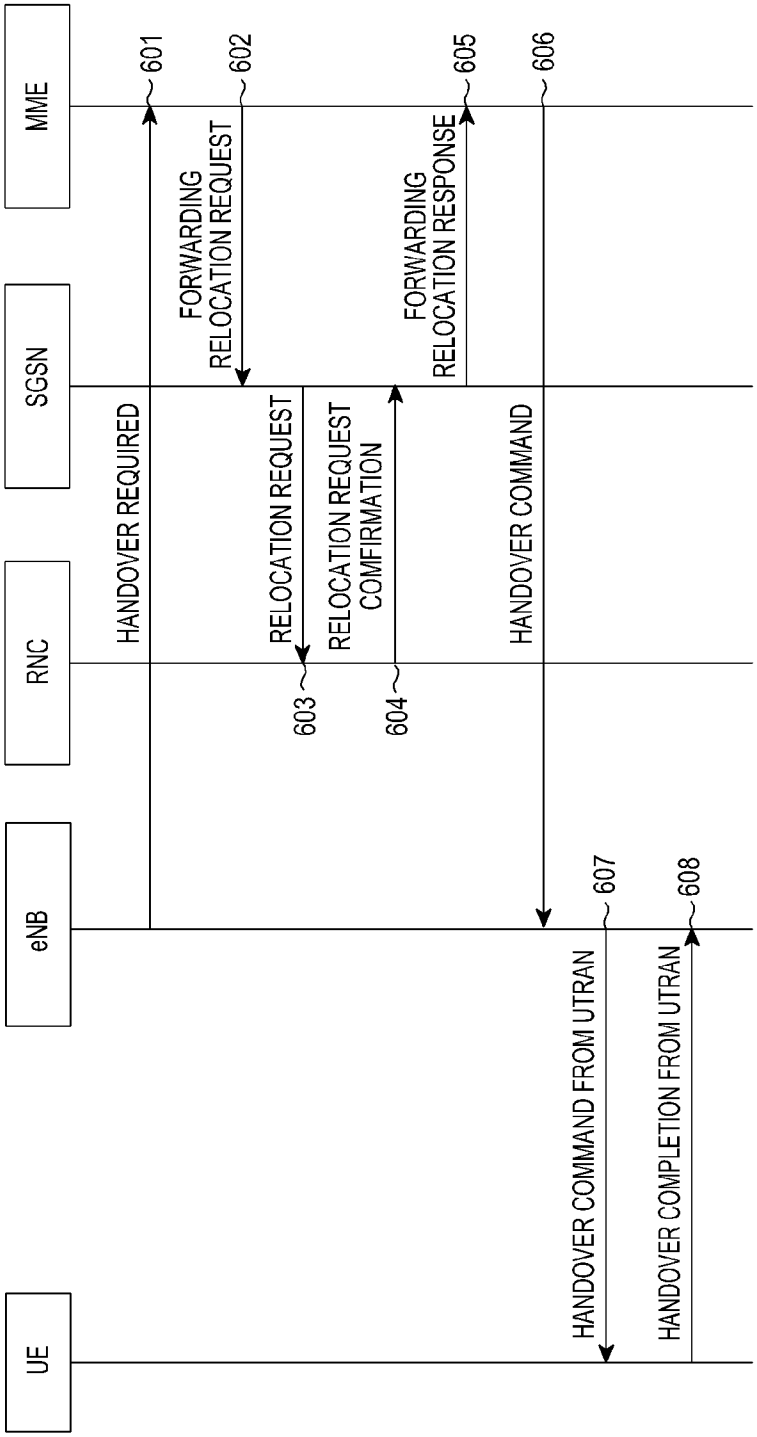
[Fig. 4]


SGSN
MME
eNB
RNC
UE
401
402
403
404
405
406
407
408
RELOCATION REQUIRED
FORWARDING RELOCATION REQUEST
HANDOVER REQUEST
HANDOVER REQUEST COMFIRMATION
FORWARDING RELOCATION RESPONSE
RELOCATION COMMAND
HANDOVER COMMAND FROM UTRAN
HANDOVER COMPLETION TO E-UTRAN

