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(54) **UPLINK REPORTS AND STORE AND FORWARD MODE**

(71) Applicant: **QUALCOMM Incorporated**, San Diego, CA (US)

(72) Inventors: **Avinash SHRIVASTAVA**, Hyderabad (IN); **Stephen William EDGE**, Escondido, CA (US)

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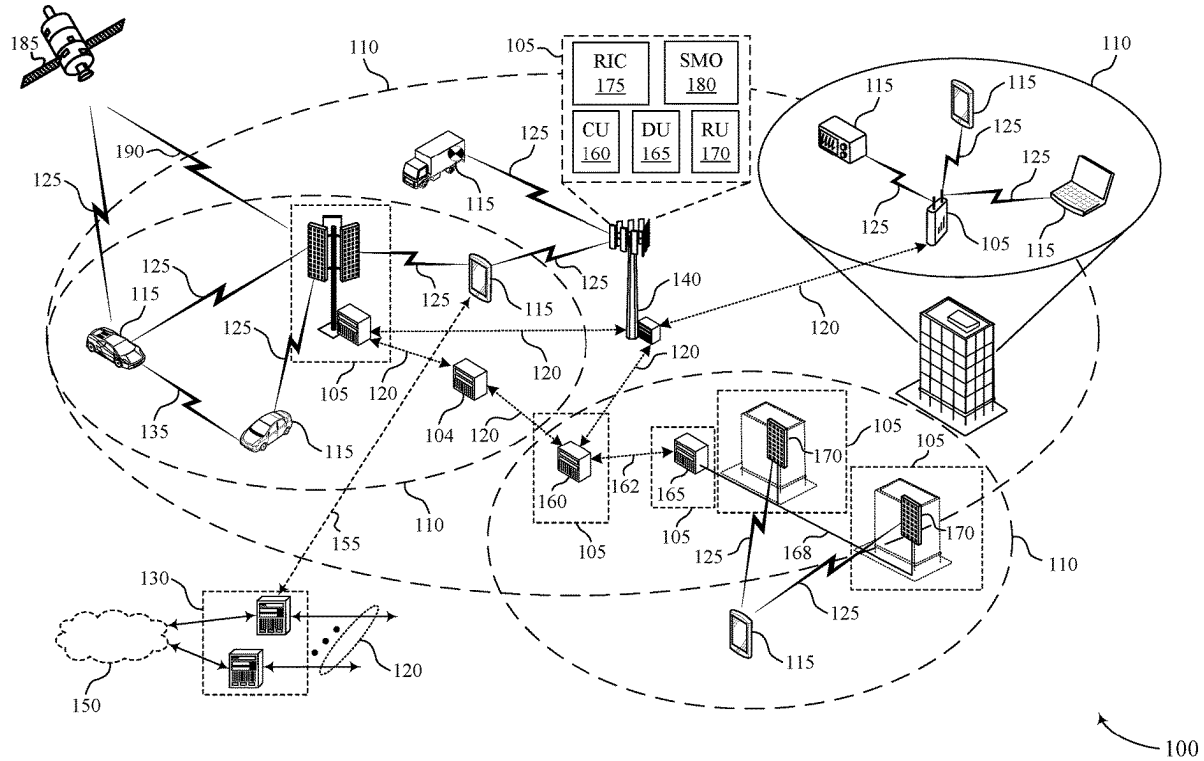
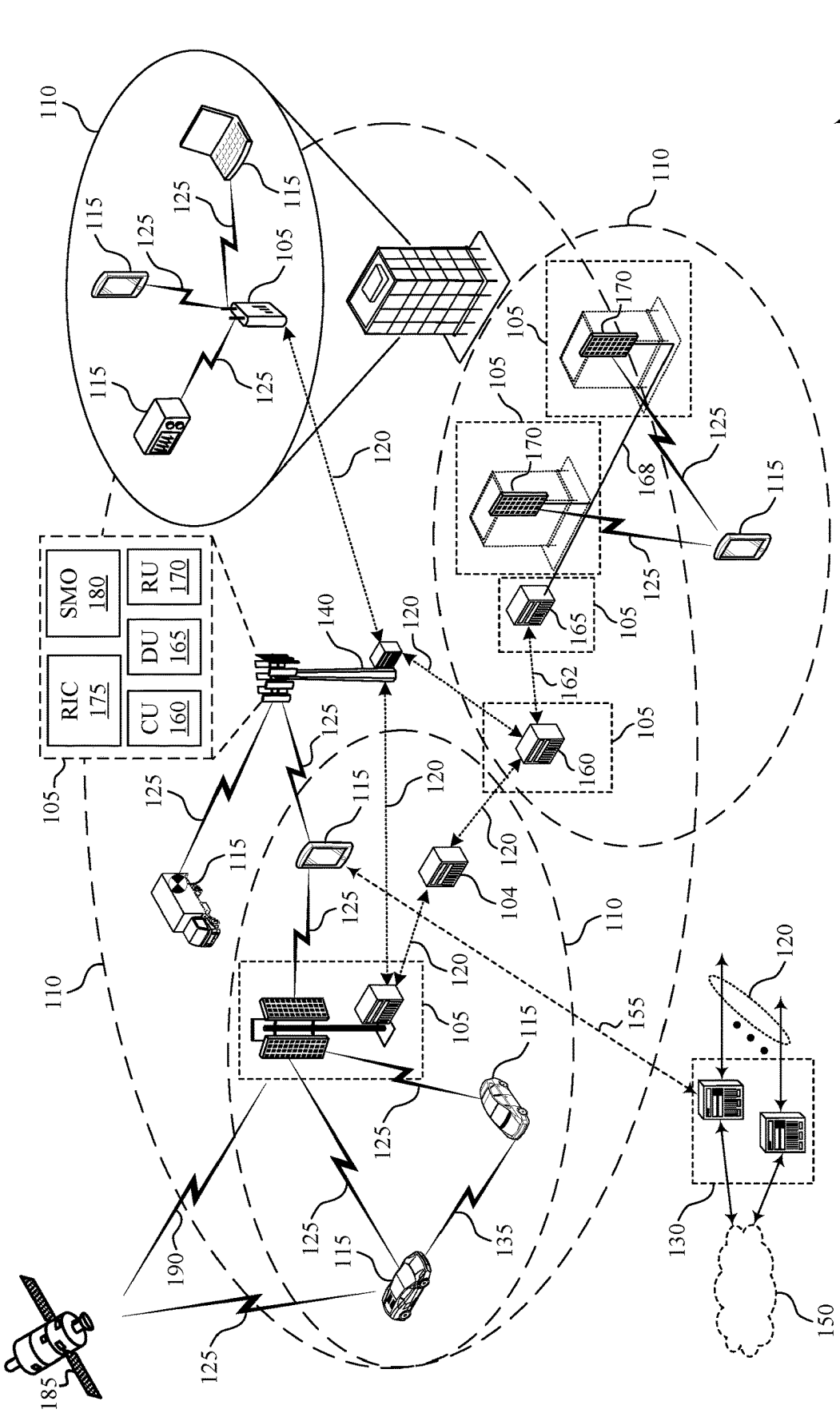
(57) **ABSTRACT**

Some wireless communication systems include one or more user equipments (UEs) and one or more non-terrestrial network (NTN) nodes (e.g., satellites). In some approaches, a UE may collect report data, such as a minimization of drive test report or UE assistance information. When a NTN node operates in a store and forward mode, the NTN node may have intermittent connectivity with a core network. In some examples of the techniques described herein, a UE may store data collected when the NTN node is operating in the store and forward mode. The UE may transmit delayed report data based on the collected data to a core network when the UE has coverage from a terrestrial network node or a NTN node. For example, the UE may transmit UE location data collected when the NTN node is operating in the store and forward mode.




100
110
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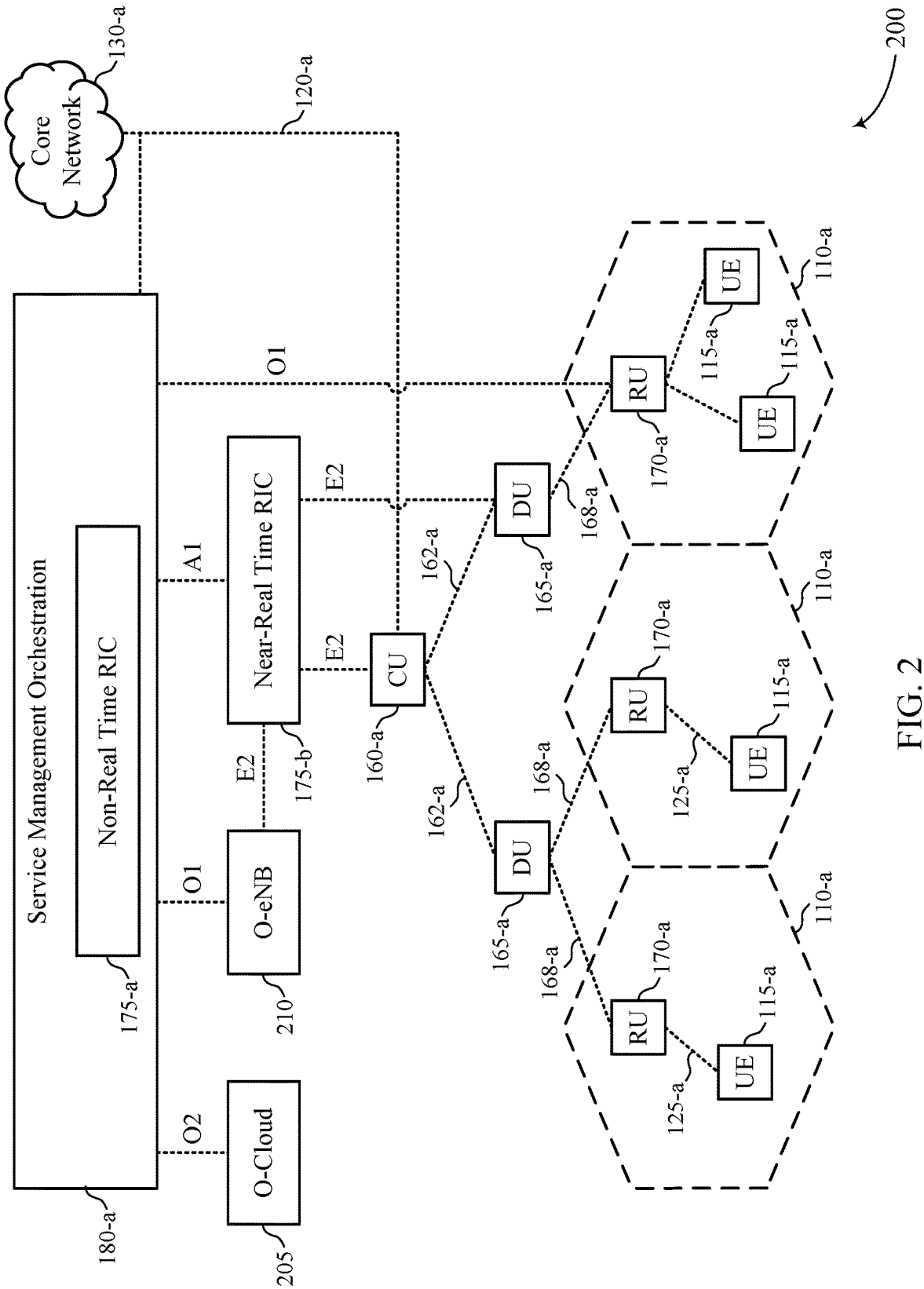
SMO 180
RU 170
DU 165
CU 160
RIC 175

FIG. 1


200
Core Network
130-a
120-a
Service Management Orchestration
180-a
Non-Real Time RIC
175-a
Near-Real Time RIC
175-b
O-eNB
210
O-Cloud
205
A1
O1
O1
O2
E2
E2
E2
CU
160-a
DU
165-a
DU
165-a
DU
165-a
162-a
162-a
168-a
168-a
168-a
168-a
RU
170-a
RU
170-a
RU
170-a
RU
170-a
UE
115-a
UE
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115-a
125-a
125-a
110-a
110-a
110-a
110-a

FIG. 2

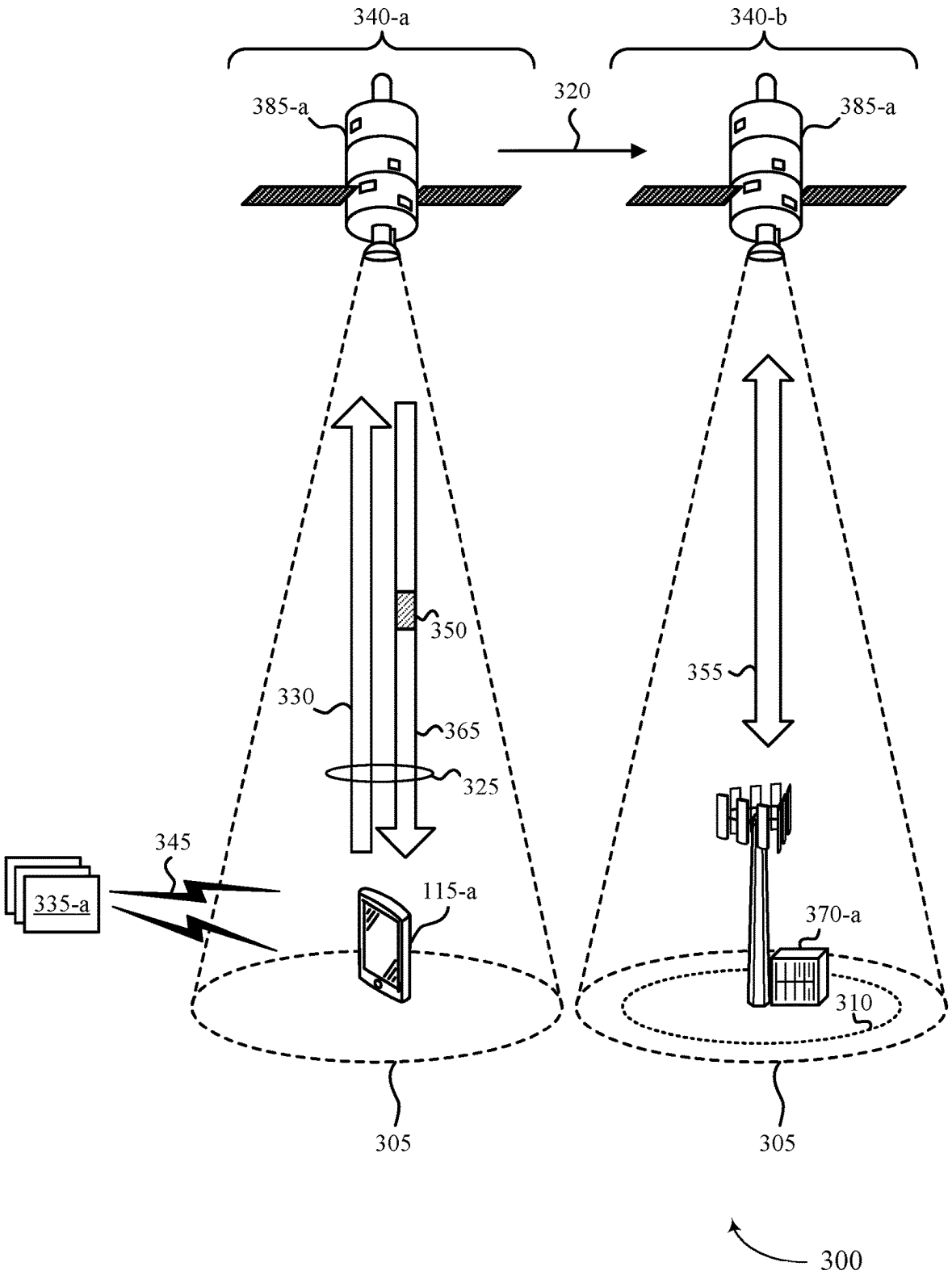
340-a
340-b
320
385-a
385-a
350
330
365
325
355
345
335-a
115-a
370-a
310
305
305
300

FIG. 3

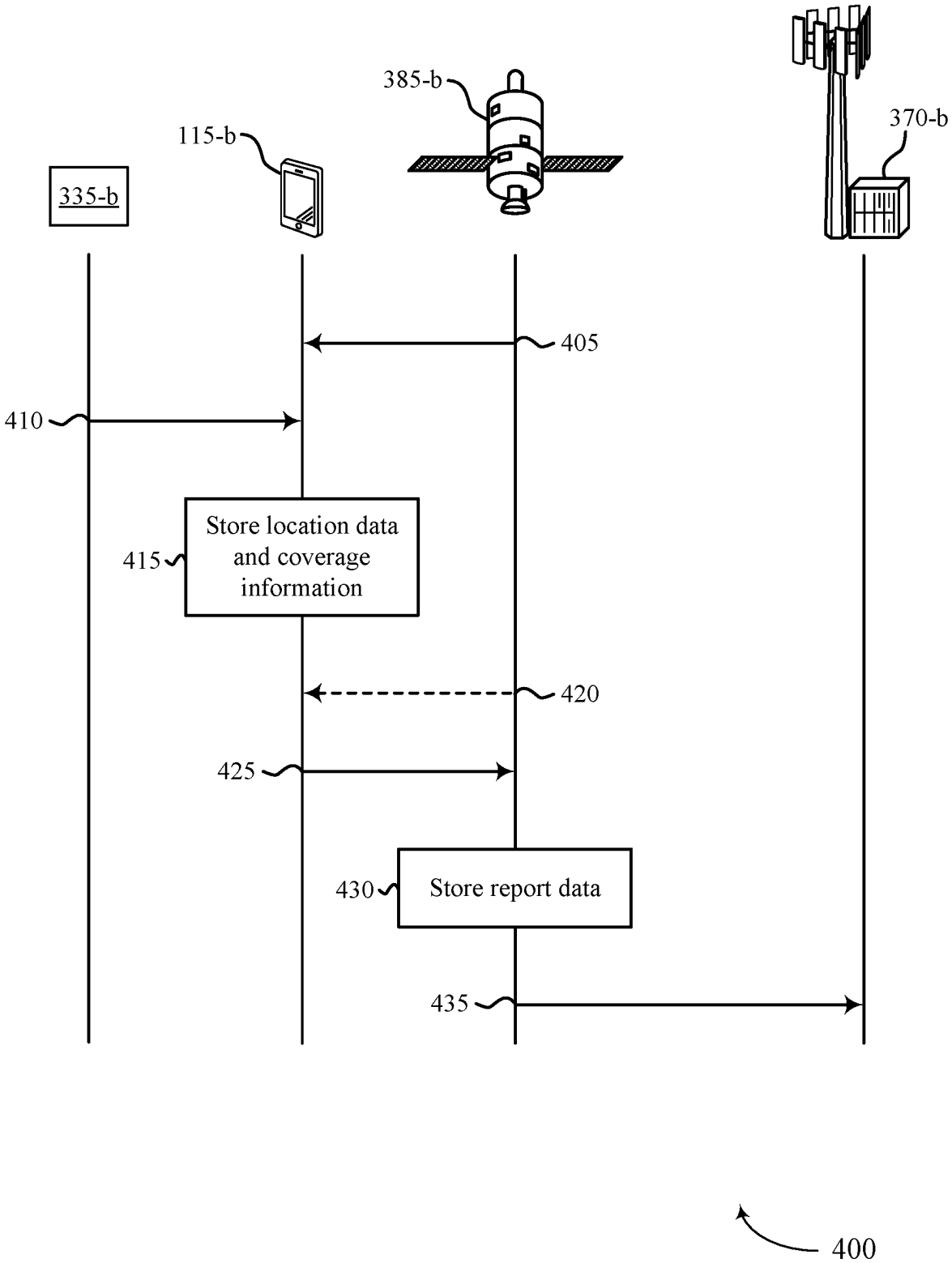
385-b
370-b
115-b
335-b
405
410
Store location data and coverage information
415
420
425
430
Store report data
435
400

FIG. 4

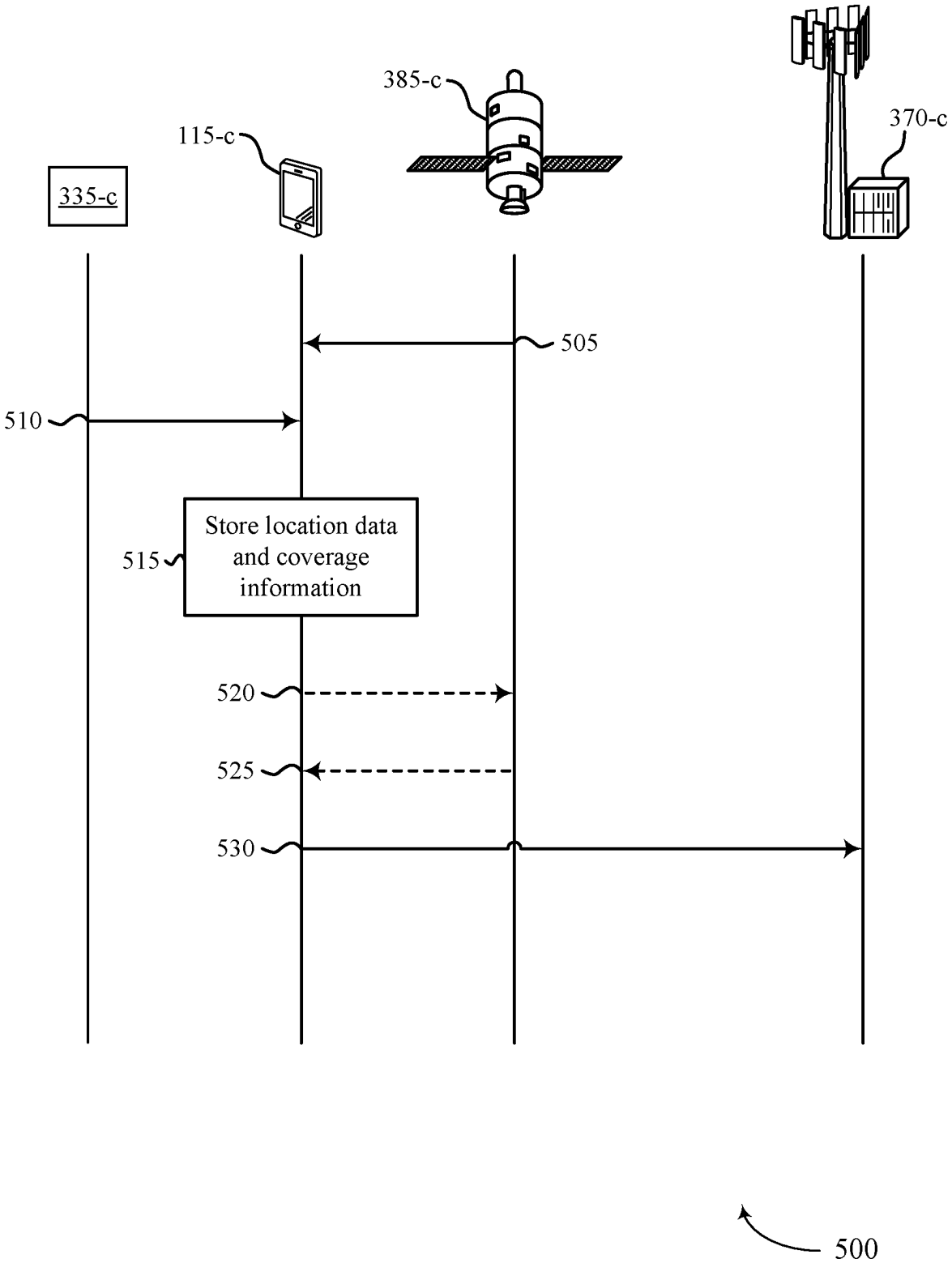
385-c
370-c
115-c
335-c
505
510
Store location data and coverage information
515
520
525
530
500

FIG. 5

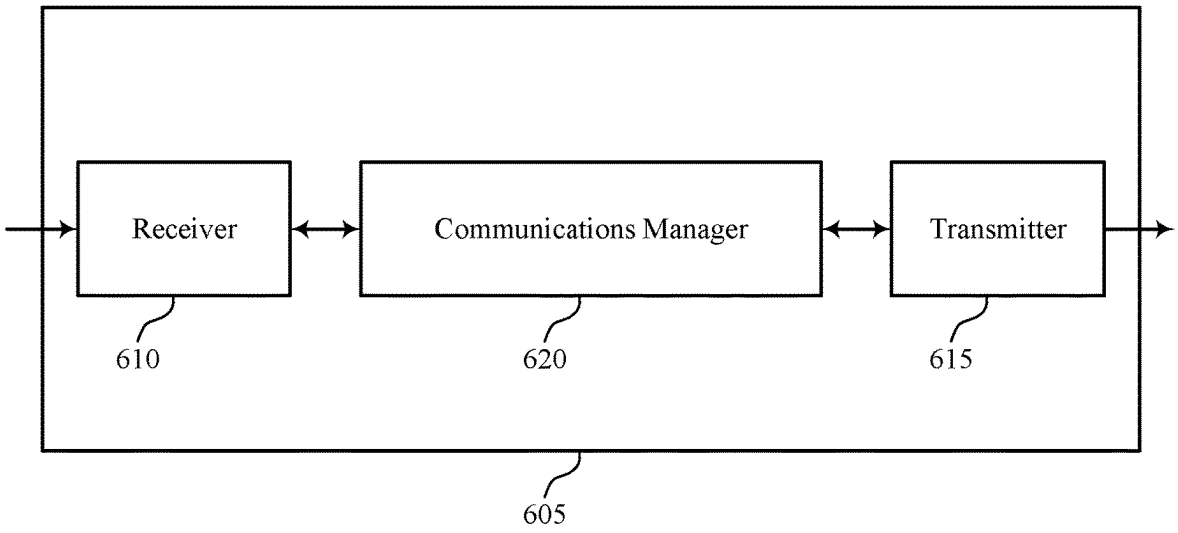
Receiver
Communications Manager
Transmitter
610
620
615
605
600

