

(51) International Patent Classification:
H04W 92/10 (2009.01)

(21) International Application Number:

PCT/CN2018/097812

(22) International Filing Date:

31 July 2018 (31.07.2018)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

62/590,868

27 November 2017 (27.11.2017) US

(71) Applicant: **GUANGDONG OPPO MOBILE TELECOMMUNICATIONS CORP., LTD.** [CN/CN]; No.18 Haibin Road, Wusha, Chang'an, Dongguan, Guangdong 523860 (CN).(72) Inventors: **LEI, Yixue**; No.18 Haibin Road, Wusha, Chang'an, Dongguan, Guangdong 523860 (CN). **LU, Qianxi**; No.18 Haibin Road, Wusha, Chang'an, Dongguan,Guangdong 523860 (CN). **WANG, Shukun**; No.18 Haibin Road, Wusha, Chang'an, Dongguan, Guangdong 523860 (CN).(74) Agent: **ESSEN PATENT&TRADEMARK AGENCY**; Room 1709-1711, Block A, Hailun Complex, No.6021 Shennan Blvd, Futian District, Shenzhen, Guangdong 518040 (CN).(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(54) Title: USER EQUIPMENT, NEXT GENERATION RADIO ACCESS NETWORK NODE, AND METHOD OF WIRELESS COMMUNICATION OF SAME

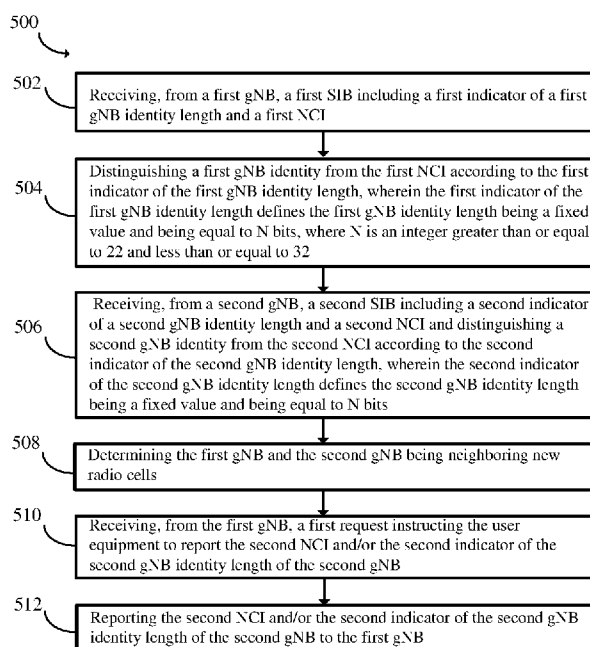


FIG. 5

(57) Abstract: A user equipment includes a receiver circuitry and a control circuitry coupled to the receiver circuitry. The receiver circuitry is configured to receive, from a first next generation node B (gNB), a first system information block (SIB) including a first indicator of a first gNB identity length and a first new radio cell identity (NCI). The control circuitry is configured to distinguish a first gNB identity from the first NCI according to the first indicator of the first gNB identity length. The first indicator of the first gNB identity length defines the first gNB identity length being a fixed value and being equal to N bits, where N is an integer greater than or equal to 22 and less than or equal to 32.



(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))*

USER EQUIPMENT, NEXT GENERATION RADIO ACCESS NETWORK NODE, AND METHOD OF
WIRELESS COMMUNICATION OF SAME
BACKGROUND OF DISCLOSURE

1. Field of the Disclosure

5 **[0001]** The present disclosure relates to the field of communication systems, and more particularly, to a user equipment, a next generation radio access network node, and a method of wireless communication of same.

2. Description of the Related Art

10 **[0002]** In long term evolution (LTE) radio access technologies, evolved UMTS terrestrial radio access network (E-UTRAN) cell global identity (E-CGI) is 28 bits long and the most significant 20 bits are evolved node B (eNB) Identity and the left 8 bits are cell index within one eNB. As the allocation between eNB identity and cell index are fixed, thus when a user equipment (UE) receives the E-CGI from system information or other signaling messages, the UE can know which bits are eNB identity.

15 **[0003]** "LS on length of NR Cell Identity", 3GPP TSG-RAN WG3 Meeting #97, R3-173643 is a related prior art for this field. More particularly, R3-173643 discloses that in a new radio (NR), per current agreement of radio access network 3 (RAN3), NR cell identity (NCI) is changed according to the following:

- 1) the NCI has fixed length of 36 bits;
- 2) the leftmost bits of the NCI correspond to a next generation node B (gNB) identity (ID); and
- 3) the gNB ID has flexible and multiple lengths to accommodate different deployment scenarios.

20 **[0004]** Thus, how the UE distinguishes the gNB ID from the NCI when the UE receives the NCI from new radio system information block (NR-SIB) is a problem that needs to be solved.

SUMMARY

25 **[0005]** An object of the present disclosure is to propose a user equipment (UE), a next generation radio access network (NG-RAN) node, and a method of wireless communication of same for solving the described problems in existing technologies by introducing a first indicator of a first next generation node B (gNB) identity length.

30 **[0006]** In a first aspect of the present disclosure, a user equipment includes a receiver circuitry and a control circuitry coupled to the receiver circuitry. The receiver circuitry is configured to receive, from a first next generation node B (gNB), a first system information block (SIB) including a first indicator of a first gNB identity length and a first new radio cell identity (NCI). The control circuitry is configured to distinguish a first gNB identity from the first NCI according to the first indicator of the first gNB identity length. The first indicator of the first gNB identity length defines the first gNB identity length being a fixed value and being equal to N bits, where N is an integer greater than or equal to 22 and less than or equal to 32.

35 **[0007]** In a second aspect of the present disclosure, a method of handling a new radio cell identity of a user equipment includes receiving, from a first next generation node B (gNB), a first system information block (SIB) including a first indicator of a first gNB identity length and a first new radio cell identity (NCI), and distinguishing a first gNB identity from the first NCI according to the first indicator of the first gNB identity length. The first indicator of the first gNB identity length defines the first gNB identity length being a fixed value and being equal to N bits, where N is an integer greater than or equal to 22 and less than or equal to 32.

[0008] In a third aspect of the present disclosure, a next generation radio access network (NG-RAN) node for wireless communication includes a first next generation node B (gNB) including a first control circuitry and a first transmitter circuitry coupled to the first receiver circuitry. The first control circuitry is configured to generate a first system information block (SIB) including a first indicator of a first gNB identity length and a first new radio cell identity (NCI), and the first indicator of the first gNB identity length defines the first gNB identity length being a fixed value and being equal to N bits, where N is an integer greater than or equal to 22 and less than or equal to 32, and the first transmitter circuitry is configured to transmit the first SIB including the first indicator of the first gNB identity length and the first NCI to a user equipment.

[0009] In a fourth aspect of the present disclosure, a method of handling a new radio cell identity of a next generation radio access network (NG-RAN) node includes generating a first system information block (SIB) including a first indicator of a first gNB identity length and a first new radio cell identity (NCI) using a first next generation node B (gNB), wherein the first indicator of the first gNB identity length defines the first gNB identity length being a fixed value and being equal to N bits, where N is an integer greater than or equal to 22 and less than or equal to 32, and transmitting the first SIB including the first indicator of the first gNB identity length and the first NCI to a user equipment.

[0010] In the embodiment of the present disclosure, a non-transitory machine-readable storage medium having stored thereon instructions that, when executed by a computer, cause the computer to perform the method.

[0011] In the embodiment of the present disclosure, the user equipment, the next generation radio access network (NG-RAN) node, and the method of wireless communication of same solve the described problems in existing technologies by introducing the first indicator of the first gNB identity length, the first indicator of the first gNB identity length defines the first gNB identity length being a fixed value and being equal to N bits, where N is an integer greater than or equal to 22 and less than or equal to 32, such that the first gNB identity can be distinguished from the first NCI.

BRIEF DESCRIPTION OF DRAWINGS

[0012] In order to more clearly illustrate the embodiments of the present disclosure or related art, the following figures will be described in the embodiments are briefly introduced. It is obvious that the drawings are merely some embodiments of the present disclosure, a person having ordinary skill in this field can obtain other figures according to these figures without paying the premise.

[0013] FIG. 1 is a diagram of a structure of a next generation radio access network (NG-RAN) in relation to a fifth generation (5G) system according to an embodiment of the present disclosure.

