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(54) **CONFIGURATION OF UPLINK WAKEUP
SIGNALS FOR ON-DEMAND SYSTEM
INFORMATION BLOCKS**

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(2013.01); *H04W 48/14* (2013.01)

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(57) **ABSTRACT**

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Various aspects of the present disclosure generally relate to wireless communication. In some aspects, a user equipment (UE) may receive a plurality of bits corresponding to one or more of an uplink wakeup signal (UL-WUS) configuration or a remaining minimum system information (RMSI) configuration. The UE may receive a flag associated with an interpretation of the plurality of bits. The UE may transmit an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration. The UE may receive an on-demand system information block (SIB) based at least in part on the UL-WUS. Numerous other aspects are described.

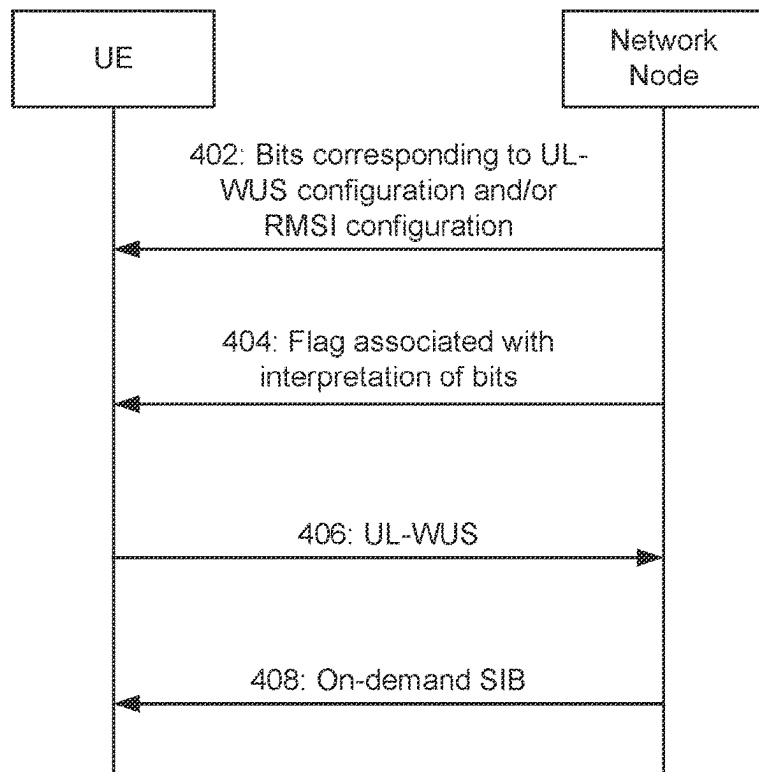
(21) Appl. No.: **18/441,706**

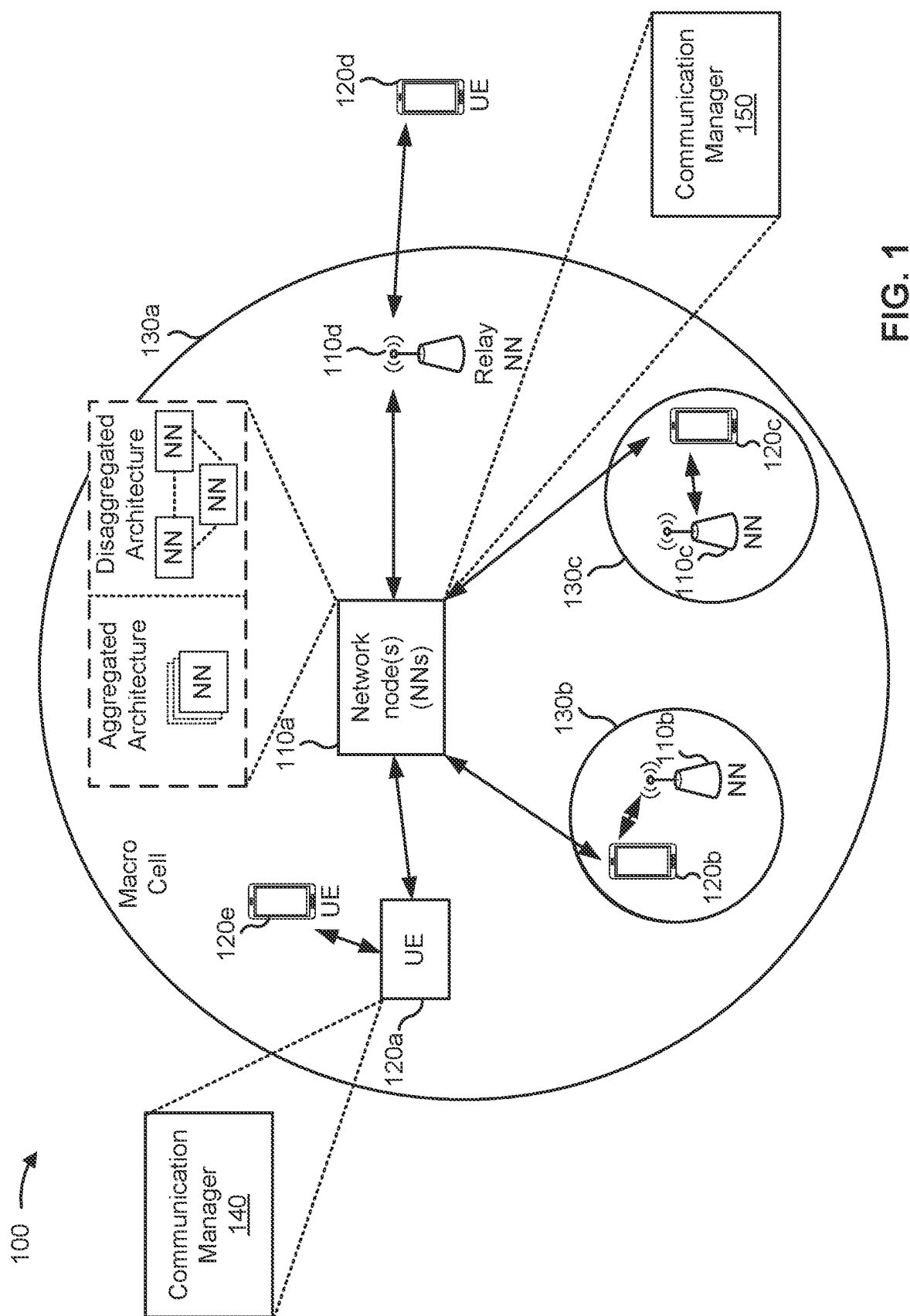
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400 