FIG. 6

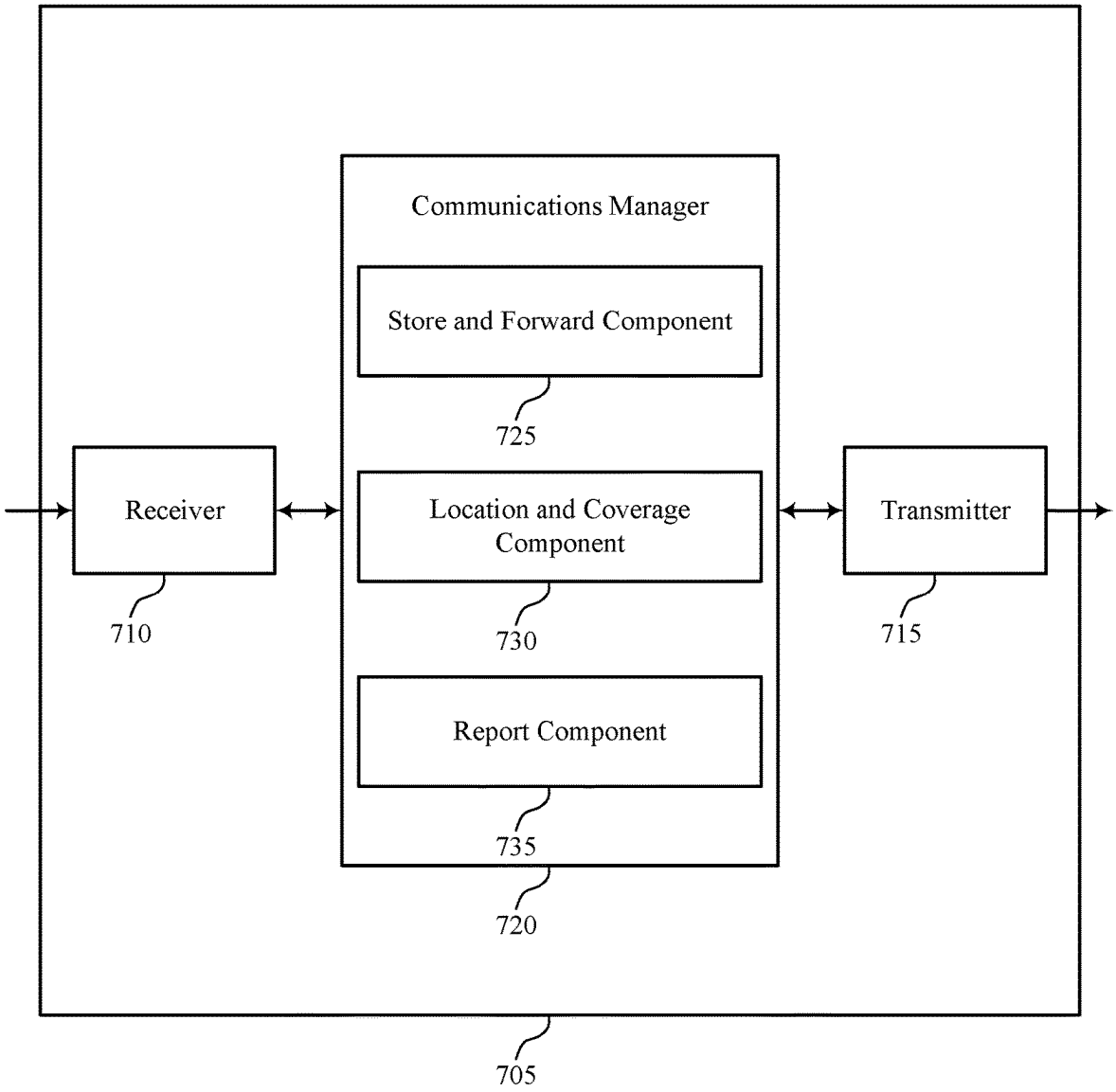
Communications Manager
Store and Forward Component
725
Receiver
Location and Coverage Component
Transmitter
710
730
715
Report Component
735
720
705
700

FIG. 7

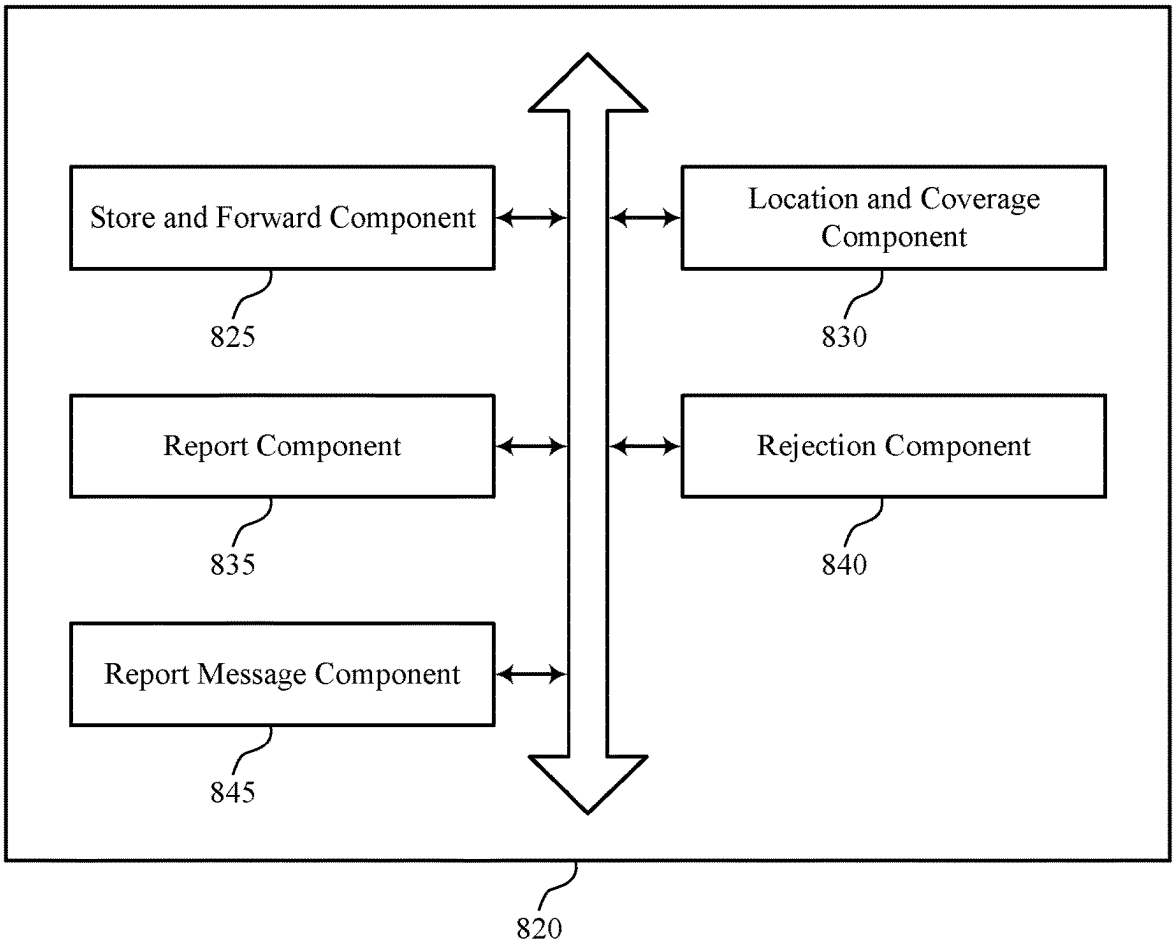
Store and Forward Component
825
Location and Coverage Component
830
Report Component
835
Rejection Component
840
Report Message Component
845
820
800

FIG. 8

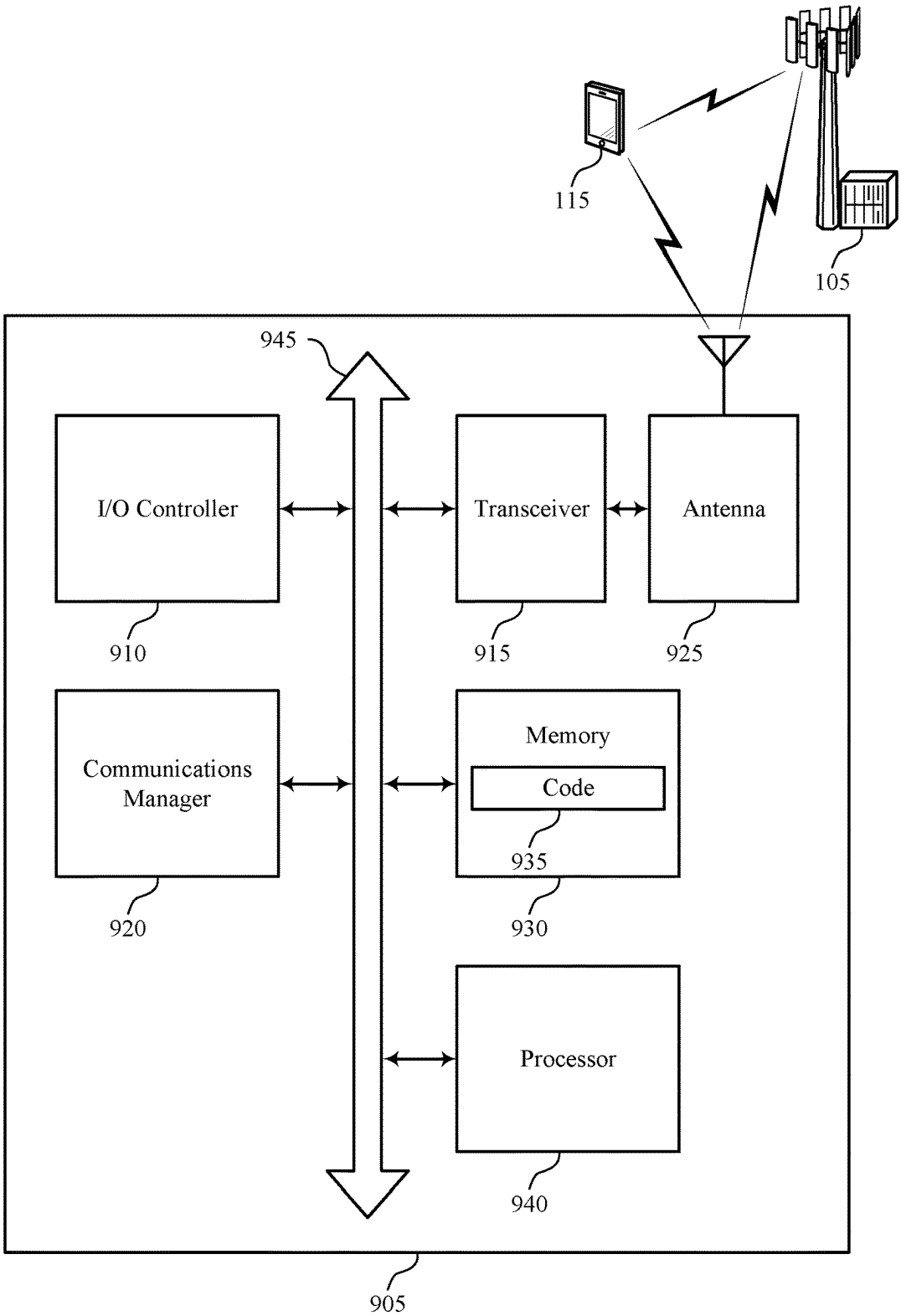
115
105
945
I/O Controller
Transceiver
Antenna
910
915
925
Communications Manager
Memory
Code
935
920
930
Processor
940
905
900

FIG. 9

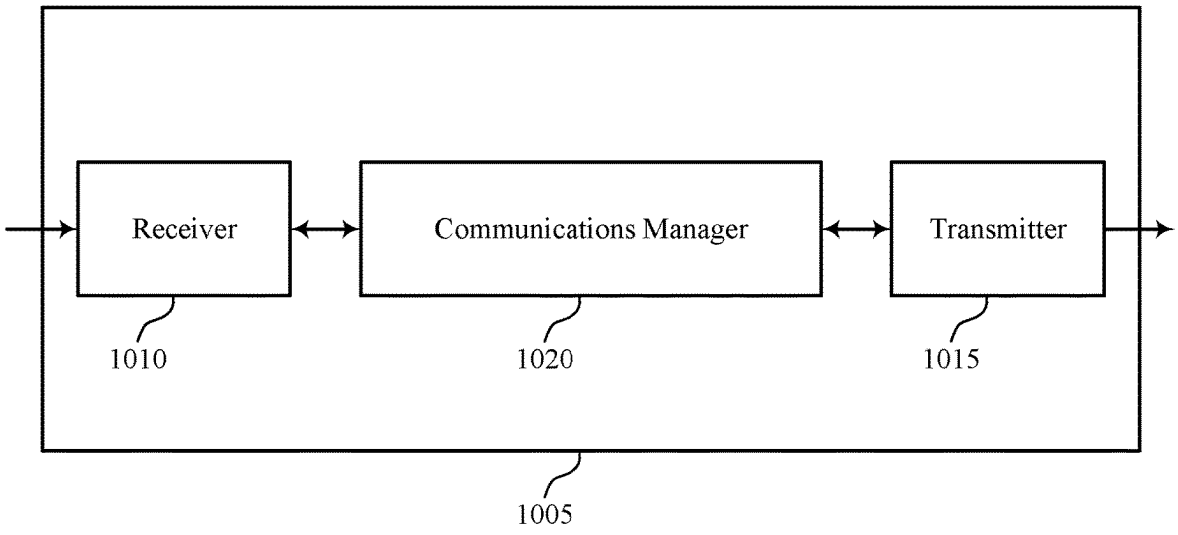
Receiver
Communications Manager
Transmitter
1010
1020
1015
1005
1000

FIG. 10

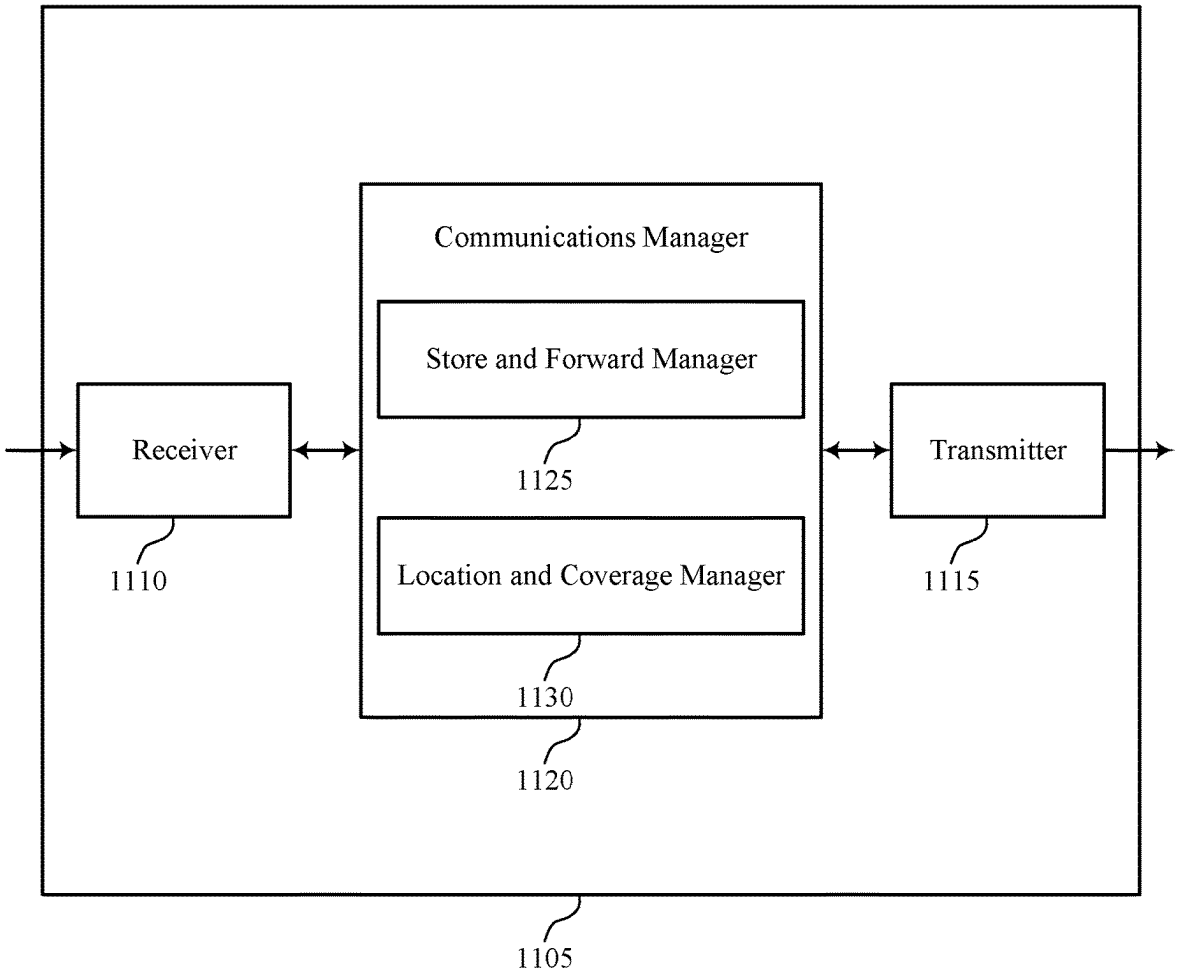
Communications Manager
Store and Forward Manager
Receiver
Transmitter
1125
1110
1115
Location and Coverage Manager
1130
1120
1105
1100

FIG. 11

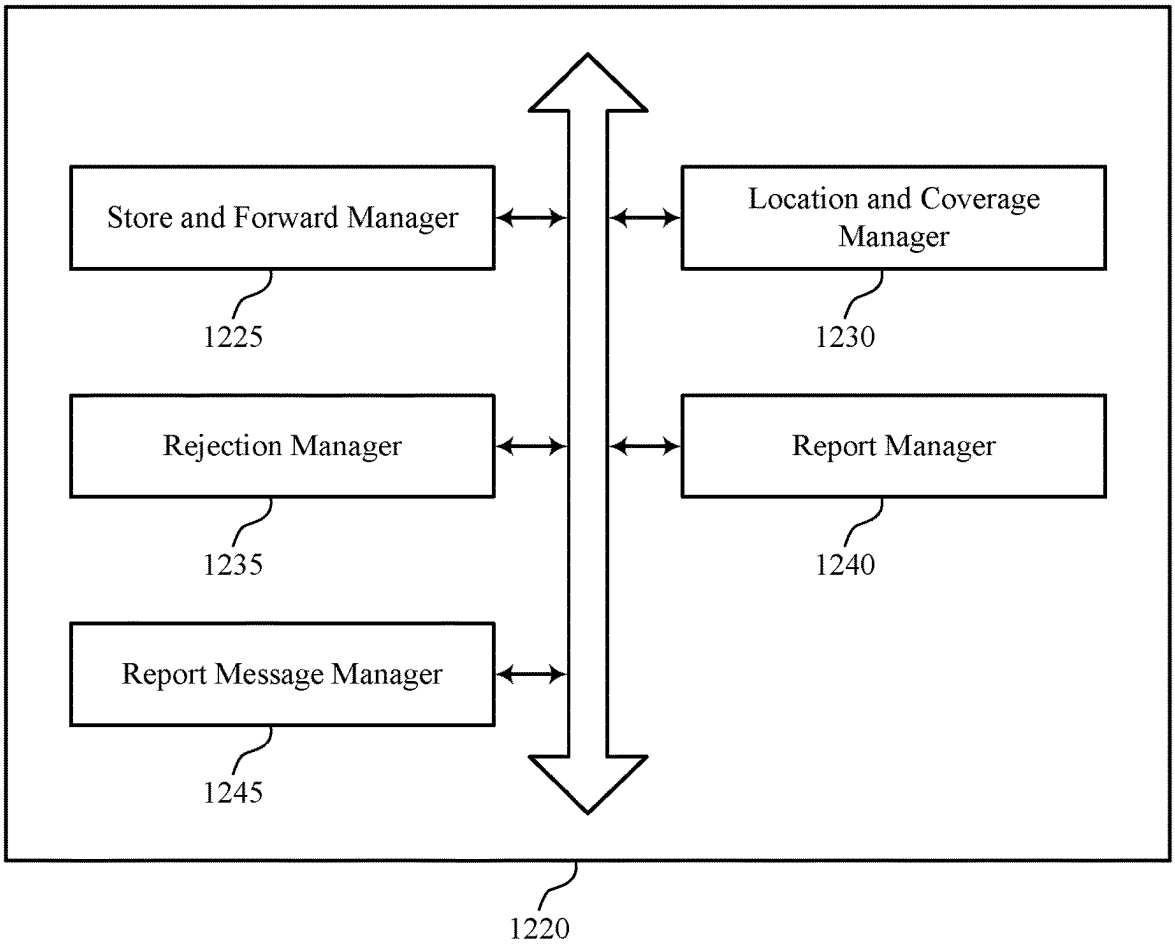
Store and Forward Manager
1225
Location and Coverage Manager
1230
Rejection Manager
1235
Report Manager
1240
Report Message Manager
1245
1220
1200

FIG. 12

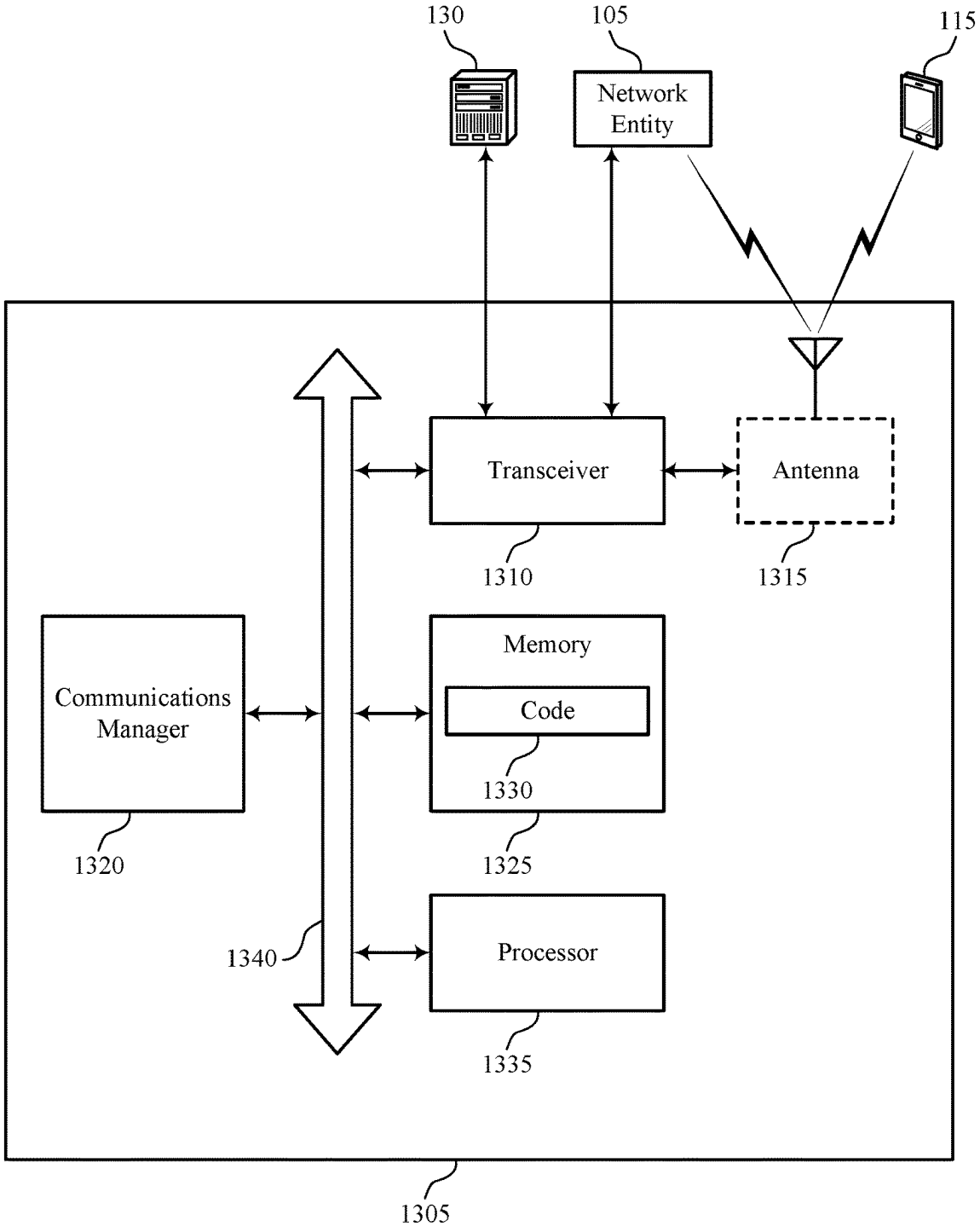
130
105
115
Network Entity
Transceiver
Antenna
1310
1315
Communications Manager
Memory
Code
1330
1320
1325
1340
Processor
1335
1305
1300

FIG. 13

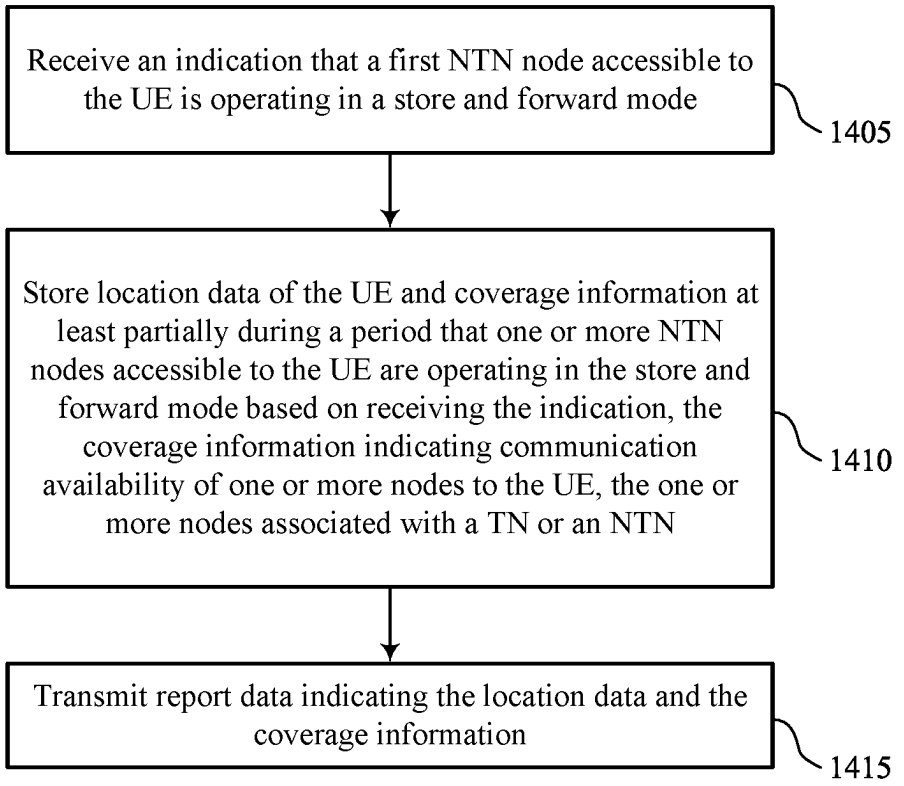
Receive an indication that a first NTN node accessible to the UE is operating in a store and forward mode
1405
Store location data of the UE and coverage information at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based on receiving the indication, the coverage information indicating communication availability of one or more nodes to the UE, the one or more nodes associated with a TN or an NTN
1410
Transmit report data indicating the location data and the coverage information
1415
1400