[0014] FIG. 2 is a diagram of a structure of a UMTS terrestrial radio access network (E-UTRAN) according to an embodiment of the present disclosure.

[0015] FIG. 3 is a block diagram of a user equipment for wireless communication according to an embodiment of the present disclosure.

[0016] FIG. 4 is a diagram of a structure of an automatic neighbor relation (ANR) according to an embodiment of the present disclosure.

[0017] FIG. 5 is a flowchart illustrating a method of handling a new radio cell identity of a user equipment according to an embodiment of the present disclosure.

[0018] FIG. 6 is a block diagram of a first next generation node B (gNB) for wireless communication according to an embodiment of the present disclosure.

5 **[0019]** FIG. 7 is a block diagram of a second gNB for wireless communication according to an embodiment of the present disclosure.

[0020] FIG. 8 is a flowchart illustrating a method of handling a new radio cell identity of a NG-RAN node according to an embodiment of the present disclosure.

10 **[0021]** FIG. 9 is a block diagram of a system for wireless communication according to an embodiment of the present disclosure.

DETAILED DESCRIPTION OF EMBODIMENTS

15 **[0022]** Embodiments of the present disclosure are described in detail with the technical matters, structural features, achieved objects, and effects with reference to the accompanying drawings as follows. Specifically, the terminologies in the embodiments of the present disclosure are merely for describing the purpose of the certain embodiment, but not to limit the disclosure.

20 **[0023]** FIG. 1 illustrates that, in some embodiments, a next generation radio access network (NG-RAN) 10 in relation to a fifth generation (5G) system. The NG-RAN 10 provides both new radio (NR) and long term evolution (LTE) radio access. An NG-RAN node, such as a base station, is either a next generation node B (gNB) 12, such as a 5G base station, providing NR user plane and control plane services, or an evolved node B (eNB) 14, providing LTE/evolved UMTS terrestrial radio access network (E-UTRAN) services towards a user equipment (UE). The gNBs 12 and eNBs 14 are interconnected with each other using an Xn interface. The gNBs 12 and eNBs 14 are also connected using NG interfaces to the 5G core (5GC) 20, such as an access and mobility management function (AMF)/user plane function (UPF) 22, more specifically to an access and mobility management function (AMF) using an NG control plane (NG-C) interface and to a user plane function (UPF) using an NG user plane (NG-U) interface. In another embodiment, the NG-RAN node means 25 either eNB which is enhanced to support LTE NR interoperation e.g. capable of being connected to 5GC or running in an LTE/NR dual-connectivity (EN-DC) mode.

30 **[0024]** FIG. 2 illustrates that, in some embodiments, a structure of an E-UTRAN 30. The E-UTRAN 30 includes a plurality of eNBs 32. The eNBs 32 are interconnected using an X2 interface, and the eNBs 32 and an evolved packet core (EPC) 40 are connected using an S1 interface, and the eNBs 32 are interconnected with a user equipment 50 (UE) using an LTE air (Uu) interface.

35 **[0025]** FIG. 3 illustrates a user equipment 50 in accordance with various embodiments. In the embodiments, the user equipment 50 may include a transmitter circuitry 52 and a receiver circuitry 54 coupled to a control circuitry 56. The transmitter circuitry 52 and the receiver circuitry 54 may be coupled to one or more antennas 58 for transmission over an air. As used herein, “circuitry” may refer to, be part of, or include an application specific integrated circuit (ASIC), an electronic circuit, a processor (shared, dedicated, or group), and/or memory (shared, dedicated, or group) that execute one or more software or firmware programs, a combinational logic circuit, and/or other suitable hardware components that provide the described functionality.

In some embodiments, the user equipment 50 may be implemented in, or perform functions associated with one or more software or firmware modules.

[0026] FIG. 4 illustrates an automatic neighbor relation (ANR) in accordance with various embodiments. In the embodiments, the user equipment 50 reports a measurement report to a gNB 16 such as a serving gNB, for example, reporting all detected cells. The gNB 16 requests X2 interface setup to a gNB 18 such as a target gNB. The eNB 18 joins the gNB 16 to a neighbor relation table (NRT) of the gNB 18, the gNB 18 sends corresponding data to the gNB 16, and the gNB 16 in turn joins the gNB 18 to a neighbor relation table (NRT) of the gNB 16.

[0027] In some embodiments, the receiver circuitry 54 is configured to receive, from a first next generation node B (gNB) such as one gNB 12 of FIG. 1 or gNB 16 of FIG. 4, a first system information block (SIB) including a first indicator of a first gNB identity length and a first new radio cell identity (NCI). The control circuitry 56 is configured to distinguish a first gNB identity from the first NCI according to the first indicator of the first gNB identity length. The first indicator of the first gNB identity length defines the first gNB identity length being a fixed value and being equal to N bits, where N is an integer greater than or equal to 22 and less than or equal to 32.

[0028] In some embodiments, the receiver circuitry 54 is configured to receive, from a second gNB, such as another gNB 12 of FIG. 1 or gNB 18 of FIG. 4, a second SIB including a second indicator of a second gNB identity length and a second NCI, and the control circuitry 54 is configured to distinguish a second gNB identity from the second NCI according to the second indicator of the second gNB identity length, wherein the second indicator of the second gNB identity length defines the second gNB identity length being a fixed value and being equal to N bits.

[0029] In the embodiment, the first indicator of the first gNB identity length is introduced in NR system information block (SIB) in minimum system information (MSI), remaining minimum system information (RMSI), or other system information (OSI). In some embodiments, the first indicator of the first gNB identity length and the first NCI are in the MSI to reduce a number of bits. When the first gNB broadcasting the NCI, the first indicator of the first gNB identity length can also be provided and an information element (IE) can be as an example defined as INTEGER type as follows.

gNBIDLength INTEGER (22...32)

[0030] In the embodiment of the present disclosure, the user equipment 50 solves the described problems in existing technologies by introducing the first indicator of the first gNB identity length.

[0031] In the embodiment, the second indicator of the second gNB identity length is introduced in NR system information block (SIB) in minimum system information (MSI), remaining minimum system information (RMSI), or other system information (OSI). In some embodiments, the second indicator of the second gNB identity length and the second NCI are in the MSI to reduce a number of bits. When the second gNB broadcasting the NCI, the second indicator of the second gNB identity length can also be provided and an information element (IE) can be as an example defined as INTEGER type as follows.

gNBIDLength INTEGER (22...32)

[0032] In another embodiment, the first indicator of the first gNB identity length further defines the first gNB identity length being 22 bits, 23 bits, 24 bits, 25 bits, 26 bits, 27 bits, 28 bits, 29 bits, 30 bits, 31 bits, or 32 bits. An information element (IE) can be as an example defined as ENUMERATED type as follows.

5 gNBIDLength ENUMERATED {twenty-two, twenty- three, twenty- four, twenty-five, twenty-sixth, twenty-seven, twenty-eight, twenty-nine, thirty, thirty-one, thirty-two}

[0033] In another embodiment, the second indicator of the second gNB identity length further defines the second gNB identity length being 22 bits, 23 bits, 24 bits, 25 bits, 26 bits, 27 bits, 28 bits, 29 bits, 30 bits, 31 bits, or 32 bits. An information element (IE) can be as an example defined as ENUMERATED type as follows.

10

gNBIDLength ENUMERATED {twenty-two, twenty- three, twenty- four, twenty-five, twenty-sixth, twenty-seven, twenty-eight, twenty-nine, thirty, thirty-one, thirty-two}

[0034] In another embodiment, the first indicator of the first gNB identity length further defines the first gNB identity length being a bit string including M bits and M is equal to N. An information element (IE) can be as an example defined as bit string type as follows.

15

gNBIDLength BIT STRING (SIZE(22..32))

[0035] In another embodiment, the second indicator of the second gNB identity length further defines the second gNB identity length being a bit string including M bits and M is equal to N. An information element (IE) can be as an example defined as bit string type as follows.

20

gNBIDLength BIT STRING (SIZE(22..32))

[0036] Further, the control circuitry 54 is configured to determine the first gNB and the second gNB being neighboring new radio cells. The receiver circuitry 52 is configured to receive, from the first gNB, a first request instructing the control circuitry 56 to report the second NCI and/or the second indicator of the second gNB identity length of the second gNB, and the control circuitry 56 is configured to report the second NCI and/or the second indicator of the second gNB identity length of the second gNB to the first gNB.

