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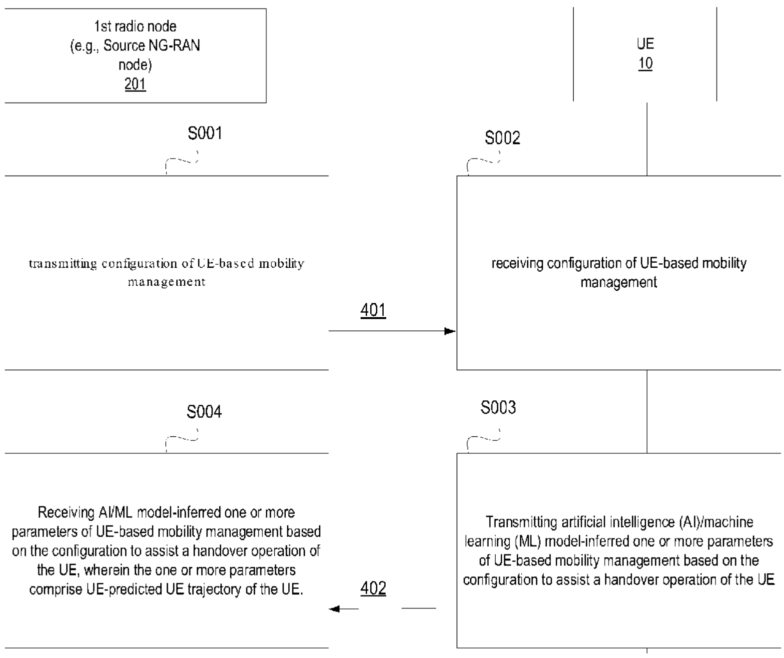

FIG. 3

(57) Abstract: A user equipment (UE) mobility management method executable by a UE. The UE receives configuration of UE-based mobility management and transmits artificial intelligence (AI) /machine learning (ML) model-inferred one or more parameters of UE-based mobility management based on the configuration to assist a handover operation of the UE. The one or more parameters comprise UE-predicted UE trajectory of the UE.

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UE MOBILITY MANAGEMENT METHOD, USER EQUIPMENT, AND BASE STATION

Technical Field

[0001] The present disclosure relates to the field of communication systems, and more particularly, to a UE mobility management method, user equipment, and base station.

Background Art

[0002] Artificial intelligence (AI) and machine learning (ML) are two related fields of computer science that aim to create systems that can perform tasks that normally require human intelligence and learning. ML can be used to solve various problems in domains such as natural language processing, computer vision, robotics, and bioinformatics. Recently, AI/ML has been increasingly applied to telecommunication networks.

[0003] The general framework for the study of AI/ML over air inference has been proposed. This framework illustrates how data collection can facilitate some AI actions, such as model training and model inference.

Technical Problem

[0004] The wireless communication system performance can be enhanced by AI/ML assisted services. Mobility enhancement, such as Mobility Robustness Optimization (MRO), has been discussed within the context of Self-Organizing Networks (SON) for Long-Term Evolution (LTE). The primary objective is to enhance mobility performance through automation.

[0005] MRO/SON offers a mechanism for the network to automatically adjust mobility parameters to enhance performance, potentially without the need for intervention from Operations, Administration, and Maintenance (OAM). The adjustment of mobility parameters typically should be controlled by OAM. Obtaining mobility parameters by the OAM for mobility management at the network side is relatively less real-time compared to the User Equipment (UE).

[0006] Hence, an AI/ML model monitoring method for enhancing the current wireless communication system is desired.

Technical Solution

[0007] An object of the present disclosure is to propose a wireless communication device, such as a user equipment (UE) or a base station, and a UE mobility management method.

[0008] In a first aspect, an embodiment of the invention provides a user equipment (UE) mobility management method, executable by a UE, comprising:

transmitting artificial intelligence (AI)/machine learning (ML) model-inferred one or more parameters of UE-based mobility management to assist a handover operation of the UE, wherein the one or more parameters comprise UE-predicted UE trajectory of the UE.

[0009] In a second aspect, an embodiment of the invention provides a user equipment (UE) comprising a processor configured to call and run a computer program stored in a memory, to cause a device in which the processor is installed to execute the disclosed method.

[0010] In a third aspect, an embodiment of the invention provides a user equipment (UE) mobility management method, executable by a base station serving as a first radio node, comprising:

receiving artificial intelligence (AI)/machine learning (ML) model-inferred one or more parameters of UE-based mobility management to assist a handover operation of a user equipment (UE), wherein the one or more parameters comprise UE-predicted UE trajectory of a user equipment (UE).

[0011] In a fourth aspect, an embodiment of the invention provides a base station comprising a processor configured to call and run a computer program stored in a memory, to cause a device in which the processor is installed to execute the disclosed method.

[0012] The disclosed method may be implemented in a chip. The chip may include a processor, configured to call and run a computer program stored in a memory, to cause a device in which the chip is installed to execute the disclosed method.

[0013] The disclosed method may be programmed as computer-executable instructions stored in non-transitory computer-readable medium. The non-transitory computer-readable medium, when loaded to a computer, directs a processor of the computer to execute the disclosed method.

[0014] The non-transitory computer-readable medium may comprise at least one from a group consisting of: a hard disk, a CD-ROM, an optical storage device, a magnetic storage device, a Read Only Memory, a Programmable Read Only Memory, an Erasable Programmable Read Only Memory, EPROM, an Electrically Erasable Programmable Read Only Memory and a Flash memory.

[0015] The disclosed method may be programmed as a computer program product, which causes a computer to execute the disclosed method.

[0016] The disclosed method may be programmed as a computer program, which causes a computer to execute the disclosed method.

Advantageous Effects

[0017] The disclosed feasible procedures, signaling, and corresponding elements can conserve network resources efficiently and reduce signaling overhead.

[0018] The disclosed method enhances UE mobility management and facilitates faster handover (HO) and accurate HO.

[0019] ■ Faster HO: In conventional handover, the UE should report the measurement report to the network, and then the network makes handover decision. In some embodiments of the disclosure, UE makes the decision for handover, and the handover will be conducted faster than conventional handover.

[0020] ■ Accurate HO: If the handover decision is performed by the network, UE should transmit UE history information regarding locations or movements of the UE to a target NG-RAN node. In some embodiments of the disclosure, handover is performed by the UE. Since UE has the UE history information, it is easier to perform a handover to the right cell.

[0021] In some embodiments of the disclosure, UE performs AI/ML model training and model inferencing to enhance UE mobility management.

[0022] The UE is enabled to use AI/ML model inference to infer the UE predicted UE trajectory and report the UE-predicted UE trajectory to the network, by which the network can have a more accurate predicted UE trajectory;

[0023] The network provides some kinds of information to the UE to assist the UE in AI/ML model training and handover decision.

[0024] After each HO, the target NG-RAN node provides feedback information to the UE to help the UE re-train the model.

Description of Drawings

[0025] 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.

[0026] FIG. 1 illustrates a schematic view showing a wireless communication system comprising a user equipment (UE), a base station, and a network entity.

[0027] FIG. 2 illustrates a schematic view showing a system with an AI/ML functional framework for executing a UE mobility management method using ML models.

[0028] FIG. 3 illustrates a schematic view showing an embodiment of the disclosed method.

[0029] FIG. 4 illustrates a schematic view showing a UE sending UE-predicted UE trajectory to the network.

[0030] FIG. 5 illustrates a schematic view showing a source NG-RAN node sending a HO request with UE-predicted UE trajectory to a target NG-RAN node.

[0031] FIG. 6 illustrates a schematic view showing an example of HO in the disclosed method.

[0032] FIG. 7 illustrates a schematic view showing an example of a UE at a boundary of cells.

[0033] FIG. 8 illustrates a schematic view showing an example of UE capability reporting and configuration for each UE capability.

[0034] FIG. 9 illustrates a schematic view showing a system for wireless communication according to an embodiment of the present disclosure.

DETAILED DESCRIPTION OF EMBODIMENTS

[0035] Embodiments of the 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.

[0036] Abbreviations used in the description are listed in the following:

Table 1

3GPP	Third Generation Partnership Project
3GPP	3rd Generation Partnership Project
5G	5th Generation
5GC	5G Core Network
ACK	Acknowledgment
AI	Artificial intelligence (AI)
AMF	Access and mobility management function
BS	Base station
CHO	Conditional Handover
CN	Core network

DAPS	Dual Active Protocol Stack
DRB	Data radio bearer
gNB	Generation Node B
HO	Handover
ID	Identifier/Identification
IE	Information element
MBR	Maximum Bit Rate
NG-RAN	Next-Generation Radio Access Network
NR	New Radio
PDU	Protocol Data Unit
QoS	Quality of Service
RAN	Radio Access Network
RB	Resource block/Radio block
RS	Reference signal
RSRP	Reference signal received power (RSRP)
RSRQ	Reference signal received quality (RSRQ)
SIB	System Information Block (SIB)
SINR	Signal-to-interference plus noise ratio (SINR)
SMF	Session management function
UE	User Equipment

[0037] Embodiments of the disclosure are related to artificial intelligence (AI) and machine learning (ML) for wireless communication system, such as LTE or new radio (NR) air interface, and address problems of AI-assisted UE mobility management. The disclosed feasible procedures, signaling, and corresponding elements can conserve network resources efficiently and reduce signaling overhead.

[0038] For simplicity, in the description an AI/ML model, AI model, ML model, and model are interchangeably used, also, AI/ML model monitoring and model monitoring are interchangeably used. In the description, Life cycle management (LCM) may comprise model selection, activation, deactivation, switching, fallback, model training, model monitoring, model registration, model deployment, model transfer retraining /fine-tuning at least for one-sided models and two-sided models.

[0039] AI/ML models can be installed and executed in one or more of UE(s) and NW (e.g., base station, LMF, etc.) In the description, one or more AI/ML models may be installed and executed in UE 10 or/and installed and executed in a NW 20, wherein the AI/ML model(s) is used for different feature and/or functions considering one-side model, and/or two side model.

[0040] With reference to FIG. 1, a telecommunication system including a UE 10a, a UE 10b, a base station (BS) 20a, and a network entity device 30 executes the disclosed method according to an embodiment of the present disclosure. FIG. 1 is shown for illustrative not limiting, and the system may comprise more UEs, BSs, and CN entities. Connections between devices and device components are shown as lines and arrows in the FIGs.