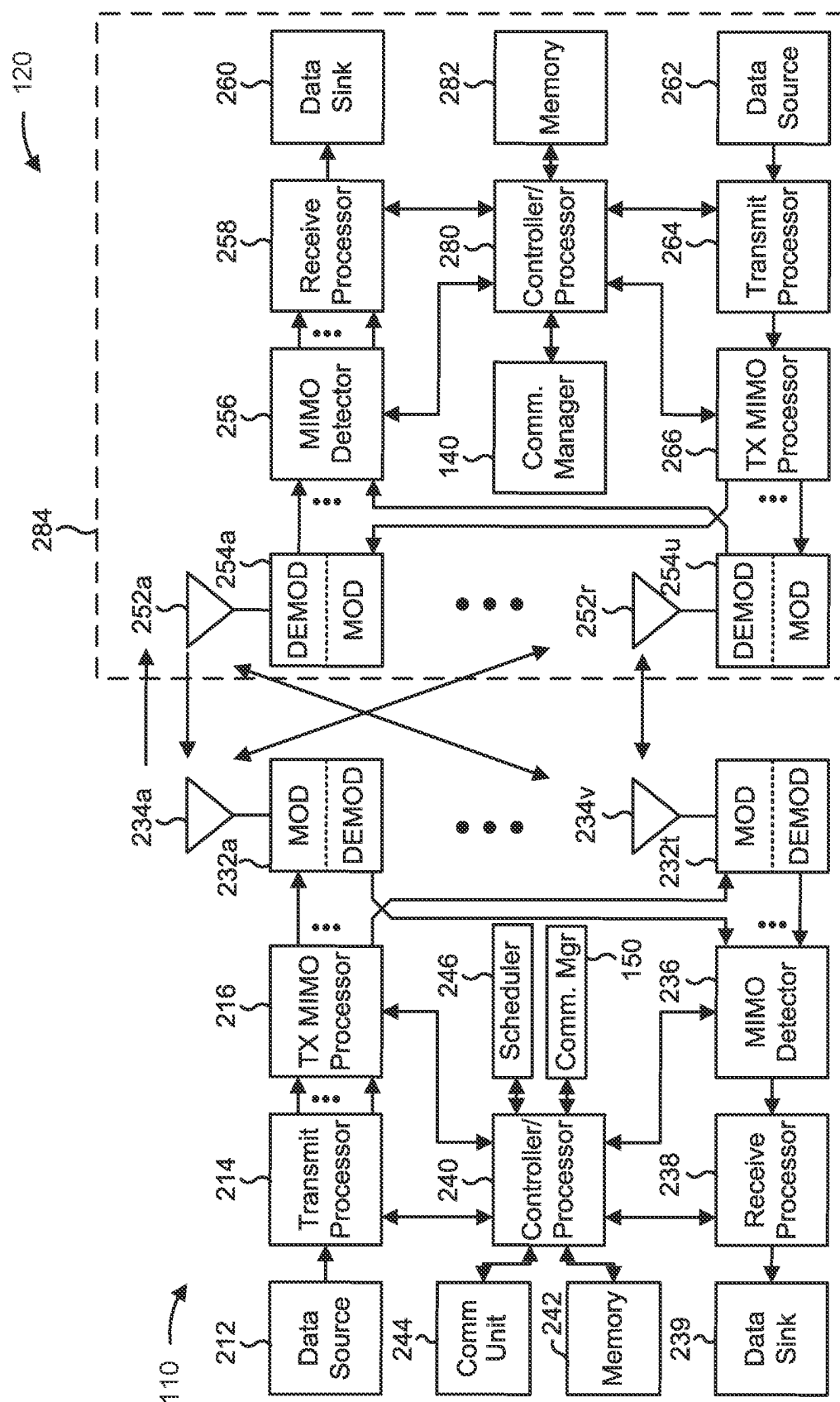


FIG. 2

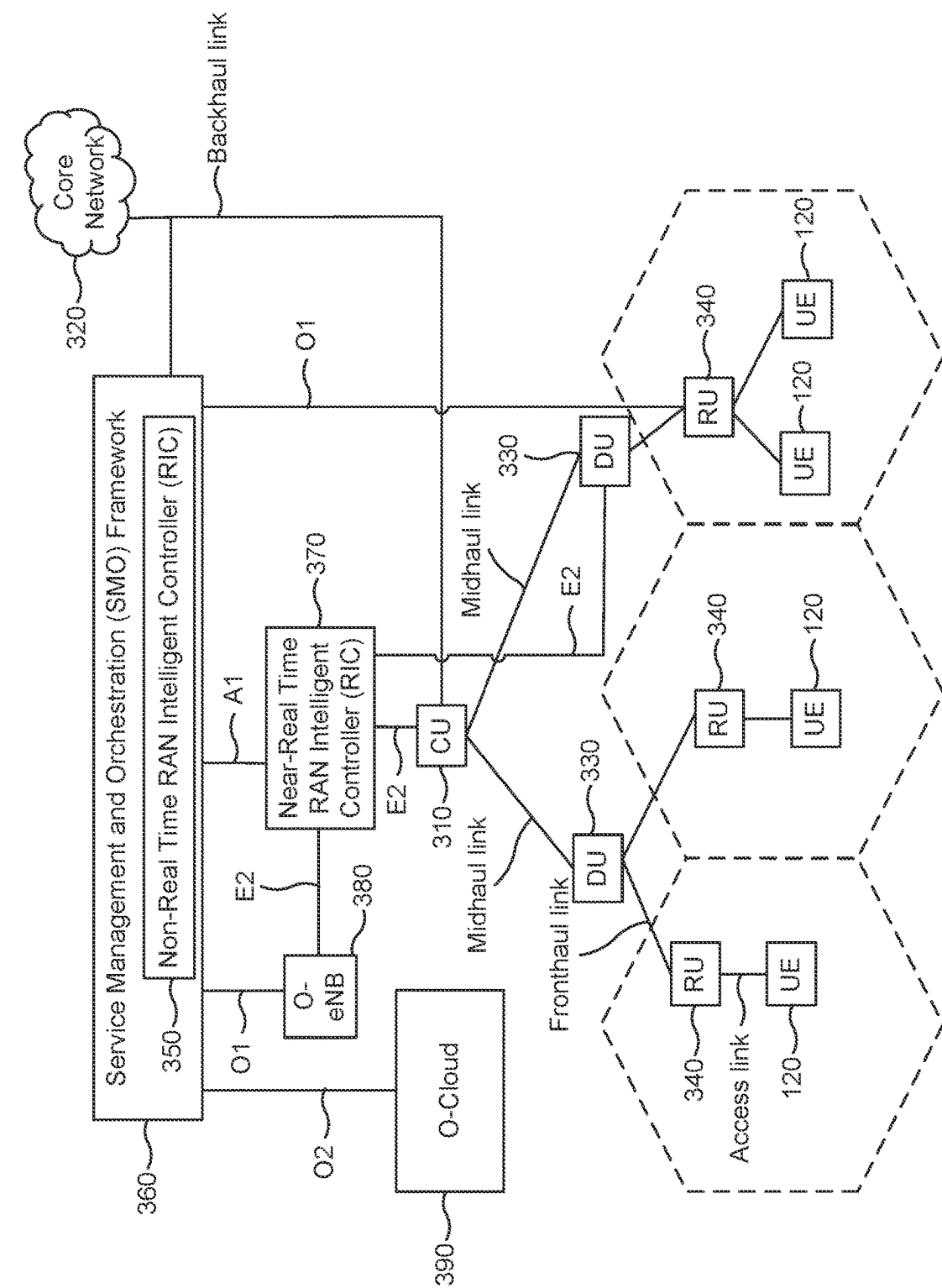


FIG. 3

400

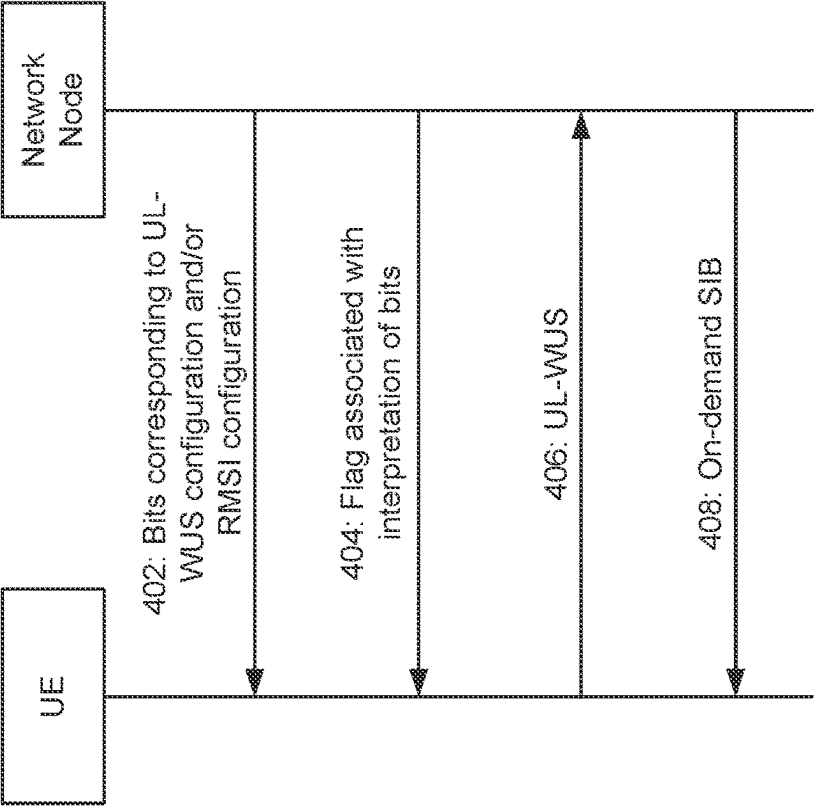