FIG. 14

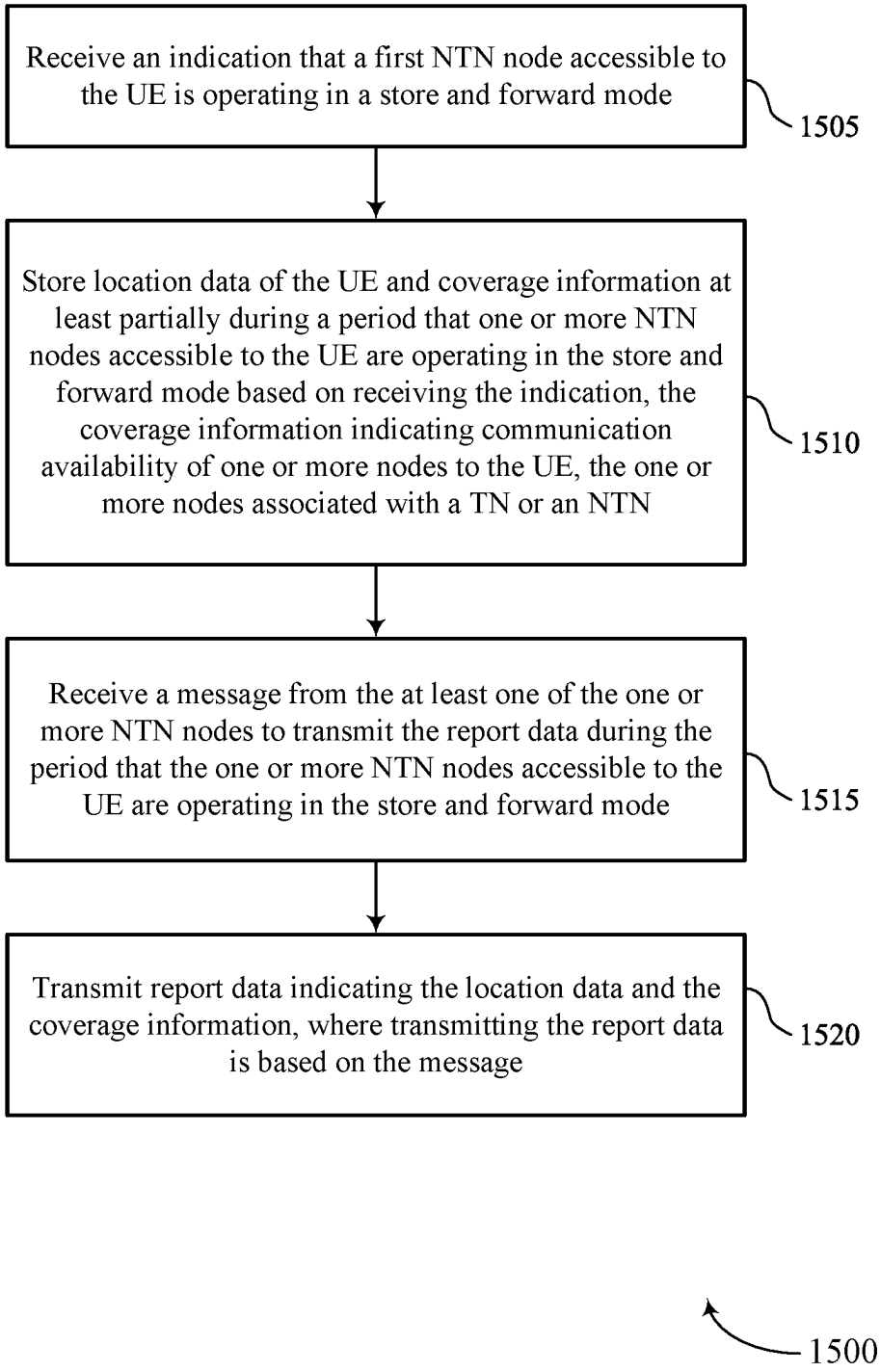
Receive an indication that a first NTN node accessible to the UE is operating in a store and forward mode
1505
Store location data of the UE and coverage information at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based on receiving the indication, the coverage information indicating communication availability of one or more nodes to the UE, the one or more nodes associated with a TN or an NTN
1510
Receive a message from the at least one of the one or more NTN nodes to transmit the report data during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode
1515
Transmit report data indicating the location data and the coverage information, where transmitting the report data is based on the message
1520
1500

FIG. 15

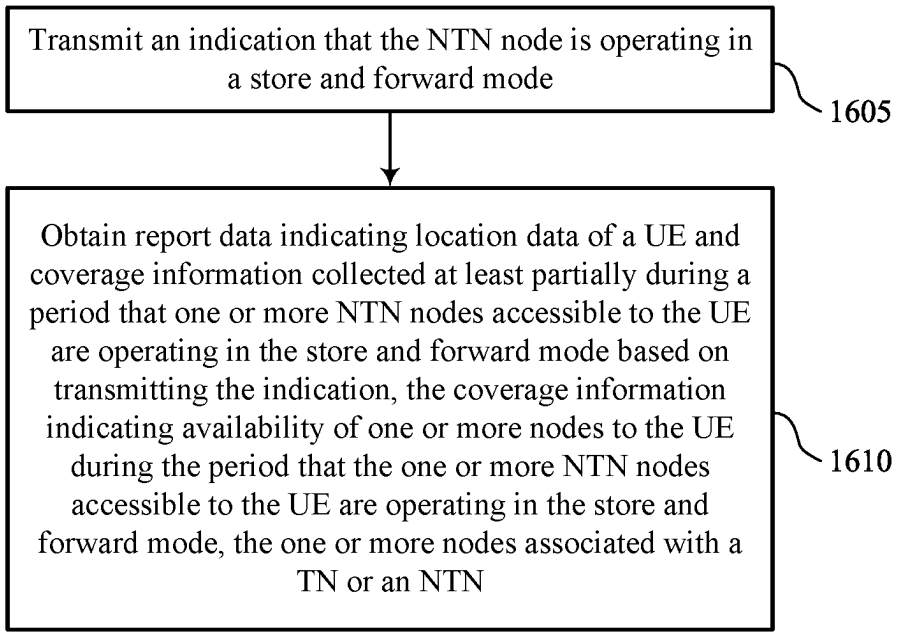
Transmit an indication that the NTN node is operating in a store and forward mode
1605
Obtain report data indicating location data of a UE and coverage information collected at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based on transmitting the indication, the coverage information indicating availability of one or more nodes to the UE during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode, the one or more nodes associated with a TN or an NTN
1610
1600

FIG. 16

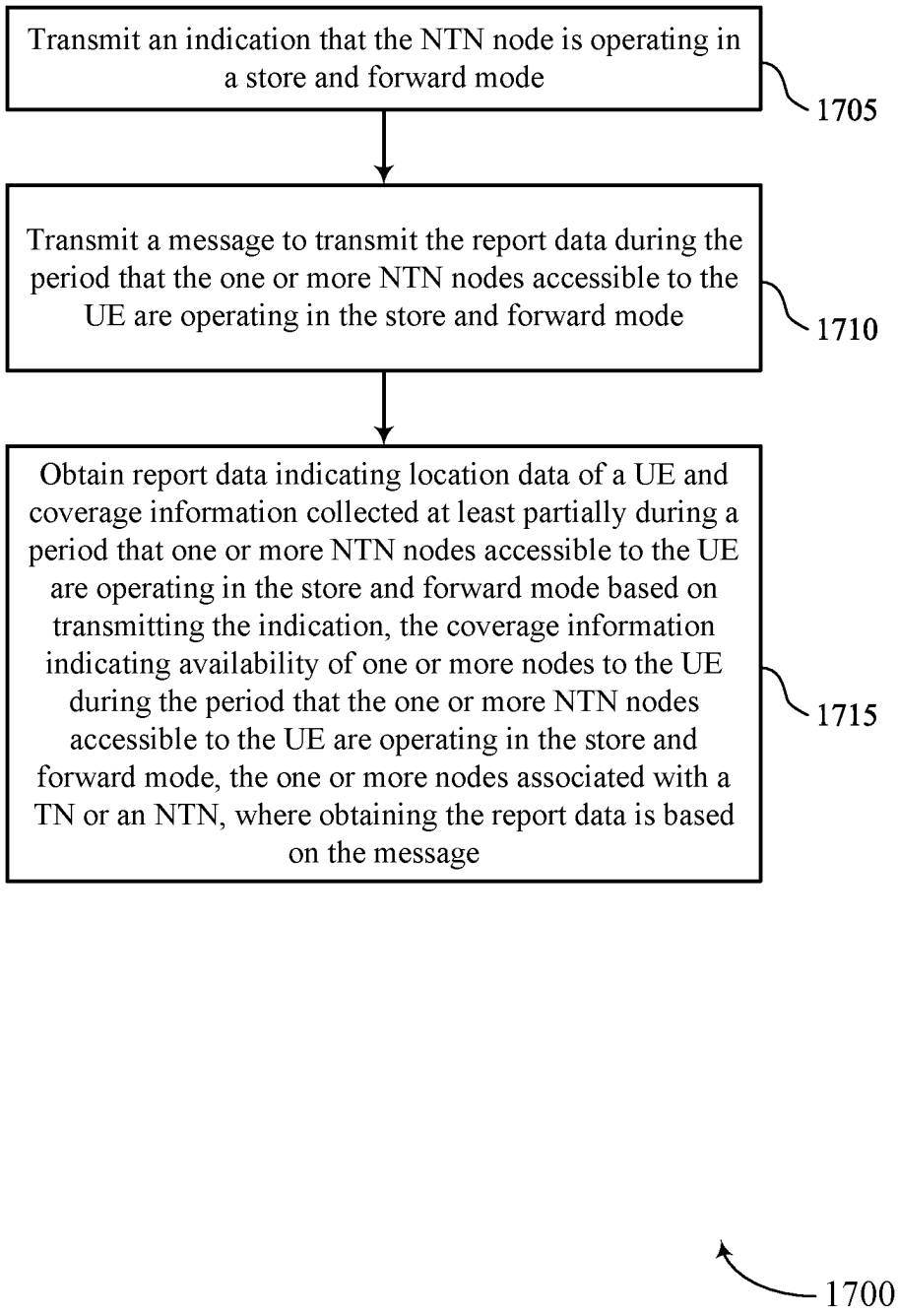
Transmit an indication that the NTN node is operating in a store and forward mode
1705
Transmit a message to transmit the report data during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode
1710
Obtain report data indicating location data of a UE and coverage information collected at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based on transmitting the indication, the coverage information indicating availability of one or more nodes to the UE during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode, the one or more nodes associated with a TN or an NTN, where obtaining the report data is based on the message
1715
1700

FIG. 17

UPLINK REPORTS AND STORE AND FORWARD MODE

FIELD OF TECHNOLOGY

[0001] The following relates to wireless communications, including uplink reports and store and forward mode.

BACKGROUND

[0002] Wireless communications systems are widely deployed to provide various types of communication content such as voice, video, packet data, messaging, broadcast, and so on. These systems may be capable of supporting communication with multiple users by sharing the available system resources (e.g., time, frequency, and power). Examples of such multiple-access systems include fourth generation (4G) systems such as Long Term Evolution (LTE) systems, LTE-Advanced (LTE-A) systems, or LTE-A Pro systems, and fifth generation (5G) systems which may be referred to as New Radio (NR) systems. These systems may employ technologies such as code division multiple access (CDMA), time division multiple access (TDMA), frequency division multiple access (FDMA), orthogonal FDMA (OFDMA), or discrete Fourier transform spread orthogonal frequency division multiplexing (DFT-S-OFDM). A wireless multiple-access communications system may include one or more base stations, each supporting wireless communication for communication devices, which may be known as user equipment (UE).

SUMMARY

[0003] Some wireless communication systems include one or more user equipments (UEs) and one or more non-terrestrial network (NTN) nodes (e.g., satellites). In some approaches, a UE may collect report data, such as a minimization of drive test (MDT) report or UE assistance information (UAI). When a NTN node operates in a store and forward mode, the NTN node may have intermittent connectivity with a core network.

[0004] In some examples of the techniques described herein, a UE may store data collected when the NTN node is operating in the store and forward mode. The UE may transmit delayed report data based on the collected data to a core network when the UE has coverage from a terrestrial network (TN) node or a NTN node. For example, the UE may transmit UE location data collected when the NTN node is operating in the store and forward mode. In some examples, the UE location data may indicate a location history in the form of coordinates (e.g., latitude and longitude, earth-centered earth-fixed (ECEF) coordinates, among other examples) or one or more physical addresses where UE has been located. In some approaches, the UE may transmit coverage information collected when the NTN node is operating in the store and forward mode. The coverage information may indicate the coverage or availability of one or more TN cells, of one or more NTN cells (that are operating in a non-store and forward mode), of one or more NTN cells operating in the store and forward mode, or may indicate a lack of coverage at one or more times or locations, or any combination thereof. In some examples, the coverage information (e.g., a wireless wide area network (WWAN) coverage status information element) may indicate a coverage status with time, which may be useful to enhance mobile network operator (MNO) services. In some approaches, a WWAN coverage map may be generated based on the coverage information. In some examples, the coverage information may indicate details of coverage, availability, or unavailability of one or more public land mobile networks (PLMNs), radio access technologies (RATs), or availability durations.

[0005] A method by a UE is described. The method may include receiving an indication that a first NTN node accessible to the UE is operating in a store and forward mode, storing location data of the UE and coverage information at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based on receiving the indication, the coverage information indicating communication availability of one or more nodes to the UE, the one or more nodes associated with a TN or an NTN, and transmitting report data indicating the location data and the coverage information.

[0006] A UE is described. The UE may include one or more memories storing processor executable code, and one or more processors coupled with the one or more memories. The one or more processors may individually or collectively be operable to execute the code to cause the UE to receive an indication that a first NTN node accessible to the UE is operating in a store and forward mode, store location data of the UE and coverage information at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based on receiving the indication, the coverage information indicating communication availability of one or more nodes to the UE, the one or more nodes associated with a TN or an NTN, and transmit report data indicating the location data and the coverage information.

[0007] Another UE is described. The UE may include means for receiving an indication that a first NTN node accessible to the UE is operating in a store and forward mode, means for storing location data of the UE and coverage information at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based on receiving the indication, the coverage information indicating communication availability of one or more nodes to the UE, the one or more nodes associated with a TN or an NTN, and means for transmitting report data indicating the location data and the coverage information.

[0008] A non-transitory computer-readable medium storing code is described. The code may include instructions executable by one or more processors to receive an indication that a first NTN node accessible to the UE is operating in a store and forward mode, store location data of the UE and coverage information at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based on receiving the indication, the coverage information indicating communication availability of one or more nodes to the UE, the one or more nodes associated with a TN or an NTN, and transmit report data indicating the location data and the coverage information.

[0009] In some examples of the method, UEs, and non-transitory computer-readable medium described herein, the report data may be transmitted to at least one of the one or more NTN nodes during the period that the one or more NTN nodes accessible to the UE may be operating in the store and forward mode.

[0010] Some examples of the method, UEs, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for receiving an indication of a rejection of management for the report data transmitted to the at least one of the one or more NTN nodes during the period and transmitting, based on the indication of the rejection, the report data to a TN node or to an NTN node not operating in the store and forward mode.

[0011] Some examples of the method, UEs, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for receiving a message from the at least one of the one or more NTN nodes to transmit the report data during the period that the one or more NTN nodes accessible to the UE may be operating in the store and forward mode, where transmitting the report data may be based on the message.

[0012] In some examples of the method, UEs, and non-transitory computer-readable medium described herein, transmitting the report data may include operations, features, means, or instructions for transmitting the report data to a terrestrial network node.

[0013] Some examples of the method, UEs, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for receiving a request for the location data and the coverage information, the request being included in a UE information request message or a logged measurement configuration message, where the location data and the coverage information may be stored at least partially during the period that the one or more NTN nodes accessible to the UE may be operating in the store and forward mode based on receiving the request.

[0014] In some examples of the method, UEs, and non-transitory computer-readable medium described herein, the coverage information includes WWAN coverage status information, PLMN availability information, RAT availability information, or any combination thereof.

[0015] In some examples of the method, UEs, and non-transitory computer-readable medium described herein, the coverage information includes a first parameter indicating availability of a TN cell, availability of an NTN cell, availability of an NTN cell operating in the store and forward mode, no coverage, or any combination thereof, and a second parameter indicating availability of a PLMN, availability of a RAT, a duration of availability, or any combination thereof.

[0016] In some examples of the method, UEs, and non-transitory computer-readable medium described herein, the report data may be included in a radio resource control (RRC) message, UE assistance information (UAI), a minimization of drive test (MDT) report, a message at a layer higher than a physical layer, a non-access stratum (NAS) message, a user plane message, or any combination thereof.

[0017] A method by a NTN node is described. The method may include transmitting an indication that the NTN node is operating in a store and forward mode and obtaining report data indicating location data of a UE and coverage information collected at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based on transmitting the indication, the coverage information indicating availability of one or more nodes to the UE during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode, the one or more nodes associated with a TN or an NTN.

[0018] A NTN node is described. The NTN node may include one or more memories storing processor executable code, and one or more processors coupled with the one or more memories. The one or more processors may individually or collectively be operable to execute the code to cause the NTN node to transmit an indication that the NTN node is operating in a store and forward mode and obtain report data indicating location data of a UE and coverage information collected at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based on transmitting the indication, the coverage information indicating availability of one or more nodes to the UE during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode, the one or more nodes associated with a TN or an NTN.

[0019] Another NTN node is described. The NTN node may include means for transmitting an indication that the NTN node is operating in a store and forward mode and means for obtaining report data indicating location data of a UE and coverage information collected at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based on transmitting the indication, the coverage information indicating availability of one or more nodes to the UE during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode, the one or more nodes associated with a TN or an NTN.

[0020] A non-transitory computer-readable medium storing code is described. The code may include instructions executable by one or more processors to transmit an indication that the NTN node is operating in a store and forward mode and obtain report data indicating location data of a UE and coverage information collected at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based on transmitting the indication, the coverage information indicating availability of one or more nodes to the UE during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode, the one or more nodes associated with a TN or an NTN.

[0021] In some examples of the method, NTN nodes, and non-transitory computer-readable medium described herein, the report data may be obtained in the period that that the one or more NTN nodes accessible to the UE may be operating in the store and forward mode.

[0022] Some examples of the method, NTN nodes, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for transmitting an indication of rejection of management for the report data obtained in the period.

[0023] Some examples of the method, NTN nodes, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for transmitting the report data to a core network when a feeder link between the NTN node and the core network may be available.

[0024] Some examples of the method, NTN nodes, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for transmitting a message to transmit the report data

during the period that the one or more NTN nodes accessible to the UE may be operating in the store and forward mode, where obtaining the report data may be based on the message.

[0025] Some examples of the method, NTN nodes, and non-transitory computer-readable medium described herein may further include operations, features, means, or instructions for transmitting a request for the location data and the coverage information, the request being included in a UE information request message or a logged measurement configuration message, where the location data and the coverage information may be obtained at least partially during the period that the NTN node may be operating in the store and forward mode based on transmitting the request.

[0026] In some examples of the method, NTN nodes, and non-transitory computer-readable medium described herein, the coverage information includes WWAN coverage status information, PLMN availability information, RAT availability information, or any combination thereof.

[0027] In some examples of the method, NTN nodes, and non-transitory computer-readable medium described herein, the coverage information includes a first parameter indicating availability of a TN cell, availability of an NTN cell, availability of an NTN cell operating in the store and forward mode, no coverage, or any combination thereof, and a second parameter indicating availability of a PLMN, availability of a RAT, a duration of availability, or any combination thereof.

[0028] In some examples of the method, NTN nodes, and non-transitory computer-readable medium described herein, the report data may be included in an RRC message, UE assistance information (UAI), a minimization of drive test (MDT) report, a message at a layer higher than a physical layer, a non-access stratum (NAS) message, a user plane message, or any combination thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] FIG. **1** shows an example of a wireless communications system that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure.

[0030] FIG. **2** shows an example of a network architecture that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure.

[0031] FIG. **3** shows an example of a wireless communications system that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure.

[0032] FIG. **4** shows an example of a process flow that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure.

[0033] FIG. **5** shows an example of a process flow that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure.

[0034] FIGS. **6** and **7** show block diagrams of devices that support uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure.

[0035] FIG. **8** shows a block diagram of a communications manager that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure.

[0036] FIG. **9** shows a diagram of a system including a device that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure.

[0037] FIGS. **10** and **11** show block diagrams of devices that support uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure.

[0038] FIG. **12** shows a block diagram of a communications manager that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure.

[0039] FIG. **13** shows a diagram of a system including a device that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure.

[0040] FIGS. **14** through **17** show flowcharts illustrating methods that support uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure.

DETAILED DESCRIPTION

[0041] Some wireless communication systems include one or more user equipments (UEs) and one or more non-terrestrial network (NTN) nodes (e.g., satellites). In some approaches, a UE may collect report data, such as a minimization of drive test (MDT) report or UE assistance information (UAI). When a NTN node operates in a store and forward mode, the NTN node may have intermittent connectivity with a core network. In some cases when the NTN node is operating in the store and forward mode, the UE may be unable to send an MDT report or UAI via the NTN node because the information may be outdated for the core network or the information may have reduced utility if a feeder link between the NTN node and the core network is not restored for an extended period of time. These issues may be exacerbated when the UE is moving or roaming, or when handover occurs. Accordingly, some approaches may not function if the UE cannot connect to the NTN (e.g., due to a restriction or loading status of the NTN or discontinuous NTN coverage). Some examples of the techniques described herein may provide approaches where one or more reports (e.g., MDT or UAI reports) may provide enhanced information in one or more scenarios or conditions.

[0042] In some examples of the techniques described herein, a UE may store data collected when the NTN node is operating in the store and forward mode. The UE may transmit delayed report data based on the collected data to a core network when the UE has coverage from a terrestrial network (TN) node or a NTN node. For example, the UE may transmit UE location data collected when the NTN node is operating in the store and forward mode. In some examples, the UE location data may indicate a location history in the form of coordinates (e.g., latitude and longitude) or one or more physical addresses where UE has been located.

[0043] In some approaches, the UE may transmit coverage information collected when the NTN node is operating in the store and forward mode. The coverage information may indicate the coverage or availability of one or more TN cells,

of one or more NTN cells (that are operating in a non-store and forward mode), of one or more NTN cells operating in the store and forward mode, or may indicate a lack of coverage at one or more times or locations, or any combination thereof. In some examples, the coverage information (e.g., a wireless wide area network (WWAN) coverage status information element) may indicate a coverage status with time, which may be useful to enhance mobile network operator (MNO) services. In some approaches, a WWAN coverage map may be generated based on the coverage information. In some examples, the coverage information may indicate details of coverage, availability, or unavailability of one or more public land mobile networks (PLMNs), radio access technologies (RATs), or availability durations.

[0044] Some examples of the techniques described herein may enable the collection of information via a satellite connection to enhance NTN or TN planning. Some of the techniques may be utilized to survey an area and collect data regarding usage demands of the users in a remote area, which may help in deploying one or more terrestrial networks in the remote area. For instance, the collected data may be utilized to determine a quantity(ies), location(s), or capability(ies) of one or more TN base stations for deployment. An NTN deployment may be utilized to collect the data (which may represent the usage demands of the users in the remote area), and may provide services to the users in the remote area. Accordingly, data may be collected via the NTN, where the data may be used for determining a TN deployment in the area.

[0045] Some approaches may provide one or more enhancements to UE or network operation. A UE may operate in a power-efficient manner to report uplink measurements to a network. Some techniques may address one or more issues related to TN or NTN enhancement (e.g., optimization) or coverage gaps and may be useful for coverage planning. Additionally, or alternatively, a UE may operate efficiently when an NTN node (e.g., satellite) is operating in the store and forward mode. For example, MDT or UAI reports may provide information (e.g., parameters) regarding a UE's surrounding environment (e.g., available service) with time or location information, which may have an enhanced role in network deployment. In some aspects, one or more relatively timely reports may be provided to a core network by delaying an amount of time when store and forward mode is active. In some examples, the reported data may be utilized to enhance one or more networks (e.g., to determine when and how an inter-satellite link (ISL) may be active, or to determine whether more NTN satellites or more NTN gateways may be utilized for feeder links).

[0046] Aspects of the disclosure are initially described in the context of wireless communications systems. Aspects of the disclosure are further illustrated by and described with reference to process flows that relate to uplink reports and store and forward mode. Aspects of the disclosure are further illustrated by and described with reference to apparatus diagrams, system diagrams, and flowcharts that relate to uplink reports and store and forward mode.

[0047] FIG. **1** shows an example of a wireless communications system **100** that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure. The wireless communications system **100** may include one or more network entities **105**, one or more UEs **115**, and a core network **130**. In some examples, the wireless communications system **100** may be a Long Term Evolution (LTE) network, an LTE-Advanced (LTE-A) network, an LTE-A Pro network, a New Radio (NR) network, or a network operating in accordance with other systems and radio technologies, including future systems and radio technologies not explicitly mentioned herein.

[0048] The network entities **105** may be dispersed throughout a geographic area to form the wireless communications system **100** and may include devices in different forms or having different capabilities. In various examples, a network entity **105** may be referred to as a network element, a mobility element, a radio access network (RAN) node, or network equipment, among other nomenclature. In some examples, network entities **105** and UEs **115** may wirelessly communicate via one or more communication links **125** (e.g., a radio frequency (RF) access link). For example, a network entity **105** may support a coverage area **110** (e.g., a geographic coverage area) over which the UEs **115** and the network entity **105** may establish one or more communication links **125**. The coverage area **110** may be an example of a geographic area over which a network entity **105** and a UE **115** may support the communication of signals according to one or more RATs.

[0049] The UEs **115** may be dispersed throughout a coverage area **110** of the wireless communications system **100**, and each UE **115** may be stationary, or mobile, or both at different times. The UEs **115** may be devices in different forms or having different capabilities. Some example UEs **115** are illustrated in FIG. **1**. The UEs **115** described herein may be capable of supporting communications with various types of devices, such as other UEs **115** or network entities **105**, as shown in FIG. **1**.