[0041] The base station 20a can operate as a gNB for 5G NR networks, an eNB for LTE networks, or a base station for future mobile network systems beyond 5G. A gNB is a 5G radio network node that connects to the core network via the NG interface. An eNB is a 4G radio network node that connects to the evolved packet core via the S1 interface. A base station for beyond 5G may be a smart virtual eNB (SVeNB) that can perform functions of EPS elements and reduce end-to-end delay.

[0042] The UE 10a may include a processor 11a, a memory 12a, and a transceiver 13a. The UE 10b may include a processor 11b, a memory 12b, and a transceiver 13b. The base station 20a may include a processor 21a, a memory 22a, and a transceiver 23a. The network entity device 30 may include a processor 31, a memory 32, and a transceiver 33. Each of the processors 11a, 11b, 21a, and 31 may be configured to implement proposed functions, procedures and/or methods described in the description. Layers of radio interface protocol may be implemented in the processors 11a, 11b, 21a, and 31. Each of the memory 12a, 12b, 22a, and 32 operatively stores a variety of programs and information to operate a connected processor. Each of the transceivers 13a, 13b, 23a, and 33 is operatively coupled with a connected processor, and transmits and/or receives radio signals or wireline signals. The UE 10a may be in communication with the UE 10b through a sidelink. The base station 20a may be an eNB, a gNB, or one of other types of radio nodes, and may configure radio resources for the UE 10a and UE 10b.

[0043] Each of the processors 11a, 11b, 21a, and 31 may include an application-specific integrated circuit (ASICs), other chipsets, logic circuits and/or data processing devices. Each of the memory 12a, 12b, 22a, and 32 may include read-only memory (ROM), a random-access memory (RAM), a flash memory, a memory card, a storage medium and/or other storage devices. Each of the transceivers 13a, 13b, 23a, and 33 may include baseband circuitry and radio frequency (RF) circuitry to process radio frequency signals. When the embodiments are implemented in software, the techniques described herein may be implemented with modules, procedures, functions, entities, and so on, that perform the functions described herein. The modules may be stored in a memory and executed by the processors. The memory may be implemented within a processor or external to the processor, in which those may be communicatively coupled to the processor via various means are known in the art.

[0044] The network entity device 30 may be a node in a CN. CN may include LTE CN or 5G core (5GC) which includes user plane function (UPF), session management function (SMF), access and mobility management function (AMF), unified data management (UDM), policy control function (PCF), control plane (CP)/user plane (UP) separation (CUPS), authentication server (AUSF), network slice selection function (NSSF), and the network exposure function (NEF). LMF, AF

[0045] An example of the UE in the description may include one of the UE 10a or UE 10b. An example of the base station in the description may include the base station 20a. The term network (NW) may be a gNB or a base station of any other types of base stations, such as an eNB or a base station for beyond 5G. Uplink (UL) transmission of a control signal or data may be a transmission operation from a UE to a base station. Downlink (DL) transmission of a control signal or data may be a transmission operation from a base station to a UE. A DL control signal may comprise downlink control information (DCI) or a radio resource control (RRC) signal, from a base station to a UE.

[0046] **AI/ML functional framework:**

[0047] A general functional framework of AIML is used to show the logical relationship among LCM actions. A possible AI/ML functional framework is show in FIG. 2.

[0048] With reference to FIG. 2, a system 100 for the disclosed method comprises units of data collection 101, model training unit 102, actor 103, and model inference 104. Please note that FIG. 2 does not necessarily limit the wireless communication method to the instant example. The wireless communication method is applicable to any design based on machine learning. The general steps comprise data collection and/or model training and/or model inference and/or (an) actor(s).

[0049] The data collection unit 101 is a function that provides input data to the model training unit 102 and the model inference unit 104. AI/ML algorithm-specific data preparation (e.g., data pre-processing and cleaning, formatting, and transformation) is not carried out in the data collection unit 101.

[0050] Examples of input data may include measurements from UEs or different network entities, feedback from Actor 103, and output from an AI/ML model.

[0051] Training data is data needed as input for the AI/ML Model training unit 102.

[0052] Inference data is data needed as input for the AI/ML Model inference unit 104.

[0053] The model training unit 102 is a function that performs the ML model training, validation, and testing. The Model training unit 102 is also responsible for data preparation (e.g., data pre-processing and cleaning, formatting, and transformation) based on training data delivered by the data collection unit 101, if required.

[0054] Model Deployment/Update between units 102 and 104 involves deployment or update of an AI/ML model (e.g., a trained machine learning model 105a or 105b) to the model inference unit 104. The model training unit 102 uses data units as training data to train a machine learning model 105a and generates a trained machine learning model 105b from the machine learning model 105a.

[0055] The model inference unit 104 is a function that provides AI/ML model inference output (e.g., predictions or decisions). The AI/ML model inference output is the output of the machine learning model 105b. The Model inference unit 104 is also responsible for data preparation (e.g., data pre-processing and cleaning, formatting, and transformation) based on inference data delivered by the data collection unit 101, if required.

[0056] The output shown between unit 103 and unit 104 is the inference output of the AI/ML model produced by the model inference unit 104.

[0057] An Actor 103 is a function that receives the output from the model inference unit 104 and triggers or performs corresponding actions. The actor 103 may trigger actions directed to other entities or to itself.

[0058] Feedback between unit 103 and unit 101 is information that may be needed to derive training or inference data or performance feedback.

[0059] The system 100 enables operators to train custom AI/ML models and integrate third-party AI/ML models under their control. This system architecture allows network-based AI/ML services to support a wider range of partners and deliver services that meet market needs. The disclosed system and methods can improve service quality and increase market competitiveness. At least one portion of all of the units, such as units 101 to 104, 105a and 105b, execute in a UE in the description, such as UE 10 in FIG. 3.

[0060] FIG. 3 shows an embodiment of the disclosed method. At least one wireless communication device, such as a UE 10 and a serving NG-RAN 210, executes a UE mobility management method. An example of the UE (e.g., the UE 10) in the description may include one of the UE 10a or UE 10b. An example of the base station (e.g., a source NG-RAN node 201 in FIG. 4 or a target NG-RAN node 202 in FIG. 5) in the description may include the base station 20a. The source NG-RAN node 201 or target NG-RAN node may be one or more entities in a radio access network (RAN), such as a gNB or base station.

[0061] The first radio node (e.g., source NG-RAN node) 201 transmits configuration 401 of UE-based mobility management (S001). The UE receives the configuration 401 of UE-based mobility management (S002) and transmits artificial intelligence (AI)/machine learning (ML) model-inferred one or more parameters 402 of UE-based mobility management based on the configuration to assist a handover operation of the UE (S003). The one or more parameters comprise UE-predicted UE trajectory of the UE. In some embodiments of the disclosure, the handover operation comprises a conditional handover (CHO).

[0062] The first radio node (e.g., source NG-RAN node) 201 receives the AI/ML model-inferred one or more parameters 402 of UE-based mobility management based on the configuration to assist a handover operation of the UE (S004).

[0063] In some embodiments of the disclosure, the AI/ML model-inferred one or more parameters of UE-based mobility management are transmitted in a handover request to the first radio node (i.e., the source NG-RAN node 201). The first radio node (e.g., source NG-RAN node) sends the handover request that conveys the UE-predicted UE trajectory to a target base station (e.g., a target NG-RAN node 202 in FIG. 5). The UE-predicted UE trajectory comprises a list of cells and predicted time of stay for each cell in cells surrounding the UE, the cells surrounding the UE comprise a serving cell and candidate target cells, and the candidate target cells are selected by the UE based on AI/ML model inference. The UE-predicted UE trajectory is generated by the UE based on AI/ML model inference that uses historical mobility data of the UE. Transmission of the UE-predicted UE trajectory to the first radio node (e.g., source NG-RAN node) can be triggered under one of the following conditions:

[0064] when the UE is prepared to perform handover,

[0065] when the UE-predicted UE trajectory is generated by the UE based on AI/ML model inference, or

[0066] when the UE intends to update predicted UE trajectory stored in the first radio node (e.g., source NG-RAN node) by the UE-predicted UE trajectory.

[0067] In some embodiments of the disclosure, UE performs cell measurements for one or more cells in a list of cells that surrounds the UE.

[0068] The UE sends a first request message (e.g., handover resource preparation request) to the first radio node (e.g., source NG-RAN node) to request radio resource of UE-suggested candidate target cells for the handover operation, the first request message includes a cell ID (e.g., a physical cell ID or a global cell ID) of a candidate target base station, UE-suggested candidate target cells, UE-suggested data radio bearer (DRB) for dual active protocol stack (DAPS), and the UE-predicted UE trajectory.

[0069] In some embodiments of the disclosure, the first radio node (e.g., source NG-RAN node) sends a HO request with the UE-predicted UE trajectory to the candidate target base station. The candidate target base station sends a HO request acknowledgement to the first radio node (e.g., source NG-RAN node).

The first radio node (e.g., source NG-RAN node) sends to the UE a response message (e.g., RRCReconfiguration message) that conveys acknowledgement of the first request message (e.g., HO resource preparation request ack), a cause value received from the candidate target base station, and configuration of each resource block (RB) accepted by the candidate target base station. The UE may interpret the cause value to understand the reason that why the second radio node (e.g., target NG-RAN node) 202 rejects establishment of a certain QoS flow or PDU session and may use the cause value to retrain the model.

[0070] The UE makes a handover decision based on AI/ML model inference and sends a notification message (e.g., RRCReconfigurationComplelete message) that conveys the handover decision to the first radio node (e.g., source NG-RAN node). The AI/ML model inference is performed based on the cell measurement

[0071] In some embodiments of the disclosure, the UE receives assistance information for model training sent from the first radio node (e.g., source NG-RAN node), and the assistance information includes one or more types of the following information:

[0072] current load status of a serving cell and a candidate target cell;

[0073] predicted load of the serving cell and the candidate target cell; and

[0074] a history HO failure rate of the candidate target cell.

[0075] In some embodiments of the disclosure, the assistance information is broadcast or groupcast periodically. In some embodiments of the disclosure, the UE sends a request for the assistance information to the first radio node (e.g., source NG-RAN node). The first radio node receives a request for the assistance information from the UE and sends the assistance information in a unicast message to the UE in response to the request. The UE receives the assistance information in a unicast message from the first radio node (e.g., source NG-RAN node) in response to the request.

[0076] In some embodiments of the disclosure, a target base station provides feedback information for model retraining to the UE, the feedback information includes one or more of parameters of UE performance and parameters of UE handover failure cause. The parameters of UE performance include UE quality of service (QoS), throughput, and Maximum Bit Rate (MBR). The parameters of UE handover failure cause include “too early HO”, “too late HO”, or “HO to wrong cell”.