FIG. 4

500

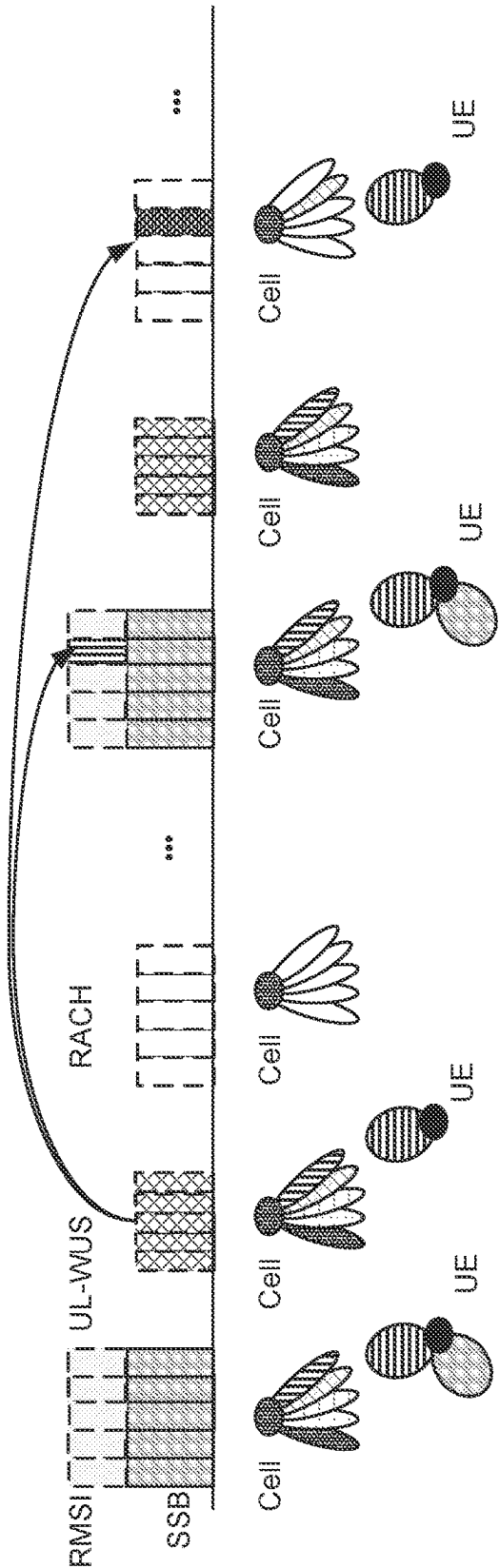


FIG. 5

600

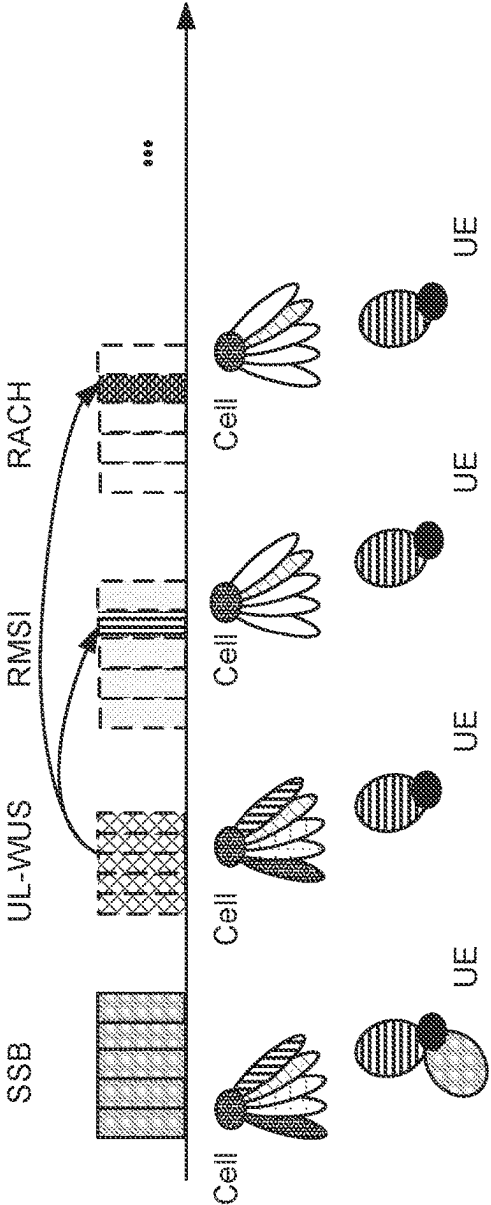
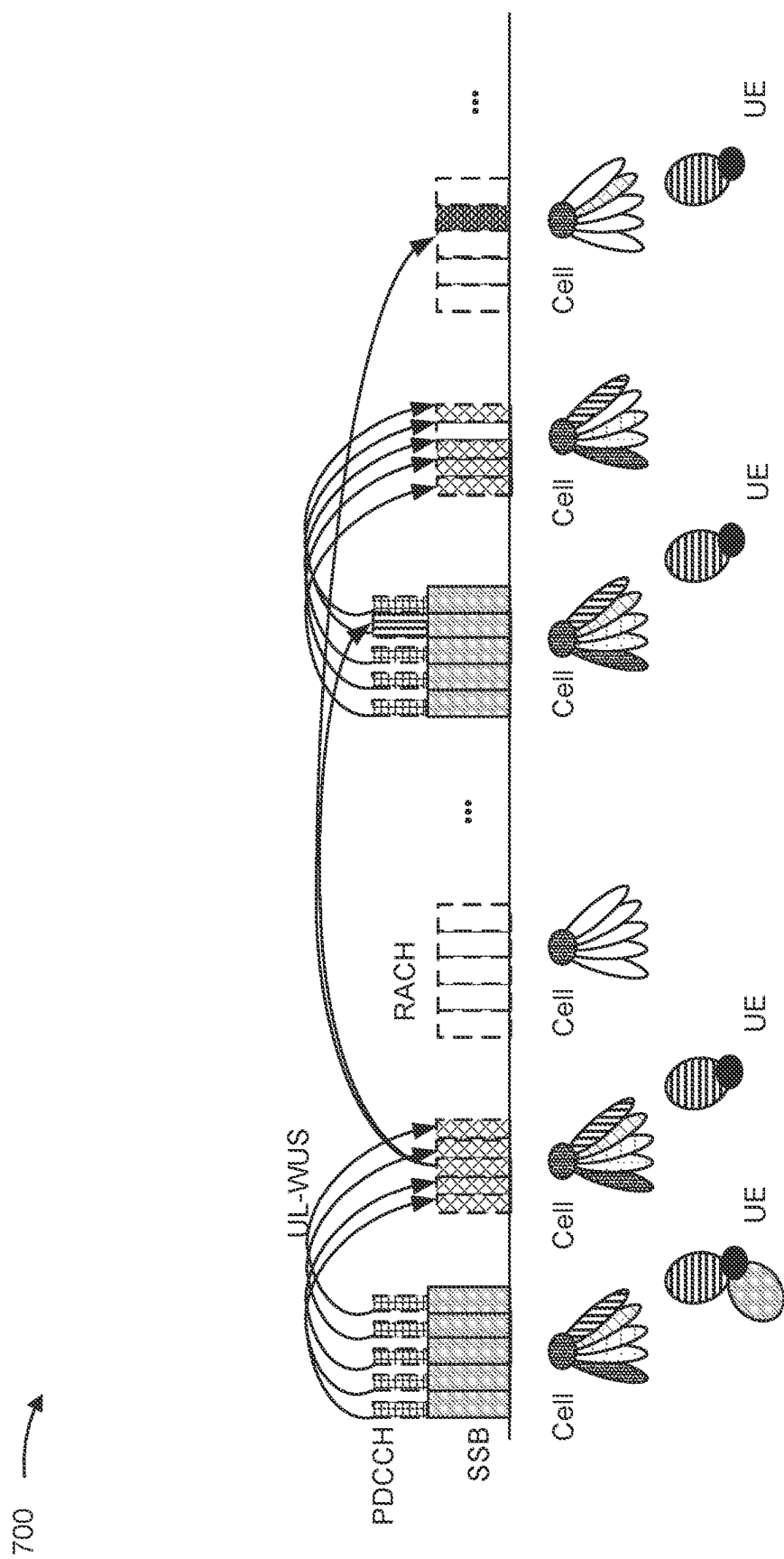