25

[0037] In another embodiment, the control circuitry 54 is configured to determine the first gNB and the second gNB being neighboring new radio cells, the receiver circuitry 52 is configured to receive, from the first gNB, a first request instructing the control circuitry 56 to report the second NCI without requesting the second indicator of the second gNB identity length of the second gNB when the first gNB knows the second gNB identity length, and the control circuitry 54 is configured to report the second NCI of the second gNB to the first gNB. The first gNB knows the second gNB identity length by pre-configuration that all neighboring new

30

radio cells have a same gNB identity length with the first gNB. The first gNB is a serving cell and the second gNB is a target cell.

[0038] In detail, the first gNB is configured to compare the second NCI with existing entries in an automatic neighbor relation (ANR) table when the control circuitry 54 reports the second NCI to the first gNB. The first gNB is configured to route a handover (HO) message to the second NCI properly when HO occurs. The control circuitry 54 is configured to perform in a long term evolution-new radio (LTE-NR) dual connectivity (DC), such that the eNB 14 routes X2/Xn messages to the first gNB using the first indicator of the first gNB identity length.

[0039] In some embodiments, the control circuitry 54 is configured to determine the first gNB and the second gNB being neighboring new radio cells, the receiver circuitry 52 is configured to receive, from the second gNB, a second request instructing the control circuitry 54 to report the first NCI and/or the first indicator of the first gNB identity length of the first gNB and the control circuitry 54 is configured to report the first NCI and/or the first indicator of the first gNB identity length of the first gNB to the second gNB.

[0040] In some embodiments, the control circuitry 54 is configured to determine the first gNB and the second gNB being neighboring new radio cells, the receiver circuitry 52 is configured to receive, from the second gNB, a second request instructing the control circuitry 54 to report the first NCI without requesting the first indicator of the first gNB identity length of the first gNB when the second gNB knows the first gNB identity length, and the control circuitry 54 is configured to report the first NCI of the first gNB to the second gNB. The second gNB knows the first gNB identity length by pre-configuration that all neighboring new radio cells have a same gNB identity length with the second gNB. The first gNB is a target cell and the second gNB is a serving cell.

[0041] In detail, the second gNB is configured to compare the first NCI with existing entries in an automatic neighbor relation (ANR) table when the control circuitry 54 reports the first NCI to the second gNB.

[0042] In the embodiments, the user equipment 50 of FIGS. 3 and 4 may be configured to perform one or more processes, such as a method 500 illustrated in FIG. 5. In the embodiments, the method 500 includes: at block 502, receiving, from a first next generation node B (gNB), a first system information block (SIB) including a first indicator of a first gNB identity length and a first new radio cell identity (NCI), at block 504, distinguishing a first gNB identity from the first NCI according to the first indicator of the first gNB identity length, wherein the first indicator of the first gNB identity length defines the first gNB identity length being a fixed value and being equal to N bits, where N is an integer greater than or equal to 22 and less than or equal to 32, at block 506, receiving, from a second gNB, a second SIB including a second indicator of a second gNB identity length and a second NCI and distinguishing a second gNB identity from the second NCI according to the second indicator of the second gNB identity length, wherein the second indicator of the second gNB identity length defines the second gNB identity length being a fixed value and being equal to N bits, at block 508, determining the first gNB and the second gNB being neighboring new radio cells, at block 510, receiving, from the first gNB, a first request instructing the user equipment to report the second NCI and/or the second indicator of the second gNB identity length of the second gNB, and at block 512, reporting the second NCI and/or the second indicator of the second gNB identity length of the second gNB to the first gNB. In the

embodiments, the user equipment 50 may be configured to perform one or more additional or alternative process elements, as described elsewhere in this specification.

[0043] FIG. 6 illustrates a first gNB in accordance with various embodiments. In the embodiments, the first gNB may include a first transmitter circuitry 62 and a first receiver circuitry 64 coupled to a first control circuitry 66. The first transmitter circuitry 62 and the first receiver circuitry 64 may be coupled to one or more first antennas 68 for transmission over the air. As used herein, “circuitry” may refer to, be part of, or include an application specific integrated circuit (ASIC), an electronic circuit, a processor (shared, dedicated, or group), and/or memory (shared, dedicated, or group) that execute one or more software or firmware programs, a combinational logic circuit, and/or other suitable hardware components that provide the described functionality.

In some embodiments, the first gNB may be implemented in, or perform functions associated with one or more software or firmware modules.

[0044] FIG. 7 illustrates a second gNB in accordance with various embodiments. In the embodiments, the second gNB may include a second transmitter circuitry 72 and a second receiver circuitry 74 coupled to a second control circuitry 76. The second transmitter circuitry 72 and the second receiver circuitry 74 may be coupled to one or more second antennas 78 for transmission over the air. As used herein, “circuitry” may refer to, be part of, or include an application specific integrated circuit (ASIC), an electronic circuit, a processor (shared, dedicated, or group), and/or memory (shared, dedicated, or group) that execute one or more software or firmware programs, a combinational logic circuit, and/or other suitable hardware components that provide the described functionality. In some embodiments, the second gNB may be implemented in, or perform functions associated with one or more software or firmware modules.

[0045] In some embodiments, the NG-RAN node includes the first next generation node B (gNB). The first control circuitry 66 is configured to generate a first system information block (SIB) including a first indicator of a first gNB identity length and a first new radio cell identity (NCI), and the first indicator of the first gNB identity length defines the first gNB identity length being a fixed value and being equal to N bits, where N is an integer greater than or equal to 22 and less than or equal to 32, and the first transmitter circuitry 62 is configured to transmit the first SIB including the first indicator of the first gNB identity length and the first NCI to the user equipment 50.

[0046] In some embodiments, the NG-RAN node further includes a second gNB. The second control circuitry 76 is configured to generate a second SIB including a second indicator of a second gNB identity length and a second NCI, the second indicator of the second gNB identity length defines the second gNB identity length being a fixed value and being equal to N bits, and the second transmitter circuitry 72 is configured to transmit the second SIB including the second indicator of the second gNB identity length and the second NCI to the user equipment.

[0047] In the embodiments, the NG-RAN node of FIGS. 1, 6 and 7 may be configured to perform one or more processes, such as a method 800 illustrated in FIG. 8. In the embodiments, the method 800 includes: at block 802, generating a first system information block (SIB) including a first indicator of a first gNB identity length and a first new radio cell identity (NCI) using a first next generation node B (gNB), wherein the first indicator of the first gNB identity length defines the first gNB identity length being a fixed value and being

equal to N bits, where N is an integer greater than or equal to 22 and less than or equal to 32, at block 804, transmitting the first SIB including the first indicator of the first gNB identity length and the first NCI to a user equipment, at block 806, generating a second SIB including a second indicator of a second gNB identity length and a second NCI using a second gNB, wherein the second indicator of the second gNB identity length defines the second gNB identity length being a fixed value and being equal to N bits, and at block 808, transmitting the second SIB including the second indicator of the second gNB identity length and the second NCI to the user equipment. In the embodiments, the NG-RAN node may be configured to perform one or more additional or alternative process elements, as described elsewhere in this specification.

[0048] In some embodiments, in practice, the transmitter circuitry 52, the first transmitter circuitry 62, the second transmitter circuitry 72, the receiver circuitry 54, the first receiver circuitry 64, and the second receiver circuitry 74 may include one or more antennas, one or more modulators/demodulators, one or more analog signal processing circuits, and/or one or more digital processing circuits for communicating with other devices. The control circuitry 56, the first control circuitry 66, and the second control circuitry 76 may be realized with one or more microprocessors, one or more network processors, one or more digital signal processing circuits, and/or other suitable processing circuits.

[0049] In some embodiments, in addition to the first gNB and/ or the second gNB broadcast the system information to the user equipment, the embodiment also discloses usage of the first indicator of the first gNB identity length and/or the second indicator of the second gNB identity length in other signaling messages such as measurement report for ANR purpose which means if gNB such as the first gNB or the second gNB requests the user equipments to report neighbor cell's NCI and/or an indicator of a gNB identity length. The gNB may only request the user equipment 50 to report NCI without requesting the indicator of the gNB identity length if the gNB knows network configures unified a gNB identity length by other approach such as pre-configuration that all neighboring NR cells have the same gNB identity length with a serving cell.