[0077] In some embodiments of the disclosure, the UE transmits a UE capability report that conveys UE capability of AI/ML enhancement to the first radio node (e.g., source NG-RAN node). The UE capability of AI/ML enhancement indicates one or more of:

[0078] whether the UE supports UE-predicted UE trajectory; and

[0079] whether the UE supports autonomously adjust the parameters for UE-based mobility management.

[0080] In some embodiments of the disclosure, based on the UE capability report, the first radio node (e.g., source NG-RAN node) provides and transmits configuration for each UE capability reported by the UE in UE capability report to the UE, and the configuration for each UE capability indicates:

[0081] whether the UE is enabled to transmit the UE-predicted UE trajectory to the first radio node (e.g., source NG-RAN node); and

[0082] whether the UE is enabled to adjust the parameters for UE-based mobility management.

[0083] In some embodiments of the disclosure, reporting of the UE-predicted UE trajectory from the UE to the first radio node (e.g., source NG-RAN node) is triggered based on a scheme of event triggered reporting or a scheme of a periodic reporting;

[0084] trigger events of the event triggered reporting comprises HO activation events or events generated by AI/ML model inference (e.g., an update of cell ID of a candidate target base station, UE-suggested candidate target cells, or the UE-predicted UE trajectory); and/or

[0085] periodicity of the periodic reporting is configured by the first radio node (e.g., source NG-RAN node).

[0086] In some embodiments of the disclosure, adjusting and reporting of the parameters for UE-based mobility management from the UE to the first radio node (e.g., source NG-RAN node) is triggered based on a scheme of event triggered reporting. Trigger events of the event triggered reporting comprises HO activation events or events generated by AI/ML model inference (e.g., an update of cell ID of a candidate target base station, UE-suggested candidate target cells, or the UE-predicted UE trajectory).

[0087] **Embodiment 1: predicted UE trajectory generated by UE**

[0088] The network has the capability to generate a predicted UE trajectory based on the UE's mobility history. Subsequently, the first radio node (e.g., source NG-RAN node) transmits the predicted UE trajectory in a HO request along with the predicted time of stay for each cell to the second radio node (e.g., target NG-RAN node). The predicted UE trajectory is comprised of a list of cells and their corresponding time of stay, as defined in TS 38.423.

[0089] UE (e.g., UE 10) may generate predicted UE trajectory which may be more accurate than predicted UE trajectory generated by gNB and send predicted UE trajectory to the network, such as the serving NG-RAN node (e.g., source NG-RAN node) and/or the second radio node (e.g., target NG-RAN node). Consequently, the UE can thus enhance UE mobility management. The predicted UE trajectory generated by UE may be referred to as UE-predicted UE trajectory.

[0090] With reference to FIG. 4, the UE 10 transmits the UE-predicted UE trajectory along with predicted time of stay for each cell to a first radio node (e.g., source NG-RAN node) 201. The first radio node (e.g., source NG-RAN node) 201 can also be a serving NG-RAN node in an HO operation.

[0091] Based on the UE-predicted UE trajectory, the serving NG-RAN node (e.g., source NG-RAN node) 201 can prepare the radio resources for an intra-gNB target cell of the UE (in the UE-predicted UE trajectory) or send UE-predicted UE trajectory to a second radio node (e.g., target NG-RAN node) 202.

[0092] With reference to FIG. 5, subsequently, the first radio node (e.g., source NG-RAN node) 201 transmits the UE-predicted UE trajectory in a HO request along with the predicted time of stay for each cell to a second radio node (e.g., target NG-RAN node) 202. The UE-predicted UE trajectory is comprised of a list of cells and their corresponding predicted time of stay for each cell, as defined in TS 38.423.

[0093] The first radio node (e.g., source NG-RAN node) 201 sends the handover request that conveys the UE-predicted UE trajectory to the second radio node (e.g., target NG-RAN node) 202. The UE-predicted UE trajectory includes a cell list and the predicted time of stay of each cell.

[0094] Transmission of the UE-predicted UE trajectory to the network (e.g., source NG-RAN node) can be triggered under one of the following conditions:

- when the UE is prepared to perform handover, or
- when the UE intends to update predicted UE trajectory stored in the network by the UE-predicted UE trajectory (when the new predicted UE trajectory is inferred).

[0095] **Embodiment 2: Procedure of UE decided handover**

[0096] In the legacy HO procedure, UE (e.g., the UE 10) performs cell measurement and reports a result of the cell measurement (referred to as measurement result) to the network, such as the first radio node (e.g., source NG-RAN node) 201. The network makes the HO decision. The HO decision is up to network implementation, which is not standardized.

[0097] In the legacy CHO procedure, the UE (e.g., the UE 10) also reports measurement result to the network only, such as the first radio node (e.g., source NG-RAN node) 201, and the network selects a number of candidate target cells for the UE (e.g., the UE 10). After that, the network configures handover condition(s) to the UE (e.g., the UE 10). When one of the conditions is satisfied, the UE detaches from a serving cell that currently serves the UE and attaches to a target cell by sending a RRCReconfigurationComplete message to the target cell to notify that the HO is completed successfully. The key issue is how the network configures the cell measurement and measurement report for the UE. For example, the configuration of cell measurement specifies which cells should be measured and reported accordingly, etc.

[0098] TS 38.331 defines the procedure for conducting Conditional Handover (CHO) in both the user plane and control plane.

[0099] Many aspects of the difference between the legacy conditional handover of the conditional handover in the disclosed method may be discerned through the detailed embodiments of the disclosure. Typically, conditional handover is controlled by configuration (e.g., handover condition(s) and candidate target cell(s)). In some embodiments of the disclosure, a UE (e.g., UE 10) selects handover condition(s) and candidate target cell(s) based on model inference and informs the network of the selected handover condition(s) and candidate target cell(s).

[0100] A Conditional Handover (CHO) refers to a handover executed by the User Equipment (UE) when one or more specific handover execution conditions are met. Upon receiving the CHO configuration from the network (e.g., a gNB), the UE begins evaluating the execution condition(s), and this evaluation ceases once a handover is executed.

[0101] The following principles govern CHO:

[0102] ■ The CHO configuration comprises the configuration of CHO candidate cell(s) generated by the candidate gNB(s) (e.g., target NG-RAN node 202) and execution condition(s) generated by the first radio node (e.g., source NG-RAN node).

[0103] ■ An execution condition may include one or two trigger conditions (CHO events A3/A5, as defined in the 3GPP standards). Only a single Reference Signal (RS) type is supported in the evaluation, and a maximum of two different trigger quantities (e.g., RSRP and RSRQ, RSRP and SINR, etc.) can be configured simultaneously for evaluating the CHO execution condition of a single candidate cell.

[0104] ■ Before any CHO execution condition is satisfied, if the UE receives a Handover (HO) command (without CHO configuration), it shall execute the HO procedure as described in TS 38.331

clause 9.2.3.2, disregarding any previously received CHO configuration.

[0105] ■ During CHO execution, starting from the moment the UE synchronizes with the target cell, the UE ceases to monitor the source cell.

[0106] Conditional Handover (CHO) is supported for the Integrated Access Backhaul (IAB) Multi-TRX (MT) concerning intra- donor and inter-donor IAB-node migration and Backhaul Radio Link Failure (BH RLF) recovery.

[0107] However, in current release of the specification, CHO is not supported for Next-Generation Core (NG-C) based handover.

[0108] C-plane handling:

[0109] Similar to intra-NR-RAN handover, in intra-NR-RAN Conditional Handover (CHO), both the preparation and execution phases of a conditional handover procedure occur without the direct involvement of the 5G Core (5GC). Specifically, the preparation messages are directly exchanged between gNBs (base stations). Additionally, the second radio node (e.g., target NG-RAN node, i.e., the gNB to which the User Equipment (UE) is being handed over) initiates the resource release from the first radio node (e.g., source NG-RAN node) during the completion phase of the conditional handover.

[0110] In R3-232523, a Baseline Change Request to 3GPP TS 38.423, for Artificial Intelligence/Machine Learning (AI/ML) implementation in Next-Generation Radio Access Network (NG-RAN), RAN3 has introduced the inclusion of predicted trajectory within a handover request message over the Xn interface.

[0111] The Next-Generation Radio Access Network (NG-RAN) is the radio access network for 5G networks. An NG-RAN node can be split into an NG-RAN centralized unit and one or more NG-RAN distributed units. The NG-RAN access node establishes an association with the access and mobility management function (AMF). An NG-RAN may comprise a base station in the description. A first radio node (e.g., source NG-RAN node) may transmit a handover request (i.e., a HANDOVER REQUEST message) to a second radio node (e.g., target NG-RAN node). This HANDOVER REQUEST message is sent by the first radio node (e.g., source NG-RAN node) to the second radio node (e.g., target NG-RAN node) to request the preparation of resources for a handover. The second radio node (e.g., target NG-RAN node) in response to transmits a handover request acknowledge (i.e., a HANDOVER REQUEST ACKNOWLEDGE message) to the first radio node (e.g., source NG-RAN node).

[0112] If a Cell-Based UE Trajectory Prediction Information Element (IE) is included in the HANDOVER REQUEST message, the second radio node (e.g., target NG-RAN node) shall, if supported, interpret the content of the UE trajectory prediction as the predicted cells for the UE trajectory provided by the first radio node (e.g., source NG-RAN node). The second radio node (e.g., target NG-RAN node) may utilize this information for mobility decisions, among other purposes.

[0113] In some embodiments of the disclosure, UE-decided HO scheme is utilized. In the scheme, UE (e.g., the UE 10) makes HO decisions for a handover operation. Some key features for this solution include:

- The UE selects a candidate target cell, and the criteria for selecting candidate target cell is up to UE decision.
- The UE makes HO decision to select one candidate target cell from the candidate target cells.
- When UE has selected candidate target cell, the UE notifies the network regarding the candidate

target cell(s).

- The first radio node (e.g., source NG-RAN node) 201 prepares the radio resources for the handover to the candidate second radio node (e.g., target NG-RAN node) 202s.
- The first radio node (e.g., source NG-RAN node) 201 configures the UE with the radio resources for handover.
- When one or more of the handover conditions are triggered, the UE detaches from the serving cell and attaches to the target cell. The UE thus enhance a legacy CHO procedure.

[0114] Dual Active Protocol Stack (DAPS):

[0115] With reference to FIG. 6, the UE (e.g., UE 10) performs the following operations to enhance HO.

[0116] Step S101: The UE performs cell measurements for one or more cells in the list of cells that surrounds the UE; however, the UE will not report the measurement results as the handover decision is solely determined by the UE.