[0050] As described herein, a node of the wireless communications system **100**, which may be referred to as a network node, or a wireless node, may be a network entity **105** (e.g., any network entity described herein), a UE **115** (e.g., any UE described herein), a network controller, an apparatus, a device, a computing system, one or more components, or another suitable processing entity configured to perform any of the techniques described herein. For example, a node may be a UE **115**. As another example, a node may be a network entity **105**. As another example, a first node may be configured to communicate with a second node or a third node. In one aspect of this example, the first node may be a UE **115**, the second node may be a network entity **105**, and the third node may be a UE **115**. In another aspect of this example, the first node may be a UE **115**, the second node may be a network entity **105**, and the third node may be a network entity **105**. In yet other aspects of this example, the first, second, and third nodes may be different relative to these examples. Similarly, reference to a UE **115**, network entity **105**, apparatus, device, computing system, or the like may include disclosure of the UE **115**, network entity **105**, apparatus, device, computing system, or the like being a node. For example, disclosure that a UE **115** is configured to receive information from a network entity **105** also discloses that a first node is configured to receive information from a second node.

[0051] In some examples, network entities **105** may communicate with the core network **130**, or with one another, or both. For example, network entities **105** may communicate with the core network **130** via one or more backhaul communication links **120** (e.g., in accordance with an S1, N2, N3, or other interface protocol). In some examples,

network entities **105** may communicate with one another via a backhaul communication link **120** (e.g., in accordance with an X2, Xn, or other interface protocol) either directly (e.g., directly between network entities **105**) or indirectly (e.g., via a core network **130**). In some examples, network entities **105** may communicate with one another via a midhaul communication link **162** (e.g., in accordance with a midhaul interface protocol) or a fronthaul communication link **168** (e.g., in accordance with a fronthaul interface protocol), or any combination thereof. The backhaul communication links **120**, midhaul communication links **162**, or fronthaul communication links **168** may be or include one or more wired links (e.g., an electrical link, an optical fiber link), one or more wireless links (e.g., a radio link, a wireless optical link), among other examples or various combinations thereof. A UE **115** may communicate with the core network **130** via a communication link **155**.

[0052] One or more of the network entities **105** described herein may include or may be referred to as a base station **140** (e.g., a base transceiver station, a radio base station, an NR base station, an access point, a radio transceiver, a NodeB, an eNodeB (eNB), a next-generation NodeB or a giga-NodeB (either of which may be referred to as a gNB), a 5G NB, a next-generation eNB (ng-eNB), a Home NodeB, a Home eNodeB, or other suitable terminology). In some examples, a network entity **105** (e.g., a base station **140**) may be implemented in an aggregated (e.g., monolithic, standalone) base station architecture, which may be configured to utilize a protocol stack that is physically or logically integrated within a single network entity **105** (e.g., a single RAN node, such as a base station **140**).

[0053] In some examples, a network entity **105** may be implemented in a disaggregated architecture (e.g., a disaggregated base station architecture, a disaggregated RAN architecture), which may be configured to utilize a protocol stack that is physically or logically distributed among two or more network entities **105**, such as an integrated access backhaul (IAB) network, an open RAN (O-RAN) (e.g., a network configuration sponsored by the O-RAN Alliance), or a virtualized RAN (vRAN) (e.g., a cloud RAN (C-RAN)). For example, a network entity **105** may include one or more of a central unit (CU) **160**, a distributed unit (DU) **165**, a radio unit (RU) **170**, a RAN Intelligent Controller (RIC) **175** (e.g., a Near-Real Time RIC (Near-RT RIC), a Non-Real Time RIC (Non-RT RIC)), a Service Management and Orchestration (SMO) **180** system, or any combination thereof. An RU **170** may also be referred to as a radio head, a smart radio head, a remote radio head (RRH), a remote radio unit (RRU), or a transmission reception point (TRP). One or more components of the network entities **105** in a disaggregated RAN architecture may be co-located, or one or more components of the network entities **105** may be located in distributed locations (e.g., separate physical locations). In some examples, one or more network entities **105** of a disaggregated RAN architecture may be implemented as virtual units (e.g., a virtual CU (VCU), a virtual DU (VDU), a virtual RU (VRU)).

[0054] The split of functionality between a CU **160**, a DU **165**, and an RU **170** is flexible and may support different functionalities depending on which functions (e.g., network layer functions, protocol layer functions, baseband functions, RF functions, and any combinations thereof) are performed at a CU **160**, a DU **165**, or an RU **170**. For example, a functional split of a protocol stack may be employed between a CU **160** and a DU **165** such that the CU **160** may support one or more layers of the protocol stack and the DU **165** may support one or more different layers of the protocol stack. In some examples, the CU **160** may host upper protocol layer (e.g., layer 3 (L3), layer 2 (L2)) functionality and signaling (e.g., Radio Resource Control (RRC), service data adaption protocol (SDAP), Packet Data Convergence Protocol (PDCP)). The CU **160** may be connected to one or more DUs **165** or RUs **170**, and the one or more DUs **165** or RUs **170** may host lower protocol layers, such as layer 1 (L1) (e.g., physical (PHY) layer) or L2 (e.g., radio link control (RLC) layer, medium access control (MAC) layer) functionality and signaling, and may each be at least partially controlled by the CU **160**. Additionally, or alternatively, a functional split of the protocol stack may be employed between a DU **165** and an RU **170** such that the DU **165** may support one or more layers of the protocol stack and the RU **170** may support one or more different layers of the protocol stack. The DU **165** may support one or multiple different cells (e.g., via one or more RUs **170**). In some cases, a functional split between a CU **160** and a DU **165**, or between a DU **165** and an RU **170** may be within a protocol layer (e.g., some functions for a protocol layer may be performed by one of a CU **160**, a DU **165**, or an RU **170**, while other functions of the protocol layer are performed by a different one of the CU **160**, the DU **165**, or the RU **170**). A CU **160** may be functionally split further into CU control plane (CU-CP) and CU user plane (CU-UP) functions. A CU **160** may be connected to one or more DUs **165** via a midhaul communication link **162** (e.g., F1, F1-c, F1-u), and a DU **165** may be connected to one or more RUs **170** via a fronthaul communication link **168** (e.g., open fronthaul (FH) interface). In some examples, a midhaul communication link **162** or a fronthaul communication link **168** may be implemented in accordance with an interface (e.g., a channel) between layers of a protocol stack supported by respective network entities **105** that are in communication via such communication links.

[0055] In wireless communications systems (e.g., wireless communications system **100**), infrastructure and spectral resources for radio access may support wireless backhaul link capabilities to supplement wired backhaul connections, providing an IAB network architecture (e.g., to a core network **130**). In some cases, in an IAB network, one or more network entities **105** (e.g., IAB nodes **104**) may be partially controlled by each other. One or more IAB nodes **104** may be referred to as a donor entity or an IAB donor. One or more DUs **165** or one or more RUs **170** may be partially controlled by one or more CUs **160** associated with a donor network entity **105** (e.g., a donor base station **140**). The one or more donor network entities **105** (e.g., IAB donors) may be in communication with one or more additional network entities **105** (e.g., IAB nodes **104**) via supported access and backhaul links (e.g., backhaul communication links **120**). IAB nodes **104** may include an IAB mobile termination (IAB-MT) controlled (e.g., scheduled) by DUs **165** of a coupled IAB donor. An IAB-MT may include an independent set of antennas for relay of communications with UEs **115**, or may share the same antennas (e.g., of an RU **170**) of an IAB node **104** used for access via the DU **165** of the IAB node **104** (e.g., referred to as virtual IAB-MT (vIAB-MT)). In some examples, the IAB nodes **104** may include DUs **165** that support communication links with additional entities (e.g., IAB nodes **104**, UEs **115**)

within the relay chain or configuration of the access network (e.g., downstream). In such cases, one or more components of the disaggregated RAN architecture (e.g., one or more IAB nodes **104** or components of IAB nodes **104**) may be configured to operate according to the techniques described herein.

[0056] For instance, an access network (AN) or RAN may include communications between access nodes (e.g., an IAB donor), IAB nodes **104**, and one or more UEs **115**. The IAB donor may facilitate connection between the core network **130** and the AN (e.g., via a wired or wireless connection to the core network **130**). That is, an IAB donor may refer to a RAN node with a wired or wireless connection to core network **130**. The IAB donor may include a CU **160** and at least one DU **165** (e.g., and RU **170**), in which case the CU **160** may communicate with the core network **130** via an interface (e.g., a backhaul link). IAB donor and IAB nodes **104** may communicate via an F1 interface according to a protocol that defines signaling messages (e.g., an F1 AP protocol). Additionally, or alternatively, the CU **160** may communicate with the core network via an interface, which may be an example of a portion of backhaul link, and may communicate with other CUs **160** (e.g., a CU **160** associated with an alternative IAB donor) via an Xn-C interface, which may be an example of a portion of a backhaul link.

[0057] An IAB node **104** may refer to a RAN node that provides IAB functionality (e.g., access for UEs **115**, wireless self-backhauling capabilities). A DU **165** may act as a distributed scheduling node towards child nodes associated with the IAB node **104**, and the IAB-MT may act as a scheduled node towards parent nodes associated with the IAB node **104**. That is, an IAB donor may be referred to as a parent node in communication with one or more child nodes (e.g., an IAB donor may relay transmissions for UEs through one or more other IAB nodes **104**). Additionally, or alternatively, an IAB node **104** may also be referred to as a parent node or a child node to other IAB nodes **104**, depending on the relay chain or configuration of the AN. Therefore, the IAB-MT entity of IAB nodes **104** may provide a Uu interface for a child IAB node **104** to receive signaling from a parent IAB node **104**, and the DU interface (e.g., DUs **165**) may provide a Uu interface for a parent IAB node **104** to signal to a child IAB node **104** or UE **115**.

[0058] For example, IAB node **104** may be referred to as a parent node that supports communications for a child IAB node, or referred to as a child IAB node associated with an IAB donor, or both. The IAB donor may include a CU **160** with a wired or wireless connection (e.g., a backhaul communication link **120**) to the core network **130** and may act as parent node to IAB nodes **104**. For example, the DU **165** of IAB donor may relay transmissions to UEs **115** through IAB nodes **104**, or may directly signal transmissions to a UE **115**, or both. The CU **160** of IAB donor may signal communication link establishment via an F1 interface to IAB nodes **104**, and the IAB nodes **104** may schedule transmissions (e.g., transmissions to the UEs **115** relayed from the IAB donor) through the DUs **165**. That is, data may be relayed to and from IAB nodes **104** via signaling via an NR Uu interface to MT of the IAB node **104**. Communications with IAB node **104** may be scheduled by a DU **165** of IAB donor and communications with IAB node **104** may be scheduled by DU **165** of IAB node **104**.

[0059] In the case of the techniques described herein applied in the context of a disaggregated RAN architecture, one or more components of the disaggregated RAN architecture may be configured to support uplink reports and store and forward mode as described herein. For example, some operations described as being performed by a UE **115** or a network entity **105** (e.g., a base station **140**) may additionally, or alternatively, be performed by one or more components of the disaggregated RAN architecture (e.g., IAB nodes **104**, DUs **165**, CUs **160**, RUs **170**, RIC **175**, SMO **180**).

[0060] A UE **115** may include or may be referred to as a mobile device, a wireless device, a remote device, a handheld device, or a subscriber device, or some other suitable terminology, where the "device" may also be referred to as a unit, a station, a terminal, or a client, among other examples. A UE **115** may also include or may be referred to as a personal electronic device such as a cellular phone, a personal digital assistant (PDA), a tablet computer, a laptop computer, or a personal computer. In some examples, a UE **115** may include or be referred to as a wireless local loop (WLL) station, an Internet of Things (IoT) device, an Internet of Everything (IoE) device, or a machine type communications (MTC) device, among other examples, which may be implemented in various objects such as appliances, or vehicles, meters, among other examples.

[0061] The UEs **115** described herein may be able to communicate with various types of devices, such as other UEs **115** that may sometimes act as relays as well as the network entities **105** and the network equipment including macro eNBs or gNBs, small cell eNBs or gNBs, or relay base stations, among other examples, as shown in FIG. **1**.

[0062] The UEs **115** and the network entities **105** may wirelessly communicate with one another via one or more communication links **125** (e.g., an access link) using resources associated with one or more carriers. The term "carrier" may refer to a set of RF spectrum resources having a defined physical layer structure for supporting the communication links **125**. For example, a carrier used for a communication link **125** may include a portion of a RF spectrum band (e.g., a bandwidth part (BWP)) that is operated according to one or more physical layer channels for a given radio access technology (e.g., LTE, LTE-A, LTE-A Pro, NR). Each physical layer channel may carry acquisition signaling (e.g., synchronization signals, system information), control signaling that coordinates operation for the carrier, user data, or other signaling. The wireless communications system **100** may support communication with a UE **115** using carrier aggregation or multi-carrier operation. A UE **115** may be configured with multiple downlink component carriers and one or more uplink component carriers according to a carrier aggregation configuration. Carrier aggregation may be used with both frequency division duplexing (FDD) and time division duplexing (TDD) component carriers. Communication between a network entity **105** and other devices may refer to communication between the devices and any portion (e.g., entity, sub-entity) of a network entity **105**. For example, the terms "transmitting," "receiving," or "communicating," when referring to a network entity **105**, may refer to any portion of a network entity **105** (e.g., a base station **140**, a CU **160**, a DU **165**, a RU **170**) of a RAN communicating with another device (e.g., directly or via one or more other network entities **105**).

[0063] In some examples, such as in a carrier aggregation configuration, a carrier may also have acquisition signaling or control signaling that coordinates operations for other carriers. A carrier may be associated with a frequency channel (e.g., an evolved universal mobile telecommunication system terrestrial radio access (E-UTRA) absolute RF channel number (EARFCN)) and may be identified according to a channel raster for discovery by the UEs **115**. A carrier may be operated in a standalone mode, in which case initial acquisition and connection may be conducted by the UEs **115** via the carrier, or the carrier may be operated in a non-standalone mode, in which case a connection is anchored using a different carrier (e.g., of the same or a different radio access technology).

[0064] The communication links **125** shown in the wireless communications system **100** may include downlink transmissions (e.g., forward link transmissions) from a network entity **105** to a UE **115**, uplink transmissions (e.g., return link transmissions) from a UE **115** to a network entity **105**, or both, among other configurations of transmissions. Carriers may carry downlink or uplink communications (e.g., in an FDD mode) or may be configured to carry downlink and uplink communications (e.g., in a TDD mode).

[0065] A carrier may be associated with a particular bandwidth of the RF spectrum and, in some examples, the carrier bandwidth may be referred to as a "system bandwidth" of the carrier or the wireless communications system **100**. For example, the carrier bandwidth may be one of a set of bandwidths for carriers of a particular radio access technology (e.g., 1.4, 3, 5, 10, 15, 20, 40, or 80 megahertz (MHz)). Devices of the wireless communications system **100** (e.g., the network entities **105**, the UEs **115**, or both) may have hardware configurations that support communications using a particular carrier bandwidth or may be configurable to support communications using one of a set of carrier bandwidths. In some examples, the wireless communications system **100** may include network entities **105** or UEs **115** that support concurrent communications using carriers associated with multiple carrier bandwidths. In some examples, each served UE **115** may be configured for operating using portions (e.g., a sub-band, a BWP) or all of a carrier bandwidth.

[0066] Signal waveforms transmitted via a carrier may be made up of multiple subcarriers (e.g., using multi-carrier modulation (MCM) techniques such as orthogonal frequency division multiplexing (OFDM) or discrete Fourier transform spread OFDM (DFT-S-OFDM)). In a system employing MCM techniques, a resource element may refer to resources of one symbol period (e.g., a duration of one modulation symbol) and one subcarrier, in which case the symbol period and subcarrier spacing may be inversely related. The quantity of bits carried by each resource element may depend on the modulation scheme (e.g., the order of the modulation scheme, the coding rate of the modulation scheme, or both), such that a relatively higher quantity of resource elements (e.g., in a transmission duration) and a relatively higher order of a modulation scheme may correspond to a relatively higher rate of communication. A wireless communications resource may refer to a combination of an RF spectrum resource, a time resource, and a spatial resource (e.g., a spatial layer, a beam), and the use of multiple spatial resources may increase the data rate or data integrity for communications with a UE **115**.

[0067] One or more numerologies for a carrier may be supported, and a numerology may include a subcarrier spacing (Δf) and a cyclic prefix. A carrier may be divided into one or more BWPs having the same or different numerologies. In some examples, a UE **115** may be configured with multiple BWPs. In some examples, a single BWP for a carrier may be active at a given time and communications for the UE **115** may be restricted to one or more active BWPs.

[0068] The time intervals for the network entities **105** or the UEs **115** may be expressed in multiples of a basic time unit which may, for example, refer to a sampling period of $T_s=1/(\Delta f_{max}\cdot N_f)$ seconds, for which Δf_{max} may represent a supported subcarrier spacing, and N_f may represent a supported discrete Fourier transform (DFT) size. Time intervals of a communications resource may be organized according to radio frames each having a specified duration (e.g., 10 milliseconds (ms)). Each radio frame may be identified by a system frame number (SFN) (e.g., ranging from 0 to 1023).

[0069] Each frame may include multiple consecutively-numbered subframes or slots, and each subframe or slot may have the same duration. In some examples, a frame may be divided (e.g., in the time domain) into subframes, and each subframe may be further divided into a quantity of slots. Alternatively, each frame may include a variable quantity of slots, and the quantity of slots may depend on subcarrier spacing. Each slot may include a quantity of symbol periods (e.g., depending on the length of the cyclic prefix prepended to each symbol period). In some wireless communications systems **100**, a slot may further be divided into multiple mini-slots associated with one or more symbols. Excluding the cyclic prefix, each symbol period may be associated with one or more (e.g., N_f) sampling periods. The duration of a symbol period may depend on the subcarrier spacing or frequency band of operation.

[0070] A subframe, a slot, a mini-slot, or a symbol may be the smallest scheduling unit (e.g., in the time domain) of the wireless communications system **100** and may be referred to as a transmission time interval (TTI). In some examples, the TTI duration (e.g., a quantity of symbol periods in a TTI) may be variable. Additionally, or alternatively, the smallest scheduling unit of the wireless communications system **100** may be dynamically selected (e.g., in bursts of shortened TTIs (STTIs)).

[0071] Physical channels may be multiplexed for communication using a carrier according to various techniques. A physical control channel and a physical data channel may be multiplexed for signaling via a downlink carrier, for example, using one or more of time division multiplexing (TDM) techniques, frequency division multiplexing (FDM) techniques, or hybrid TDM-FDM techniques. A control region (e.g., a control resource set (CORESET)) for a physical control channel may be defined by a set of symbol periods and may extend across the system bandwidth or a subset of the system bandwidth of the carrier. One or more control regions (e.g., CORESETs) may be configured for a set of the UEs **115**. For example, one or more of the UEs **115** may monitor or search control regions for control information according to one or more search space sets, and each search space set may include one or multiple control channel candidates in one or more aggregation levels arranged in a cascaded manner. An aggregation level for a control channel candidate may refer to an amount of control channel resources (e.g., control channel elements (CCEs)) associated

with encoded information for a control information format having a given payload size. Search space sets may include common search space sets configured for sending control information to multiple UEs **115** and UE-specific search space sets for sending control information to a specific UE **115**.

[0072] A network entity **105** may provide communication coverage via one or more cells, for example a macro cell, a small cell, a hot spot, or other types of cells, or any combination thereof. The term "cell" may refer to a logical communication entity used for communication with a network entity **105** (e.g., using a carrier) and may be associated with an identifier for distinguishing neighboring cells (e.g., a physical cell identifier (PCID), a virtual cell identifier (VCID), or others). In some examples, a cell also may refer to a coverage area **110** or a portion of a coverage area **110** (e.g., a sector) over which the logical communication entity operates. Such cells may range from smaller areas (e.g., a structure, a subset of structure) to larger areas depending on various factors such as the capabilities of the network entity **105**. For example, a cell may be or include a building, a subset of a building, or exterior spaces between or overlapping with coverage areas **110**, among other examples.

[0073] A macro cell generally covers a relatively large geographic area (e.g., several kilometers in radius) and may allow unrestricted access by the UEs **115** with service subscriptions with the network provider supporting the macro cell. A small cell may be associated with a lower-powered network entity **105** (e.g., a lower-powered base station **140**), as compared with a macro cell, and a small cell may operate using the same or different (e.g., licensed, unlicensed) frequency bands as macro cells. Small cells may provide unrestricted access to the UEs **115** with service subscriptions with the network provider or may provide restricted access to the UEs **115** having an association with the small cell (e.g., the UEs **115** in a closed subscriber group (CSG), the UEs **115** associated with users in a home or office). A network entity **105** may support one or multiple cells and may also support communications via the one or more cells using one or multiple component carriers.

[0074] In some examples, a carrier may support multiple cells, and different cells may be configured according to different protocol types (e.g., MTC, narrowband IoT (NB-IoT), enhanced mobile broadband (eMBB)) that may provide access for different types of devices.

[0075] In some examples, a network entity **105** (e.g., a base station **140**, an RU **170**) may be movable and therefore provide communication coverage for a moving coverage area **110**. In some examples, different coverage areas **110** associated with different technologies may overlap, but the different coverage areas **110** may be supported by the same network entity **105**. In some other examples, the overlapping coverage areas **110** associated with different technologies may be supported by different network entities **105**. The wireless communications system **100** may include, for example, a heterogeneous network in which different types of the network entities **105** provide coverage for various coverage areas **110** using the same or different radio access technologies.

[0076] The wireless communications system **100** may support synchronous or asynchronous operation. For synchronous operation, network entities **105** (e.g., base stations **140**) may have similar frame timings, and transmissions from different network entities **105** may be approximately aligned in time. For asynchronous operation, network entities **105** may have different frame timings, and transmissions from different network entities **105** may, in some examples, not be aligned in time. The techniques described herein may be used for either synchronous or asynchronous operations.

[0077] Some UEs **115**, such as MTC or IoT devices, may be low cost or low complexity devices and may provide for automated communication between machines (e.g., via Machine-to-Machine (M2M) communication). M2M communication or MTC may refer to data communication technologies that allow devices to communicate with one another or a network entity **105** (e.g., a base station **140**) without human intervention. In some examples, M2M communication or MTC may include communications from devices that integrate sensors or meters to measure or capture information and relay such information to a central server or application program that uses the information or presents the information to humans interacting with the application program. Some UEs **115** may be designed to collect information or enable automated behavior of machines or other devices. Examples of applications for MTC devices include smart metering, inventory monitoring, water level monitoring, equipment monitoring, healthcare monitoring, wildlife monitoring, weather and geological event monitoring, fleet management and tracking, remote security sensing, physical access control, and transaction-based business charging.

[0078] Some UEs **115** may be configured to employ operating modes that reduce power consumption, such as half-duplex communications (e.g., a mode that supports one-way communication via transmission or reception, but not transmission and reception concurrently). In some examples, half-duplex communications may be performed at a reduced peak rate. Other power conservation techniques for the UEs **115** include entering a power saving deep sleep mode when not engaging in active communications, operating using a limited bandwidth (e.g., according to narrowband communications), or a combination of these techniques. For example, some UEs **115** may be configured for operation using a narrowband protocol type that is associated with a defined portion or range (e.g., set of subcarriers or resource blocks (RBs)) within a carrier, within a guardband of a carrier, or outside of a carrier.

[0079] The wireless communications system **100** may be configured to support ultra-reliable communications or low-latency communications, or various combinations thereof. For example, the wireless communications system **100** may be configured to support ultra-reliable low-latency communications (URLLC). The UEs **115** may be designed to support ultra-reliable, low-latency, or critical functions. Ultra-reliable communications may include private communication or group communication and may be supported by one or more services such as push-to-talk, video, or data. Support for ultra-reliable, low-latency functions may include prioritization of services, and such services may be used for public safety or general commercial applications. The terms ultra-reliable, low-latency, and ultra-reliable low-latency may be used interchangeably herein.

[0080] In some examples, a UE **115** may be configured to support communicating directly with other UEs **115** via a device-to-device (D2D) communication link **135** (e.g., in accordance with a peer-to-peer (P2P), D2D, or sidelink protocol). In some examples, one or more UEs **115** of a group that are performing D2D communications may be

within the coverage area **110** of a network entity **105** (e.g., a base station **140**, an RU **170**), which may support aspects of such D2D communications being configured by (e.g., scheduled by) the network entity **105**. In some examples, one or more UEs **115** of such a group may be outside the coverage area **110** of a network entity **105** or may be otherwise unable to or not configured to receive transmissions from a network entity **105**. In some examples, groups of the UEs **115** communicating via D2D communications may support a one-to-many (1:M) system in which each UE **115** transmits to each of the other UEs **115** in the group. In some examples, a network entity **105** may facilitate the scheduling of resources for D2D communications. In some other examples, D2D communications may be carried out between the UEs **115** without an involvement of a network entity **105**.

[0081] In some systems, a D2D communication link **135** may be an example of a communication channel, such as a sidelink communication channel, between vehicles (e.g., UEs **115**). In some examples, vehicles may communicate using vehicle-to-everything (V2X) communications, vehicle-to-vehicle (V2V) communications, or some combination of these. A vehicle may signal information related to traffic conditions, signal scheduling, weather, safety, emergencies, or any other information relevant to a V2X system. In some examples, vehicles in a V2X system may communicate with roadside infrastructure, such as roadside units, or with the network via one or more network nodes (e.g., network entities **105**, base stations **140**, RUs **170**) using vehicle-to-network (V2N) communications, or with both.

[0082] The core network **130** may provide user authentication, access authorization, tracking, Internet Protocol (IP) connectivity, and other access, routing, or mobility functions. The core network **130** may be an evolved packet core (EPC) or 5G core (5GC), which may include at least one control plane entity that manages access and mobility (e.g., a mobility management entity (MME), an access and mobility management function (AMF)) and at least one user plane entity that routes packets or interconnects to external networks (e.g., a serving gateway (S-GW), a Packet Data Network (PDN) gateway (P-GW), or a user plane function (UPF)). The control plane entity may manage non-access stratum (NAS) functions such as mobility, authentication, and bearer management for the UEs **115** served by the network entities **105** (e.g., base stations **140**) associated with the core network **130**. User IP packets may be transferred through the user plane entity, which may provide IP address allocation as well as other functions. The user plane entity may be connected to IP services **150** for one or more network operators. The IP services **150** may include access to the Internet, Intranet(s), an IP Multimedia Subsystem (IMS), or a Packet-Switched Streaming Service.