[0050] The embodiment may work when a report of gNB identity length is not urgent for a serving gNB. In the embodiment, the serving gNB can firstly request the user equipment 50 to report the NCI of neighbor cell and compare with existing entries in the ANR table. In ANR table, it is assumed that gNB identity of the neighboring cells have been provided. Then, if the left most bits of reported NCI matches one of the gNB identity, then gNB can resolve the ambiguity. The gNB identity is unique and the serving gNB needs to request the user equipment 50 to report the indicator of the gNB identity length there is no entry matched in the maintained ANR table.

[0051] In some embodiments, the serving gNB can route a handover (HO) message a neighboring gNB properly when HO occurs. Some embodiments can be implemented by measurement configuration performed by LTE eNB or NR gNB.

[0052] In some embodiments, in case of LTE-NR dual connectivity (EN-DC), if a LTE eNB needs to know the gNB identity to route X2/Xn message, the LTE eNB needs to know the gNB identity from NCI. When NR gNB is a master node for DC operation or the NR gNB works in a single connectivity (SC) mode, the NR gNB needs to resolve the gNB identity using the embodiments.

[0053] The embodiments of the present disclosure introduce the indicator to the user equipment 50, such that the user equipment 50 can distinguish the gNB identity from the NCI. Also, during ANR operation, the embodiments also enable the user equipment 50 to report neighbor cells gNB identity length to the serving gNB so that the serving gNB can route the HO message a neighboring gNB properly when HO occurs. The
5 embodiments also contribute to LTE NR interoperation in EN-DC case where enable LTE eNB to correctly route X2/Xn messages to gNB using a correctly resolved gNB identity.

[0054] FIG. 9 is a block diagram of a system for wireless communication according to an embodiment of the present disclosure. Embodiments described herein may be implemented into the system using any suitably configured hardware and/or software. FIG. 9 illustrates, for one embodiment, an example system comprising a
10 radio frequency (RF) circuitry, a baseband circuitry, an application circuitry, a memory/storage, a display, a camera, a sensor, and an input/output (I/O) interface, coupled with each other at least as illustrated.

[0055] The application circuitry may include a circuitry such as, but not limited to, one or more single-core or multi-core processors. The processors may include any combination of general-purpose processors and dedicated processors, such as graphics processors, application processors. The processors may be coupled with
15 memory/storage and configured to execute instructions stored in the memory/storage to enable various applications and/or operating systems running on the system.

[0056] The baseband circuitry may include circuitry such as, but not limited to, one or more single-core or multi-core processors. The processors may include a baseband processor. The baseband circuitry may handle various radio control functions that enables communication with one or more radio networks via the RF
20 circuitry. The radio control functions may include, but are not limited to, signal modulation, encoding, decoding, radio frequency shifting, etc. In some embodiments, the baseband circuitry may provide for communication compatible with one or more radio technologies. For example, in some embodiments, the baseband circuitry may support communication with an evolved universal terrestrial radio access network (EUTRAN) and/or other wireless metropolitan area networks (WMAN), a wireless local area network (WLAN), a wireless personal area network (WPAN). Embodiments in which the baseband circuitry is
25 configured to support radio communications of more than one wireless protocol may be referred to as multi-mode baseband circuitry.

[0057] In various embodiments, the baseband circuitry may include circuitry to operate with signals that are not strictly considered as being in a baseband frequency. For example, in some embodiments, baseband
30 circuitry may include circuitry to operate with signals having an intermediate frequency, which is between a baseband frequency and a radio frequency.

[0058] RF circuitry may enable communication with wireless networks using modulated electromagnetic radiation through a non-solid medium. In various embodiments, the RF circuitry may include switches, filters, amplifiers, etc. to facilitate the communication with the wireless network.

[0059] In various embodiments, the RF circuitry may include circuitry to operate with signals that are not strictly considered as being in a radio frequency. For example, in some embodiments, RF circuitry may include
35 circuitry to operate with signals having an intermediate frequency, which is between a baseband frequency and a radio frequency.

[0060] In various embodiments, the transmitter circuitry, control circuitry, or receiver circuitry discussed above with respect to the user equipment or eNB may be embodied in whole or in part in one or more of the RF circuitry, the baseband circuitry, and/or the application circuitry. As used herein, “circuitry” may refer to, be part of, or include an Application Specific Integrated Circuit (ASIC), an electronic circuit, a processor (shared, dedicated, or group), and/or memory (shared, dedicated, or group) that execute one or more software or firmware programs, a combinational logic circuit, and/or other suitable hardware components that provide the described functionality. In some embodiments, the electronic device circuitry may be implemented in, or functions associated with the circuitry may be implemented by, one or more software or firmware modules.

[0061] In some embodiments, some or all of the constituent components of the baseband circuitry, the application circuitry, and/or the memory/storage may be implemented together on a system on a chip (SOC).

[0062] Memory/storage may be used to load and store data and/or instructions, for example, for system. Memory/storage for one embodiment may include any combination of suitable volatile memory, such as dynamic random access memory (DRAM)), and/or non-volatile memory, such as flash memory.

[0063] In various embodiments, the I/O interface may include one or more user interfaces designed to enable user interaction with the system and/or peripheral component interfaces designed to enable peripheral component interaction with the system. User interfaces may include, but are not limited to a physical keyboard or keypad, a touchpad, a speaker, a microphone, etc. Peripheral component interfaces may include, but are not limited to, a non-volatile memory port, a universal serial bus (USB) port, an audio jack, and a power supply interface.

[0064] In various embodiments sensor may include one or more sensing devices to determine environmental conditions and/or location information related to the system. In some embodiments, the sensors may include, but are not limited to, a gyro sensor, an accelerometer, a proximity sensor, an ambient light sensor, and a positioning unit. The positioning unit may also be part of, or interact with, the baseband circuitry and/or RF circuitry to communicate with components of a positioning network, e.g., a global positioning system (GPS) satellite.

[0065] In various embodiments, the display may include a display, such as a liquid crystal display and a touch screen display.

[0066] In various embodiments, the system may be a mobile computing device such as, but not limited to, a laptop computing device, a tablet computing device, a netbook, an ultrabook, a smartphone, etc. In various embodiments, system may have more or less components, and/or different architectures.

[0067] Where appropriate, methods described herein may be implemented as a computer program. The computer program may be stored on a storage medium, such as a non-transitory storage medium.

[0068] In summary, in the embodiment of the present disclosure, the user equipment, the next generation radio access network (NG-RAN) node, and the method of wireless communication of same solve the described problems in existing technologies by introducing the first indicator of the first gNB identity length, the first indicator of the first gNB identity length defines the first gNB identity length being a fixed value and being equal to N bits, where N is an integer greater than or equal to 22 and less than or equal to 32, such that the first gNB identity can be distinguished from the first NCI.

[0069] A person having ordinary skill in the art understands that each of the units, algorithm, and steps described and disclosed in the embodiments of the present disclosure are realized using electronic hardware or combinations of software for computers and electronic hardware. Whether the functions run in hardware or software depends on the condition of application and design requirement for a technical plan. A person having ordinary skill in the art can use different ways to realize the function for each specific application while such realizations should not go beyond the scope of the present disclosure.

[0070] It is understood by a person having ordinary skill in the art that he/she can refer to the working processes of the system, device, and unit in the above-mentioned embodiment since the working processes of the above-mentioned system, device, and unit are basically the same. For easy description and simplicity, these working processes will not be detailed.

[0071] It is understood that the disclosed system, device, and method in the embodiments of the present disclosure can be realized with other ways. The above-mentioned embodiments are exemplary only. The division of the units is merely based on logical functions while other divisions exist in realization. It is possible that a plurality of units or components are combined or integrated in another system. It is also possible that some characteristics are omitted or skipped. On the other hand, the displayed or discussed mutual coupling, direct coupling, or communicative coupling operate through some ports, devices, or units whether indirectly or communicatively by ways of electrical, mechanical, or other kinds of forms.

[0072] The units as separating components for explanation are or are not physically separated. The units for display are or are not physical units, that is, located in one place or distributed on a plurality of network units. Some or all of the units are used according to the purposes of the embodiments.

[0073] Moreover, each of the functional units in each of the embodiments can be integrated in one processing unit, physically independent, or integrated in one processing unit with two or more than two units.