[0117] Step S102: The UE determines UE-predicted UE trajectory based on AI/ML model inferencing. The UE sends a HO resource preparation request to the first radio node (e.g., source NG-RAN node) 201 to request radio resource for handover. The HO resource preparation request includes physical cell ID(s) of selected candidate target NG-RAN node(s) (e.g., a physical cell ID of a candidate target NG-RAN node 202) and UE-predicted UE trajectory.

[0118] Step S103: The first radio node (e.g., source NG-RAN node) 201 sends a HO request with the UE-predicted UE trajectory to the second radio node (e.g., target NG-RAN node) 202.

[0119] Step S104: The second radio node (e.g., target NG-RAN node) 202 sends a HO request acknowledgement to the first radio node (e.g., source NG-RAN node) 201 as usual.

[0120] Step S105: The first radio node (e.g., source NG-RAN node) 201 sends to the UE a RRCReconfiguration message that conveys acknowledgement of the first request message (i.e., HO resource preparation request ack), a cause value, and configuration of each resource block (RB) accepted by the second radio node (e.g., target NG-RAN node) 202 in step S104. If not accepting any HO resource preparation request, the first radio node (e.g., source NG-RAN node) 201 forwards the cause value of each unaccepted QoS flow and PDU session to the UE.

[0121] Step S106: The UE makes a handover decision.

[0122] Step S107: The UE sends a RRCReconfiguration message to the second NG-RAN node 202, notify the network of the handover decision. The RRCReconfiguration message conveys the handover decision.

[0123] The UE operation thus enhances a conditional handover procedure.

[0124] **Benefit of UE decided handover compared to CHO:**

[0125] With reference to FIG. 7, in CHO scenario, the UE (e.g., UE 10) will report measurement report regarding candidate target cell C1, C2, and C3 to the first radio node (e.g., source NG-RAN node) 201 through serving cell C0. Thus, the network (including source NG-RAN node 201) has to prepare radio resources in the candidate target cell C1, C2, and C3. In an embodiment of the disclosure, the UE selects candidate target cell in a HO decision based on AI/ML model inferencing. For example, the UE can only select candidate target cell C1 and C2 as the UE is moving to the south, because UE knows its trajectory better than the network, and radio resource of the candidate target cell C3 can be saved.

[0126] **Embodiment 3: assistant information provided by network.**

[0127] Based on the architecture of AI/ML, the model training should collect data for the purpose of model training. To facilitate model training in the UE (e.g., the UE 10), the network can provide assistance information to the UE.

[0128] Network (e.g., the source NG-RAN node 201 or the target NG-RAN node 202) can provide assistance information to the UE for model training on the UE side and to assist the UE to make a right handover decision.

[0129] **The assistance information is detailed in the following:**

[0130] The assistance information sent from the network (e.g., the source NG-RAN node 201 or the target NG-RAN node 202) to the UE (e.g., the UE 10) can include one or more types of the following information:

- current load status of a serving cell and candidate target cell(s);
- predicted load of a serving cell and candidate target cell(s); and
- a history HO failure rate of candidate target cells.

[0131] The assistance information can be sent from the network (e.g., the source NG-RAN node 201 or the target NG-RAN node 202) to the UE (e.g., the UE 10) periodically through broadcast or groupcast. For example, the network sends the assistance information in a system information block (SIB) to the UE so that the UE uses the assistance information from time to time for model training.

[0132] **Embodiment 4: UE trajectory/performance feedback from the network**

[0133] To enhance AI/ML model inference, after each HO performed by the UE, the second radio node (e.g., target NG-RAN node) 202 provides feedback information to the UE to help the UE re-train the model. The feedback information may be used as the feedback in system 100. The feedback information from the network includes one or more of the following parameters:

- UE performance: The UE performance, for example, includes UE quality of service (QoS), throughput, or Maximum Bit Rate (MBR); and
- UE handover failure cause: The UE handover failure cause, for example, includes “too early HO”, “too late HO”, or “HO to wrong cell”.

[0134] **Embodiment 5: configuration of UE-based mobility management.**

[0135] Typically, the UE behavior should be controlled by the network. In that sense, the network should be able to configure the UE behavior regarding e.g., whether the UE is allowed to infer parameters of the UE-based mobility management and whether the UE is allowed/requested to report the inferred parameters of UE-based mobility management.

[0136] **The following configuration/capability should be exchanged between the network and the UE:**

[0137] UE capability reporting to the network:

[0138] With reference to FIG. 8, the UE (e.g., the UE 10) transmits a UE capability report that conveys UE capability of AI/ML enhancement to the network (e.g., the source NG-RAN node 201) (S301). For example, the UE capability of AI/ML enhancement indicates one or more of:

- whether the UE supports UE-predicted UE trajectory; and
- whether the UE supports autonomously adjust the parameters for UE-based mobility management.

[0139] Configuration of UE capability from the network to UE:

[0140] From the network point of view, the UE behavior is fully controlled by the network. The network (e.g., the source NG-RAN node 201) receives the UE capability report. Based on the UE capability report, the network (e.g., the source NG-RAN node 201) provides and transmits configuration for each UE capability reported by the UE in UE capability report to the UE (S302).

[0141] The network configures the UE in the configuration regarding:

- whether the UE is enabled to transmit UE-predicted UE trajectory to the first radio node (e.g., source NG-RAN node); and
- whether the UE is enabled to adjust the parameters for UE-based mobility management.

[0142] The reporting of the UE-predicted UE trajectory from the UE may be triggered based on a scheme of event triggered reporting or a scheme of a periodic reporting. Trigger events of the event triggered reporting may comprise HO activation events or events generated by AI/ML model inference. The first radio node (e.g., source NG-RAN node) 201 may configure periodicity of the periodic reporting.

[0143] The parameters for UE-based mobility management can be changed by UE autonomously. When one or more of handover execution conditions are satisfied, the UE will execute the handover. These parameters are defined in TS38.331. For example, the parameters comprise what is listed in the following table.

[0144] Table 2

```
    CondReconfigToAddModList-r16 ::= SEQUENCE (SIZE (1.. maxNrofCondCells-r16)) OF
CondReconfigToAddMod-r16
    CondReconfigToAddMod-r16 ::= SEQUENCE {
    condReconfigId-r16 CondReconfigId-r16,
    condExecutionCond-r16 SEQUENCE (SIZE (1..2)) OF MeasId OPTIONAL, -- Need M
    condRRCReconfig-r16 OCTET STRING (CONTAINING RRCReconfiguration) OPTIONAL, -- Cond
condReconfigAdd
    ...,
    [[
    condExecutionCondSCG-r17 OCTET STRING (CONTAINING CondReconfigExecCondSCG-r17)
OPTIONAL -- Need M
    ]]
    }
CondReconfigExecCondSCG-r17 ::= SEQUENCE (SIZE (1..2)) OF MeasId
```

[0145] Trigger events of the adjusting and reporting of the parameters for UE-based mobility management to the first radio node (e.g., source NG-RAN node) 201 may comprise HO activation events or events generated by AI/ML model inference.

[0146] FIG. 9 is a block diagram of an example system 700 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 the system 700 including a radio frequency (RF) circuitry 710, a baseband circuitry 720, a processing unit 730, a memory/storage 740, a display 750, a camera 760, a sensor 770, and an input/output (I/O) interface 780, coupled with each other as illustrated.

[0147] The processing unit 730 may include circuitry, such as, but not limited to, one or more single-core or multi-core processors. The processors may include any combinations of general-purpose processors and dedicated processors, such as graphics processors and application processors. The processors may be coupled with the memory/storage and configured to execute instructions stored in the memory/storage to enable various applications and/or operating systems running on the system.

[0148] 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 5G NR, LTE, 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 configured to support radio communications of more than one wireless protocol may be referred to as multi-mode baseband circuitry. In various embodiments, the baseband circuitry 720 may include circuitry to operate with signals that are not strictly considered as being in a baseband frequency. For example, in some embodiments, baseband circuitry may include circuitry to operate with signals having an intermediate frequency, which is between a baseband frequency and a radio frequency.

[0149] In various embodiments, the system 700 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, the system may have more or less components, and/or different architectures. Where appropriate, the 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.

[0150] The embodiment of the present disclosure is a combination of techniques/processes that can be adopted in 3GPP specification to create an end product.

[0151] 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.

[0152] Embodiments of the disclosure describe a comprehensive method for UE handover operation. The disclosure enhances AI/ML models for wireless communication systems.

[0153] The disclosed feasible procedures, signaling, and corresponding elements can conserve network resources efficiently and reduce signaling overhead.

[0154] The disclosed method enhances UE mobility management and facilitates faster handover (HO) and accurate HO.

[0155] ■ Faster HO: In conventional handover, the UE should report the measurement report to the network, and then the network makes handover decision. In some embodiments of the disclosure, UE make the decision for handover, and the handover will be conducted faster than conventional handover.

[0156] ■ Accurate HO: If the handover decision is performed by the network, UE should transmit UE history information regarding locations or movements of the UE to a second radio node (e.g., target NG-RAN node). In some embodiments of the disclosure, handover is performed by the UE. Since UE has the UE history information, it is easier to perform a handover to the right cell.

[0157] In some embodiments of the disclosure, UE performs AI/ML model training and model inferencing to enhance UE mobility management.

[0158] The UE is enabled to infer the UE-predicted UE trajectory using AI/ML model inferencing and report the UE-predicted UE trajectory to the network, by which the network can have a more accurate predicted UE trajectory;

[0159] The network provides some kinds of information to the UE to assist the UE in AI/ML model training and handover decision.

[0160] After each HO, the second radio node (e.g., target NG-RAN node) provides feedback information to the UE to help the UE re-train the model.

[0161] 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.

Claims:

1. A user equipment (UE) mobility management method, executable by a UE, comprising:
transmitting artificial intelligence (AI)/machine learning (ML) model-inferred one or more parameters of UE-based mobility management to assist a handover operation of the UE, wherein the one or more parameters comprise UE-predicted UE trajectory of the UE.

2. The UE mobility management method of claim 1, wherein before the transmitting further comprises receiving configuration of UE-based mobility management; and
the transmitting of model-inferred one or more parameters of UE-based mobility management is based on the configuration.

3. The UE mobility management method of claim 2, wherein the configuration of UE-based mobility management is received from a first radio node, and the AI/ML model-inferred one or more parameters of UE-based mobility management are transmitted in a handover request to the first radio node.

4. The UE mobility management method of claim 3, wherein the handover request that conveys the UE-predicted UE trajectory is sent by the first radio node to a second radio node.