[0083] The wireless communications system **100** may operate using one or more frequency bands, which may be in the range of 300 megahertz (MHz) to 300 gigahertz (GHz). Generally, the region from 300 MHz to 3 GHz is known as the ultra-high frequency (UHF) region or decimeter band because the wavelengths range from approximately one decimeter to one meter in length. UHF waves may be blocked or redirected by buildings and environmental features, which may be referred to as clusters, but the waves may penetrate structures sufficiently for a macro cell to provide service to the UEs **115** located indoors. Communications using UHF waves may be associated with smaller antennas and shorter ranges (e.g., less than 100 kilometers) compared to communications using the smaller frequencies and longer waves of the high frequency (HF) or very high frequency (VHF) portion of the spectrum below 300 MHz.

[0084] The wireless communications system **100** may also operate using a super high frequency (SHF) region, which may be in the range of 3 GHz to 30 GHz, also known as the centimeter band, or using an extremely high frequency (EHF) region of the spectrum (e.g., from 30 GHz to 300 GHz), also known as the millimeter band. In some examples, the wireless communications system **100** may support millimeter wave (mmW) communications between the UEs **115** and the network entities **105** (e.g., base stations **140**, RUs **170**), and EHF antennas of the respective devices may be smaller and more closely spaced than UHF antennas. In some examples, such techniques may facilitate using antenna arrays within a device. The propagation of EHF transmissions, however, may be subject to even greater attenuation and shorter range than SHF or UHF transmissions. The techniques disclosed herein may be employed across transmissions that use one or more different frequency regions, and designated use of bands across these frequency regions may differ by country or regulating body.

[0085] The wireless communications system **100** may utilize both licensed and unlicensed RF spectrum bands. For example, the wireless communications system **100** may employ License Assisted Access (LAA), LTE-Unlicensed (LTE-U) radio access technology, or NR technology using an unlicensed band such as the 5 GHz industrial, scientific, and medical (ISM) band. While operating using unlicensed RF spectrum bands, devices such as the network entities **105** and the UEs **115** may employ carrier sensing for collision detection and avoidance. In some examples, operations using unlicensed bands may be based on a carrier aggregation configuration in conjunction with component carriers operating using a licensed band (e.g., LAA). Operations using unlicensed spectrum may include downlink transmissions, uplink transmissions, P2P transmissions, or D2D transmissions, among other examples.

[0086] A network entity **105** (e.g., a base station **140**, an RU **170**) or a UE **115** may be equipped with multiple antennas, which may be used to employ techniques such as transmit diversity, receive diversity, multiple-input multiple-output (MIMO) communications, or beamforming. The antennas of a network entity **105** or a UE **115** may be located within one or more antenna arrays or antenna panels, which may support MIMO operations or transmit or receive beamforming. For example, one or more base station antennas or antenna arrays may be co-located at an antenna assembly, such as an antenna tower. In some examples, antennas or antenna arrays associated with a network entity **105** may be located at diverse geographic locations. A network entity **105** may include an antenna array with a set of rows and columns of antenna ports that the network entity **105** may use to support beamforming of communications with a UE **115**. Likewise, a UE **115** may include one or more antenna arrays that may support various MIMO or beamforming operations. Additionally, or alternatively, an antenna panel may support RF beamforming for a signal transmitted via an antenna port.

[0087] The network entities **105** or the UEs **115** may use MIMO communications to exploit multipath signal propagation and increase spectral efficiency by transmitting or receiving multiple signals via different spatial layers. Such

techniques may be referred to as spatial multiplexing. The multiple signals may, for example, be transmitted by the transmitting device via different antennas or different combinations of antennas. Likewise, the multiple signals may be received by the receiving device via different antennas or different combinations of antennas. Each of the multiple signals may be referred to as a separate spatial stream and may carry information associated with the same data stream (e.g., the same codeword) or different data streams (e.g., different codewords). Different spatial layers may be associated with different antenna ports used for channel measurement and reporting. MIMO techniques include single-user MIMO (SU-MIMO), for which multiple spatial layers are transmitted to the same receiving device, and multiple-user MIMO (MU-MIMO), for which multiple spatial layers are transmitted to multiple devices.

[0088] Beamforming, which may also be referred to as spatial filtering, directional transmission, or directional reception, is a signal processing technique that may be used at a transmitting device or a receiving device (e.g., a network entity **105**, a UE **115**) to shape or steer an antenna beam (e.g., a transmit beam, a receive beam) along a spatial path between the transmitting device and the receiving device. Beamforming may be achieved by combining the signals communicated via antenna elements of an antenna array such that some signals propagating along particular orientations with respect to an antenna array experience constructive interference while others experience destructive interference. The adjustment of signals communicated via the antenna elements may include a transmitting device or a receiving device applying amplitude offsets, phase offsets, or both to signals carried via the antenna elements associated with the device. The adjustments associated with each of the antenna elements may be defined by a beamforming weight set associated with a particular orientation (e.g., with respect to the antenna array of the transmitting device or receiving device, or with respect to some other orientation).

[0089] A network entity **105** or a UE **115** may use beam sweeping techniques as part of beamforming operations. For example, a network entity **105** (e.g., a base station **140**, an RU **170**) may use multiple antennas or antenna arrays (e.g., antenna panels) to conduct beamforming operations for directional communications with a UE **115**. Some signals (e.g., synchronization signals, reference signals, beam selection signals, or other control signals) may be transmitted by a network entity **105** multiple times along different directions. For example, the network entity **105** may transmit a signal according to different beamforming weight sets associated with different directions of transmission. Transmissions along different beam directions may be used to identify (e.g., by a transmitting device, such as a network entity **105**, or by a receiving device, such as a UE **115**) a beam direction for later transmission or reception by the network entity **105**.

[0090] Some signals, such as data signals associated with a particular receiving device, may be transmitted by transmitting device (e.g., a transmitting network entity **105**, a transmitting UE **115**) along a single beam direction (e.g., a direction associated with the receiving device, such as a receiving network entity **105** or a receiving UE **115**). In some examples, the beam direction associated with transmissions along a single beam direction may be determined based on a signal that was transmitted along one or more beam directions. For example, a UE **115** may receive one or more of the signals transmitted by the network entity **105** along different directions and may report to the network entity **105** an indication of the signal that the UE **115** received with a highest signal quality or an otherwise acceptable signal quality.

[0091] In some examples, transmissions by a device (e.g., by a network entity **105** or a UE **115**) may be performed using multiple beam directions, and the device may use a combination of digital precoding or beamforming to generate a combined beam for transmission (e.g., from a network entity **105** to a UE **115**). The UE **115** may report feedback that indicates precoding weights for one or more beam directions, and the feedback may correspond to a configured set of beams across a system bandwidth or one or more sub-bands. The network entity **105** may transmit a reference signal (e.g., a cell-specific reference signal (CRS), a channel state information reference signal (CSI-RS)), which may be precoded or unprecoded. The UE **115** may provide feedback for beam selection, which may be a precoding matrix indicator (PMI) or codebook-based feedback (e.g., a multi-panel type codebook, a linear combination type codebook, a port selection type codebook). Although these techniques are described with reference to signals transmitted along one or more directions by a network entity **105** (e.g., a base station **140**, an RU **170**), a UE **115** may employ similar techniques for transmitting signals multiple times along different directions (e.g., for identifying a beam direction for subsequent transmission or reception by the UE **115**) or for transmitting a signal along a single direction (e.g., for transmitting data to a receiving device).

[0092] A receiving device (e.g., a UE **115**) may perform reception operations in accordance with multiple receive configurations (e.g., directional listening) when receiving various signals from a transmitting device (e.g., a network entity **105**), such as synchronization signals, reference signals, beam selection signals, or other control signals. For example, a receiving device may perform reception in accordance with multiple receive directions by receiving via different antenna subarrays, by processing received signals according to different antenna subarrays, by receiving according to different receive beamforming weight sets (e.g., different directional listening weight sets) applied to signals received at multiple antenna elements of an antenna array, or by processing received signals according to different receive beamforming weight sets applied to signals received at multiple antenna elements of an antenna array, any of which may be referred to as "listening" according to different receive configurations or receive directions. In some examples, a receiving device may use a single receive configuration to receive along a single beam direction (e.g., when receiving a data signal). The single receive configuration may be aligned along a beam direction determined based on listening according to different receive configuration directions (e.g., a beam direction determined to have a highest signal strength, highest signal-to-noise ratio (SNR), or otherwise acceptable signal quality based on listening according to multiple beam directions).

[0093] The wireless communications system **100** may be a packet-based network that operates according to a layered protocol stack. In the user plane, communications at the bearer or PDCP layer may be IP-based. An RLC layer may perform packet segmentation and reassembly to communicate via logical channels. A MAC layer may perform priority handling and multiplexing of logical channels into transport channels. The MAC layer also may implement error detec-

tion techniques, error correction techniques, or both to support retransmissions to improve link efficiency. In the control plane, an RRC layer may provide establishment, configuration, and maintenance of an RRC connection between a UE **115** and a network entity **105** or a core network **130** supporting radio bearers for user plane data. A PHY layer may map transport channels to physical channels.

[0094] The UEs **115** and the network entities **105** may support retransmissions of data to increase the likelihood that data is received successfully. Hybrid automatic repeat request (HARQ) feedback is one technique for increasing the likelihood that data is received correctly via a communication link (e.g., a communication link **125**, a D2D communication link **135**). HARQ may include a combination of error detection (e.g., using a cyclic redundancy check (CRC)), forward error correction (FEC), and retransmission (e.g., automatic repeat request (ARQ)). HARQ may improve throughput at the MAC layer in poor radio conditions (e.g., low signal-to-noise conditions). In some examples, a device may support same-slot HARQ feedback, in which case the device may provide HARQ feedback in a specific slot for data received via a previous symbol in the slot. In some other examples, the device may provide HARQ feedback in a subsequent slot, or according to some other time interval.

[0095] An example of a NTN node **185** (e.g., a satellite) is also illustrated in FIG. **1**. In some approaches, the NTN node **185** may be an example of a network entity **105**, a RU **170**, a DU **165**, or a CU **160**. The NTN node **185** may implement one or more of the functions described with reference to a network entity **105**, RU **170**, DU **165**, CU **160**, or other network node. The NTN node **185** may communicate with one or more UEs **115** via a communication link **125**. In some examples, the NTN node **185** may communicate with a network entity **105** via a second communication link **190**. For instance, the NTN node **185** may relay a signal or data between a UE **115** and a network entity **105**. In some examples, one or more signals or data may be communicated (e.g., relayed) between multiple NTN nodes (e.g., via one or more ISLs). Some examples of the techniques described herein may be utilized in the context of store and forward mode for mobile originated (MO) communication, mobile terminated (MT) communication, inter-satellite communication, data transfer for IoT devices in remote areas, or emergency reports.

[0096] In some approaches, a UE **115** may collect report data, such as a MDT report or UAI. When a NTN node **185** operates in a store and forward mode, the NTN node **185** may have intermittent connectivity with a core network (via a network entity **105**, for example). Some examples of the techniques described herein may provide approaches where one or more reports (e.g., MDT or UAI reports) may provide enhanced information in one or more scenarios or conditions.

[0097] In some examples of the techniques described herein, a UE **115** may store data collected when the NTN node **185** is operating in the store and forward mode. The UE **115** may transmit delayed report data based on the collected data to a core network when the UE **115** has coverage from a TN node (e.g., a network entity **105** of a TN) or a NTN node **185**. For example, a UE **115** may transmit UE location data collected when the NTN node **185** is operating in the store and forward mode. In some examples, the UE location data may indicate a location history in the form of coordinates (e.g., latitude and longitude) or one or more physical addresses where UE **115** has been located.

[0098] In some approaches, a UE **115** may transmit coverage information collected when the NTN node **185** is operating in the store and forward mode. The coverage information may indicate the coverage or availability of one or more TN cells, of one or more NTN cells (that are operating in a non-store and forward mode), of one or more NTN cells operating in the store and forward mode, or may indicate a lack of coverage at one or more times or locations, or any combination thereof. In some examples, the coverage information (e.g., a WWAN coverage status information element) may indicate a coverage status with time, which may be useful to enhance MNO services. In some approaches, a WWAN coverage map may be generated based on the coverage information. In some examples, the coverage information may indicate details of coverage, availability, or unavailability of one or more PLMNs, RATs, or availability durations.

[0099] In some cases, a UE **115** may send one or more reports (e.g., delayed uplink measurement reports) to a PLMN when the UE **115** is in TN or NTN coverage (e.g., when a link to a core network is available). For example, the UE **115** may send the one or more reports when a feeder link between the NTN node **185** and a network entity **105** is available or restored. The one or more reports may include one or more parameters (e.g., one or more parameters in one or more information elements (IEs)) that indicate the UE location data or the coverage information. For example, a UE **115** may send one or more parameters to the network via a RRC message (e.g., in a UAI or in an MDT report), via an upper layer message (e.g., a NAS message, a message at a layer higher than a physical layer), or via a user plane (e.g., to a server that collects information).

[0100] Examples of parameters (e.g., IEs) that may be sent may include a location history parameter, a WWAN coverage parameter, or a PLMN parameter or RAT parameter. The location history parameter (e.g., Location_History_Info_r19) may indicate one or more locations of the UE (while the NTN node **185** was in store and forward mode, for instance). For example, the location history parameter may be an IE that indicates the location history of the UE **115** (e.g., one or more locations that the UE has visited). The location history parameter may indicate coordinates (e.g., latitude and longitude coordinates), global navigation satellite system (GNSS) data (e.g., latitude and longitude, global positioning system (GPS) data, globalnaya navigazionnaya sputnikovaya sistema (GLONASS) data, among other examples), an address (e.g., street address, zip code, landmark data, among other examples), other data indicating location, or any combination thereof.

[0101] The WWAN coverage parameter (e.g., WWAN_Coverage_Status_r19) may indicate the coverage, availability, or unavailability of one or more TN cells, one or more NTN cells (operating in a "normal mode" or non-store and forward mode, for example), one or more NTN cells in store and forward mode, or no coverage (while the NTN node **185** was in store and forward mode, for instance). The WWAN coverage parameter may indicate or may be associated with one or more locations or times at which the one or more cell(s) are available. In some examples, the WWAN coverage parameter may be an IE that is helpful to capture WWAN coverage status with time. The WWAN coverage parameter may be utilized to improve MNO services. The

WWAN coverage parameter may be utilized to create a WWAN coverage map in some approaches.

[0102] A PLMN parameter or RAT parameter (e.g., PLMN_RAT_Info_r19) may indicate coverage, availability, or unavailability of one or more PLMNs or RATs (e.g., cellular PLMN(s) or RAT(s), such as 3G, 4G, or 5G network availability). For example, the PLMN parameter or RAT parameter may indicate the availability of one or more PLMNs or RATs while the NTN node **185** was in store and forward mode, for instance. In some examples, the PLMN parameter or RAT parameter may indicate one or more durations associated with the one or more PLMNs or RATs.

[0103] In some approaches, the one or more parameters may be sent via a report (e.g., an uplink NTN MDT report or UAI report). For instance, one or more of the parameters (e.g., IEs) may be included in a report when the UE **115** has a core network link (e.g., when the UE is back in normal TN or NTN coverage) when a feeder link via an NTN node **185** is available or restored. In some aspects, sending the report when the UE **115** has a core network link (e.g., when a feeder link is available) may be performed by default. In some examples, the network may not send a request for the information (e.g., report(s), location data, coverage information, or parameter(s)). For instance, no specific request for the information may be sent or received from the network side, and the UE **115** may report the collected information when the UE has an available uplink resource for the report.

[0104] In some approaches, the network (e.g., NTN node **185** or network entity **105**) may request the information (e.g., one or more IEs) by configuring an IE (e.g., NTN_Satellite_Mode_r19: Normal (Default)/Store and Forward) in a UE information request message or in a logged measurement for NTN information. An example of the NTN_Satellite_Mode_r19 is given with reference to Listing (2). The UE **115** may accordingly collect, update, or include the parameter(s) (e.g., Location_History_Info_r19, WWAN_Coverage_Status_r19, or PLMN_RAT_Info_r19 IE information) in an uplink transmission in the report(s) (e.g., MDT report or UAI as provided with reference to Listing (1)). In some examples, if the IE indicates store and forward (e.g., NTN_Satellite_Mode_r19: Store and Forward) in the UE information request message or logged measurement, the UE may provide information (e.g., one or more reports) with one or more of the location history parameter, WWAN coverage parameter, PLMN parameter, or RAT parameter (e.g., Location_History_Info_r19, WWAN_Coverage_Status_r19, or PLMN_RAT_Info_r19). In some examples, if the IE indicates normal or default (e.g., NTN_Satellite_Mode_r19: Normal) in the UE information request or logged measurement, the UE may not send one or more of the location history parameter, WWAN coverage parameter, PLMN parameter, or RAT parameter (e.g., Location_History_Info_r19, WWAN_Coverage_Status_r19, or PLMN_RAT_Info_r19).

[0105] FIG. **2** shows an example of a network architecture **200** (e.g., a disaggregated base station architecture, a disaggregated RAN architecture) that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure. The network architecture **200** may illustrate an example for implementing one or more aspects of the wireless communications system **100**. The network architecture **200** may include one or more CUs **160**-*a* that may communicate directly with a core network **130**-*a* via a backhaul communication link **120**-*a*, or indirectly with the core network **130**-*a* through one or more disaggregated network entities **105** (e.g., a Near-RT RIC **175**-*b* via an E2 link, or a Non-RT RIC **175**-*a* associated with an SMO **180**-*a* (e.g., an SMO Framework), or both). A CU **160**-*a* may communicate with one or more DUs **165**-*a* via respective midhaul communication links **162**-*a* (e.g., an F1 interface). The DUs **165**-*a* may communicate with one or more RUs **170**-*a* via respective fronthaul communication links **168**-*a*. The RUs **170**-*a* may be associated with respective coverage areas **110**-*a* and may communicate with UEs **115**-*a* via one or more communication links **125**-*a*. In some implementations, a UE **115**-*a* may be simultaneously served by multiple RUs **170**-*a*.

[0106] Each of the network entities **105** of the network architecture **200** (e.g., CUs **160**-*a*, DUs **165**-*a*, RUs **170**-*a*, Non-RT RICs **175**-*a*, Near-RT RICs **175**-*b*, SMOs **180**-*a*, Open Clouds (O-Clouds) **205**, Open eNBs (O-eNBs) **210**) may include one or more interfaces or may be coupled with one or more interfaces configured to receive or transmit signals (e.g., data, information) via a wired or wireless transmission medium. Each network entity **105**, or an associated processor (e.g., controller) providing instructions to an interface of the network entity **105**, may be configured to communicate with one or more of the other network entities **105** via the transmission medium. For example, the network entities **105** may include a wired interface configured to receive or transmit signals over a wired transmission medium to one or more of the other network entities **105**. Additionally, or alternatively, the network entities **105** may include a wireless interface, which may include a receiver, a transmitter, or transceiver (e.g., an RF transceiver) configured to receive or transmit signals, or both, over a wireless transmission medium to one or more of the other network entities **105**.

[0107] In some examples, a CU **160**-*a* may host one or more higher layer control functions. Such control functions may include RRC, PDCP, SDAP, or the like. Each control function may be implemented with an interface configured to communicate signals with other control functions hosted by the CU **160**-*a*. A CU **160**-*a* may be configured to handle user plane functionality (e.g., CU-UP), control plane functionality (e.g., CU-CP), or a combination thereof. In some examples, a CU **160**-*a* may be logically split into one or more CU-UP units and one or more CU-CP units. A CU-UP unit may communicate bidirectionally with the CU-CP unit via an interface, such as an E1 interface when implemented in an O-RAN configuration. A CU **160**-*a* may be implemented to communicate with a DU **165**-*a*, as necessary, for network control and signaling.

[0108] A DU **165**-*a* may correspond to a logical unit that includes one or more functions (e.g., base station functions, RAN functions) to control the operation of one or more RUs **170**-*a*. In some examples, a DU **165**-*a* may host, at least partially, one or more of an RLC layer, a MAC layer, and one or more aspects of a PHY layer (e.g., a high PHY layer, such as modules for FEC encoding and decoding, scrambling, modulation and demodulation, or the like) depending, at least in part, on a functional split, such as those defined by the 3rd Generation Partnership Project (3GPP). In some examples, a DU **165**-*a* may further host one or more low PHY layers. Each layer may be implemented with an inter-

face configured to communicate signals with other layers hosted by the DU **165**-*a*, or with control functions hosted by a CU **160**-*a*.

[0109] In some examples, lower-layer functionality may be implemented by one or more RUs **170**-*a*. For example, an RU **170**-*a*, controlled by a DU **165**-*a*, may correspond to a logical node that hosts RF processing functions, or low-PHY layer functions (e.g., performing fast Fourier transform (FFT), inverse FFT (IFFT), digital beamforming, physical random access channel (PRACH) extraction and filtering, or the like), or both, based at least in part on the functional split, such as a lower-layer functional split. In such an architecture, an RU **170**-*a* may be implemented to handle over the air (OTA) communication with one or more UEs **115**-*a*. In some implementations, real-time and non-real-time aspects of control and user plane communication with the RU(s) **170**-*a* may be controlled by the corresponding DU **165**-*a*. In some examples, such a configuration may enable a DU **165**-*a* and a CU **160**-*a* to be implemented in a cloud-based RAN architecture, such as a vRAN architecture.

[0110] The SMO **180**-*a* may be configured to support RAN deployment and provisioning of non-virtualized and virtualized network entities **105**. For non-virtualized network entities **105**, the SMO **180**-*a* may be configured to support the deployment of dedicated physical resources for RAN coverage requirements which may be managed via an operations and maintenance interface (e.g., an O1 interface). For virtualized network entities **105**, the SMO **180**-*a* may be configured to interact with a cloud computing platform (e.g., an O-Cloud **205**) to perform network entity life cycle management (e.g., to instantiate virtualized network entities **105**) via a cloud computing platform interface (e.g., an O2 interface). Such virtualized network entities **105** can include, but are not limited to, CUs **160**-*a*, DUs **165**-*a*, RUs **170**-*a*, and Near-RT RICs **175**-*b*. In some implementations, the SMO **180**-*a* may communicate with components configured in accordance with a 4G RAN (e.g., via an O1 interface). Additionally, or alternatively, in some implementations, the SMO **180**-*a* may communicate directly with one or more RUs **170**-*a* via an O1 interface. The SMO **180**-*a* also may include a Non-RT RIC **175**-*a* configured to support functionality of the SMO **180**-*a*.

[0111] The Non-RT RIC **175**-*a* may be configured to include a logical function that enables non-real-time control and optimization of RAN elements and resources, Artificial Intelligence (AI) or Machine Learning (ML) workflows including model training and updates, or policy-based guidance of applications/features in the Near-RT RIC **175**-*b*. The Non-RT RIC **175**-*a* may be coupled to or communicate with (e.g., via an A1 interface) the Near-RT RIC **175**-*b*. The Near-RT RIC **175**-*b* may be configured to include a logical function that enables near-real-time control and optimization of RAN elements and resources via data collection and actions over an interface (e.g., via an E2 interface) connecting one or more CUs **160**-*a*, one or more DUs **165**-*a*, or both, as well as an O-eNB **210**, with the Near-RT RIC **175**-*b*.

[0112] In some examples, to generate AI/ML models to be deployed in the Near-RT RIC **175**-*b*, the Non-RT RIC **175**-*a* may receive parameters or external enrichment information from external servers. Such information may be utilized by the Near-RT RIC **175**-*b* and may be received at the SMO **180**-*a* or the Non-RT RIC **175**-*a* from non-network data sources or from network functions. In some examples, the Non-RT RIC **175**-*a* or the Near-RT RIC **175**-*b* may be configured to tune RAN behavior or performance. For example, the Non-RT RIC **175**-*a* may monitor long-term trends and patterns for performance and employ AI or ML models to perform corrective actions through the SMO **180**-*a* (e.g., reconfiguration via O1) or via generation of RAN management policies (e.g., A1 policies).

[0113] FIG. **3** shows an example of a wireless communications system **300** that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure. In some examples, the wireless communications system **300** may implement aspects of the wireless communication system **100** or the network architecture **200**. The wireless communications system **300** may include a UE **115**-*a*, a NTN node **385**-*a*, a TN node **370**-*a*, and one or more nodes **335**-*a*. With reference to FIG. **1**, the UE **115**-*a* may be an example of the UE **115**, the NTN node **385**-*a* may be an example of the NTN node **185**, the TN node **370**-*a* may be a network entity **105**, or a combination thereof. The one or more nodes **335**-*a* may be one or more nodes of a TN (not shown in FIG. **3**), one or more nodes of a NTN (not shown in FIG. **3**), one or more devices of a PLMN or a RAT, or any combination thereof. In some cases, the NTN node **385**-*a* may be one of the one or more nodes **335**-*a* or the TN node **370**-*a* may be one of the one or more nodes **335**-*a*.

[0114] In some examples, the NTN node **385**-*a* may be a satellite, high altitude platform station (HAPS), high altitude vehicle (HAV), balloon, etc. For instance, the NTN node **385**-*a* may be in an orbit, such as low earth orbit, medium earth orbit, geostationary earth orbit, or other non-geostationary earth orbit. The NTN node **385**-*a* may be positioned at some distance from Earth (e.g., hundreds or thousands of kilometers from Earth), which may vary or remain relatively fixed. The NTN node **385**-*a* may include communication circuitry (e.g., one or more processors, memories, modems, baseband circuitries, among other examples), one or more antennas, or one or more transponders to facilitate reception and transmission of RF signals. The NTN node **385**-*a* may serve a coverage area **305** in cases of a NTN.

[0115] The TN node **370**-*a* may be positioned on the Earth's surface or relatively near to the Earth's surface (e.g., within a mile of the Earth's surface). In some examples, the TN node **370**-*a* may be anchored or attached to the Earth's surface. The TN node **370**-*a* may include communication circuitry (e.g., one or more processors, memories, modems, baseband circuitries, among other examples) or one or more antennas to facilitate reception and transmission of RF signals. The TN node **370**-*a* may provide communication service within a cell area **310**. In some examples, the cell area **310** may be included within the coverage area **305**, may partially overlap with the coverage area **305**, or may be located outside of the coverage area **305**. In some examples, network entity **105** (e.g., gNB of a RAN) functionality may be split between the NTN node **385**-*a* (e.g., a satellite, an RU on a satellite, or a gNB DU of the RAN, among other examples) and the TN node **370**-*a* (e.g., a DU located on the ground or gNB CU of the RAN, among other examples). For instance, the NTN node **385**-*a* may be a DU **165** (e.g., may implement DU **165** functionality) and the TN node **370**-*a* may be a CU (e.g., may implement CU **160** functionality). In some examples, the NTN node **385**-*a* and the TN node **370**-*a* are next generation radio access network (NG-RAN) nodes. In some examples, a CU **160** and a DU **165** may reside on the ground and may be associated with one or more terrestrial and non-terrestrial cells or RUs. In a NTN, one or

more DUs **165** may be located on a satellite and a CU **160** may be located on the Earth's surface.