[0074] If the software function unit is realized and used and sold as a product, it can be stored in a readable storage medium in a computer. Based on this understanding, the technical plan proposed by the present disclosure can be essentially or partially realized as the form of a software product. Or, one part of the technical plan beneficial to the conventional technology can be realized as the form of a software product. The software product in the computer is stored in a storage medium, including a plurality of commands for a computational device (such as a personal computer, a server, or a network device) to run all or some of the steps disclosed by the embodiments of the present disclosure. The storage medium includes a USB disk, a mobile hard disk, a read-only memory (ROM), a random access memory (RAM), a floppy disk, or other kinds of media capable of storing program codes.

[0075] While the present disclosure has been described in connection with what is considered the most practical and preferred embodiments, it is understood that the present disclosure is not limited to the disclosed embodiments but is intended to cover various arrangements made without departing from the scope of the broadest interpretation of the appended claims.

What is claimed is:

1. A user equipment for wireless communication, comprising:

a receiver circuitry configured to receive, from a first next generation node B (gNB), a first system information block (SIB) comprising a first indicator of a first gNB identity length and a first new radio cell identity (NCI); and

a control circuitry coupled to the receiver circuitry, configured to distinguish a first gNB identity from the first NCI according to the first indicator of the first gNB identity length, wherein the first indicator of the first gNB identity length defines the first gNB identity length being a fixed value and being equal to N bits, where N is an integer greater than or equal to 22 and less than or equal to 32.

2. The user equipment of claim 1, wherein the first indicator of the first gNB identity length further defines the first gNB identity length being 22 bits, 23 bits, 24 bits, 25 bits, 26 bits, 27 bits, 28 bits, 29 bits, 30 bits, 31 bits, or 32 bits.

3. The user equipment of any one of claims 1 and 2, wherein the first indicator of the first gNB identity length further defines the first gNB identity length being a bit string comprising M bits and M is equal to N.

4. The user equipment of any one of claims 1 to 3, wherein the first indicator of the first gNB identity length is in minimum system information (MSI), remaining minimum system information (RMSI), or other system information (OSI).

5. The user equipment of any one of claims 1 to 4, wherein the first indicator of the first gNB identity length and the first NCI are in the MSI.

6. The user equipment of any one of claims 1 to 5, wherein the receiver circuitry is configured to receive, from a second gNB, a second SIB comprising a second indicator of a second gNB identity length and a second NCI, and the control circuitry is configured to distinguish a second gNB identity from the second NCI according to the second indicator of the second gNB identity length, wherein the second indicator of the second gNB identity length defines the second gNB identity length being a fixed value and being equal to N bits.

7. The user equipment of claim 6, wherein the second indicator of the second gNB identity length further defines the second gNB identity length being 22 bits, 23 bits, 24 bits, 25 bits, 26 bits, 27 bits, 28 bits, 29 bits, 30 bits, 31 bits, or 32 bits.

8. The user equipment of claim 6, wherein the second indicator of the second gNB identity length further defines the second gNB identity length being a bit string comprising M bits and M is equal to N.

9. The user equipment of claim 6, wherein the second indicator of the second gNB identity length is in minimum system information (MSI), remaining minimum system information (RMSI), or other system information (OSI).

10. The user equipment of claim 6, wherein the second indicator of the second gNB identity length and the second NCI are in the MSI.

11. The user equipment of claim 6, wherein the control circuitry is configured to determine the first gNB and the second gNB being neighboring new radio cells, the receiver circuitry is configured to receive, from the first gNB, a first request instructing the control circuitry to report the second NCI and/or the second indicator of the second gNB identity length of the second gNB, and the control circuitry is configured to report the second NCI and/or the second indicator of the second gNB identity length of the second gNB to the first gNB.

12. The user equipment of claim 6, wherein the control circuitry is configured to determine the first gNB and the second gNB being neighboring new radio cells, the receiver circuitry is configured to receive, from the first gNB, a first request instructing the control circuitry to report the second NCI without requesting the second indicator of the second gNB identity length of the second gNB when the first gNB knows the second gNB identity length, and the control circuitry is configured to report the second NCI of the second gNB to the first gNB.

13. The user equipment of claim 12, wherein the first gNB knows the second gNB identity length by pre-configuration that all neighboring new radio cells have a same gNB identity length with the first gNB.

14. The user equipment of claim 12, wherein the first gNB is a serving cell and the second gNB is a target cell.

15. The user equipment of claim 14, wherein the first gNB is configured to compare the second NCI with existing entries in an automatic neighbor relation (ANR) table when the control circuitry reports the second NCI to the first gNB.

16. The user equipment of claim 14, wherein the first gNB is configured to route a handover (HO) message to the second NCI properly when HO occurs.

17. The user equipment of any one of claims 1 to 16, wherein the control circuitry is configured to perform in a long term evolution-new radio (LTE-NR) dual connectivity (DC), such that an evolved node B (eNB) routes X2/Xn messages to the first gNB using the first indicator of the first gNB identity length.

18. The user equipment of claim 6, wherein the control circuitry is configured to determine the first gNB and the second gNB being neighboring new radio cells, the receiver circuitry is configured to receive, from the

second gNB, a second request instructing the control circuitry to report the first NCI and/or the first indicator of the first gNB identity length of the first gNB and the control circuitry is configured to report the first NCI and/or the first indicator of the first gNB identity length of the first gNB to the second gNB.

19. The user equipment of claim 6, wherein the control circuitry is configured to determine the first gNB and the second gNB being neighboring new radio cells, the receiver circuitry is configured to receive, from the second gNB, a second request instructing the control circuitry to report the first NCI without requesting the first indicator of the first gNB identity length of the first gNB when the second gNB knows the first gNB identity length, and the control circuitry is configured to report the first NCI of the first gNB to the second gNB.

20. The user equipment of claim 18, wherein the second gNB knows the first gNB identity length by pre-configuration that all neighboring new radio cells have a same gNB identity length with the second gNB.

21. The user equipment of claim 18, wherein the first gNB is a target cell and the second gNB is a serving cell.

22. The user equipment of claim 21, wherein the second gNB is configured to compare the first NCI with existing entries in an automatic neighbor relation (ANR) table when the control circuitry reports the first NCI to the second gNB.

23. A method of handling a new radio cell identity of a user equipment, comprising:

receiving, from a first next generation node B (gNB), a first system information block (SIB) comprising a first indicator of a first gNB identity length and a first new radio cell identity (NCI); and

distinguishing a first gNB identity from the first NCI according to the first indicator of the first gNB identity length, wherein the first indicator of the first gNB identity length defines the first gNB identity length being a fixed value and being equal to N bits, where N is an integer greater than or equal to 22 and less than or equal to 32.

24. The method of claim 23, wherein the first indicator of the first gNB identity length further defines the first gNB identity length being 22 bits, 23 bits, 24 bits, 25 bits, 26 bits, 27 bits, 28 bits, 29 bits, 30 bits, 31 bits, or 32 bits.

25. The method of any one of claims 23 and 24, wherein the first indicator of the first gNB identity length further defines the first gNB identity length being a bit string comprising M bits and M is equal to N.

26. The method of any one of claims 23 to 25, wherein the first indicator of the first gNB identity length is in minimum system information (MSI), remaining minimum system information (RMSI), or other system

information (OSI).

27. The method of any one of claims 23 to 26, wherein the first indicator of the first gNB identity length and the first NCI are in the MSI.

5 28. The method of any one of claims 23 to 27, further comprising receiving, from a second gNB, a second SIB comprising a second indicator of a second gNB identity length and a second NCI, distinguishing a second gNB identity from the second NCI according to the second indicator of the second gNB identity length, wherein the second indicator of the second gNB identity length defines the second gNB identity length being a fixed value and being equal to N bits.

10 29. The method of claim 28, wherein the second indicator of the second gNB identity length further defines the second gNB identity length being 22 bits, 23 bits, 24 bits, 25 bits, 26 bits, 27 bits, 28 bits, 29 bits, 30 bits, 31 bits, or 32 bits.

30. The method of claim 28, wherein the second indicator of the second gNB identity length further defines the second gNB identity length being a bit string comprising M bits and M is equal to N.

15 31. The method of claim 28, wherein the second indicator of the second gNB identity length is in minimum system information (MSI), remaining minimum system information (RMSI), or other system information (OSI).