5. The UE mobility management method of claim 3, wherein the UE-predicted UE trajectory comprises a list of cells and predicted time of stay for each cell in cells surrounding the UE, the cells surrounding the UE comprise a serving cell and candidate target cells, and the candidate target cells are selected by the UE based on AI/ML model inference.

6. The UE mobility management method of claim 3, wherein transmission of the UE-predicted UE trajectory to the first radio node is triggered under one of the following conditions:
when the UE is prepared to perform handover,
when the UE-predicted UE trajectory is generated by the UE based on AI/ML model inference, or
when the UE intends to update predicted UE trajectory stored in the first radio node by the UE-predicted UE trajectory.

7. The UE mobility management method of claim 6, wherein the UE-predicted UE trajectory is generated by the UE based on AI/ML model inference that uses historical mobility data of the UE.

8. The UE mobility management method of claim 1 or 3, wherein the handover operation comprises a conditional handover (CHO).

9. The UE mobility management method of claim 3, wherein the UE performs cell measurements for one or more cells in a list of cells that surrounds the UE;
the UE sends a first request message to the first radio node to request radio resource of UE-suggested candidate target cells for the handover operation, the first request message includes a cell ID of a candidate second radio node, UE-suggested candidate target cells, UE-suggested data radio bearer (DRB) for dual active protocol stack (DAPS), and the UE-predicted UE trajectory.

10. The UE mobility management method of claim 9, wherein
a HO request with the UE-predicted UE trajectory is sent by the first radio node to the second radio node;
a HO request acknowledgement is sent by the second radio node to the first radio node;
a response message is sent from the first radio node to the UE and conveys acknowledgement of the first request message, a cause value received from the second radio node, and configuration of each resource block (RB) accepted by the second radio node; and
the UE makes a handover decision based on AI/ML model inference and sends a notification message that

conveys the handover decision to the first radio node, wherein the AI/ML model inference is performed based on the cell measurement.

11. The UE mobility management method of claim 3, wherein the UE receives assistance information for model training sent from the first radio node, and the assistance information includes one or more types of the following information:

current load status of a serving cell and a candidate target cell;

predicted load of the serving cell and the candidate target cell; and

a history HO failure rate of the candidate target cell.

12. The UE mobility management method of claim 11, wherein the assistance information is broadcast or groupcast periodically.

13. The UE mobility management method of claim 11, wherein the UE sends a request for the assistance information to the first radio node and receives the assistance information in a unicast message from the first radio node in response to the request.

14. The UE mobility management method of claim 3, wherein feedback information for model retraining is provided by a second radio node to the UE, the feedback information includes one or more of parameters of UE performance and parameters of UE handover failure cause.

15. The UE mobility management method of claim 14, wherein the parameters of UE performance include UE quality of service (QoS), throughput, and Maximum Bit Rate (MBR).

16. The UE mobility management method of claim 3, wherein the UE transmits a UE capability report that conveys UE capability of AI/ML enhancement to the first radio node.

17. The UE mobility management method of claim 16, wherein the UE capability of AI/ML enhancement indicates one or more of:

whether the UE supports UE-predicted UE trajectory; and

whether the UE supports autonomously adjust the parameters for UE-based mobility management.

18. The UE mobility management method of claim 16, wherein based on the UE capability report, configuration for each UE capability reported by the UE in UE capability report is provided and transmitted by the first radio node to the UE, and the configuration for each UE capability indicates:

whether the UE is enabled to transmit the UE-predicted UE trajectory to the first radio node; and

whether the UE is enabled to adjust the parameters for UE-based mobility management.

19. The UE mobility management method of claim 18, wherein reporting of the UE-predicted UE trajectory from the UE to the first radio node is triggered based on a scheme of event triggered reporting or a scheme of a periodic reporting;

trigger events of the event triggered reporting comprises HO activation events or events generated by AI/ML model inference; and/or

periodicity of the periodic reporting is configured by the first radio node.

20. The UE mobility management method of claim 18, wherein adjusting and reporting of the parameters for UE-based mobility management from the UE to the first radio node is triggered based on a scheme of event triggered reporting;

trigger events of the event triggered reporting comprises HO activation events or events generated by AI/ML model inference.

21. A user equipment (UE) comprising:

a processor configured to call and run a computer program stored in a memory, to cause a device in which the processor is installed to execute the method of any of claims 1 to 20.

22. A chip, comprising:

a processor, configured to call and run a computer program stored in a memory, to cause a device in which the chip is installed to execute the method of any of claims 1 to 20.

23. A computer-readable storage medium, in which a computer program is stored, wherein the computer program causes a computer to execute the method of any of claims 1 to 20.

24. A computer program product, comprising a computer program, wherein the computer program causes a computer to execute the method of any of claims 1 to 20.

25. A computer program, wherein the computer program causes a computer to execute the method of any of claims 1 to 20.

26. A user equipment (UE) mobility management method, executable by a base station serving as a first radio node, comprising:

receiving artificial intelligence (AI)/machine learning (ML) model-inferred one or more parameters of UE-based mobility management to assist a handover operation of a user equipment (UE), wherein the one or more parameters comprise UE-predicted UE trajectory of a user equipment (UE).

27. The UE mobility management method of claim 26, wherein before the receiving further comprises:

transmitting configuration of UE-based mobility management; and

the model-inferred one or more parameters of UE-based mobility management is based on the configuration.

28. The UE mobility management method of claim 26, wherein the AI/ML model-inferred one or more parameters of UE-based mobility management are included in a handover request.

29. The UE mobility management method of claim 28, wherein the first radio node sends the handover request that conveys the UE-predicted UE trajectory to a second radio node.

30. The UE mobility management method of claim 28, wherein the UE-predicted UE trajectory comprises a list of cells and predicted time of stay for each cell in cells surrounding the UE, the cells surrounding the UE comprise a serving cell and candidate target cells, and the candidate target cells are selected by the UE based on AI/ML model inference.

31. The UE mobility management method of claim 28, wherein transmission of the UE-predicted UE trajectory to the first radio node is triggered under one of the following conditions:

when the UE is prepared to perform handover,

when the UE-predicted UE trajectory is generated by the UE based on AI/ML model inference, or

when the UE intends to update predicted UE trajectory stored in the first radio node by the UE-predicted UE trajectory.

32. The UE mobility management method of claim 31, wherein the UE-predicted UE trajectory is generated by the UE based on AI/ML model inference that uses historical mobility data of the UE.

33. The UE mobility management method of claim 26 or 28, wherein the handover operation comprises a conditional handover (CHO).

34. The UE mobility management method of claim 28, wherein the first radio node receives from the UE a first request message used to request radio resource for the handover operation, the first request message

includes a cell ID of a candidate second radio node, UE-suggested candidate target cells, UE-suggested data radio bearer (DRB) for dual active protocol stack (DAPS), and the UE-predicted UE trajectory.

35. The UE mobility management method of claim 34, wherein

the first radio node sends a HO request with the UE-predicted UE trajectory to the second radio node;

the second radio node sends a HO request acknowledgement to the first radio node;

the first radio node sends to the UE a response message that conveys acknowledgement of the first request message, a cause value received from the second radio node, and configuration of each resource block (RB) accepted by the second radio node; and

the first radio node receives from the UE a notification message that conveys a handover decision made by the UE.

36. The UE mobility management method of claim 28, wherein the first radio node transmits assistance information for model training to the UE, and the assistance information includes one or more types of the following information:

current load status of a serving cell and a candidate target cell;

predicted load of the serving cell and the candidate target cell; and

a history HO failure rate of the candidate target cell.

37. The UE mobility management method of claim 36, wherein the assistance information is broadcast or groupcast periodically.

38. The UE mobility management method of claim 36, wherein the first radio node receives a request for the assistance information from the UE and sends the assistance information in a unicast message to the UE in response to the request.

39. The UE mobility management method of claim 28, wherein a second radio node provides feedback information for model retraining to the UE, the feedback information includes one or more of parameters of UE performance and parameters of UE handover failure cause.

40. The UE mobility management method of claim 39, wherein the parameters of UE performance include UE quality of service (QoS), throughput, and Maximum Bit Rate (MBR).

41. The UE mobility management method of claim 28, wherein the first radio node receives a UE capability report that conveys UE capability of AI/ML enhancement from the UE.

42. The UE mobility management method of claim 41, wherein the UE capability of AI/ML enhancement indicates one or more of:

whether the UE supports UE-predicted UE trajectory; and

whether the UE supports autonomously adjust the parameters for UE-based mobility management.

43. The UE mobility management method of claim 41, wherein based on the UE capability report, the first radio node provides and transmits configuration for each UE capability reported by the UE in UE capability report to the UE, and the configuration for each UE capability indicates:

whether the UE is enabled to transmit the UE-predicted UE trajectory to the first radio node; and

whether the UE is enabled to adjust the parameters for UE-based mobility management.

44. The UE mobility management method of claim 43, wherein reporting of the UE-predicted UE trajectory from the UE to the first radio node is triggered based on a scheme of event triggered reporting or a scheme of a periodic reporting;

trigger events of the event triggered reporting comprises HO activation events or events generated by AI/ML model inference; and/or

periodicity of the periodic reporting is configured by the first radio node.

45. The UE mobility management method of claim 43, wherein adjusting and reporting of the parameters for UE-based mobility management from the UE to the first radio node is triggered based on a scheme of event triggered reporting;

trigger events of the event triggered reporting comprises HO activation events or events generated by AI/ML model inference.

46. A base station comprising:

a processor configured to call and run a computer program stored in a memory, to cause a device in which the processor is installed to execute the method of any of claims 26 to 45.

47. A chip, comprising:

a processor, configured to call and run a computer program stored in a memory, to cause a device in which the chip is installed to execute the method of any of claims 26 to 45.

48. A computer-readable storage medium, in which a computer program is stored, wherein the computer program causes a computer to execute the method of any of claims 26 to 45.

49. A computer program product, comprising a computer program, wherein the computer program causes a computer to execute the method of any of claims 26 to 45.