[0116] In some examples, the TN node **370**-*a* may be linked to (e.g., may communicate with) a core network or may be included in the core network. For instance, the TN node **370**-*a* may communicate with the core network (e.g., 5G core network) via a NG interface.

[0117] The one or more nodes **335**-*a* may transmit one or more signals **345**. The one or more signals **345** may be detectable (e.g., detected) by the UE **115**-*a*. For instance, the UE **115**-*a* may detect that the one or more nodes **335**-*a* provide coverage (e.g., are available for communication with the UE **115**-*a*). In some examples, the UE **115**-*a* may ascertain one or more measurements based on the one or more signals **345**. For instance, the UE **115**-*a* may determine one or more signal measurements (e.g., signal strength measurement(s), received signal strength indicator (RSSI), signal-to-noise ratio (SNR), among other examples) based on the one or more signals **345**. In some aspects, the one or more signals **345** may include a broadcast signal, synchronization signal, beacon, or other signal.

[0118] The NTN node **385**-*a* may operate in a store and forward mode. In the store and forward mode, the NTN node **385**-*a* may not have access to (e.g., communication with) a core network or may have intermittent access to (e.g., communication with) the core network. For instance, when the NTN node **385**-*a* is in a first position **340**-*a*, the NTN node **385**-*a* may communicate with the UE **115**-*a*, but may not communicate with the TN node **370**-*a* due to lack of a second communication link **355** (e.g., feeder link) between the NTN node **385**-*a* and the TN node **370**-*a*. When the NTN node **385**-*a* is in the first position **340**-*a*, the UE **115**-*a* may communicate with the NTN node **385**-*a* using a first communication link **325**. The first communication link **325** between the UE **115**-*a* and the NTN node **385**-*a* may be an example of the communication links **125** described with respect to FIG. **1**.

[0119] The NTN node **385**-*a* may move **320** or change position relative to the TN node **370**-*a*. For instance, the NTN node **385**-*a* may move **320** due to an orbit of the NTN node **385**-*a* or due to movement of the Earth. The coverage area **305** may also move accordingly. When the NTN node **385**-*a* is in a second position **340**-*b*, the NTN node **385**-*a* may communicate with the TN node **370**-*a* via a second communication link **355** (and may not communicate with the UE **115**-*a*). In some examples, the NTN node **385**-*a* may store information corresponding to signals received when the link to the core network is unavailable, and may send (e.g., forward) the information when the link to the core network is available. When the NTN node **385**-*a* is in the second position **340**-*b*, the NTN node **385**-*a* may communicate with the TN node **370**-*a* using a second communication link **355**. The second communication link **355** between the NTN node **385**-*a* and the TN node **370**-*a* may be an example of the second communication link **190** described with reference to FIG. **1**.

[0120] The first communication link **325** and the second communication link **355** may include bi-directional links that enable uplink or downlink communications. For example, the UE **115**-*a* may transmit one or more signals on an uplink **330** (e.g., uplink channel(s), uplink resource(s)), such as uplink control signals or uplink data signals, to the NTN node **385**-*a* using the first communication link **325**. The NTN node **385**-*a* may transmit one or more downlink signals on a downlink **365** (e.g., downlink channel(s), downlink resource(s)), such as downlink control signals or downlink data signals, to the UE **115**-*a* using the first communication link **325**. The NTN node **385**-*a* and the TN node **370**-*a* may communicate one or more uplink signals on an uplink (e.g., uplink channel(s), uplink resource(s)) of the second communication link **355** or one or more downlink signals on a downlink (e.g., downlink channel(s), downlink resource(s)) of the second communication link **355**.

[0121] The NTN node **385**-*a* may output (e.g., transmit) an indication **350** that the NTN node **385**-*a* is operating in the store and forward mode. For instance, the NTN node **385**-*a* may transmit one or more signals, messages, or parameters indicating that the NTN node **385**-*a* is operating in the store and forward mode. The UE **115**-*a* may receive the indication **350** that the NTN node **385**-*a* accessible to the UE **115**-*a* is operating in the store and forward mode. While one NTN node **385**-*a* is shown in FIG. **1**, one or more NTN nodes may be accessible to the UE **115**-*a* or may operate in the store and forward mode. Additionally, or alternatively, the UE **115**-*a* may receive the indication **350** from another entity (e.g., from the TN node **370**-*a* or one or more nodes **335**-*a*).

[0122] The UE **115**-*a* may collect or determine location data at least partially during a period that the NTN node **385**-*a* is operating in the store and forward mode. For example, the UE **115**-*a* may determine location data of the UE **115**-*a* indicating one or more locations of the UE **115**-*a*. The location data may include coordinates (e.g., latitude and longitude coordinates), GNSS data (e.g., latitude and longitude, GPS data, GLONASS data, among other examples), an address (e.g., street address, zip code, landmark data, among other examples), other data indicating location, or any combination thereof. For instance, the UE **115**-*a* may determine the location data using GPS trilateration, Wi-Fi positioning, signal strength measurements from established beacons, or any combination thereof.

[0123] The UE **115**-*a* may collect or determine coverage information at least partially during the period that the NTN node **385**-*a* is operating in the store and forward mode. As described herein, the coverage information may indicate the coverage or availability of one or more TN cells, of one or more NTN cells (that are operating in a "normal" or non-store and forward mode), of one or more NTN cells operating in the store and forward mode, or may indicate a lack of coverage at one or more times or locations, or any combination thereof. Additionally, or alternatively, the coverage information may indicate details of coverage, availability, or unavailability of one or more PLMNs, RATs, or availability durations. In some examples, the UE **115**-*a* may collect or determine the coverage information based on the one or more signals **345** from the one or more nodes **335**-*a*. For instance, the UE **115**-*a* may collect or determine the coverage information based on the one or more signals **345** as one or more signal strength measurements, one or more identifiers indicated by the one or more signals **345** (e.g., identifier(s) indicating one or more cell identities, node identifiers, or node addresses, among other examples), or one or more accessibility indicators (e.g., whether the UE **115**-*a* is permitted to access the node(s) **335**-*a*, carrier identifier(s), whether the node(s) **335**-*a* are publicly accessible, among other examples). In some aspects, the coverage information may indicate the coverage, availability, or unavailability of one or more TN cells, one or more NTN

cells (operating in a "normal mode" or non-store and forward mode, for example), one or more NTN cells in store and forward mode, no coverage, location(s), or time(s) (e.g., period(s)) of availability. In some examples, the coverage information may indicate coverage, availability, unavailability of one or more PLMNs or RATs, or may indicate one or more durations (e.g., availability times or periods) of the one or more PLMNs or RATs.

[0124] The UE **115**-*a* may store location data of the UE **115**-*a* or the coverage information at least partially during the period that one or more NTN nodes (e.g., the NTN node **385**-*a*) accessible to the UE **115**-*a* are operating in the store and forward mode based on receiving the indication **350**. For instance, the UE **115**-*a* may store the location data or the coverage information in a format associated with the store and forward mode. As described herein, the coverage information may indicate communication availability of one or more nodes **335**-*a* to the UE **115**-*a*, where the one or more nodes **335**-*a* may be associated with a TN or an NTN. The coverage information may include WWAN coverage status information, PLMN availability information, RAT availability information, or any combination thereof.

[0125] In some examples, the coverage information may include a first parameter (e.g., WWAN coverage parameter, IE, or WWAN_Coverage_Status_r19, among other examples) indicating availability of a TN cell, availability of an NTN cell, availability of an NTN cell operating in the store and forward mode, no coverage, or any combination thereof, or a second parameter (e.g., PLMN parameter or RAT parameter, IE, or PLMN_RAT_Info_r19, among other examples) indicating availability of a PLMN, availability of a RAT, a duration of availability, or any combination thereof. For instance, the UE **115**-*a* may generate, store, or format the coverage information as the first parameter or the second parameter.

[0126] The UE **115**-*a* may transmit report data indicating the location data or the coverage information. For example, the UE **115**-*a* may transmit the report data to the NTN node **385**-*a*, to the TN node **370**-*a* (when the UE **115**-*a* is located in the cell area **310**, for example), to another NTN node, or to another TN node. In some examples, the report data may be included in a RRC message, UAI, a MDT report, a message at a layer higher than a physical layer, a NAS message, a user plane message, or any combination thereof.

[0127] An example of the report data is given in Listing (1). For instance, Listing (1) illustrates an example of a UEAssistanceInformation message (e.g., UAI). The UEAssistanceInformation message may be utilized for the indication of UE assistance information to the network. The UEAssistanceInformation message may be sent in association with a signaling radio bearer (e.g., SRB**1** or SRB**3**) for radio link control (RLC) for a service access point (SAP) using a logical channel (e.g., a dedicated control channel (DCCH)) from the UE **115**-*a* to the network. In some examples, the UEAssistanceInformation message may be communicated in one or more modes (e.g., transparent mode (TM), unacknowledged mode (UM), acknowledge mode (AM), or store and forward mode). In AM, for instance, when the UE **115**-*a* transmits the UEAssistanceInformation message to a network node (e.g., NTN node **385**-*a* or TN node **370**-*a*) via an uplink, the UE **115**-*a* may receive an acknowledgment (ACK) via a downlink. In Listing (1), the Location_History_info_r19 may indicate a location history where the UE **115**-*a* last visited. The WWAN_Coverage_Status_r19 may indicate the availability of one or more TNs, NTNs (in "normal" or non-store and forward mode), NTNs in store and forward mode, or no coverage, at one or more locations or times. The PLMN_RAT_info_r19 may indicate one or more details regarding the availability or unavailability of one or more PLMNs or RATs (or availability durations, for example).

Listing (1)

```
-- ASN1START
-- TAG-UEASSISTANCEINFORMATION-START
 UEAssistanceInformation ::=      SEQUENCE {
  criticalExtensions          CHOICE {
    ueAssistanceInformation          UEAssistanceInformation-IEs,
    criticalExtensionsFuture         SEQUENCE { }
  }
}
 DelayBudgetReport::=          CHOICE {
  type1                 ENUMERATED {
                        msMinus1280, msMinus640, msMinus320,
                        msMinus160, msMinus80, msMinus60, msMinus40,
                        msMinus20, ms0, ms20, ms40, ms60, ms80, ms160,
                        ms320, ms640, ms1280},
  ...
}
UEAssistance Information-IEs ::=  SEQUENCE {
 Location_History_info_r19          OPTIONAL, -- Need R
WWAN_Coverage_Status_r19            OPTIONAL, -- Need R
PLMN_RAT_info_r19                   OPTIONAL, -- Need R
```

[0128] In some approaches, the report data is transmitted to at least one of the one or more NTN nodes (e.g., the NTN node **385**-*a*) during the period that the one or more NTN nodes accessible to the UE **115**-*a* are operating in the store and forward mode. For instance, the NTN node **385**-*a* may obtain (e.g., receive) report data indicating location data of the UE **115**-*a* or coverage information collected at least partially during the period that one or more NTN nodes (e.g., the NTN node **385**-*a*) accessible to the UE **115**-*a* are operating in the store and forward mode based on transmitting the indication **350**.

[0129] In some cases, the report data may be obtained (e.g., received by the NTN node **385**-*a*) in the period that that the one or more NTN nodes accessible to the UE **115**-*a* are operating in the store and forward mode. In some approaches, the NTN node **385**-*a* may output (e.g., transmit) an indication of rejection of management for the report data obtained in the period. For instance, the NTN node **385**-*a* may indicate that the NTN node **385**-*a* may not manage the report data (e.g., may not store the report data, may not forward the report data, or may not be relied upon to forward the report data). In some examples, the NTN node **385**-*a* may be set up to reject storage and forwarding of report data, may have inadequate storage to store report data from one or more UEs, or may reject management of the report data to cause (e.g., instruct, command) the UE **115**-*a* to hold the report data until the report data can be transmitted or relayed to a TN node (e.g., TN node **370**-*a*) via a direct link or a feeder link. In some examples, the NTN node **385**-*a* may attempt to store and forward the report data while rejecting the management (e.g., responsibility) of the report data. In some examples, the NTN node **385**-*a* may transmit the report data to a core network when a second communication link **355** (e.g., feeder link) between the NTN node **385**-*a* and the core network is available.

[0130] The UE **115**-*a* may receive the indication of the rejection of management for the report data transmitted to the at least one of the one or more NTN nodes during the period. The UE **115**-*a* may transmit, based on the indication of the rejection, the report data to a TN node (e.g., the TN node **370**-*a*) or to an NTN node not operating in the store and forward mode. For example, when a link (e.g., a direct link to a TN node or an indirect link via an NTN node) to the core network is available, the UE **115**-*a* may transmit the report data via the link.

[0131] In some aspects, the NTN node **385**-*a* may output (e.g., transmit) a message to transmit the report data during the period that the one or more NTN nodes (e.g., the NTN node **385**-*a*) accessible to the UE **115**-*a* are operating in the store and forward mode. The NTN node **385**-*a* may obtain the report data is based on the message. For example, the NTN node **385**-*a* may output a message (e.g., a command, an instruction, an indication, or information, among other examples) to the UE **115**-*a* for the UE **115**-*a* to send the report data.

[0132] The UE **115**-*a* may receive the message from the at least one of the one or more NTN nodes (e.g., the NTN node **385**-*a*) to transmit the report data during the period that the one or more NTN nodes (e.g., the NTN node **385**-*a*) accessible to the UE **115**-*a* are operating in the store and forward mode. The UE **115**-*a* may transmit the report data based on (e.g., in response to) the message.

[0133] In some aspects, the NTN node **385**-*a* may output (e.g., transmit) a request for the location data or the coverage information. The request may be included in a UE information request message or a logged measurement configuration message. For example, the request may be configuration information (e.g., NTN_Satellite_Mode_r19: Store and Forward) to configure the UE **115**-*a* to collect, store, or transmit the location information, the coverage information, or the report data. In some cases, the location data or the coverage information may be obtained (e.g., received) at least partially during the period that the NTN node **385**-*a* is operating in the store and forward mode based on transmitting the request. For example, the UE **115**-*a* may receive the request for the location data or the coverage information (in an information request message or a logged measurement configuration message, for example), where the UE **115**-*a* stores the location data or the coverage information at least partially during the period that the one or more NTN nodes accessible to the UE **115**-*a* are operating in the store and forward mode based on receiving the request.

[0134] In some examples, the location data or coverage information may be requested by the network (e.g., NTN node **385**-*a* or TN node **370**-*a*) to the UE **115**-*a* as part of a logged measurement configuration. The LoggedMeasurementConfiguration message may be utilized to perform logging of measurement results while the UE **115**-*a* is in a RRC_IDLE or RRC_INACTIVE state. The LoggedMeasurementConfiguration message may be utilized to transfer the logged measurement configuration for network performance enhancement. An example of the LoggedMeasurementConfiguration message including a NTN_Satellite_Mode_r19 IE is given in Listing (2). For instance, the LoggedMeasurementConfiguration may be sent for RLC for a SAP using a logical channel (e.g., a DCCH) from the network to the UE **115**-*a*. In some examples, the LoggedMeasurementConfiguration message may be communicated in one or more modes (e.g., TM, UM, AM, or store and forward mode). In AM, for instance, when a network node (e.g., NTN node **385**-*a* or TN node **370**-*a*) outputs the LoggedMeasurementConfiguration message to the UE **115**-*a* via a downlink, the UE **115**-*a* may transmit an ACK via an uplink.

Listing (2)

```
LoggedMeasurementConfiguration-r16-IEs ::= SEQUENCE {
  traceReference-r16                TraceReference-r16,
  traceRecordingSessionRef-r16      OCTET STRING (SIZE (2)),
  tce-Id-r16                        OCTET STRING (SIZE (1)),
  absoluteTimeInfo-r16              Absolute TimeInfo-r16,
  areaConfiguration-r16             AreaConfiguration-r16              OPTIONAL, -- Need R
  plmn-IdentityList-r16             PLMN-IdentityList2-r16            OPTIONAL, -- Need R
  bt-NameList-r16                 SetupRelease {BT-NameList-r16}      OPTIONAL, -- Need M
  wlan-NameList-r16             SetupRelease {WLAN-NameList-r16}      OPTIONAL, -- Need M
  sensor-NameList-r16           SetupRelease {Sensor-NameList-r16}    OPTIONAL, -- Need M
  loggingDuration-r16               LoggingDuration-r16,
  reportType                        CHOICE {
    periodical                        LoggedPeriodicalReportConfig-r16,
    eventTriggered                    LoggedEventTriggerConfig-r16,
    ...
LoggedMeasurementConfiguration-v1700-IEs ::= SEQUENCE {
  sigLoggedMeasType-r17             ENUMERATED {true}                 OPTIONAL, -- Need R
  earlyMeasIndication-r17           ENUMERATED {true}                 OPTIONAL, -- Need R
  areaConfiguration-v1700           AreaConfiguration-v1700           OPTIONAL, -- Need R
  nonCriticalExtension              SEQUENCE { }                      OPTIONAL
 NTN_Satellite_Mode_r19    Normal (Default) Or S&F                    OPTIONAL, -- Need R
```

[0135] FIG. **4** shows an example of a process flow **400** that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure. The process flow **400** may include a UE **115**-*b*, which may be an example of UEs **115**, as described herein. The process flow **400** may also include a NTN node **385**-*b* and a TN node **370**-*b*, which may be respective examples of a NTN node **385**-*a* and a TN node **370**-*a*, as described herein. The process flow **400** may also include a node **335**-*b*, which may be an example of the node **335**-*a*, as described herein.

[0136] In the following description of the process flow **400**, the signaling or communications between the UE **115**-*b*, the NTN node **385**-*b*, the TN node **370**-*b*, and the node **335**-*b* may be transmitted in a different order than the

example order shown, or the operations performed by the UE **115**-*b*, the NTN node **385**-*b*, the TN node **370**-*b*, and the node **335**-*b*, may be performed in different orders or at different times. Some operations may also be omitted from the process flow **400**, and other operations may be added to the process flow **400**. Further, although some operations or signaling may be shown to occur at different times for discussion purposes, these operations may actually occur at the same time or in overlapping time periods in some examples.

[0137] At **405**, the NTN node **385**-*b* may output (e.g., transmit) an indication that the NTN node **385**-*b* is operating in a store and forward mode. For instance, the indication may be transmitted to the UE **115**-*b* as described with reference to FIG. **1** or FIG. **3**.

[0138] At **410**, the UE **115**-*b* may detect, determine, or receive coverage information from the node **335**-*b*. Detecting or receiving coverage information may be performed as described with reference to FIG. **1** or FIG. **3**.

[0139] At **415**, the UE **115**-*b* may store location data of the UE **115**-*b* and coverage information at least partially during a period that the NTN node **385**-*b* is operating in the store and forward mode based on receiving the indication. Storing the location data and coverage information may be performed as described with reference to FIG. **1** or FIG. **3**.

[0140] At **420**, the NTN node **385**-*b* may output (e.g., transmit) a message indicating (e.g., commanding or instructing, among other examples) the UE **115**-*b* to transmit report data during the period that the NTN node **385**-*b* is operating in the store and forward mode. The UE **115**-*b* may receive the message. Outputting and receiving the message for the UE **115**-*b* to transmit the report data may be performed as described with reference to FIG. **1** or FIG. **3**.

[0141] At **425**, the UE **115**-*b* may transmit the report data indicating the location data or the coverage information. Transmitting the report data may be performed as described with reference to FIG. **1** or FIG. **3**.

[0142] At **430**, the NTN node **385**-*b* may store the report data. For example, the NTN node **385**-*b* may store the report data in memory.

[0143] At **435**, the NTN node **385**-*b* may output (e.g., transmit) the report data to the TN node **370**-*b*. For example, the NTN node **385**-*b* may forward the report data to the TN node **370**-*b* as described with reference to FIG. **1** or FIG. **3**.

[0144] FIG. **5** shows an example of a process flow **500** that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure. The process flow **500** may include a UE **115**-*c*, which may be an example of UEs **115**, as described herein. The process flow **500** may also include a NTN node **385**-*c* and a TN node **370**-*c*, which may be respective examples of a NTN node **385**-*a* and a TN node **370**-*a*, as described herein. The process flow **500** may also include a node **335**-*c*, which may be an example of the node **335**-*a*, as described herein.

[0145] In the following description of the process flow **500**, the signaling or communications between the UE **115**-*c*, the NTN node **385**-*c*, the TN node **370**-*c*, and the node **335**-*c* may be transmitted in a different order than the example order shown, or the operations performed by the UE **115**-*c*, the NTN node **385**-*c*, the TN node **370**-*c*, and the node **335**-*c*, may be performed in different orders or at different times. Some operations may also be omitted from the process flow **500**, and other operations may be added to the process flow **500**. Further, although some operations or signaling may be shown to occur at different times for discussion purposes, these operations may actually occur at the same time or in overlapping time periods in some examples.

[0146] At **505**, the NTN node **385**-*c* may output (e.g., transmit) an indication that the NTN node **385**-*c* is operating in a store and forward mode. For instance, the indication may be transmitted to the UE **115**-*c* as described with reference to FIG. **1** or FIG. **3**.

[0147] At **510**, the UE **115**-*c* may detect, determine, or receive coverage information from the node **335**-*c*. Detecting or receiving coverage information may be performed as described with reference to FIG. **1** or FIG. **3**.

[0148] At **515**, the UE **115**-*c* may store location data of the UE **115**-*c* and coverage information at least partially during a period that the NTN node **385**-*c* is operating in the store and forward mode based on receiving the indication. Storing the location data and coverage information may be performed as described with reference to FIG. **1** or FIG. **3**.

[0149] At **520**, the UE **115**-*c* may transmit the report data indicating the location data or the coverage information. Transmitting the report data may be performed as described with reference to FIG. **1** or FIG. **3**.

[0150] At **525**, the NTN node **385**-*c* may output (e.g., transmit) an indication of a rejection of management for the report data. The UE **115**-*c* may receive the indication. Outputting and receiving the indication of the rejection of management for the report data may be performed as described with reference to FIG. **1** or FIG. **3**.

[0151] At **530**, the UE **115**-*c* may transmit the report data. Transmitting the report data may be performed as described with reference to FIG. **1** or FIG. **3**. For example, the UE **115**-*c* may hold the report data until a link to a core network is available. When the link to the core network is available, the UE **115**-*c* may transmit the report data. In some examples, the link to the core network may be via the TN node **370**-*c*, via the NTN node **385**-*c*, or via another node (e.g., another TN node or another NTN node). In some examples, the NTN node **385**-*c* may output (e.g., transmit) the report data (for which management was rejected) to a core network when a link to the core network is available.

[0152] FIG. **6** shows a block diagram **600** of a device **605** that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure. The device **605** may be an example of aspects of a UE **115** as described herein. The device **605** may include a receiver **610**, a transmitter **615**, and a communications manager **620**. The device **605**, or one or more components of the device **605** (e.g., the receiver **610**, the transmitter **615**, and the communications manager **620**), may include at least one processor, which may be coupled with at least one memory, to, individually or collectively, support or enable the described techniques. Each of these components may be in communication with one another (e.g., via one or more buses).

[0153] The receiver **610** may provide a means for receiving information such as packets, user data, control information, or any combination thereof associated with various information channels (e.g., control channels, data channels, information channels related to uplink reports and store and forward mode). Information may be passed on to other components of the device **605**. The receiver **610** may utilize a single antenna or a set of multiple antennas.

[0154] The transmitter **615** may provide a means for transmitting signals generated by other components of the device **605**. For example, the transmitter **615** may transmit information such as packets, user data, control information, or any combination thereof associated with various information channels (e.g., control channels, data channels, information channels related to uplink reports and store and forward mode). In some examples, the transmitter **615** may be co-located with a receiver **610** in a transceiver module. The transmitter **615** may utilize a single antenna or a set of multiple antennas.

[0155] The communications manager **620**, the receiver **610**, the transmitter **615**, or various combinations thereof or various components thereof may be examples of means for performing various aspects of uplink reports and store and forward mode as described herein. For example, the communications manager **620**, the receiver **610**, the transmitter **615**, or various combinations or components thereof may be capable of performing one or more of the functions described herein.

[0156] In some examples, the communications manager **620**, the receiver **610**, the transmitter **615**, or various combinations or components thereof may be implemented in hardware (e.g., in communications management circuitry). The hardware may include at least one of a processor, a digital signal processor (DSP), a central processing unit (CPU), an application-specific integrated circuit (ASIC), a field-programmable gate array (FPGA) or other programmable logic device, a microcontroller, discrete gate or transistor logic, discrete hardware components, or any combination thereof configured as or otherwise supporting, individually or collectively, a means for performing the functions described in the present disclosure. In some examples, at least one processor and at least one memory coupled with the at least one processor may be configured to perform one or more of the functions described herein (e.g., by one or more processors, individually or collectively, executing instructions stored in the at least one memory).

[0157] Additionally, or alternatively, the communications manager **620**, the receiver **610**, the transmitter **615**, or various combinations or components thereof may be implemented in code (e.g., as communications management software or firmware) executed by at least one processor. If implemented in code executed by at least one processor, the functions of the communications manager **620**, the receiver **610**, the transmitter **615**, or various combinations or components thereof may be performed by a general-purpose processor, a DSP, a CPU, an ASIC, an FPGA, a microcontroller, or any combination of these or other programmable logic devices (e.g., configured as or otherwise supporting, individually or collectively, a means for performing the functions described in the present disclosure).

[0158] In some examples, the communications manager **620** may be configured to perform various operations (e.g., receiving, obtaining, monitoring, outputting, transmitting) using or otherwise in cooperation with the receiver **610**, the transmitter **615**, or both. For example, the communications manager **620** may receive information from the receiver **610**, send information to the transmitter **615**, or be integrated in combination with the receiver **610**, the transmitter **615**, or both to obtain information, output information, or perform various other operations as described herein.

[0159] For example, the communications manager **620** is capable of, configured to, or operable to support a means for receiving an indication that a first NTN node accessible to the UE is operating in a store and forward mode. The communications manager **620** is capable of, configured to, or operable to support a means for storing location data of the UE and coverage information at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based on receiving the indication, the coverage information indicating communication availability of one or more nodes to the UE, the one or more nodes associated with a TN or an NTN. The communications manager **620** is capable of, configured to, or operable to support a means for transmitting report data indicating the location data and the coverage information.

[0160] By including or configuring the communications manager **620** in accordance with examples as described herein, the device **605** (e.g., at least one processor controlling or otherwise coupled with the receiver **610**, the transmitter **615**, the communications manager **620**, or a combination thereof) may support techniques for reduced processing, reduced power consumption, or more efficient utilization of communication resources.