32. The method of claim 28, wherein the second indicator of the second gNB identity length and the second NCI are in the MSI.

20 33. The method of claim 28, further comprising determining the first gNB and the second gNB being neighboring new radio cells, receiving, from the first gNB, a first request instructing the user equipment to report the second NCI and/or the second indicator of the second gNB identity length of the second gNB, and reporting the second NCI and/or the second indicator of the second gNB identity length of the second gNB to the first gNB.

25 34. The method of claim 28, further comprising determining the first gNB and the second gNB being neighboring new radio cells, receiving, from the first gNB, a first request instructing the user equipment to report the second NCI without requesting the second indicator of the second gNB identity length of the second gNB when the first gNB knows the second gNB identity length, and reporting the second NCI of the second gNB to the first gNB.

30 35. The method of claim 34, wherein the first gNB knows the second gNB identity length by pre-configuration that all neighboring new radio cells have a same gNB identity length with the first gNB.

36. The method of claim 34, wherein the first gNB is a serving cell and the second gNB is a target cell.

37. The method of claim 36, wherein the first gNB is configured to compare the second NCI with existing entries in an automatic neighbor relation (ANR) table when the user equipment reports the second NCI to the first gNB.

5 38. The method of claim 36, wherein the first gNB is configured to route a handover (HO) message to the second NCI properly when HO occurs.

39. The method of any one of claims 23 to 38, further comprising performing in a long term evolution-new radio (LTE-NR) dual connectivity (DC), such that an evolved node B (eNB) routes X2/Xn messages to the first gNB using the first indicator of the first gNB identity length.

10 40. The method of claim 28, further comprising determining the first gNB and the second gNB being neighboring new radio cells, receiving, from the second gNB, a second request instructing the user equipment to report the first NCI and/or the first indicator of the first gNB identity length of the first gNB, and reporting the first NCI and/or the first indicator of the first gNB identity length of the first gNB to the second gNB.

15 41. The method of claim 28, further comprising determining the first gNB and the second gNB being neighboring new radio cells, receiving, from the second gNB, a second request instructing the user equipment to report the first NCI without requesting the first indicator of the first gNB identity length of the first gNB when the second gNB knows the first gNB identity length, and reporting the first NCI of the first gNB to the second gNB.

20 42. The method of claim 40, wherein the second gNB knows the first gNB identity length by pre-configuration that all neighboring new radio cells have a same gNB identity length with the second gNB.

43. The method of claim 40, wherein the first gNB is a target cell and the second gNB is a serving cell.

44. The method of claim 43, wherein the second gNB is configured to compare the first NCI with existing entries in an automatic neighbor relation (ANR) table when the user equipment reports the first NCI to the second gNB.

25 45. A next generation radio access network (NG-RAN) node for wireless communication, comprising:

a first next generation node B (gNB) comprising a first control circuitry and a first transmitter circuitry coupled to the first receiver circuitry, wherein the first control circuitry is configured to generate a first system information block (SIB) comprising a first indicator of a first gNB identity length and a first new radio cell identity (NCI), and the first indicator of the first gNB identity length defines the first gNB identity length being
30 a fixed value and being equal to N bits, where N is an integer greater than or equal to 22 and less than or equal

to 32, and the first transmitter circuitry is configured to transmit the first SIB comprising the first indicator of the first gNB identity length and the first NCI to a user equipment.

46. The NG-RAN node of claim 45, wherein the first indicator of the first gNB identity length further defines the first gNB identity length being 22 bits, 23 bits, 24 bits, 25 bits, 26 bits, 27 bits, 28 bits, 29 bits, 30 bits, 31 bits, or 32 bits.

47. The NG-RAN node of any one of claims 45 to 46, wherein the first indicator of the first gNB identity length further defines the first gNB identity length being a bit string comprising M bits and M is equal to N.

48. The NG-RAN node of any one of claims 45 to 47, wherein the first indicator of the first gNB identity length is in minimum system information (MSI), remaining minimum system information (RMSI), or other system information (OSI).

49. The NG-RAN node of any one of claims 45 to 48, wherein the first indicator of the first gNB identity length and the first NCI are in the MSI.

50. The NG-RAN node of any one of claims 45 to 49, further comprising a second gNB comprising a second control circuitry and a second transmitter circuitry coupled to the second receiver circuitry, wherein the second control circuitry is configured to generate a second SIB comprising a second indicator of a second gNB identity length and a second NCI, the second indicator of the second gNB identity length defines the second gNB identity length being a fixed value and being equal to N bits, and the second transmitter circuitry is configured to transmit the second SIB comprising the second indicator of the second gNB identity length and the second NCI to the user equipment.

51. The NG-RAN node of claim 50, wherein the second indicator of the second gNB identity length further defines the second gNB identity length being 22 bits, 23 bits, 24 bits, 25 bits, 26 bits, 27 bits, 28 bits, 29 bits, 30 bits, 31 bits, or 32 bits.

52. The NG-RAN node of claim 50, wherein the second indicator of the second gNB identity length further defines the second gNB identity length being a bit string comprising M bits and M is equal to N.

53. The NG-RAN node of claim 50, wherein the second indicator of the second gNB identity length is in minimum system information (MSI), remaining minimum system information (RMSI), or other system information (OSI).

54. The NG-RAN node of claim 50, wherein the second indicator of the second gNB identity length and the second NCI are in the MSI.

55. The NG-RAN node of claim 50, wherein the first gNB and the second gNB are neighboring new radio

cells, the first gNB is configured to instruct the user equipment to report the second NCI and/or the second indicator of the second gNB identity length of the second gNB.

56. The NG-RAN node of claim 50, wherein the first gNB and the second gNB are neighboring new radio cells, the second gNB is configured to instruct the user equipment to report the second NCI without requesting the second indicator of the second gNB identity length of the second gNB when the first gNB knows the second gNB identity length.

57. The NG-RAN node of claim 56, wherein the first gNB knows the second gNB identity length by pre-configuration that all neighboring new radio cells have a same gNB identity length with the first gNB.

58. The NG-RAN node of claim 56, wherein the first gNB is a serving cell and the second gNB is a target cell.

59. The NG-RAN node of claim 56, wherein the first gNB is configured to compare the second NCI with existing entries in an automatic neighbor relation (ANR) table when the user equipment reports the second NCI to the first gNB.

60. The NG-RAN node of claim 56, wherein the first gNB is configured to route a handover (HO) message to the second NCI properly when HO occurs.

61. The NG-RAN node of any one of claims 45 to 60, wherein the NG-RAN node is configured to perform in a long term evolution-new radio (LTE-NR) dual connectivity (DC), such that an evolved node B (eNB) routes X2/Xn messages to the first gNB using the first indicator of the first gNB identity length.

62. The NG-RAN node of any one of claims 45 to 61, wherein the first gNB and the second gNB are neighboring new radio cells, the second gNB is configured to instructing the user equipment to report the first NCI and/or the first indicator of the first gNB identity length of the first gNB.

63. The NG-RAN node of any one of claims 45 to 62, wherein the first gNB and the second gNB are neighboring new radio cells, the second gNB is configured to instruct the user equipment to report the first NCI without requesting the first indicator of the first gNB identity length of the first gNB when the second gNB knows the first gNB identity length.

64. The NG-RAN node of claim 62, wherein the second gNB knows the first gNB identity length by pre-configuration that all neighboring new radio cells have a same gNB identity length with the second gNB.

65. The NG-RAN node of claim 62, wherein the first gNB is a target cell and the second gNB is a serving cell.

66. The NG-RAN node of claim 65, wherein the second gNB is configured to compare the first NCI with

existing entries in an automatic neighbor relation (ANR) table when the user equipment reports the first NCI to the second gNB.

67. A method of handling a new radio cell identity of a next generation radio access network (NG-RAN) node, comprising:

5 generating a first system information block (SIB) comprising a first indicator of a first gNB identity length and a first new radio cell identity (NCI) using a first next generation node B (gNB), wherein the first indicator of the first gNB identity length defines the first gNB identity length being a fixed value and being equal to N bits, where N is an integer greater than or equal to 22 and less than or equal to 32; and

10 transmitting the first SIB comprising the first indicator of the first gNB identity length and the first NCI to a user equipment.