FIG. 6



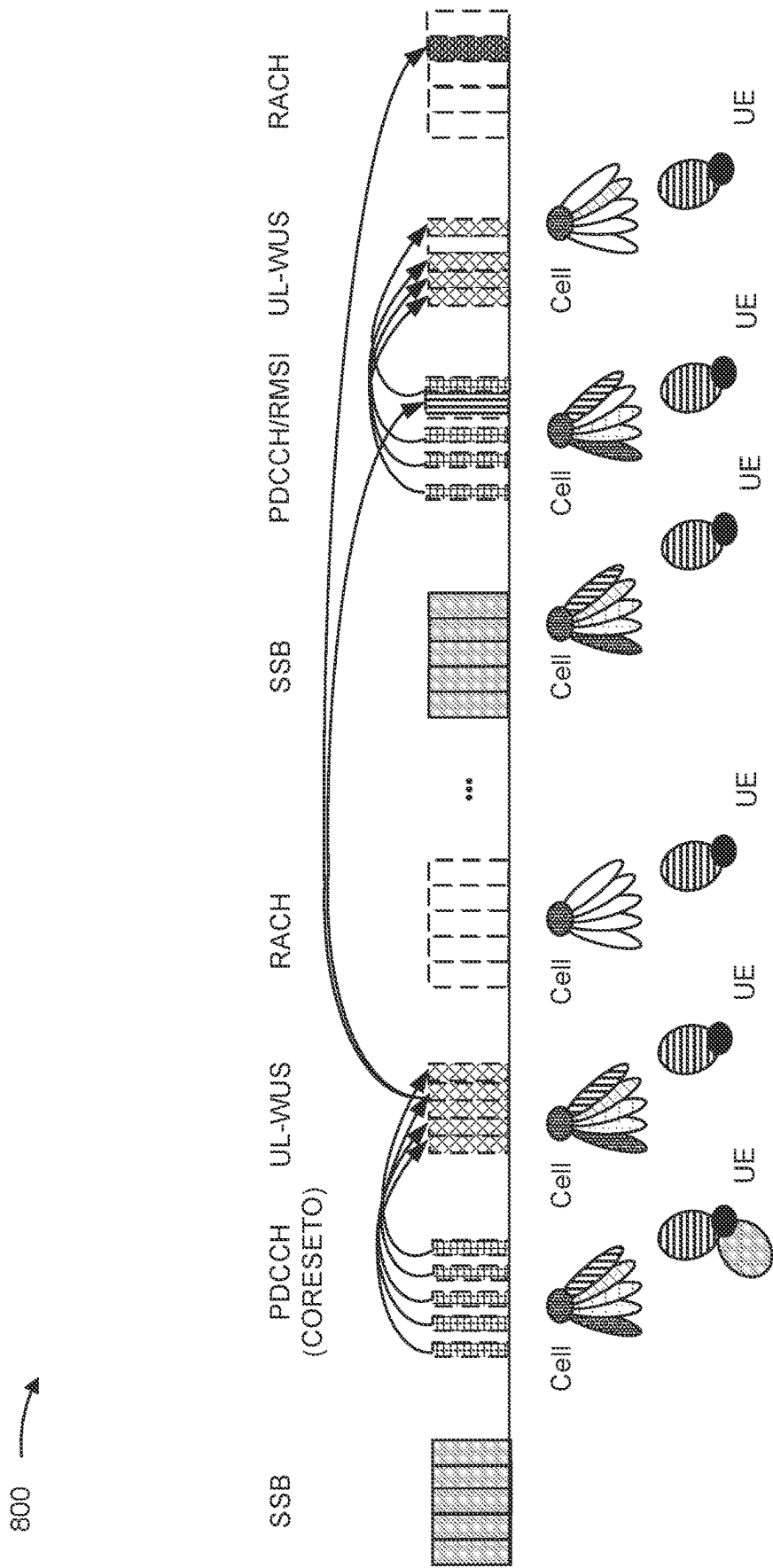


FIG. 8

900

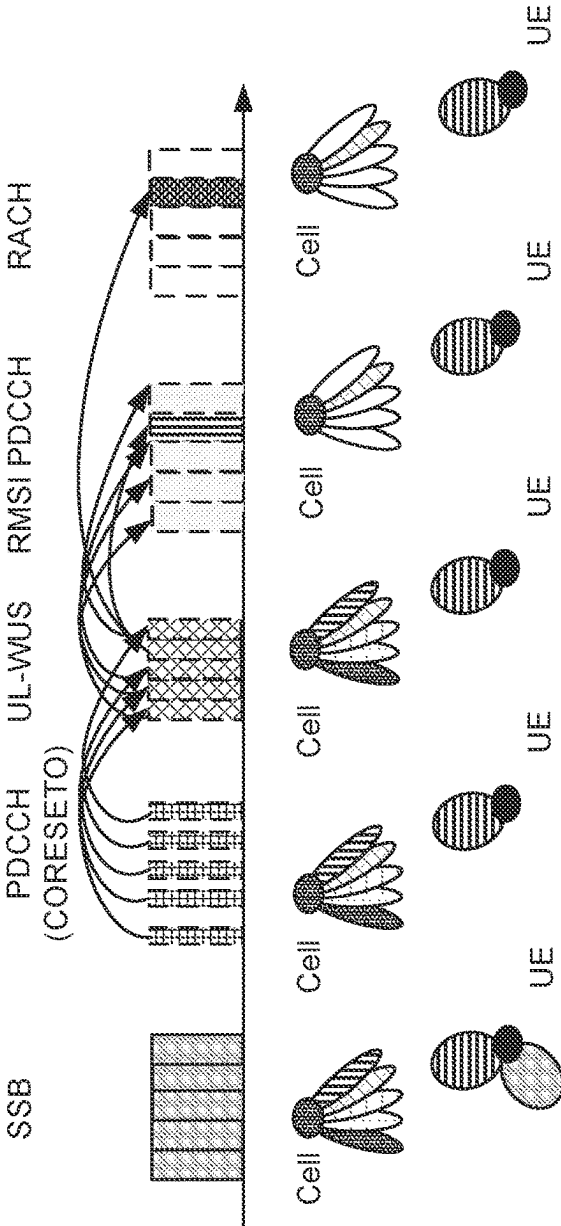


FIG. 9

1000 →

```
-- ASN1START
-- TAG-PLMN-IDENTITYINFOLIST-START
PLMN-IdentityInfoList ::=
SEQUENCE (SIZE (1..maxPLMN)) OF PLMN-IdentityInfo

PLMN-IdentityInfo ::=
  plmn-IdentityList
  trackingAreaCode
  ranac
  cellIdentity
  cellReservedForOperatorUse
  ...,
  [[
    iab-Support-r16
  ]],
  [[
    trackingAreaList-r17
    gNB-ID-Length-r17
  ]]
}
-- TAG-PLMN-IDENTITYINFOLIST-STOP
-- ASN1STOP
```