[0161] FIG. **7** shows a block diagram **700** of a device **705** that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure. The device **705** may be an example of aspects of a device **605** or a UE **115** as described herein. The device **705** may include a receiver **710**, a transmitter **715**, and a communications manager **720**. The device **705**, or one or more components of the device **705** (e.g., the receiver **710**, the transmitter **715**, and the communications manager **720**), may include at least one processor, which may be coupled with at least one memory, to support the described techniques. Each of these components may be in communication with one another (e.g., via one or more buses).

[0162] The receiver **710** may provide a means for receiving information such as packets, user data, control information, or any combination thereof associated with various information channels (e.g., control channels, data channels, information channels related to uplink reports and store and forward mode). Information may be passed on to other components of the device **705**. The receiver **710** may utilize a single antenna or a set of multiple antennas.

[0163] The transmitter **715** may provide a means for transmitting signals generated by other components of the device **705**. For example, the transmitter **715** may transmit information such as packets, user data, control information, or any combination thereof associated with various information channels (e.g., control channels, data channels, information channels related to uplink reports and store and forward mode). In some examples, the transmitter **715** may be co-located with a receiver **710** in a transceiver module. The transmitter **715** may utilize a single antenna or a set of multiple antennas.

[0164] The device **705**, or various components thereof, may be an example of means for performing various aspects of uplink reports and store and forward mode as described herein. For example, the communications manager **720** may include a store and forward component **725**, a location and coverage component **730**, a report component **735**, or any combination thereof. The communications manager **720** may be an example of aspects of a communications manager **620** as described herein. In some examples, the communi-

cations manager **720**, or various components thereof, may be configured to perform various operations (e.g., receiving, obtaining, monitoring, outputting, transmitting) using or otherwise in cooperation with the receiver **710**, the transmitter **715**, or both. For example, the communications manager **720** may receive information from the receiver **710**, send information to the transmitter **715**, or be integrated in combination with the receiver **710**, the transmitter **715**, or both to obtain information, output information, or perform various other operations as described herein.

[0165] The store and forward component **725** is capable of, configured to, or operable to support a means for receiving an indication that a first NTN node accessible to the UE is operating in a store and forward mode. The location and coverage component **730** is capable of, configured to, or operable to support a means for storing location data of the UE and coverage information at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based on receiving the indication, the coverage information indicating communication availability of one or more nodes to the UE, the one or more nodes associated with a TN or an NTN. The report component **735** is capable of, configured to, or operable to support a means for transmitting report data indicating the location data and the coverage information.

[0166] FIG. **8** shows a block diagram **800** of a communications manager **820** that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure. The communications manager **820** may be an example of aspects of a communications manager **620**, a communications manager **720**, or both, as described herein. The communications manager **820**, or various components thereof, may be an example of means for performing various aspects of uplink reports and store and forward mode as described herein. For example, the communications manager **820** may include a store and forward component **825**, a location and coverage component **830**, a report component **835**, a rejection component **840**, a report message component **845**, or any combination thereof. Each of these components, or components or subcomponents thereof (e.g., one or more processors, one or more memories), may communicate, directly or indirectly, with one another (e.g., via one or more buses).

[0167] The store and forward component **825** is capable of, configured to, or operable to support a means for receiving an indication that a first NTN node accessible to the UE is operating in a store and forward mode. The location and coverage component **830** is capable of, configured to, or operable to support a means for storing location data of the UE and coverage information at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based on receiving the indication, the coverage information indicating communication availability of one or more nodes to the UE, the one or more nodes associated with a TN or an NTN. The report component **835** is capable of, configured to, or operable to support a means for transmitting report data indicating the location data and the coverage information.

[0168] In some examples, the report data is transmitted to at least one of the one or more NTN nodes during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode.

[0169] In some examples, the rejection component **840** is capable of, configured to, or operable to support a means for receiving an indication of a rejection of management for the report data transmitted to the at least one of the one or more NTN nodes during the period. In some examples, the report component **835** is capable of, configured to, or operable to support a means for transmitting, based on the indication of the rejection, the report data to a TN node or to an NTN node not operating in the store and forward mode.

[0170] In some examples, the report message component **845** is capable of, configured to, or operable to support a means for receiving a message from the at least one of the one or more NTN nodes to transmit the report data during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode, where transmitting the report data is based on the message.

[0171] In some examples, to support transmitting the report data, the report component **835** is capable of, configured to, or operable to support a means for transmitting the report data to a terrestrial network node.

[0172] In some examples, the location and coverage component **830** is capable of, configured to, or operable to support a means for receiving a request for the location data and the coverage information, the request being included in a UE information request message or a logged measurement configuration message, where the location data and the coverage information are stored at least partially during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode based on receiving the request.

[0173] In some examples, the coverage information includes wireless wide area network coverage status information, PLMN availability information, RAT availability information, or any combination thereof.

[0174] In some examples, the coverage information includes a first parameter indicating availability of a TN cell, availability of an NTN cell, availability of an NTN cell operating in the store and forward mode, no coverage, or any combination thereof, and a second parameter indicating availability of a PLMN, availability of a RAT, a duration of availability, or any combination thereof.

[0175] In some examples, the report data is included in an RRC message, UAI, a MDT report, a message at a layer higher than a physical layer, a non-access stratum (NAS) message, a user plane message, or any combination thereof.

[0176] FIG. **9** shows a diagram of a system **900** including a device **905** that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure. The device **905** may be an example of or include the components of a device **605**, a device **705**, or a UE **115** as described herein. The device **905** may communicate (e.g., wirelessly) with one or more network entities **105**, one or more UEs **115**, or any combination thereof. The device **905** may include components for bi-directional voice and data communications including components for transmitting and receiving communications, such as a communications manager **920**, an input/output (I/O) controller **910**, a transceiver **915**, an antenna **925**, at least one memory **930**, code **935**, and at least one processor **940**. These components may be in electronic communication or otherwise coupled (e.g., operatively, communicatively, functionally, electronically, electrically) via one or more buses (e.g., a bus **945**).

[0177] The I/O controller **910** may manage input and output signals for the device **905**. The I/O controller **910** may also manage peripherals not integrated into the device **905**. In some cases, the I/O controller **910** may represent a

physical connection or port to an external peripheral. In some cases, the I/O controller **910** may utilize an operating system such as iOS®, ANDROID®, MS-DOS®, MS-WINDOWS®, OS/2®, UNIX®, LINUX®, or another known operating system. Additionally, or alternatively, the I/O controller **910** may represent or interact with a modem, a keyboard, a mouse, a touchscreen, or a similar device. In some cases, the I/O controller **910** may be implemented as part of one or more processors, such as the at least one processor **940**. In some cases, a user may interact with the device **905** via the I/O controller **910** or via hardware components controlled by the I/O controller **910**.

[0178] In some cases, the device **905** may include a single antenna **925**. However, in some other cases, the device **905** may have more than one antenna **925**, which may be capable of concurrently transmitting or receiving multiple wireless transmissions. The transceiver **915** may communicate bi-directionally, via the one or more antennas **925**, wired, or wireless links as described herein. For example, the transceiver **915** may represent a wireless transceiver and may communicate bi-directionally with another wireless transceiver. The transceiver **915** may also include a modem to modulate the packets, to provide the modulated packets to one or more antennas **925** for transmission, and to demodulate packets received from the one or more antennas **925**. The transceiver **915**, or the transceiver **915** and one or more antennas **925**, may be an example of a transmitter **615**, a transmitter **715**, a receiver **610**, a receiver **710**, or any combination thereof or component thereof, as described herein.

[0179] The at least one memory **930** may include random access memory (RAM) and read-only memory (ROM). The at least one memory **930** may store computer-readable, computer-executable code **935** including instructions that, when executed by the at least one processor **940**, cause the device **905** to perform various functions described herein. The code **935** may be stored in a non-transitory computer-readable medium such as system memory or another type of memory. In some cases, the code **935** may not be directly executable by the at least one processor **940** but may cause a computer (e.g., when compiled and executed) to perform functions described herein. In some cases, the at least one memory **930** may contain, among other things, a basic I/O system (BIOS) which may control basic hardware or software operation such as the interaction with peripheral components or devices.

[0180] The at least one processor **940** may include an intelligent hardware device (e.g., a general-purpose processor, a DSP, a CPU, a microcontroller, an ASIC, an FPGA, a programmable logic device, a discrete gate or transistor logic component, a discrete hardware component, or any combination thereof). In some cases, the at least one processor **940** may be configured to operate a memory array using a memory controller. In some other cases, a memory controller may be integrated into the at least one processor **940**. The at least one processor **940** may be configured to execute computer-readable instructions stored in a memory (e.g., the at least one memory **930**) to cause the device **905** to perform various functions (e.g., functions or tasks supporting uplink reports and store and forward mode). For example, the device **905** or a component of the device **905** may include at least one processor **940** and at least one memory **930** coupled with or to the at least one processor **940**, the at least one processor **940** and at least one memory **930** configured to perform various functions described herein. In some examples, the at least one processor **940** may include multiple processors and the at least one memory **930** may include multiple memories. One or more of the multiple processors may be coupled with one or more of the multiple memories, which may, individually or collectively, be configured to perform various functions herein. In some examples, the at least one processor **940** may be a component of a processing system, which may refer to a system (such as a series) of machines, circuitry (including, for example, one or both of processor circuitry (which may include the at least one processor **940**) and memory circuitry (which may include the at least one memory **930**)), or components, that receives or obtains inputs and processes the inputs to produce, generate, or obtain a set of outputs. The processing system may be configured to perform one or more of the functions described herein. For example, the at least one processor **940** or a processing system including the at least one processor **940** may be configured to, configurable to, or operable to cause the device **905** to perform one or more of the functions described herein. Further, as described herein, being "configured to," being "configurable to," and being "operable to" may be used interchangeably and may be associated with a capability, when executing code stored in the at least one memory **930** or otherwise, to perform one or more of the functions described herein.

[0181] For example, the communications manager **920** is capable of, configured to, or operable to support a means for receiving an indication that a first NTN node accessible to the UE is operating in a store and forward mode. The communications manager **920** is capable of, configured to, or operable to support a means for storing location data of the UE and coverage information at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based on receiving the indication, the coverage information indicating communication availability of one or more nodes to the UE, the one or more nodes associated with a TN or an NTN. The communications manager **920** is capable of, configured to, or operable to support a means for transmitting report data indicating the location data and the coverage information.

[0182] By including or configuring the communications manager **920** in accordance with examples as described herein, the device **905** may support techniques for improved communication reliability, reduced latency, reduced power consumption, more efficient utilization of communication resources, improved coordination between devices, longer battery life, or improved utilization of processing capability.

[0183] In some examples, the communications manager **920** may be configured to perform various operations (e.g., receiving, monitoring, transmitting) using or otherwise in cooperation with the transceiver **915**, the one or more antennas **925**, or any combination thereof. Although the communications manager **920** is illustrated as a separate component, in some examples, one or more functions described with reference to the communications manager **920** may be supported by or performed by the at least one processor **940**, the at least one memory **930**, the code **935**, or any combination thereof. For example, the code **935** may include instructions executable by the at least one processor **940** to cause the device **905** to perform various aspects of uplink reports and store and forward mode as described herein, or the at least one processor **940** and the at least one

memory **930** may be otherwise configured to, individually or collectively, perform or support such operations.

[0184] FIG. **10** shows a block diagram **1000** of a device **1005** that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure. The device **1005** may be an example of aspects of a NTN node as described herein. The device **1005** may include a receiver **1010**, a transmitter **1015**, and a communications manager **1020**. The device **1005**, or one or more components of the device **1005** (e.g., the receiver **1010**, the transmitter **1015**, and the communications manager **1020**), may include at least one processor, which may be coupled with at least one memory, to, individually or collectively, support or enable the described techniques. Each of these components may be in communication with one another (e.g., via one or more buses).

[0185] The receiver **1010** may provide a means for obtaining (e.g., receiving, determining, identifying) information such as user data, control information, or any combination thereof (e.g., I/Q samples, symbols, packets, protocol data units, service data units) associated with various channels (e.g., control channels, data channels, information channels, channels associated with a protocol stack). Information may be passed on to other components of the device **1005**. In some examples, the receiver **1010** may support obtaining information by receiving signals via one or more antennas. Additionally, or alternatively, the receiver **1010** may support obtaining information by receiving signals via one or more wired (e.g., electrical, fiber optic) interfaces, wireless interfaces, or any combination thereof.

[0186] The transmitter **1015** may provide a means for outputting (e.g., transmitting, providing, conveying, sending) information generated by other components of the device **1005**. For example, the transmitter **1015** may output information such as user data, control information, or any combination thereof (e.g., I/Q samples, symbols, packets, protocol data units, service data units) associated with various channels (e.g., control channels, data channels, information channels, channels associated with a protocol stack). In some examples, the transmitter **1015** may support outputting information by transmitting signals via one or more antennas. Additionally, or alternatively, the transmitter **1015** may support outputting information by transmitting signals via one or more wired (e.g., electrical, fiber optic) interfaces, wireless interfaces, or any combination thereof. In some examples, the transmitter **1015** and the receiver **1010** may be co-located in a transceiver, which may include or be coupled with a modem.

[0187] The communications manager **1020**, the receiver **1010**, the transmitter **1015**, or various combinations thereof or various components thereof may be examples of means for performing various aspects of uplink reports and store and forward mode as described herein. For example, the communications manager **1020**, the receiver **1010**, the transmitter **1015**, or various combinations or components thereof may be capable of performing one or more of the functions described herein.

[0188] In some examples, the communications manager **1020**, the receiver **1010**, the transmitter **1015**, or various combinations or components thereof may be implemented in hardware (e.g., in communications management circuitry). The hardware may include at least one of a processor, a DSP, a CPU, an ASIC, an FPGA or other programmable logic device, a microcontroller, discrete gate or transistor logic, discrete hardware components, or any combination thereof configured as or otherwise supporting, individually or collectively, a means for performing the functions described in the present disclosure. In some examples, at least one processor and at least one memory coupled with the at least one processor may be configured to perform one or more of the functions described herein (e.g., by one or more processors, individually or collectively, executing instructions stored in the at least one memory).

[0189] Additionally, or alternatively, the communications manager **1020**, the receiver **1010**, the transmitter **1015**, or various combinations or components thereof may be implemented in code (e.g., as communications management software or firmware) executed by at least one processor. If implemented in code executed by at least one processor, the functions of the communications manager **1020**, the receiver **1010**, the transmitter **1015**, or various combinations or components thereof may be performed by a general-purpose processor, a DSP, a CPU, an ASIC, an FPGA, a microcontroller, or any combination of these or other programmable logic devices (e.g., configured as or otherwise supporting, individually or collectively, a means for performing the functions described in the present disclosure).

[0190] In some examples, the communications manager **1020** may be configured to perform various operations (e.g., receiving, obtaining, monitoring, outputting, transmitting) using or otherwise in cooperation with the receiver **1010**, the transmitter **1015**, or both. For example, the communications manager **1020** may receive information from the receiver **1010**, send information to the transmitter **1015**, or be integrated in combination with the receiver **1010**, the transmitter **1015**, or both to obtain information, output information, or perform various other operations as described herein.

[0191] For example, the communications manager **1020** is capable of, configured to, or operable to support a means for transmitting an indication that the NTN node is operating in a store and forward mode. The communications manager **1020** is capable of, configured to, or operable to support a means for obtaining report data indicating location data of a UE and coverage information collected at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based on transmitting the indication, the coverage information indicating availability of one or more nodes to the UE during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode, the one or more nodes associated with a TN or an NTN.

[0192] By including or configuring the communications manager **1020** in accordance with examples as described herein, the device **1005** (e.g., at least one processor controlling or otherwise coupled with the receiver **1010**, the transmitter **1015**, the communications manager **1020**, or a combination thereof) may support techniques for reduced processing, reduced power consumption, more efficient utilization of communication resources.

[0193] FIG. **11** shows a block diagram **1100** of a device **1105** that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure. The device **1105** may be an example of aspects of a device **1005** or a network entity **105** (e.g., NTN node **185**) as described herein. The device **1105** may include a receiver **1110**, a transmitter **1115**, and a communications manager **1120**. The device **1105**, or one or more components of the device **1105** (e.g., the receiver **1110**, the transmitter

1115, and the communications manager 1120), may include at least one processor, which may be coupled with at least one memory, to support the described techniques. Each of these components may be in communication with one another (e.g., via one or more buses).

[0194] The receiver 1110 may provide a means for obtaining (e.g., receiving, determining, identifying) information such as user data, control information, or any combination thereof (e.g., I/Q samples, symbols, packets, protocol data units, service data units) associated with various channels (e.g., control channels, data channels, information channels, channels associated with a protocol stack). Information may be passed on to other components of the device 1105. In some examples, the receiver 1110 may support obtaining information by receiving signals via one or more antennas. Additionally, or alternatively, the receiver 1110 may support obtaining information by receiving signals via one or more wired (e.g., electrical, fiber optic) interfaces, wireless interfaces, or any combination thereof.

[0195] The transmitter 1115 may provide a means for outputting (e.g., transmitting, providing, conveying, sending) information generated by other components of the device 1105. For example, the transmitter 1115 may output information such as user data, control information, or any combination thereof (e.g., I/Q samples, symbols, packets, protocol data units, service data units) associated with various channels (e.g., control channels, data channels, information channels, channels associated with a protocol stack). In some examples, the transmitter 1115 may support outputting information by transmitting signals via one or more antennas. Additionally, or alternatively, the transmitter 1115 may support outputting information by transmitting signals via one or more wired (e.g., electrical, fiber optic) interfaces, wireless interfaces, or any combination thereof. In some examples, the transmitter 1115 and the receiver 1110 may be co-located in a transceiver, which may include or be coupled with a modem.

[0196] The device 1105, or various components thereof, may be an example of means for performing various aspects of uplink reports and store and forward mode as described herein. For example, the communications manager 1120 may include a store and forward manager 1125 a location and coverage manager 1130, or any combination thereof. The communications manager 1120 may be an example of aspects of a communications manager 1020 as described herein. In some examples, the communications manager 1120, or various components thereof, may be configured to perform various operations (e.g., receiving, obtaining, monitoring, outputting, transmitting) using or otherwise in cooperation with the receiver 1110, the transmitter 1115, or both. For example, the communications manager 1120 may receive information from the receiver 1110, send information to the transmitter 1115, or be integrated in combination with the receiver 1110, the transmitter 1115, or both to obtain information, output information, or perform various other operations as described herein.

[0197] The store and forward manager 1125 is capable of, configured to, or operable to support a means for transmitting an indication that the NTN node is operating in a store and forward mode. The location and coverage manager 1130 is capable of, configured to, or operable to support a means for obtaining report data indicating location data of a UE and coverage information collected at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based on transmitting the indication, the coverage information indicating availability of one or more nodes to the UE during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode, the one or more nodes associated with a TN or an NTN.

[0198] FIG. 12 shows a block diagram 1200 of a communications manager 1220 that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure. The communications manager 1220 may be an example of aspects of a communications manager 1020, a communications manager 1120, or both, as described herein. The communications manager 1220, or various components thereof, may be an example of means for performing various aspects of uplink reports and store and forward mode as described herein. For example, the communications manager 1220 may include a store and forward manager 1225, a location and coverage manager 1230, a rejection manager 1235, a report manager 1240, a report message manager 1245, or any combination thereof. Each of these components, or components or subcomponents thereof (e.g., one or more processors, one or more memories), may communicate, directly or indirectly, with one another (e.g., via one or more buses).

[0199] The store and forward manager 1225 is capable of, configured to, or operable to support a means for transmitting an indication that the NTN node is operating in a store and forward mode. The location and coverage manager 1230 is capable of, configured to, or operable to support a means for obtaining report data indicating location data of a UE and coverage information collected at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based on transmitting the indication, the coverage information indicating availability of one or more nodes to the UE during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode, the one or more nodes associated with a TN or an NTN.

[0200] In some examples, the report data is obtained in the period that that the one or more NTN nodes accessible to the UE are operating in the store and forward mode.

[0201] In some examples, the rejection manager 1235 is capable of, configured to, or operable to support a means for transmitting an indication of rejection of management for the report data obtained in the period.

[0202] In some examples, the report manager 1240 is capable of, configured to, or operable to support a means for transmitting the report data to a core network when a feeder link between the NTN node and the core network is available.

[0203] In some examples, the report message manager 1245 is capable of, configured to, or operable to support a means for transmitting a message to transmit the report data during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode, where obtaining the report data is based on the message.

[0204] In some examples, the location and coverage manager 1230 is capable of, configured to, or operable to support a means for transmitting a request for the location data and the coverage information, the request being included in a UE information request message or a logged measurement configuration message, where the location data and the coverage information are obtained at least partially during the period

that the NTN node is operating in the store and forward mode based on transmitting the request.

[0205] In some examples, the coverage information includes wireless wide area network coverage status information, PLMN availability information, RAT availability information, or any combination thereof.

[0206] In some examples, the coverage information includes a first parameter indicating availability of a TN cell, availability of an NTN cell, availability of an NTN cell operating in the store and forward mode, no coverage, or any combination thereof, and a second parameter indicating availability of a PLMN, availability of a RAT, a duration of availability, or any combination thereof.

[0207] In some examples, the report data is included in an RRC message, UAI, a MDT report, a message at a layer higher than a physical layer, a non-access stratum (NAS) message, a user plane message, or any combination thereof.

[0208] FIG. **13** shows a diagram of a system **1300** including a device **1305** that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure. The device **1305** may be an example of or include the components of a device **1005**, a device **1105**, or a NTN node as described herein. The device **1305** may include components for bi-directional voice and data communications including components for transmitting and receiving communications, such as a communications manager **1320**, a transceiver **1310**, an antenna **1315**, at least one memory **1325**, code **1330**, and at least one processor **1335**. These components may be in electronic communication or otherwise coupled (e.g., operatively, communicatively, functionally, electronically, electrically) via one or more buses (e.g., a bus **1340**).

[0209] The transceiver **1310** may support bi-directional communications via wired links, wireless links, or both as described herein. In some examples, the transceiver **1310** may include a wired transceiver and may communicate bi-directionally with another wired transceiver. Additionally, or alternatively, in some examples, the transceiver **1310** may include a wireless transceiver and may communicate bi-directionally with another wireless transceiver. In some examples, the device **1305** may include one or more antennas **1315**, which may be capable of transmitting or receiving wireless transmissions (e.g., concurrently). The transceiver **1310** may also include a modem to modulate signals, to provide the modulated signals for transmission (e.g., by one or more antennas **1315**, by a wired transmitter), to receive modulated signals (e.g., from one or more antennas **1315**, from a wired receiver), and to demodulate signals. In some implementations, the transceiver **1310** may include one or more interfaces, such as one or more interfaces coupled with the one or more antennas **1315** that are configured to support various receiving or obtaining operations, or one or more interfaces coupled with the one or more antennas **1315** that are configured to support various transmitting or outputting operations, or a combination thereof. In some implementations, the transceiver **1310** may include or be configured for coupling with one or more processors or one or more memory components that are operable to perform or support operations based on received or obtained information or signals, or to generate information or other signals for transmission or other outputting, or any combination thereof. In some implementations, the transceiver **1310**, or the transceiver **1310** and the one or more antennas **1315**, or the transceiver **1310** and the one or more antennas **1315** and one or more processors or one or more memory components (e.g., the at least one processor **1335**, the at least one memory **1325**, or both), may be included in a chip or chip assembly that is installed in the device **1305**. In some examples, the transceiver **1310** may be operable to support communications via one or more communications links (e.g., a communication link **125**, a backhaul communication link **120**, a midhaul communication link **162**, a fronthaul communication link **168**).

[0210] The at least one memory **1325** may include RAM, ROM, or any combination thereof. The at least one memory **1325** may store computer-readable, computer-executable code **1330** including instructions that, when executed by one or more of the at least one processor **1335**, cause the device **1305** to perform various functions described herein. The code **1330** may be stored in a non-transitory computer-readable medium such as system memory or another type of memory. In some cases, the code **1330** may not be directly executable by a processor of the at least one processor **1335** but may cause a computer (e.g., when compiled and executed) to perform functions described herein. In some cases, the at least one memory **1325** may contain, among other things, a BIOS which may control basic hardware or software operation such as the interaction with peripheral components or devices. In some examples, the at least one processor **1335** may include multiple processors and the at least one memory **1325** may include multiple memories. One or more of the multiple processors may be coupled with one or more of the multiple memories which may, individually or collectively, be configured to perform various functions herein (for example, as part of a processing system).

[0211] The at least one processor **1335** may include an intelligent hardware device (e.g., a general-purpose processor, a DSP, an ASIC, a CPU, an FPGA, a microcontroller, a programmable logic device, discrete gate or transistor logic, a discrete hardware component, or any combination thereof). In some cases, the at least one processor **1335** may be configured to operate a memory array using a memory controller. In some other cases, a memory controller may be integrated into one or more of the at least one processor **1335**. The at least one processor **1335** may be configured to execute computer-readable instructions stored in a memory (e.g., one or more of the at least one memory **1325**) to cause the device **1305** to perform various functions (e.g., functions or tasks supporting uplink reports and store and forward mode). For example, the device **1305** or a component of the device **1305** may include at least one processor **1335** and at least one memory **1325** coupled with one or more of the at least one processor **1335**, the at least one processor **1335** and the at least one memory **1325** configured to perform various functions described herein. The at least one processor **1335** may be an example of a cloud-computing platform (e.g., one or more physical nodes and supporting software such as operating systems, virtual machines, or container instances) that may host the functions (e.g., by executing code **1330**) to perform the functions of the device **1305**. The at least one processor **1335** may be any one or more suitable processors capable of executing scripts or instructions of one or more software programs stored in the device **1305** (such as within one or more of the at least one memory **1325**). In some examples, the at least one processor **1335** may include multiple processors and the at least one memory **1325** may include multiple memories. One or more of the multiple processors may be coupled with one or more of the multiple

memories, which may, individually or collectively, be configured to perform various functions herein. In some examples, the at least one processor **1335** may be a component of a processing system, which may refer to a system (such as a series) of machines, circuitry (including, for example, one or both of processor circuitry (which may include the at least one processor **1335**) and memory circuitry (which may include the at least one memory **1325**)), or components, that receives or obtains inputs and processes the inputs to produce, generate, or obtain a set of outputs. The processing system may be configured to perform one or more of the functions described herein. For example, the at least one processor **1335** or a processing system including the at least one processor **1335** may be configured to, configurable to, or operable to cause the device **1305** to perform one or more of the functions described herein. Further, as described herein, being "configured to," being "configurable to," and being "operable to" may be used interchangeably and may be associated with a capability, when executing code stored in the at least one memory **1325** or otherwise, to perform one or more of the functions described herein.