68. The method of claim 67, wherein the first indicator of the first gNB identity length further defines the first gNB identity length being 22 bits, 23 bits, 24 bits, 25 bits, 26 bits, 27 bits, 28 bits, 29 bits, 30 bits, 31 bits, or 32 bits.

15 69. The method of any one of claims 67 and 68, wherein the first indicator of the first gNB identity length further defines the first gNB identity length being a bit string comprising M bits and M is equal to N.

70. The method of any one of claims 67 to 69, wherein the first indicator of the first gNB identity length is in minimum system information (MSI), remaining minimum system information (RMSI), or other system information (OSI).

20 71. The method of any one of claims 67 to 70, wherein the first indicator of the first gNB identity length and the first NCI are in the MSI.

72. The method of any one of claims 67 to 71, further comprising generating a second SIB comprising a second indicator of a second gNB identity length and a second NCI using a second gNB, wherein the second indicator of the second gNB identity length defines the second gNB identity length being a fixed value and being equal to N bits, transmitting the second SIB comprising the second indicator of the second gNB identity
25 length and the second NCI to the user equipment.

73. The method of claim 72, wherein the second indicator of the second gNB identity length further defines the second gNB identity length being 22 bits, 23 bits, 24 bits, 25 bits, 26 bits, 27 bits, 28 bits, 29 bits, 30 bits, 31 bits, or 32 bits.

30 74. The method of claim 72, wherein the second indicator of the second gNB identity length further defines the second gNB identity length being a bit string comprising M bits and M is equal to N.

75. The method of claim 72, wherein the second indicator of the second gNB identity length is in minimum system information (MSI), remaining minimum system information (RMSI), or other system information (OSI).

76. The method of claim 72, wherein the second indicator of the second gNB identity length and the second NCI are in the MSI.

77. The method of claim 72, wherein the first gNB and the second gNB are neighboring new radio cells, the first gNB is configured to instruct the user equipment to report the second NCI and/or the second indicator of the second gNB identity length of the second gNB.

78. The method of claim 72, wherein the first gNB and the second gNB are neighboring new radio cells, the second gNB is configured to instruct the user equipment to report the second NCI without requesting the second indicator of the second gNB identity length of the second gNB when the first gNB knows the second gNB identity length.

79. The method of claim 78, wherein the first gNB knows the second gNB identity length by pre-configuration that all neighboring new radio cells have a same gNB identity length with the first gNB.

80. The method of claim 78, wherein the first gNB is a serving cell and the second gNB is a target cell.

81. The method of claim 78, wherein the first gNB is configured to compare the second NCI with existing entries in an automatic neighbor relation (ANR) table when the user equipment reports the second NCI to the first gNB.

82. The method of claim 78, wherein the first gNB is configured to route a handover (HO) message to the second NCI properly when HO occurs.

83. The method of claim 77, wherein the NG-RAN node is configured to perform in a long term evolution-new radio (LTE-NR) dual connectivity (DC), such that an evolved node B (eNB) routes X2/Xn messages to the first gNB using the first indicator of the first gNB identity length.

84. The method of claim 72, wherein the first gNB and the second gNB are neighboring new radio cells, the second gNB is configured to instructing the user equipment to report the first NCI and/or the first indicator of the first gNB identity length of the first gNB.

85. The method of claim 72, wherein the first gNB and the second gNB are neighboring new radio cells, the second gNB is configured to instruct the user equipment to report the first NCI without requesting the first indicator of the first gNB identity length of the first gNB when the second gNB knows the first gNB identity length.

86. The method of claim 84, wherein the second gNB knows the first gNB identity length by pre-configuration that all neighboring new radio cells have a same gNB identity length with the second gNB.

87. The method of claim 84, wherein the first gNB is a target cell and the second gNB is a serving cell.

88. The method of claim 87, wherein the second gNB is configured to compare the first NCI with existing entries in an automatic neighbor relation (ANR) table when the user equipment reports the first NCI to the second gNB.

89. A non-transitory machine-readable storage medium having stored thereon instructions that, when executed by a computer, cause the computer to perform the method of any one of claims 1 to 44 and 67 to 88.

90. A terminal device, comprising: a processor and a memory configured to store a computer program, the processor configured to execute the computer program stored in the memory to perform the method of any one of claims 1 to 44.

91. A next generation node B (gNB), comprising: a processor and a memory configured to store a computer program, the processor configured to execute the computer program stored in the memory to perform the method of any one of claims 67 to 88.