50. A computer program, wherein the computer program causes a computer to execute the method of any of claims 26 to 45.

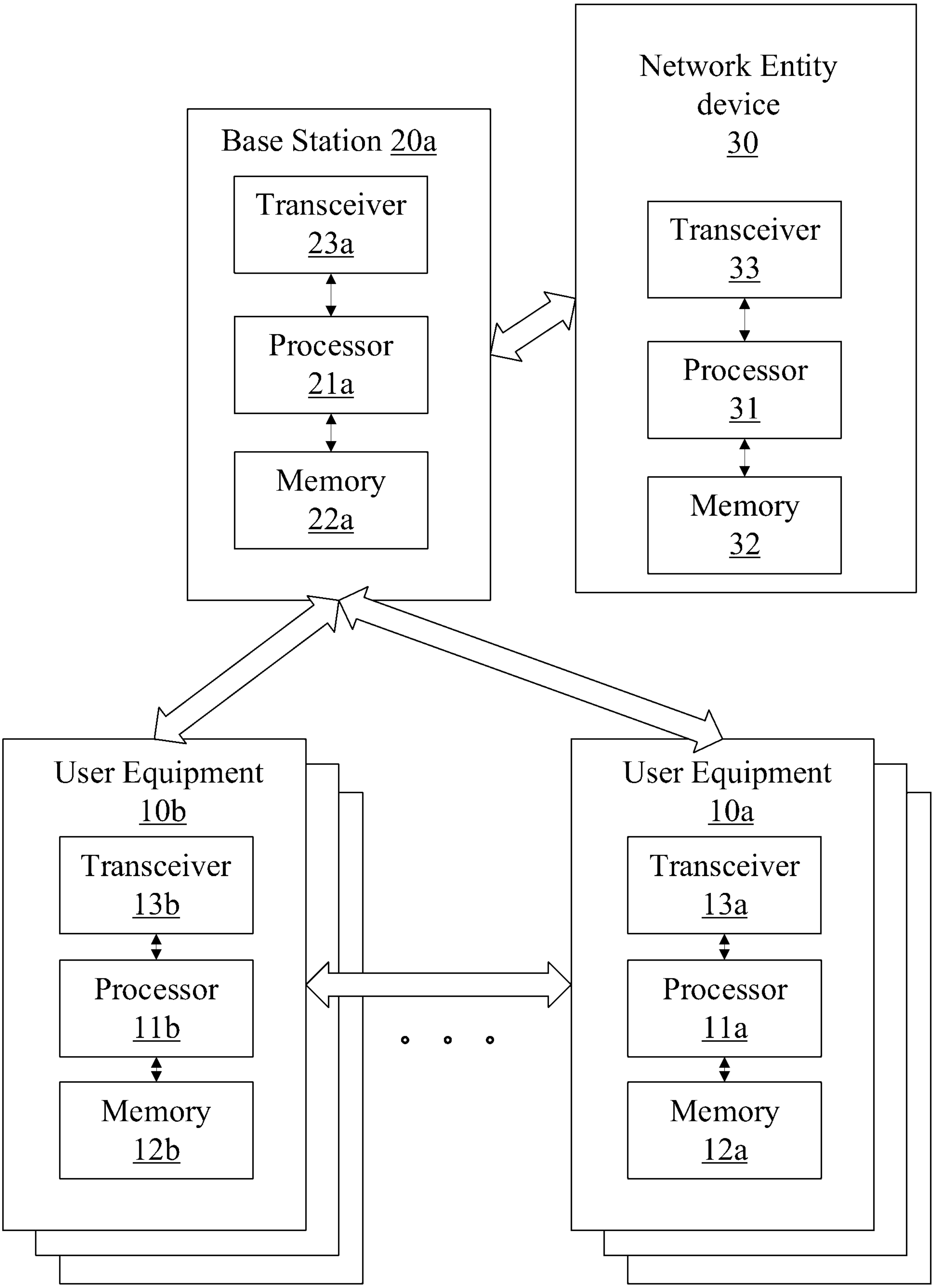
Network Entity device 30
Transceiver 33
Processor 31
Memory 32
Base Station 20a
Transceiver 23a
Processor 21a
Memory 22a
User Equipment 10b
Transceiver 13b
Processor 11b
Memory 12b
User Equipment 10a
Transceiver 13a
Processor 11a
Memory 12a

FIG. 1

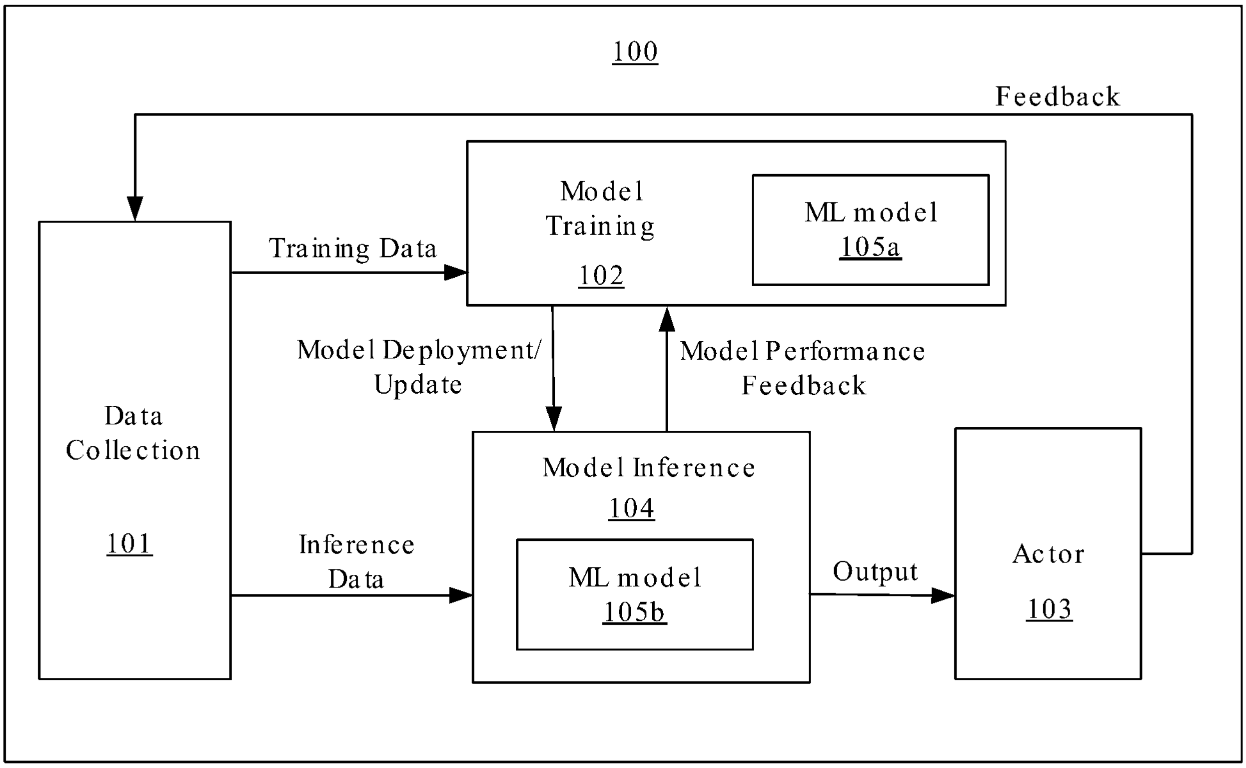
100
Feedback
Model
Training
102
ML model
105a
Training Data
Data
Collection
101
Model Deployment/
Update
Model Performance
Feedback
Model Inference
104
ML model
105b
Inference
Data
Output
Actor
103

FIG. 2

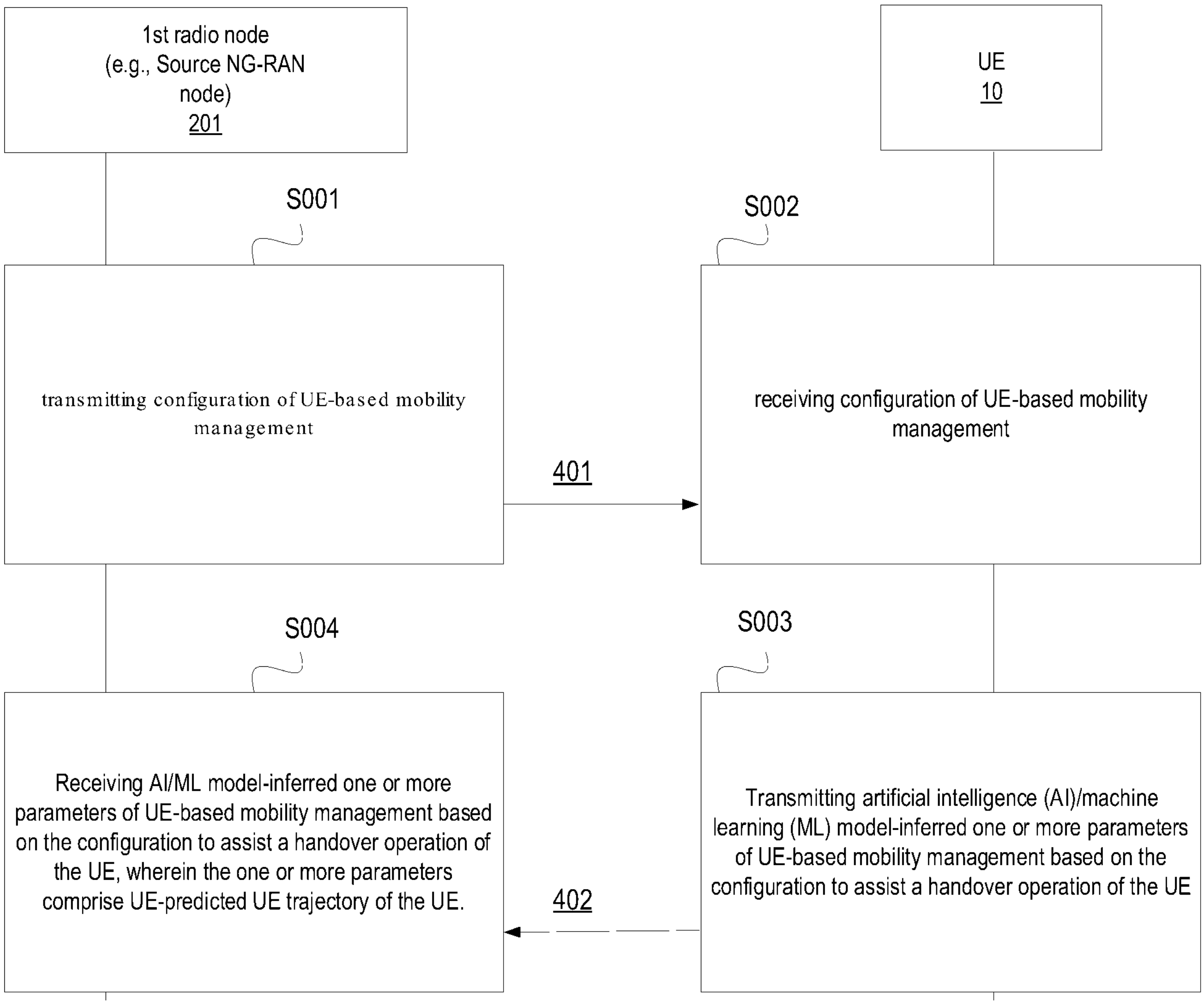
1st radio node
(e.g., Source NG-RAN node)
201
UE
10
S001
S002
transmitting configuration of UE-based mobility management
receiving configuration of UE-based mobility management
401
S004
S003
Receiving AI/ML model-inferred one or more parameters of UE-based mobility management based on the configuration to assist a handover operation of the UE, wherein the one or more parameters comprise UE-predicted UE trajectory of the UE.
Transmitting artificial intelligence (AI)/machine learning (ML) model-inferred one or more parameters of UE-based mobility management based on the configuration to assist a handover operation of the UE
402