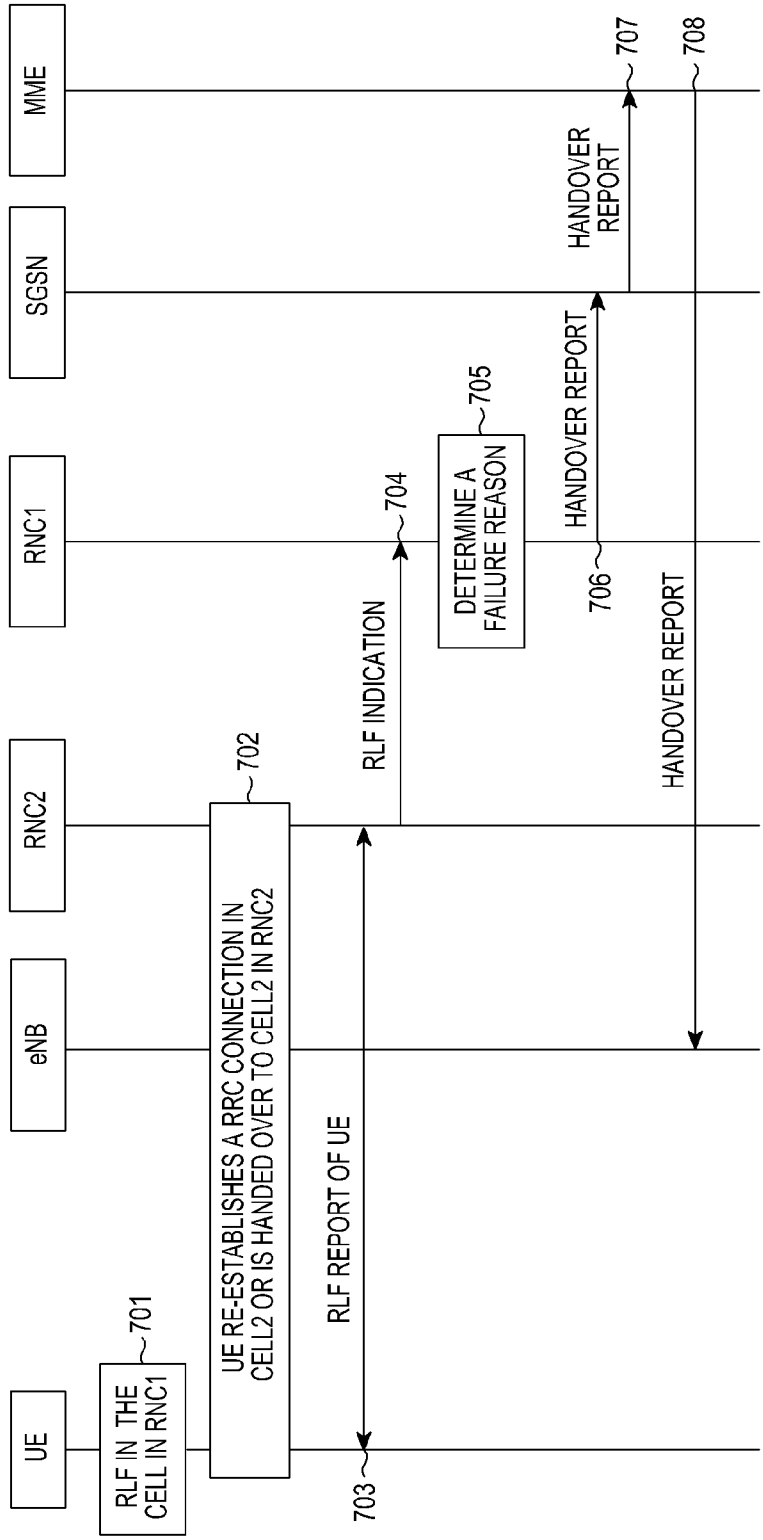
[Fig. 5]


UE
RNC
eNB2
eNB1
MME
SGSN
RLF IN THE CELL IN eNB1
501
UE RE-ESTABLISHES A RRC CONNECTION OR SETS UP THE RRC CONNECTION IN CELL 2
502
RLF REPORT OF UE
503
RLF INDICATION
504
DETERMINE A FAILURE REASON
505
HANDOVER REPORT
506
HANDOVER REPORT
HANDOVER REPORT
507
508

[Fig. 6]


MME
SGSN
RNC
eNB
UE
601
602
603
604
605
606
607
608
HANDOVER REQUIRED
FORWARDING RELOCATION REQUEST
RELOCATION REQUEST
RELOCATION REQUEST COMFIRMATION
FORWARDING RELOCATION RESPONSE
HANDOVER COMMAND
HANDOVER COMMAND FROM UTRAN
HANDOVER COMPLETION FROM UTRAN

[Fig. 7]


UE
eNB
RNC2
RNC1
SGSN
MME
RLF IN THE CELL IN RNC1
701
UE RE-ESTABLISHES A RRC CONNECTION IN CELL2 OR IS HANDED OVER TO CELL2 IN RNC2
702
RLF REPORT OF UE
703
RLF INDICATION
704
DETERMINE A FAILURE REASON
705
HANDOVER REPORT
706
HANDOVER REPORT
707
HANDOVER REPORT
708

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2013/008390

A. CLASSIFICATION OF SUBJECT MATTER

H04W 24/02(2009.01)i, H04W 8/02(2009.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04W 24/02; H04W 4/22; H04W 24/00; H04Q 7/00; H04W 68/00; H04Q 7/20; H04W 36/08; H04W 12/08; H04W 36/00; H04W 8/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: RLF indication, handover report, source access system, target access system, cell identifier

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR 10-2011-0138548 A (SAMSUNG ELECTRONICS CO., LTD.) 28 December 2011 See paragraphs [0014]-[0030]; claim 1; and figures 1-2b.	1-3
A	US 2012-0069732 A1 (LIXIANG XU et al.) 22 March 2012 See paragraphs [0038]-[0058]; claim 1; and figures 3-4B.	1-3
A	US 2008-0025263 A1 (MARI-JAANA PELKONEN) 31 January 2008 See paragraphs [0030]-[0036]; claim 1; and figures 2-5.	1-3
A	US 2011-0250925 A1 (LIFENG HAN) 13 October 2011 See paragraphs [0054]-[0062], [0067]-[0078]; claim 1; and figures 3-4.	1-3
A	WO 2011-090290 A2 (SAMSUNG ELECTRONICS CO., LTD.) 28 July 2011 See paragraphs [0076]-[0084]; claim 1; and figure 5.	1-3

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
17 December 2013 (17.12.2013)	**17 December 2013 (17.12.2013)**

Name and mailing address of the ISA/KR
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/KR2013/008390

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US 2012-0069732 A1	22/03/2012	AU 2011-306565 A1	14/03/2013
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US 2011-0250925 A1	13/10/2011	CN 101959262 A	26/01/2011
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		WO 2011-090290 A3	01/12/2011