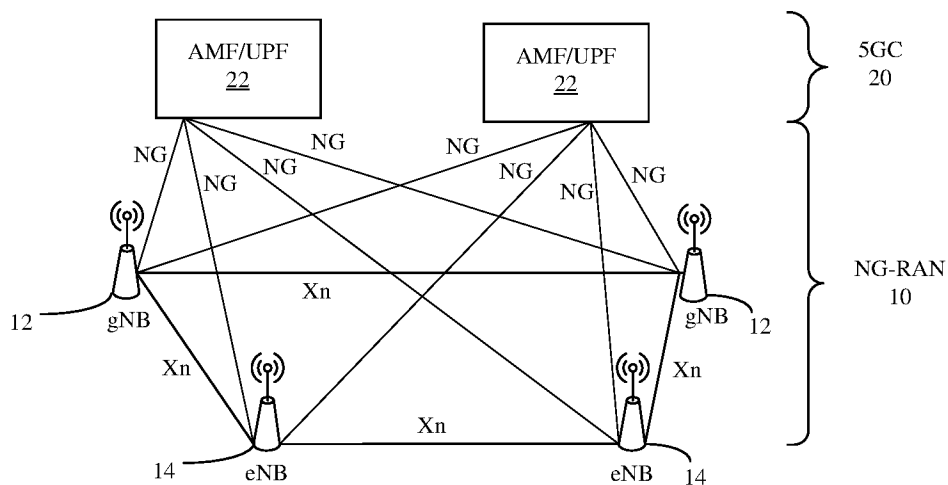


FIG. 1

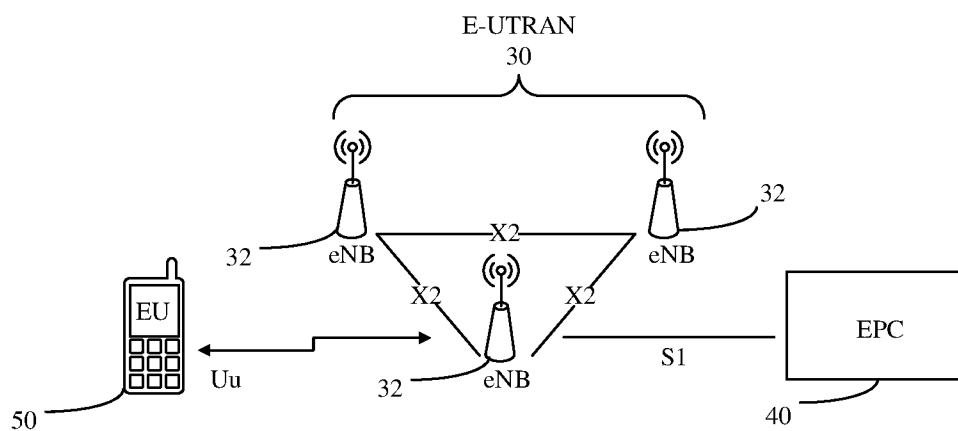


FIG. 2

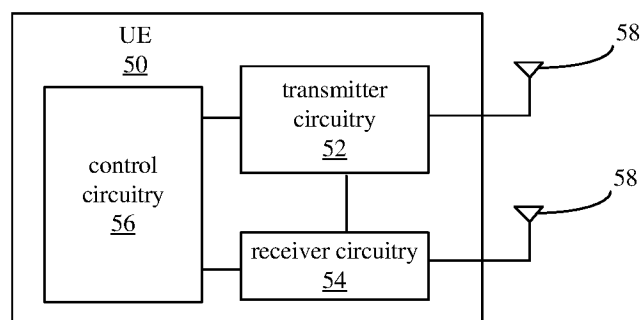


FIG. 3

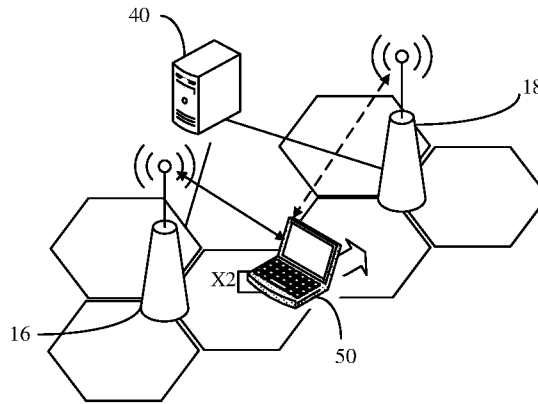


FIG. 4

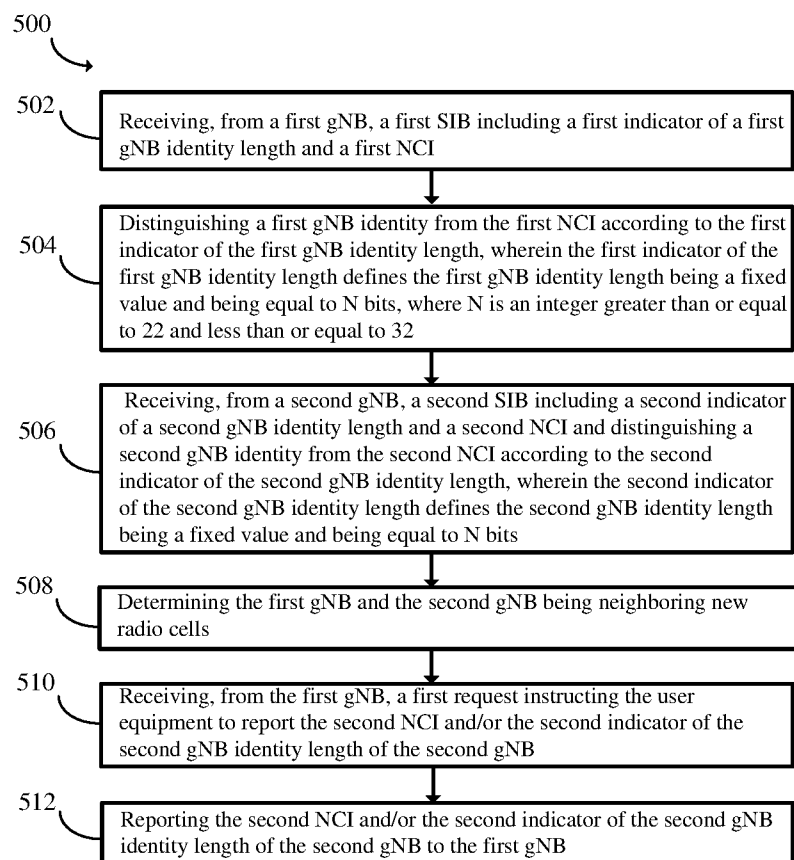


FIG. 5

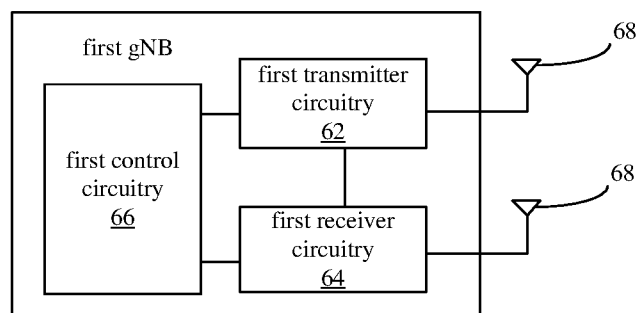


FIG. 6

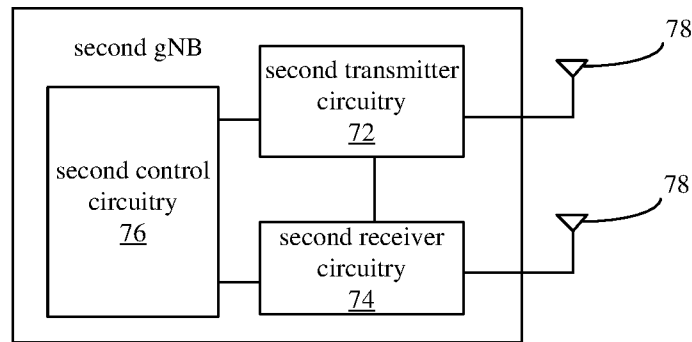


FIG. 7

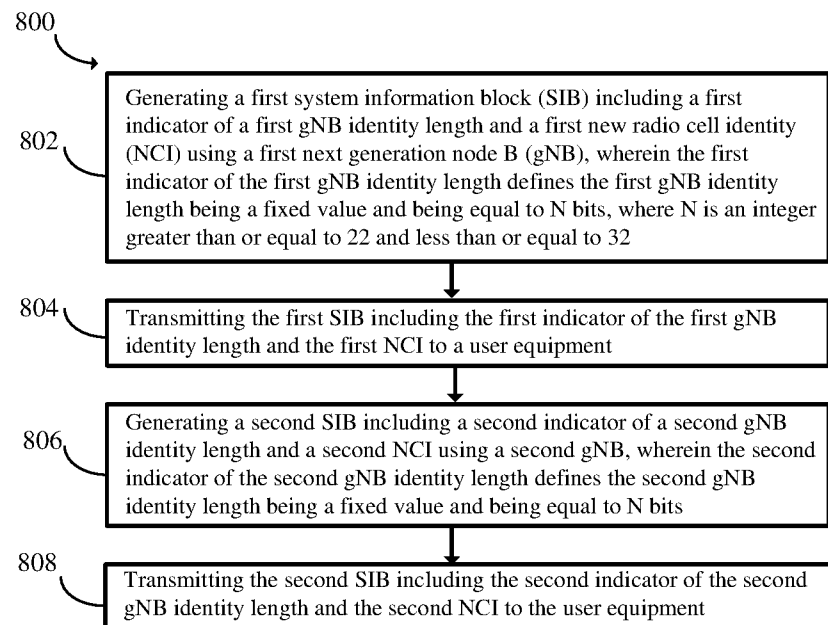


FIG. 8

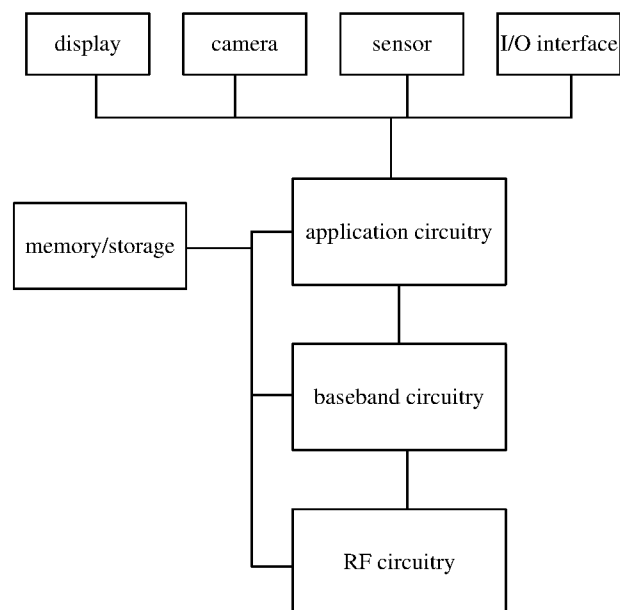


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2018/097812

A. CLASSIFICATION OF SUBJECT MATTER

H04W 92/10(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

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)

WPI;EPODOC;CNKI;CNPAT;3GPP: next, generation, node, NB, gNB, length, identity, ID, new, radio, cell, NCI, variable

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	MITSUBISHI ELECTRIC. "Variable length gNB IDs encoding" <i>3GPP TSG RAN WG3 #97bis R3-174075</i> , 13 October 2017 (2017-10-13), page 1-2	1-91
A	SAMSUNG, KT. "Discussions on NCI and gNB ID" <i>3GPP TSG-RAN WG3 Meeting #97bis R3-173843</i> , 13 October 2017 (2017-10-13), the whole document	1-91
A	CN 104469554 A (ZTE CORP.) 25 March 2015 (2015-03-25) the whole document	1-91

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

☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

29 September 2018

Date of mailing of the international search report

16 October 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

XU,Quan

Telephone No. 86-(010)-53961794

International application No.

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	104469554	A	25 March 2015	WO	2014187426	A1	27 November 2014
				US	2016226589	A1	04 August 2016
				EP	3046333	A1	20 July 2016