FIG. 3

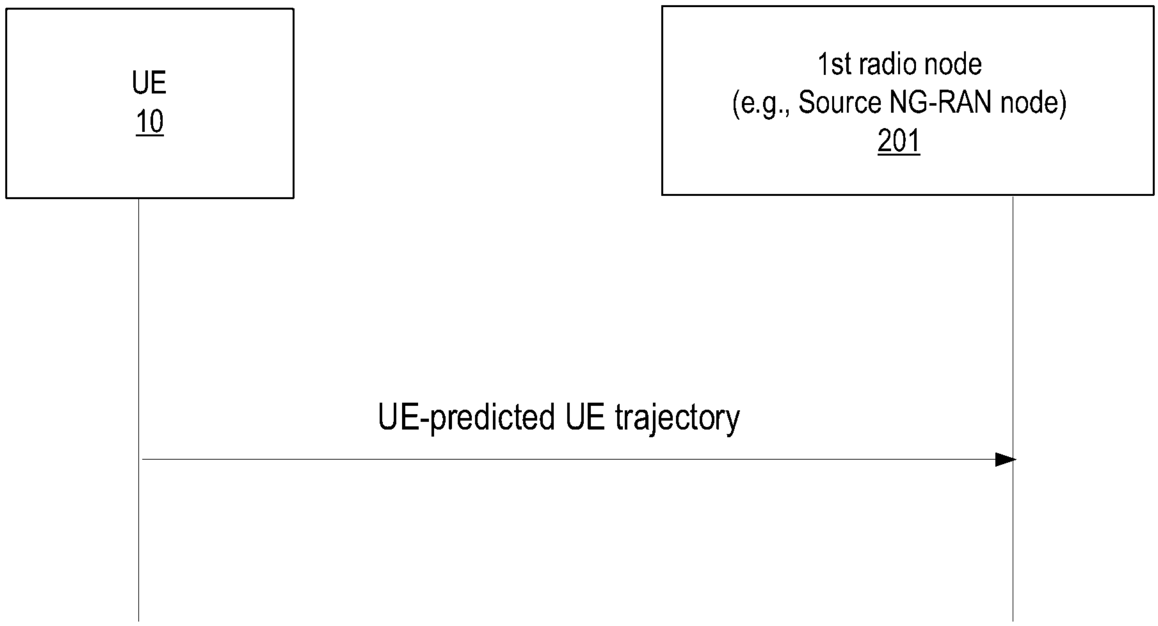
UE
10
1st radio node
(e.g., Source NG-RAN node)
201
UE-predicted UE trajectory

FIG. 4

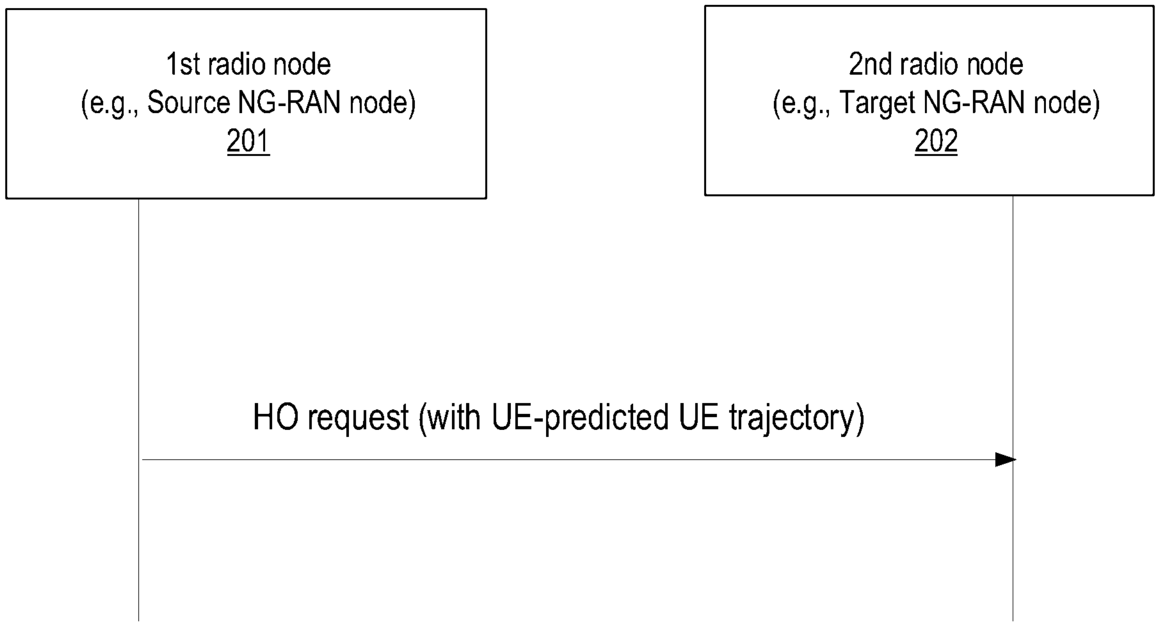
1st radio node
(e.g., Source NG-RAN node)
201
2nd radio node
(e.g., Target NG-RAN node)
202
HO request (with UE-predicted UE trajectory)

FIG. 5

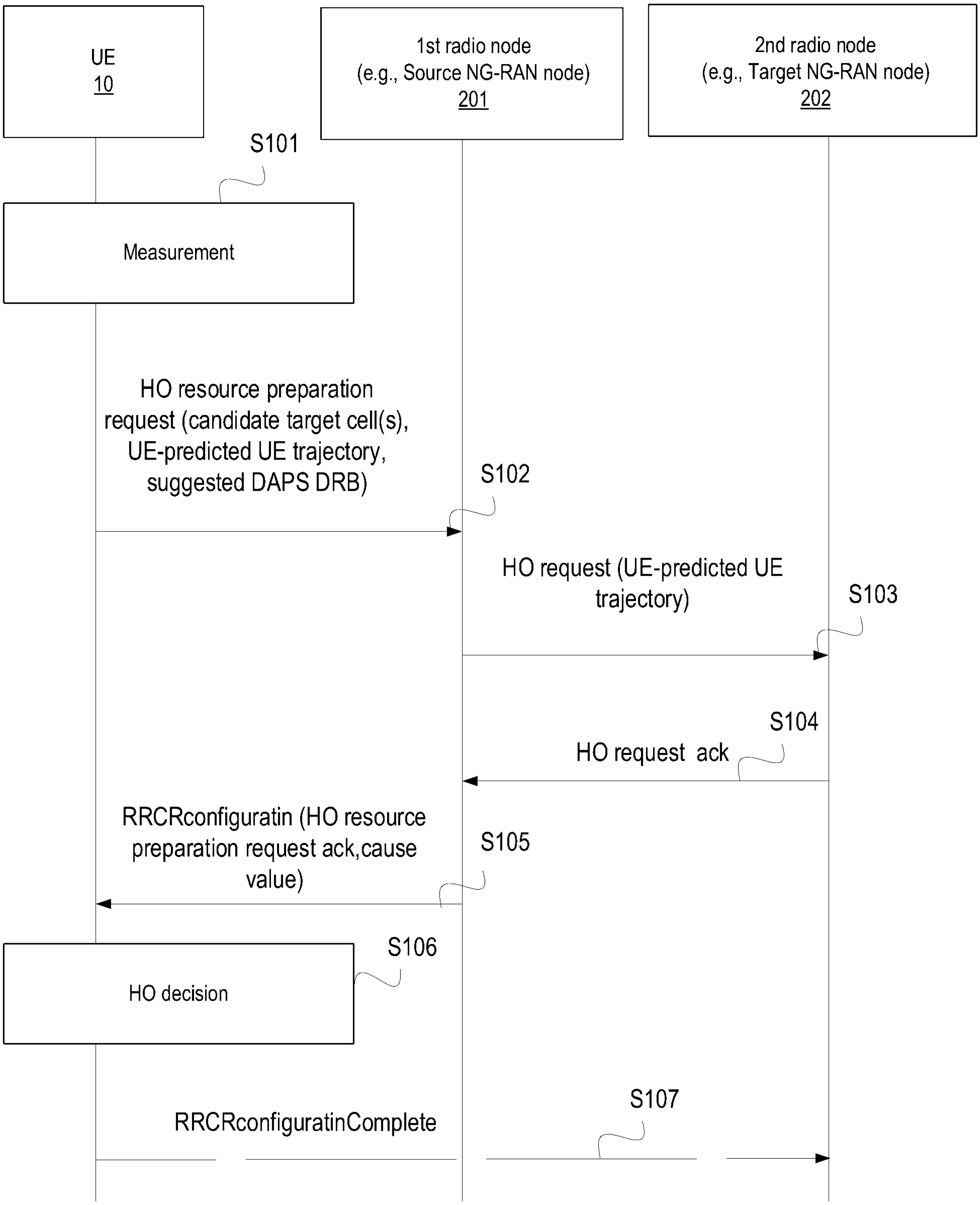
UE
10
1st radio node
(e.g., Source NG-RAN node)
201
2nd radio node
(e.g., Target NG-RAN node)
202
S101
Measurement
HO resource preparation request (candidate target cell(s), UE-predicted UE trajectory, suggested DAPS DRB)
S102
HO request (UE-predicted UE trajectory)
S103
S104
HO request ack
RRCRconfiguratin (HO resource preparation request ack,cause value)
S105
S106
HO decision
RRCRconfiguratinComplete
S107