OPTIONAL,	-- Need R
OPTIONAL,	-- Need R
OPTIONAL,	----
OPTIONAL,	----
OPTIONAL,	-- Need R
OPTIONAL,	----

FIG. 10

1100 

```

--- ASN1START
-- TAG-PLMN-IDENTITY-START

PLMN-Identity ::=
    mcc
    mnc
}

MCC ::=
SEQUENCE (SIZE (3)) OF MCC-MNC-Digit

MNC ::=
SEQUENCE (SIZE (2..3)) OF MCC-MNC-Digit

MCC-MNC-Digit ::=
    INTEGER (0..9)

--- TAG-PLMN-IDENTITY-STOP
-- ASN1STOP
--- Cond MCC
```

FIG. 11

1200 →

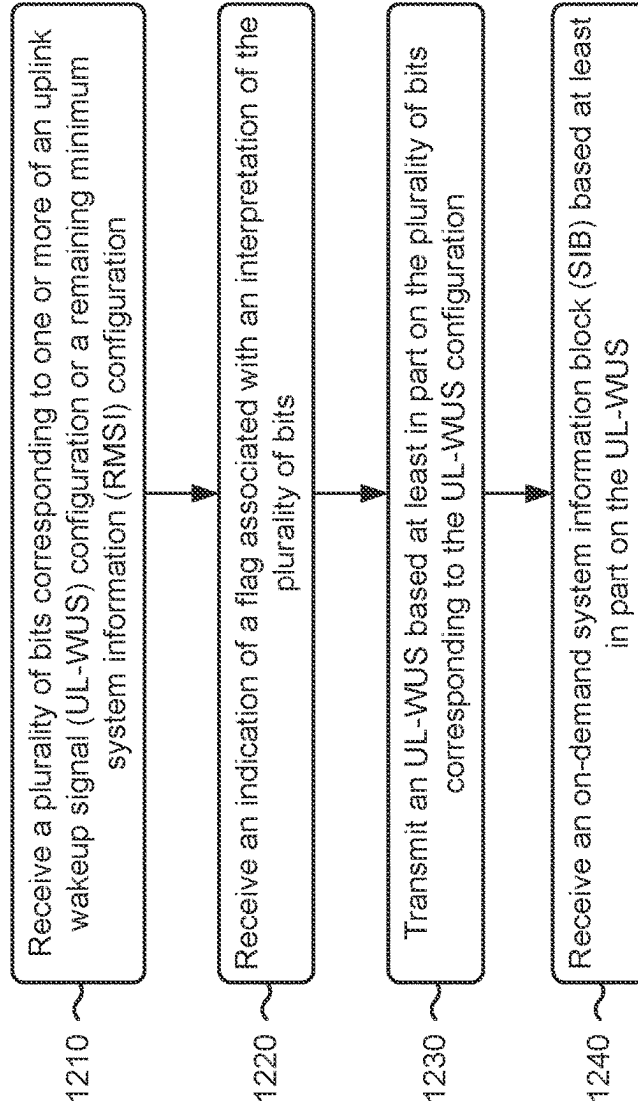


FIG. 12

1300 →

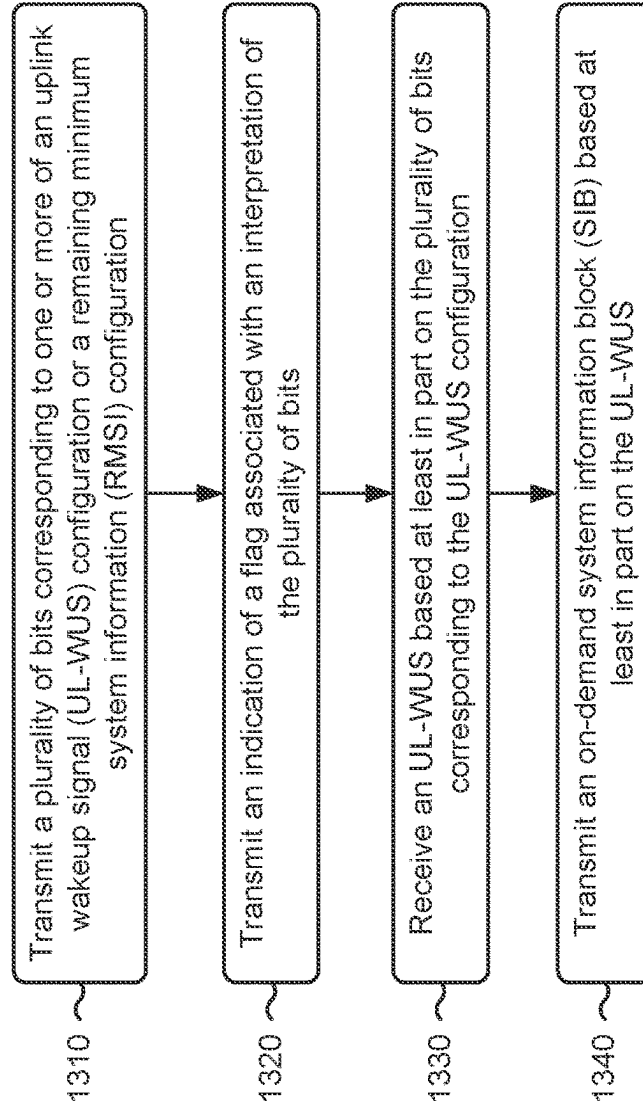


FIG. 13

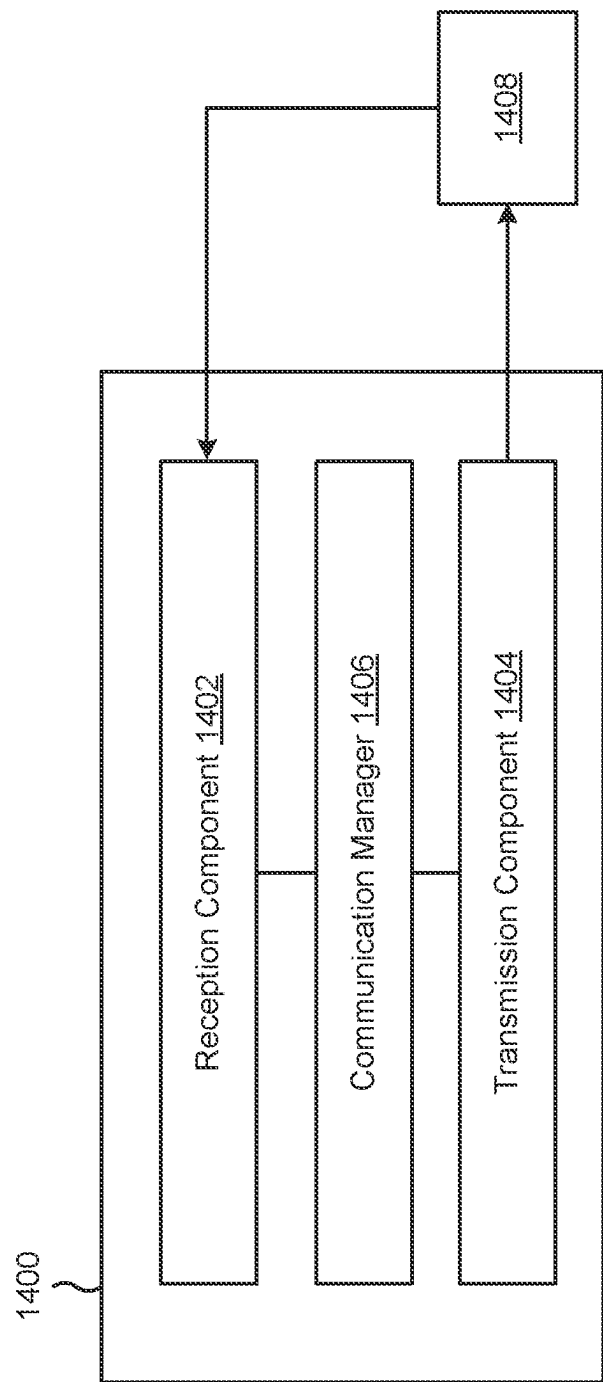


FIG. 14

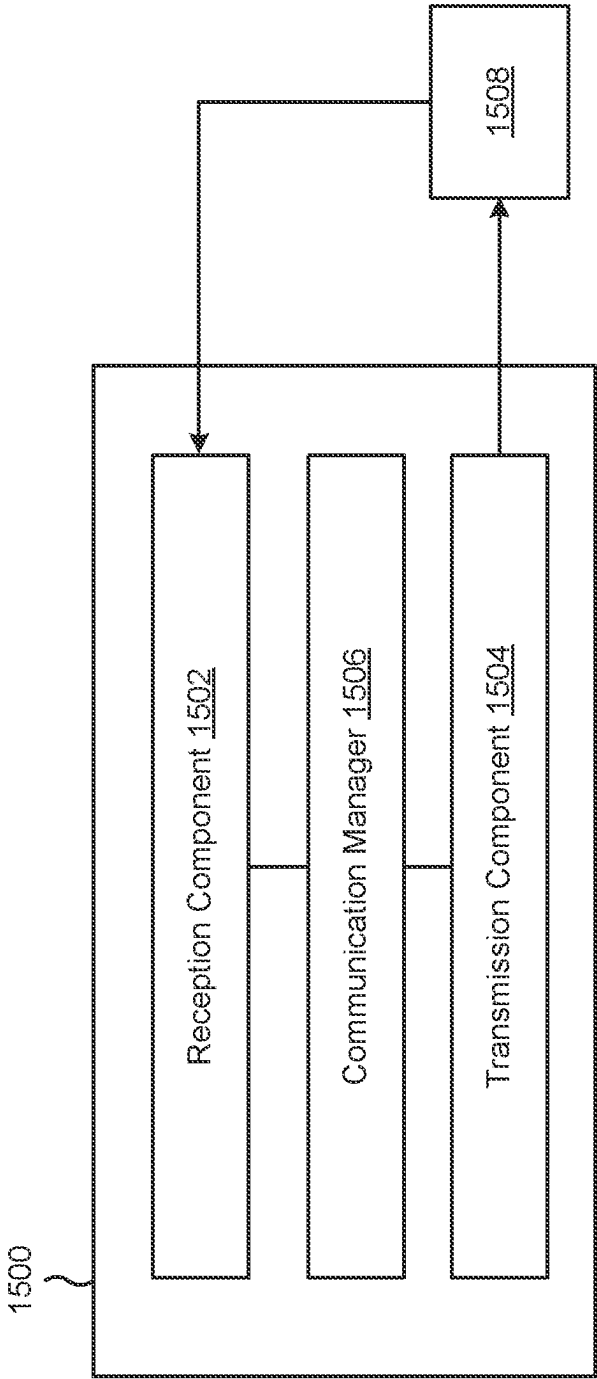


FIG. 15

CONFIGURATION OF UPLINK WAKEUP SIGNALS FOR ON-DEMAND SYSTEM INFORMATION BLOCKS

FIELD OF THE DISCLOSURE

[0001] Aspects of the present disclosure generally relate to wireless communication and specifically relate to techniques, apparatuses, and methods for configuring uplink wakeup signals (UL-WUSs) for on-demand system information blocks (SIBs).

BACKGROUND

[0002] Wireless communication systems are widely deployed to provide various services that may include carrying voice, text, messaging, video, data, and/or other traffic. The services may include unicast, multicast, and/or broadcast services, among other examples. Typical wireless communication systems may employ multiple-access radio access technologies (RATs) capable of supporting communication with multiple users by sharing available system resources (for example, time domain resources, frequency domain resources, spatial domain resources, and/or device transmit power, among other examples). Examples of such multiple-access RATs include code division multiple access (CDMA) systems, time division multiple access (TDMA) systems, frequency division multiple access (FDMA) systems, orthogonal frequency division multiple access (OFDMA) systems, single-carrier frequency division multiple access (SC-FDMA) systems, and time division synchronous code division multiple access (TD-SCDMA) systems.

[0003] The above multiple-access RATs have been adopted in various telecommunication standards to provide common protocols that enable different wireless communication devices to communicate on a municipal, national, regional, or global level. An example telecommunication standard is New Radio (NR). NR, which may also be referred to as 5G, is part of a continuous mobile broadband evolution promulgated by the Third Generation Partnership Project (3GPP). NR (and other mobile broadband evolutions beyond NR) may be designed to better support Internet of things (IoT) and reduced capability device deployments, industrial connectivity, millimeter wave (mmWave) expansion, licensed and unlicensed spectrum access, non-terrestrial network (NTN) deployment, sidelink and other device-to-device direct communication technologies (for example, cellular vehicle-to-everything (CV2X) communication), massive multiple-input multiple-output (MIMO), disaggregated network architectures and network topology expansions, multiple-subscriber implementations, high-precision positioning, and/or radio frequency (RF) sensing, among other examples. As the demand for mobile broadband access continues to increase, further improvements in NR may be implemented, and other radio access technologies such as 6G may be introduced, to further advance mobile broadband evolution.

SUMMARY

[0004] In some implementations, an apparatus for wireless communication includes one or more memories; and one or more processors coupled to the one or more memories, the one or more processors individually or collectively configured to: receive a plurality of bits corresponding to one or