[0212] In some examples, a bus **1340** may support communications of (e.g., within) a protocol layer of a protocol stack. In some examples, a bus **1340** may support communications associated with a logical channel of a protocol stack (e.g., between protocol layers of a protocol stack), which may include communications performed within a component of the device **1305**, or between different components of the device **1305** that may be co-located or located in different locations (e.g., where the device **1305** may refer to a system in which one or more of the communications manager **1320**, the transceiver **1310**, the at least one memory **1325**, the code **1330**, and the at least one processor **1335** may be located in one of the different components or divided between different components).

[0213] In some examples, the communications manager **1320** may manage aspects of communications with a core network **130** (e.g., via one or more wired or wireless backhaul links). For example, the communications manager **1320** may manage the transfer of data communications for client devices, such as one or more UEs **115**. In some examples, the communications manager **1320** may manage communications with other network entities **105**, and may include a controller or scheduler for controlling communications with UEs **115** in cooperation with other network entities **105**. In some examples, the communications manager **1320** may support an X2 interface within an LTE/LTE-A wireless communications network technology to provide communication between network entities **105**.

[0214] For example, the communications manager **1320** is capable of, configured to, or operable to support a means for transmitting an indication that the NTN node is operating in a store and forward mode. The communications manager **1320** is capable of, configured to, or operable to support a means for obtaining report data indicating location data of a UE and coverage information collected at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based on transmitting the indication, the coverage information indicating availability of one or more nodes to the UE during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode, the one or more nodes associated with a TN or an NTN.

[0215] By including or configuring the communications manager **1320** in accordance with examples as described herein, the device **1305** may support techniques for improved communication reliability, reduced latency, reduced power consumption, more efficient utilization of communication resources, improved coordination between devices, longer battery life, improved utilization of processing capability.

[0216] In some examples, the communications manager **1320** may be configured to perform various operations (e.g., receiving, obtaining, monitoring, outputting, transmitting) using or otherwise in cooperation with the transceiver **1310**, the one or more antennas **1315** (e.g., where applicable), or any combination thereof. Although the communications manager **1320** is illustrated as a separate component, in some examples, one or more functions described with reference to the communications manager **1320** may be supported by or performed by the transceiver **1310**, one or more of the at least one processor **1335**, one or more of the at least one memory **1325**, the code **1330**, or any combination thereof (for example, by a processing system including at least a portion of the at least one processor **1335**, the at least one memory **1325**, the code **1330**, or any combination thereof). For example, the code **1330** may include instructions executable by one or more of the at least one processor **1335** to cause the device **1305** to perform various aspects of uplink reports and store and forward mode as described herein, or the at least one processor **1335** and the at least one memory **1325** may be otherwise configured to, individually or collectively, perform or support such operations.

[0217] FIG. **14** shows a flowchart illustrating a method **1400** that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure. The operations of the method **1400** may be implemented by a UE or its components as described herein. For example, the operations of the method **1400** may be performed by a UE **115** as described with reference to FIGS. **1** through **9**. In some examples, a UE may execute a set of instructions to control the functional elements of the UE to perform the described functions. Additionally, or alternatively, the UE may perform aspects of the described functions using special-purpose hardware.

[0218] At **1405**, the method may include receiving an indication that a first NTN node accessible to the UE is operating in a store and forward mode. The operations of block **1405** may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of **1405** may be performed by a store and forward component **825** as described with reference to FIG. **8**.

[0219] At **1410**, the method may include storing location data of the UE and coverage information at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based on receiving the indication, the coverage information indicating communication availability of one or more nodes to the UE, the one or more nodes associated with a TN or an NTN. The operations of block **1410** may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of **1410** may be performed by a location and coverage component **830** as described with reference to FIG. **8**.

[0220] At **1415**, the method may include transmitting report data indicating the location data and the coverage information. The operations of block **1415** may be per-

formed in accordance with examples as disclosed herein. In some examples, aspects of the operations of **1415** may be performed by a report component **835** as described with reference to FIG. **8**.

[0221] FIG. **15** shows a flowchart illustrating a method **1500** that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure. The operations of the method **1500** may be implemented by a UE or its components as described herein. For example, the operations of the method **1500** may be performed by a UE **115** as described with reference to FIGS. **1** through **9**. In some examples, a UE may execute a set of instructions to control the functional elements of the UE to perform the described functions. Additionally, or alternatively, the UE may perform aspects of the described functions using special-purpose hardware.

[0222] At **1505**, the method may include receiving an indication that a first NTN node accessible to the UE is operating in a store and forward mode. The operations of block **1505** may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of **1505** may be performed by a store and forward component **825** as described with reference to FIG. **8**.

[0223] At **1510**, the method may include storing location data of the UE and coverage information at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based on receiving the indication, the coverage information indicating communication availability of one or more nodes to the UE, the one or more nodes associated with a TN or an NTN. The operations of block **1510** may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of **1510** may be performed by a location and coverage component **830** as described with reference to FIG. **8**.

[0224] At **1515**, the method may include receiving a message from the at least one of the one or more NTN nodes to transmit the report data during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode. The operations of block **1515** may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of **1515** may be performed by a report message component **845** as described with reference to FIG. **8**.

[0225] At **1520**, the method may include transmitting report data indicating the location data and the coverage information, where transmitting the report data is based on the message. The operations of block **1520** may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of **1520** may be performed by a report component **835** as described with reference to FIG. **8**.

[0226] FIG. **16** shows a flowchart illustrating a method **1600** that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure. The operations of the method **1600** may be implemented by a NTN node or its components as described herein. For example, the operations of the method **1600** may be performed by a NTN node as described with reference to FIGS. **1** through **5** and **10** through **13**. In some examples, a NTN node may execute a set of instructions to control the functional elements of the NTN node to perform the described functions. Additionally, or alternatively, the NTN node may perform aspects of the described functions using special-purpose hardware.

[0227] At **1605**, the method may include transmitting an indication that the NTN node is operating in a store and forward mode. The operations of block **1605** may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of **1605** may be performed by a store and forward manager **1225** as described with reference to FIG. **12**.

[0228] At **1610**, the method may include obtaining report data indicating location data of a UE and coverage information collected at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based on transmitting the indication, the coverage information indicating availability of one or more nodes to the UE during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode, the one or more nodes associated with a TN or an NTN. The operations of block **1610** may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of **1610** may be performed by a location and coverage manager **1230** as described with reference to FIG. **12**.

[0229] FIG. **17** shows a flowchart illustrating a method **1700** that supports uplink reports and store and forward mode in accordance with one or more aspects of the present disclosure. The operations of the method **1700** may be implemented by a NTN or its components as described herein. For example, the operations of the method **1700** may be performed by a NTN node as described with reference to FIGS. **1** through **5** and **10** through **13**. In some examples, a NTN node may execute a set of instructions to control the functional elements of the NTN node to perform the described functions. Additionally, or alternatively, the NTN node may perform aspects of the described functions using special-purpose hardware.

[0230] At **1705**, the method may include transmitting an indication that the NTN node is operating in a store and forward mode. The operations of block **1705** may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of **1705** may be performed by a store and forward manager **1225** as described with reference to FIG. **12**.

[0231] At **1710**, the method may include transmitting a message to transmit the report data during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode. The operations of block **1710** may be performed in accordance with examples as disclosed herein. In some examples, aspects of the operations of **1710** may be performed by a report message manager **1245** as described with reference to FIG. **12**.

[0232] At **1715**, the method may include obtaining report data indicating location data of a UE and coverage information collected at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based on transmitting the indication, the coverage information indicating availability of one or more nodes to the UE during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode, the one or more nodes associated with a TN or an NTN, where obtaining the report data is based on the message. The operations of block **1715** may be performed in accordance with examples as disclosed herein. In

some examples, aspects of the operations of **1715** may be performed by a location and coverage manager **1230** as described with reference to FIG. **12**.

[0233] The following provides an overview of aspects of the present disclosure:

[0234] Aspect 1: A method for wireless communications by a UE, comprising: receiving an indication that a first NTN node accessible to the UE is operating in a store and forward mode; storing location data of the UE and coverage information at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based at least in part on receiving the indication, the coverage information indicating communication availability of one or more nodes to the UE, the one or more nodes associated with a TN or an NTN; and transmitting report data indicating the location data and the coverage information.

[0235] Aspect 2: The method of aspect 1, wherein the report data is transmitted to at least one of the one or more NTN nodes during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode.

[0236] Aspect 3: The method of aspect 2, further comprising: receiving an indication of a rejection of management for the report data transmitted to the at least one of the one or more NTN nodes during the period; and transmitting, based at least in part on the indication of the rejection, the report data to a TN node or to an NTN node not operating in the store and forward mode.

[0237] Aspect 4: The method of aspect 2, further comprising: receiving a message from the at least one of the one or more NTN nodes to transmit the report data during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode, wherein transmitting the report data is based at least in part on the message.

[0238] Aspect 5: The method of any of aspects 1 through 4, wherein transmitting the report data comprises: transmitting the report data to a TN node.

[0239] Aspect 6: The method of any of aspects 1 through 5, further comprising: receiving a request for the location data and the coverage information, the request being included in a UE information request message or a logged measurement configuration message, wherein the location data and the coverage information are stored at least partially during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode based at least in part on receiving the request.

[0240] Aspect 7: The method of any of aspects 1 through 6, wherein the coverage information comprises WWAN coverage status information, PLMN availability information, RAT availability information, or any combination thereof.

[0241] Aspect 8: The method of any of aspects 1 through 7, wherein the coverage information comprises a first parameter indicating availability of a TN cell, availability of an NTN cell, availability of an NTN cell operating in the store and forward mode, no coverage, or any combination thereof, and a second parameter indicating availability of a PLMN, availability of a RAT, a duration of availability, or any combination thereof.

[0242] Aspect 9: The method of any of aspects 1 through 8, wherein the report data is included in an RRC message, UAI, a MDT report, a message at a layer higher than a physical layer, a NAS message, a user plane message, or any combination thereof.

[0243] Aspect 10: A method for wireless communications by a NTN node, comprising: transmitting an indication that the NTN node is operating in a store and forward mode; and obtaining report data indicating location data of a UE and coverage information collected at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based at least in part on transmitting the indication, the coverage information indicating availability of one or more nodes to the UE during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode, the one or more nodes associated with a TN or an NTN.

[0244] Aspect 11: The method of aspect 10, wherein the report data is obtained in the period that that the one or more NTN nodes accessible to the UE are operating in the store and forward mode.

[0245] Aspect 12: The method of aspect 11, further comprising: transmitting an indication of rejection of management for the report data obtained in the period.

[0246] Aspect 13: The method of aspect 11, further comprising: transmitting the report data to a core network when a feeder link between the NTN node and the core network is available.

[0247] Aspect 14: The method of any of aspects 11 through 13, further comprising: transmitting a message to transmit the report data during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode, wherein obtaining the report data is based at least in part on the message.

[0248] Aspect 15: The method of any of aspects 10 through 14, further comprising: transmitting a request for the location data and the coverage information, the request being included in a UE information request message or a logged measurement configuration message, wherein the location data and the coverage information are obtained at least partially during the period that the NTN node is operating in the store and forward mode based at least in part on transmitting the request.

[0249] Aspect 16: The method of any of aspects 10 through 15, wherein the coverage information comprises WWAN coverage status information, PLMN availability information, RAT availability information, or any combination thereof.

[0250] Aspect 17: The method of any of aspects 10 through 16, wherein the coverage information comprises a first parameter indicating availability of a TN cell, availability of an NTN cell, availability of an NTN cell operating in the store and forward mode, no coverage, or any combination thereof, and a second parameter indicating availability of a PLMN, availability of a RAT, a duration of availability, or any combination thereof.

[0251] Aspect 18: The method of any of aspects 10 through 17, wherein the report data is included in an RRC message, UAI, a MDT report, a message at a layer higher than a physical layer, a NAS message, a user plane message, or any combination thereof.

[0252] Aspect 19: A UE comprising one or more memories storing processor-executable code, and one or more processors coupled with the one or more memories and

individually or collectively operable to execute the code to cause the UE to perform a method of any of aspects 1 through 9.

[0253] Aspect 20: A UE comprising at least one means for performing a method of any of aspects 1 through 9.

[0254] Aspect 21: A non-transitory computer-readable medium storing code the code comprising instructions executable by one or more processors to perform a method of any of aspects 1 through 9.

[0255] Aspect 22: A NTN node comprising one or more memories storing processor-executable code, and one or more processors coupled with the one or more memories and individually or collectively operable to execute the code to cause the NTN node to perform a method of any of aspects 10 through 18.

[0256] Aspect 23: A NTN node comprising at least one means for performing a method of any of aspects 10 through 18.

[0257] Aspect 24: A non-transitory computer-readable medium storing code the code comprising instructions executable by one or more processors to perform a method of any of aspects 10 through 18.

[0258] It should be noted that the methods described herein describe possible implementations, and that the operations and the steps may be rearranged or otherwise modified and that other implementations are possible. Further, aspects from two or more of the methods may be combined.

[0259] Although aspects of an LTE, LTE-A, LTE-A Pro, or NR system may be described for purposes of example, and LTE, LTE-A, LTE-A Pro, or NR terminology may be used in much of the description, the techniques described herein are applicable beyond LTE, LTE-A, LTE-A Pro, or NR networks. For example, the described techniques may be applicable to various other wireless communications systems such as Ultra Mobile Broadband (UMB), Institute of Electrical and Electronics Engineers (IEEE) 802.11 (Wi-Fi), IEEE 802.16 (WiMAX), IEEE 802.20, Flash-OFDM, as well as other systems and radio technologies not explicitly mentioned herein.

[0260] Information and signals described herein may be represented using any of a variety of different technologies and techniques. For example, data, instructions, commands, information, signals, bits, symbols, and chips that may be referenced throughout the description may be represented by voltages, currents, electromagnetic waves, magnetic fields or particles, optical fields or particles, or any combination thereof.

[0261] The various illustrative blocks and components described in connection with the disclosure herein may be implemented or performed using a general-purpose processor, a DSP, an ASIC, a CPU, an FPGA or other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described herein. A general-purpose processor may be a microprocessor but, in the alternative, the processor may be any processor, controller, microcontroller, or state machine. A processor may also be implemented as a combination of computing devices (e.g., a combination of a DSP and a microprocessor, multiple microprocessors, one or more microprocessors in conjunction with a DSP core, or any other such configuration). Any functions or operations described herein as being capable of being performed by a processor may be performed by multiple processors that, individually or collectively, are capable of performing the described functions or operations.

[0262] The functions described herein may be implemented using hardware, software executed by a processor, firmware, or any combination thereof. If implemented using software executed by a processor, the functions may be stored as or transmitted using one or more instructions or code of a computer-readable medium. Other examples and implementations are within the scope of the disclosure and appended claims. For example, due to the nature of software, functions described herein may be implemented using software executed by a processor, hardware, firmware, hardwiring, or combinations of any of these. Features implementing functions may also be physically located at various positions, including being distributed such that portions of functions are implemented at different physical locations.

[0263] Computer-readable media includes both non-transitory computer storage media and communication media including any medium that facilitates transfer of a computer program from one location to another. A non-transitory storage medium may be any available medium that may be accessed by a general-purpose or special-purpose computer. By way of example, and not limitation, non-transitory computer-readable media may include RAM, ROM, electrically erasable programmable ROM (EEPROM), flash memory, compact disk (CD) ROM or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other non-transitory medium that may be used to carry or store desired program code means in the form of instructions or data structures and that may be accessed by a general-purpose or special-purpose computer, or a general-purpose or special-purpose processor. Also, any connection is properly termed a computer-readable medium. For example, if the software is transmitted from a website, server, or other remote source using a coaxial cable, fiber optic cable, twisted pair, digital subscriber line (DSL), or wireless technologies such as infrared, radio, and microwave, then the coaxial cable, fiber optic cable, twisted pair, DSL, or wireless technologies such as infrared, radio, and microwave are included in the definition of computer-readable medium. Disk and disc, as used herein, include CD, laser disc, optical disc, digital versatile disc (DVD), floppy disk and Blu-ray disc. Disks may reproduce data magnetically, and discs may reproduce data optically using lasers. Combinations of the above are also included within the scope of computer-readable media. Any functions or operations described herein as being capable of being performed by a memory may be performed by multiple memories that, individually or collectively, are capable of performing the described functions or operations.

[0264] As used herein, including in the claims, "or" as used in a list of items (e.g., a list of items prefaced by a phrase such as "at least one of" or "one or more of") indicates an inclusive list such that, for example, a list of at least one of A, B, or C means A or B or C or AB or AC or BC or ABC (i.e., A and B and C). Also, as used herein, the phrase "based on" shall not be construed as a reference to a closed set of conditions. For example, an example step that is described as "based on condition A" may be based on both a condition A and a condition B without departing from the scope of the present disclosure. In other words, as used herein, the phrase "based on" shall be construed in the same manner as the phrase "based at least in part on."

[0265] As used herein, including in the claims, the article "a" before a noun is open-ended and understood to refer to "at least one" of those nouns or "one or more" of those nouns. Thus, the terms "a," "at least one," "one or more," "at least one of one or more" may be interchangeable. For example, if a claim recites "a component" that performs one or more functions, each of the individual functions may be performed by a single component or by any combination of multiple components. Thus, the term "a component" having characteristics or performing functions may refer to "at least one of one or more components" having a particular characteristic or performing a particular function. Subsequent reference to a component introduced with the article "a" using the terms "the" or "said" may refer to any or all of the one or more components. For example, a component introduced with the article "a" may be understood to mean "one or more components," and referring to "the component" subsequently in the claims may be understood to be equivalent to referring to "at least one of the one or more components." Similarly, subsequent reference to a component introduced as "one or more components" using the terms "the" or "said" may refer to any or all of the one or more components. For example, referring to "the one or more components" subsequently in the claims may be understood to be equivalent to referring to "at least one of the one or more components."

[0266] The term "determine" or "determining" encompasses a variety of actions and, therefore, "determining" can include calculating, computing, processing, deriving, investigating, looking up (such as via looking up in a table, a database or another data structure), ascertaining and the like. Also, "determining" can include receiving (e.g., receiving information), accessing (e.g., accessing data stored in memory) and the like. Also, "determining" can include resolving, obtaining, selecting, choosing, establishing, and other such similar actions.

[0267] In the appended figures, similar components or features may have the same reference label. Further, various components of the same type may be distinguished by following the reference label by a dash and a second label that distinguishes among the similar components. If just the first reference label is used in the specification, the description is applicable to any one of the similar components having the same first reference label irrespective of the second reference label, or other subsequent reference label.

[0268] The description set forth herein, in connection with the appended drawings, describes example configurations and does not represent all the examples that may be implemented or that are within the scope of the claims. The term "example" used herein means "serving as an example, instance, or illustration," and not "preferred" or "advantageous over other examples." The detailed description includes specific details for the purpose of providing an understanding of the described techniques. These techniques, however, may be practiced without these specific details. In some instances, known structures and devices are shown in block diagram form in order to avoid obscuring the concepts of the described examples.

[0269] The description herein is provided to enable a person having ordinary skill in the art to make or use the disclosure. Various modifications to the disclosure will be apparent to a person having ordinary skill in the art, and the generic principles defined herein may be applied to other variations without departing from the scope of the disclosure. Thus, the disclosure is not limited to the examples and designs described herein but is to be accorded the broadest scope consistent with the principles and novel features disclosed herein.

What is claimed is:

1. A user equipment (UE), comprising:

one or more memories storing processor-executable code; and

one or more processors coupled with the one or more memories and individually or collectively operable to execute the code to cause the UE to:

receive an indication that a first non-terrestrial network (NTN) node accessible to the UE is operating in a store and forward mode;

store location data of the UE and coverage information at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based at least in part on receiving the indication, the coverage information indicating communication availability of one or more nodes to the UE, the one or more nodes associated with a terrestrial network (TN) or an NTN; and

transmit report data indicating the location data and the coverage information.

2. The UE of claim **1**, wherein the report data is transmitted to at least one of the one or more NTN nodes during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode.

3. The UE of claim **2**, wherein the one or more processors are individually or collectively further operable to execute the code to cause the UE to:

receive an indication of a rejection of management for the report data transmitted to the at least one of the one or more NTN nodes during the period; and

transmit, based at least in part on the indication of the rejection, the report data to a TN node or to an NTN node not operating in the store and forward mode.

4. The UE of claim **2**, wherein the one or more processors are individually or collectively further operable to execute the code to cause the UE to:

receive a message from the at least one of the one or more NTN nodes to transmit the report data during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode, wherein transmitting the report data is based at least in part on the message.

5. The UE of claim **1**, wherein, to transmit the report data, the one or more processors are individually or collectively operable to execute the code to cause the UE to:

transmit the report data to a TN node.

6. The UE of claim **1**, wherein the one or more processors are individually or collectively further operable to execute the code to cause the UE to:

receive a request for the location data and the coverage information, the request being included in a UE information request message or a logged measurement configuration message, wherein the location data and the coverage information are stored at least partially during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode based at least in part on receiving the request.

7. The UE of claim 1, wherein the coverage information comprises wireless wide area network (WWAN) coverage status information, public land mobile network (PLMN) availability information, radio access technology (RAT) availability information, or any combination thereof.

8. The UE of claim 1, wherein the coverage information comprises a first parameter indicating availability of a TN cell, availability of an NTN cell, availability of an NTN cell operating in the store and forward mode, no coverage, or any combination thereof, and a second parameter indicating availability of a public land mobile network (PLMN), availability of a radio access technology (RAT), a duration of availability, or any combination thereof.

9. The UE of claim 1, wherein the report data is included in a radio resource control (RRC) message, UE assistance information (UAI), a minimization of drive test (MDT) report, a message at a layer higher than a physical layer, a non-access stratum (NAS) message, a user plane message, or any combination thereof.

10. A non-terrestrial network (NTN) node, comprising:

one or more memories storing processor-executable code; and

one or more processors coupled with the one or more memories and individually or collectively operable to execute the code to cause the NTN node to:

transmit an indication that the NTN node is operating in a store and forward mode; and

obtain report data indicating location data of a user equipment (UE) and coverage information collected at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based at least in part on transmitting the indication, the coverage information indicating availability of one or more nodes to the UE during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode, the one or more nodes associated with a terrestrial network (TN) or an NTN.

11. The NTN node of claim 10, wherein the report data is obtained in the period that that the one or more NTN nodes accessible to the UE are operating in the store and forward mode.

12. The NTN node of claim 11, wherein the one or more processors are individually or collectively further operable to execute the code to cause the NTN node to:

transmit an indication of rejection of management for the report data obtained in the period.

13. The NTN node of claim 11, wherein the one or more processors are individually or collectively further operable to execute the code to cause the NTN node to:

transmit the report data to a core network when a feeder link between the NTN node and the core network is available.

14. The NTN node of claim 11, wherein the one or more processors are individually or collectively further operable to execute the code to cause the NTN node to:

transmit a message to transmit the report data during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode, wherein obtaining the report data is based at least in part on the message.

15. The NTN node of claim 10, wherein the one or more processors are individually or collectively further operable to execute the code to cause the NTN node to:

transmit a request for the location data and the coverage information, the request being included in a UE information request message or a logged measurement configuration message, wherein the location data and the coverage information are obtained at least partially during the period that the NTN node is operating in the store and forward mode based at least in part on transmitting the request.

16. The NTN node of claim 10, wherein the coverage information comprises wireless wide area network (WWAN) coverage status information, public land mobile network (PLMN) availability information, radio access technology (RAT) availability information, or any combination thereof.

17. The NTN node of claim 10, wherein the coverage information comprises a first parameter indicating availability of a TN cell, availability of an NTN cell, availability of an NTN cell operating in the store and forward mode, no coverage, or any combination thereof, and a second parameter indicating availability of a public land mobile network (PLMN), availability of a radio access technology (RAT), a duration of availability, or any combination thereof.

18. The NTN node of claim 10, wherein the report data is included in a radio resource control (RRC) message, UE assistance information (UAI), a minimization of drive test (MDT) report, a message at a layer higher than a physical layer, a non-access stratum (NAS) message, a user plane message, or any combination thereof.

19. A method for wireless communications by a user equipment (UE), comprising:

receiving an indication that a first non-terrestrial network (NTN) node accessible to the UE is operating in a store and forward mode;

storing location data of the UE and coverage information at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based at least in part on receiving the indication, the coverage information indicating communication availability of one or more nodes to the UE, the one or more nodes associated with a terrestrial network (TN) or an NTN; and

transmitting report data indicating the location data and the coverage information.

20. The method of claim 19, wherein the report data is transmitted to at least one of the one or more NTN nodes during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode.

21. The method of claim 20, further comprising:

receiving an indication of a rejection of management for the report data transmitted to the at least one of the one or more NTN nodes during the period; and

transmitting, based at least in part on the indication of the rejection, the report data to a TN node or to an NTN node not operating in the store and forward mode.

22. The method of claim 20, further comprising:

receiving a message from the at least one of the one or more NTN nodes to transmit the report data during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode, wherein transmitting the report data is based at least in part on the message.

23. The method of claim **19**, wherein transmitting the report data comprises:

transmitting the report data to a terrestrial network node.

24. The method of claim **19**, further comprising:

receiving a request for the location data and the coverage information, the request being included in a UE information request message or a logged measurement configuration message, wherein the location data and the coverage information are stored at least partially during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode based at least in part on receiving the request.

25. A method for wireless communications by a non-terrestrial network (NTN) node, comprising:

transmitting an indication that the NTN node is operating in a store and forward mode; and

obtaining report data indicating location data of a user equipment (UE) and coverage information collected at least partially during a period that one or more NTN nodes accessible to the UE are operating in the store and forward mode based at least in part on transmitting the indication, the coverage information indicating availability of one or more nodes to the UE during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode, the one or more nodes associated with a terrestrial network (TN) or an NTN.

26. The method of claim **25**, wherein the report data is obtained in the period that that the one or more NTN nodes accessible to the UE are operating in the store and forward mode.

27. The method of claim **26**, further comprising:

transmitting an indication of rejection of management for the report data obtained in the period.

28. The method of claim **26**, further comprising:

transmitting the report data to a core network when a feeder link between the NTN node and the core network is available.

29. The method of claim **26**, further comprising:

transmitting a message to transmit the report data during the period that the one or more NTN nodes accessible to the UE are operating in the store and forward mode, wherein obtaining the report data is based at least in part on the message.

30. The method of claim **25**, further comprising:

transmitting a request for the location data and the coverage information, the request being included in a UE information request message or a logged measurement configuration message, wherein the location data and the coverage information are obtained at least partially during the period that the NTN node is operating in the store and forward mode based at least in part on transmitting the request.

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