FIG. 6

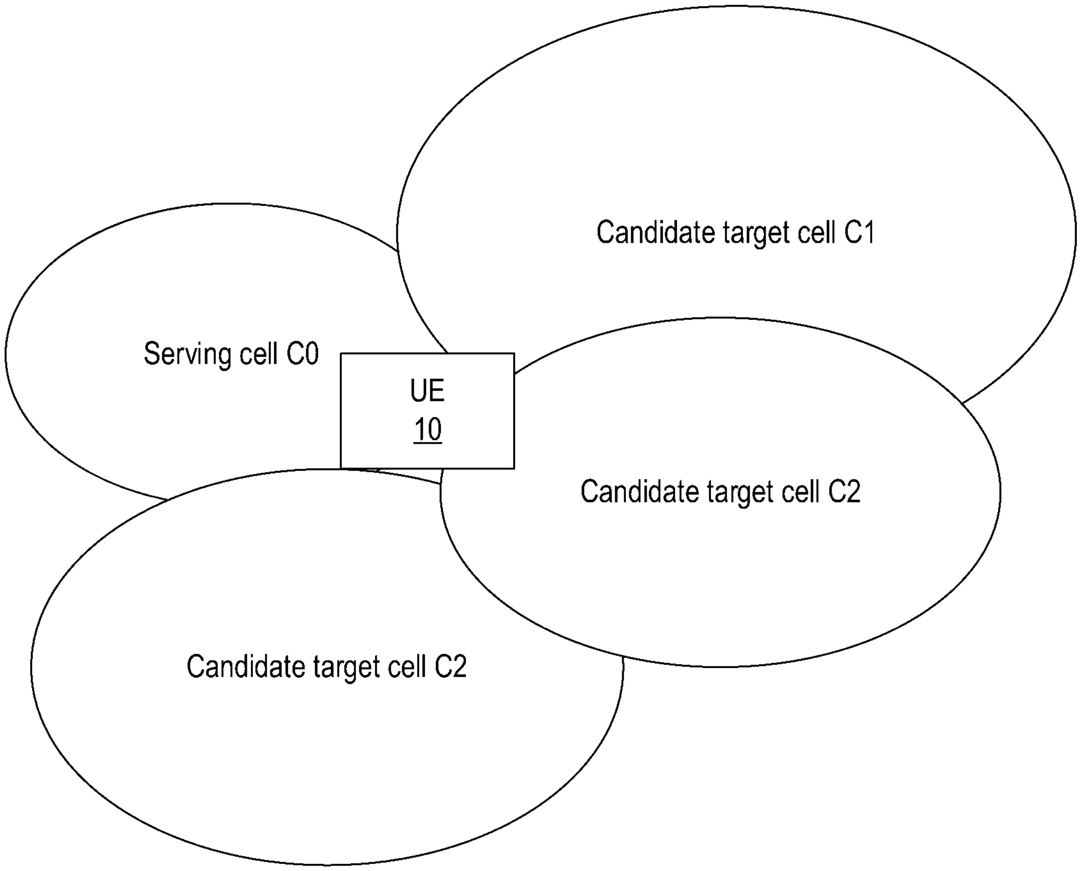
Candidate target cell C1
Serving cell C0
UE
10
Candidate target cell C2
Candidate target cell C2

FIG. 7

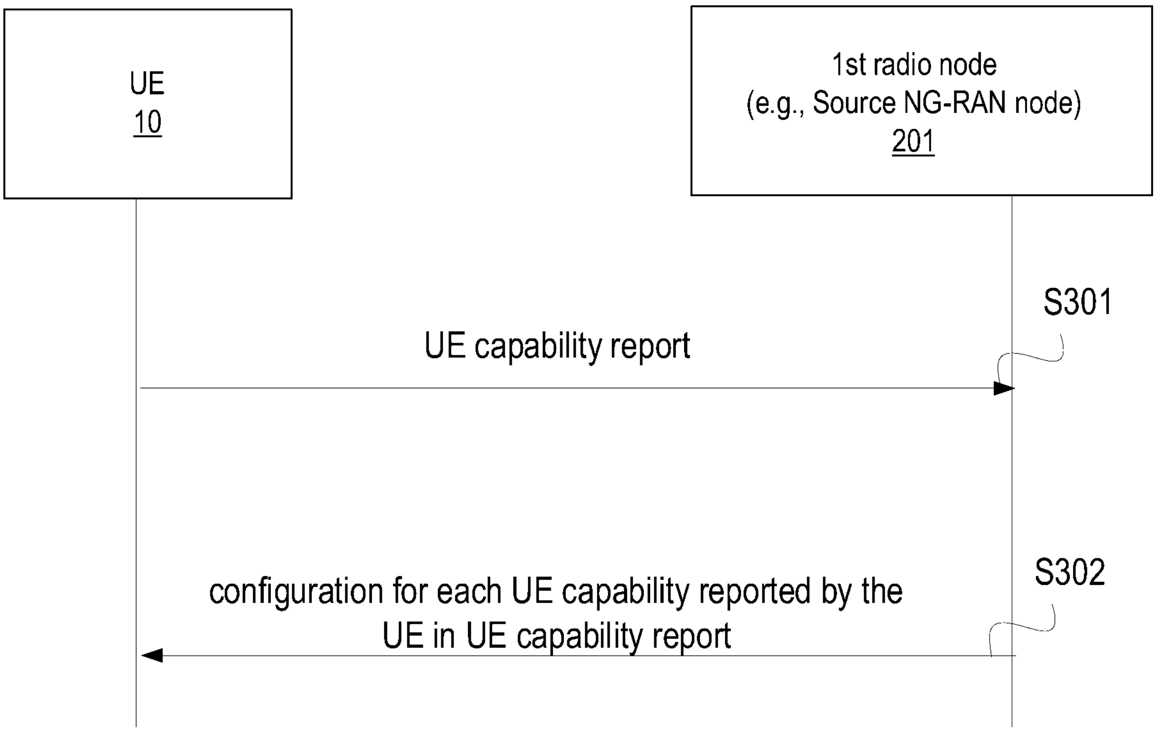
UE
10
1st radio node
(e.g., Source NG-RAN node)
201
S301
UE capability report
S302
configuration for each UE capability reported by the UE in UE capability report

FIG. 8

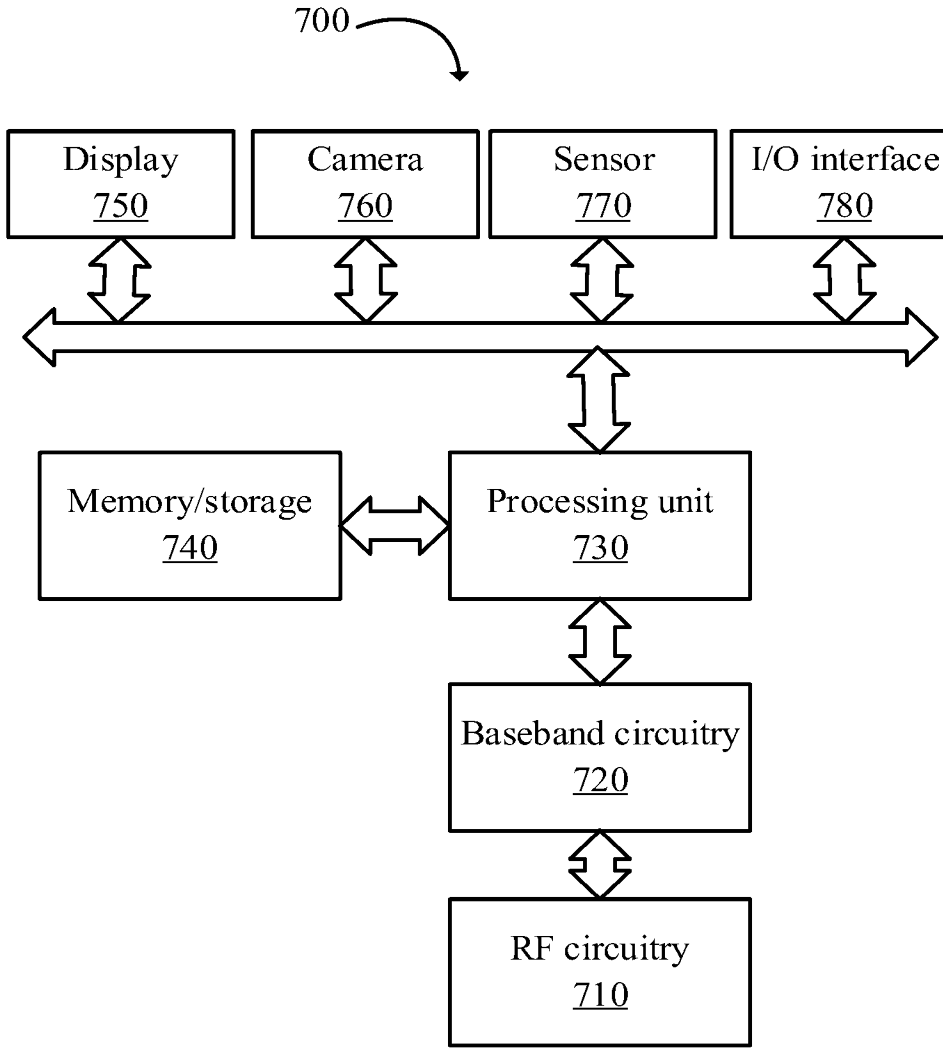
700
Display
750
Camera
760
Sensor
770
I/O interface
780
Memory/storage
740
Processing unit
730
Baseband circuitry
720
RF circuitry
710

FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/112982

A. CLASSIFICATION OF SUBJECT MATTER

H04W24/10(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)

IPC: H04W H04B H04Q

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)

CNTXT, ENTXTC, WPABS, VEN, ENTXT, CNKI, 3GPP: AI, ML, model, UE, terminal, trajectory, predict+, switch+, handover, handoff, CHO, HO

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2022286927 A1 (SAMSUNG ELECTRONICS CO., LTD.) 08 September 2022 (2022-09-08) description, paragraphs [0063] to [0151] and claims 1-20	1-50
A	CN 116541088 A (HUAWEI TECHNOLOGIES CO., LTD.) 04 August 2023 (2023-08-04) the whole document	1-50
A	WO 2023014896 A1 (INTEL CORPORATION) 09 February 2023 (2023-02-09) the whole document	1-50
A	LENOVO et al. "Collecting UE trajectory measurement from the new serving RAN node" *3GPP TSG-RAN WG3 #114bis-e R3-220487,* 26 January 2022 (2022-01-26), the whole document	1-50

☐ 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
- "D" document cited by the applicant in the international application
- "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	Date of mailing of the international search report
07 April 2024	**11 April 2024**

Name and mailing address of the ISA/CN

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2023/112982

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
US	2022286927	A1	08 September 2022	WO	2022191493	A1	15 September 2022
				EP	4289178	A1	13 December 2023
				CN	116965097	A	27 October 2023
CN	116541088	A	04 August 2023	WO	2023143267	A1	03 August 2023
WO	2023014896	A1	09 February 2023		None		