more of an uplink wakeup signal (UL-WUS) configuration or a remaining minimum system information (RMSI) configuration; receive a flag associated with an interpretation of the plurality of bits; transmit an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration; and receive an on-demand system information block (SIB) based at least in part on the UL-WUS.

[0005] In some implementations, an apparatus for wireless communication includes one or more memories; and one or more processors coupled to the one or more memories, the one or more processors individually or collectively configured to: transmit a plurality of bits corresponding to one or more of an UL-WUS configuration or an RMSI configuration; transmit a flag associated with an interpretation of the plurality of bits; receive an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration; and transmit an on-demand SIB based at least in part on the UL-WUS.

[0006] In some implementations, a method of wireless communication performed by a user equipment (UE) includes receiving a plurality of bits corresponding to one or more of an UL-WUS configuration or an RMSI configuration; receiving a flag associated with an interpretation of the plurality of bits; transmitting an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration; and receiving an on-demand SIB based at least in part on the UL-WUS.

[0007] In some implementations, a method of wireless communication performed by a network node includes transmitting a plurality of bits corresponding to one or more of an UL-WUS configuration or an RMSI configuration; transmitting a flag associated with an interpretation of the plurality of bits; receiving an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration; and transmitting an on-demand SIB based at least in part on the UL-WUS.

[0008] In some implementations, a non-transitory computer-readable medium storing a set of instructions for wireless communication includes one or more instructions that, when executed by one or more processors of a UE, cause the UE to: receive a plurality of bits corresponding to one or more of an UL-WUS configuration or an RMSI configuration; receive a flag associated with an interpretation of the plurality of bits; transmit an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration; and receive an on-demand SIB based at least in part on the UL-WUS.

[0009] In some implementations, a non-transitory computer-readable medium storing a set of instructions for wireless communication includes one or more instructions that, when executed by one or more processors of a network node, cause the network node to: transmit a plurality of bits corresponding to one or more of an UL-WUS configuration or an RMSI configuration; transmit a flag associated with an interpretation of the plurality of bits; receive an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration; and transmit an on-demand SIB based at least in part on the UL-WUS.

[0010] In some implementations, an apparatus for wireless communication includes means for receiving a plurality of bits corresponding to one or more of an UL-WUS configuration or an RMSI configuration; means for receiving a flag associated with an interpretation of the plurality of bits; means for transmitting an UL-WUS based at least in part on

the plurality of bits corresponding to the UL-WUS configuration; and means for receiving an on-demand SIB based at least in part on the UL-WUS.

[0011] In some implementations, an apparatus for wireless communication includes means for transmitting a plurality of bits corresponding to one or more of an UL-WUS configuration or an RMSI configuration; means for transmitting a flag associated with an interpretation of the plurality of bits; means for receiving an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration; and means for transmitting an on-demand SIB based at least in part on the UL-WUS.

[0012] Aspects of the present disclosure may generally be implemented by or as a method, apparatus, system, computer program product, non-transitory computer-readable medium, user equipment, base station, network node, network entity, wireless communication device, and/or processing system as substantially described with reference to, and as illustrated by, the specification and accompanying drawings.

[0013] The foregoing paragraphs of this section have broadly summarized some aspects of the present disclosure. These and additional aspects and associated advantages will be described hereinafter. The disclosed aspects may be used as a basis for modifying or designing other aspects for carrying out the same or similar purposes of the present disclosure. Such equivalent aspects do not depart from the scope of the appended claims. Characteristics of the aspects disclosed herein, both their organization and method of operation, together with associated advantages, will be better understood from the following description when considered in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The appended drawings illustrate some aspects of the present disclosure, but are not limiting of the scope of the present disclosure because the description may enable other aspects. Each of the drawings is provided for purposes of illustration and description, and not as a definition of the limits of the claims. The same or similar reference numbers in different drawings may identify the same or similar elements.

[0015] FIG. 1 is a diagram illustrating an example of a wireless network, in accordance with the present disclosure.

[0016] FIG. 2 is a diagram illustrating an example of a network node in communication with a user equipment (UE) in a wireless network, in accordance with the present disclosure.

[0017] FIG. 3 is a diagram illustrating an example disaggregated base station architecture, in accordance with the present disclosure.

[0018] FIGS. 4-9 are diagrams illustrating examples associated with configuring uplink wakeup signals (UL-WUSs) for on-demand system information blocks (SIBs), in accordance with the present disclosure.

[0019] FIG. 10 is a diagram illustrating an example associated with a public land mobile network (PLMN) identity information list information element (IE), in accordance with the present disclosure.

[0020] FIG. 11 is a diagram illustrating an example associated with a PLMN identity IE, in accordance with the present disclosure.

[0021] FIGS. 12-13 are diagrams illustrating example processes associated with configuring UL-WUSs for on-demand SIBs, in accordance with the present disclosure.

[0022] FIGS. 14-15 are diagrams of example apparatuses for wireless communication, in accordance with the present disclosure.

DETAILED DESCRIPTION

[0023] Various aspects of the present disclosure are described hereinafter with reference to the accompanying drawings. However, aspects of the present disclosure may be embodied in many different forms and is not to be construed as limited to any specific aspect illustrated by or described with reference to an accompanying drawing or otherwise presented in this disclosure. Rather, these aspects are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the disclosure to those skilled in the art. One skilled in the art may appreciate that the scope of the disclosure is intended to cover any aspect of the disclosure disclosed herein, whether implemented independently of or in combination with any other aspect of the disclosure. For example, an apparatus may be implemented or a method may be practiced using various combinations or quantities of the aspects set forth herein. In addition, the scope of the disclosure is intended to cover an apparatus having, or a method that is practiced using, other structures and/or functionalities in addition to or other than the structures and/or functionalities with which various aspects of the disclosure set forth herein may be practiced. Any aspect of the disclosure disclosed herein may be embodied by one or more elements of a claim.

[0024] Several aspects of telecommunication systems will now be presented with reference to various methods, operations, apparatuses, and techniques. These methods, operations, apparatuses, and techniques will be described in the following detailed description and illustrated in the accompanying drawings by various blocks, modules, components, circuits, steps, processes, or algorithms (collectively referred to as “elements”). These elements may be implemented using hardware, software, or a combination of hardware and software. Whether such elements are implemented as hardware or software depends upon the particular application and design constraints imposed on the overall system.

[0025] In a wireless network that supports network energy savings (NES), a cell may not always periodically broadcast its system information block (SIB) type 1 (SIB1) and/or remaining system information (RMSI). An anchor cell may provide a copy of the cell's SIB1 (e.g., an NES cell's SIB1), or alternatively, the cell may transmit its SIB1 in response to a request (e.g., from a user equipment (UE)). The cell that transmits its SIB1 in response to the request may be a non-anchor-cell. NES may involve an on-demand SIB1 transmission by the cell for idle/inactive UEs, which may be based at least in part on a triggering mechanism (e.g., an uplink demand signal such as a UE uplink wakeup signal (UL-WUS) using an existing signal/channel, a cell on/off indication via a backhaul, and/or secondary cell (SCell) activation/deactivation signaling).

[0026] An NES feature in which the cell does not always periodically broadcast its SIB1/RMSI may rely on help from the anchor node, but supporting the NES feature in a standalone manner may be desirable. The standalone manner may involve no (or minimal) reliance on the anchor/assisting cell. However, one issue with the standalone man-

ner may relate to the configuration of the uplink demand signal (e.g., the UL-WUS) that the idle/inactive UE needs to transmit to the cell when requesting for the cell's SIB1. For assisted access, the anchor cell may provide such configuration information for the uplink demand signal (e.g., an indication of time-frequency resources, type of sequence, and/or subcarrier spacing for the uplink demand signal). The configuration information for the uplink demand signal should be provided to the UE prior to the on-demand SIB1 transmission. For non-assisted access, preconfiguring/fixing the configuration information for the uplink demand signal may be limiting (e.g., fixing a cell-specific configuration in a specification may not be possible). The cell may indicate, via a master information block (MIB) transmitted over a physical broadcast channel (PBCH), the configuration information for the uplink demand signal, but such an approach may be prohibitive due to a limited payload that the PBCH is able to carry. The MIB may have limited bits (or no additional available bits) to carry the configuration information for the uplink demand signal.

[0027] Various aspects relate generally to configuring UL-WUS signals for on-demand SIBs. Some aspects more specifically relate to conveying an UL-WUS configuring using repurposed bits that would otherwise be used to convey an RMSI configuration. In some examples, a UE may receive, from a network node, a plurality of bits corresponding to the UL-WUS configuration and/or the RMSI configuration. For example, the UE may receive an MIB in a synchronization signal block (SSB) or a physical downlink control channel (PDCCH) transmission, where the MIB or the PDCCH transmission may indicate the plurality of bits based at least in part on no RMSI transmission being triggered. When no RMSI transmission is triggered, bits that would otherwise be used to convey the RMSI configuration may be repurposed to convey the UL-WUS configuration, thereby not adding additional overhead to the MIB. The UE may be in an idle or inactive state. The UE may receive, from the network node, a flag associated with an interpretation of the plurality of bits. For example, the UE may receive the flag in the MIB, a primary synchronization signal (PSS), a secondary synchronization signal (SSS), or a demodulation reference signal (DMRS). The UE may determine, based at least in part on the flag, that the plurality of bits correspond to the UL-WUS configuration. The UE may transmit, to the network node, an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration. The UE may transmit the UL-WUS in order to request an on-demand SIB1. The UE may receive, from the network node, the on-demand SIB based at least in part on the UL-WUS.

[0028] Particular aspects of the subject matter described in this disclosure can be implemented to realize one or more of the following potential advantages. In some examples, by configuring the UL-WUS for the on-demand SIB1 by repurposing the bits that would otherwise be used to convey the RMSI configuration when no RMSI transmission is triggered, the described techniques can be used by the UE to receive the UL-WUS configuration without adding additional overhead to the MIB. The MIB may have a limited payload and incorporating additional bits into the MIB solely for the purpose of conveying the UL-WUS configuration may be prohibitive and increase a signaling overhead, so repurposing the bits that are not needed may not negatively affect the signaling overhead, thereby improving an

overall system performance. On the other hand, when the RMSI transmission is triggered, the bits may not be used to convey the UL-WUS configuration.

[0029] Multiple-access radio access technologies (RATs) have been adopted in various telecommunication standards to provide common protocols that enable wireless communication devices to communicate on a municipal, enterprise, national, regional, or global level. For example, 5G New Radio (NR) is part of a continuous mobile broadband evolution promulgated by the Third Generation Partnership Project (3GPP). 5G NR supports various technologies and use cases including enhanced mobile broadband (eMBB), ultra-reliable low-latency communication (URLLC), massive machine-type communication (mMTC), millimeter wave (mmWave) technology, beamforming, network slicing, edge computing, Internet of Things (IoT) connectivity and management, and network function virtualization (NFV).

[0030] As the demand for broadband access increases and as technologies supported by wireless communication networks evolve, further technological improvements may be adopted in or implemented for 5G NR or future RATs, such as 6G, to further advance the evolution of wireless communication for a wide variety of existing and new use cases and applications. Such technological improvements may be associated with new frequency band expansion, licensed and unlicensed spectrum access, overlapping spectrum use, small cell deployments, non-terrestrial network (NTN) deployments, disaggregated network architectures and network topology expansion, device aggregation, advanced duplex communication, sidelink and other device-to-device direct communication, IoT (including passive or ambient IoT) networks, reduced capability (RedCap) UE functionality, industrial connectivity, multiple-subscriber implementations, high-precision positioning, radio frequency (RF) sensing, and/or artificial intelligence or machine learning (AI/ML), among other examples. These technological improvements may support use cases such as wireless backhauls, wireless data centers, extended reality (XR) and metaverse applications, meta services for supporting vehicle connectivity, holographic and mixed reality communication, autonomous and collaborative robots, vehicle platooning and cooperative maneuvering, sensing networks, gesture monitoring, human-brain interfacing, digital twin applications, asset management, and universal coverage applications using non-terrestrial and/or aerial platforms, among other examples. The methods, operations, apparatuses, and techniques described herein may enable one or more of the foregoing technologies and/or support one or more of the foregoing use cases.

[0031] FIG. 1 is a diagram illustrating an example of a wireless communication network 100 in accordance with the present disclosure. The wireless communication network 100 may be or may include elements of a 5G (or NR) network or a 6G network, among other examples. The wireless communication network 100 may include multiple network nodes 110, shown as a network node (NN) 110a, a network node 110b, a network node 110c, and a network node 110d. The network nodes 110 may support communications with multiple UEs 120, shown as a UE 120a, a UE 120b, a UE 120c, a UE 120d, and a UE 120e.

[0032] The network nodes 110 and the UEs 120 of the wireless communication network 100 may communicate using the electromagnetic spectrum, which may be subdivided

vided by frequency or wavelength into various classes, bands, carriers, and/or channels. For example, devices of the wireless communication network **100** may communicate using one or more operating bands. In some aspects, multiple wireless networks **100** may be deployed in a given geographic area. Each wireless communication network **100** may support a particular RAT (which may also be referred to as an air interface) and may operate on one or more carrier frequencies in one or more frequency ranges. Examples of RATs include a 4G RAT, a 5G/NR RAT, and/or a 6G RAT, among other examples. In some examples, when multiple RATs are deployed in a given geographic area, each RAT in the geographic area may operate on different frequencies to avoid interference with one another.

[0033] Various operating bands have been defined as frequency range designations FR1 (410 MHz through 7.125 GHz), FR2 (24.25 GHz through 52.6 GHz), FR3 (7.125 GHz through 24.25 GHz), FR4a or FR4-1 (52.6 GHz through 71 GHz), FR4 (52.6 GHz through 114.25 GHz), and FR5 (114.25 GHz through 300 GHz). Although a portion of FR1 is greater than 6 GHz, FR1 is often referred to (interchangeably) as a “Sub-6 GHz” band in some documents and articles. Similarly, FR2 is often referred to (interchangeably) as a “millimeter wave” band in some documents and articles, despite being different than the extremely high frequency (EHF) band (30 GHz through 300 GHz), which is identified by the International Telecommunications Union (ITU) as a “millimeter wave” band. The frequencies between FR1 and FR2 are often referred to as mid-band frequencies, which include FR3. Frequency bands falling within FR3 may inherit FR1 characteristics or FR2 characteristics, and thus may effectively extend features of FR1 or FR2 into mid-band frequencies. Thus, “sub-6 GHz,” if used herein, may broadly refer to frequencies that are less than 6 GHz, that are within FR1, and/or that are included in mid-band frequencies. Similarly, the term “millimeter wave,” if used herein, may broadly refer to frequencies that are included in mid-band frequencies, that are within FR2, FR4, FR4-a or FR4-1, or FR5, and/or that are within the EHF band. Higher frequency bands may extend 5G NR operation, 6G operation, and/or other RATs beyond 52.6 GHz. For example, each of FR4a, FR4-1, FR4, and FR5 falls within the EHF band. In some examples, the wireless communication network **100** may implement dynamic spectrum sharing (DSS), in which multiple RATs (for example, 4G/LTE and 5G/NR) are implemented with dynamic bandwidth allocation (for example, based on user demand) in a single frequency band. It is contemplated that the frequencies included in these operating bands (for example, FR1, FR2, FR3, FR4, FR4-a, FR4-1, and/or FR5) may be modified, and techniques described herein may be applicable to those modified frequency ranges.

[0034] A network node **110** may include one or more devices, components, or systems that enable communication between a UE **120** and one or more devices, components, or systems of the wireless communication network **100**. A network node **110** may be, may include, or may also be referred to as an NR network node, a 5G network node, a 6G network node, a Node B, an eNB, a gNB, an access point (AP), a transmission reception point (TRP), a mobility element, a core, a network entity, a network element, a network equipment, and/or another type of device, component, or system included in a radio access network (RAN).

[0035] A network node **110** may be implemented as a single physical node (for example, a single physical structure) or may be implemented as two or more physical nodes (for example, two or more distinct physical structures). For example, a network node **110** may be a device or system that implements part of a radio protocol stack, a device or system that implements a full radio protocol stack (such as a full gNB protocol stack), or a collection of devices or systems that collectively implement the full radio protocol stack. For example, and as shown, a network node **110** may be an aggregated network node (having an aggregated architecture), meaning that the network node **110** may implement a full radio protocol stack that is physically and logically integrated within a single node (for example, a single physical structure) in the wireless communication network **100**. For example, an aggregated network node **110** may consist of a single standalone base station or a single TRP that uses a full radio protocol stack to enable or facilitate communication between a UE **120** and a core network of the wireless communication network **100**.

[0036] Alternatively, and as also shown, a network node **110** may be a disaggregated network node (sometimes referred to as a disaggregated base station), meaning that the network node **110** may implement a radio protocol stack that is physically distributed and/or logically distributed among two or more nodes in the same geographic location or in different geographic locations. For example, a disaggregated network node may have a disaggregated architecture. In some deployments, disaggregated network nodes **110** may be used in an integrated access and backhaul (IAB) network, in an open radio access network (O-RAN) (such as a network configuration in compliance with the O-RAN Alliance), or in a virtualized radio access network (vRAN), also known as a cloud radio access network (C-RAN), to facilitate scaling by separating base station functionality into multiple units that can be individually deployed.

[0037] The network nodes **110** of the wireless communication network **100** may include one or more central units (CUs), one or more distributed units (DUs), and/or one or more radio units (RUs). A CU may host one or more higher layer control functions, such as radio resource control (RRC) functions, packet data convergence protocol (PDCP) functions, and/or service data adaptation protocol (SDAP) functions, among other examples. A DU may host one or more of a radio link control (RLC) layer, a medium access control (MAC) layer, and/or one or more higher physical (PHY) layers depending, at least in part, on a functional split, such as a functional split defined by the 3GPP. In some examples, a DU also may host one or more lower PHY layer functions, such as a fast Fourier transform (FFT), an inverse FFT (iFFT), beamforming, physical random access channel (PRACH) extraction and filtering, and/or scheduling of resources for one or more UEs **120**, among other examples. An RU may host RF processing functions or lower PHY layer functions, such as an FFT, an iFFT, beamforming, or PRACH extraction and filtering, among other examples, according to a functional split, such as a lower layer functional split. In such an architecture, each RU can be operated to handle over the air (OTA) communication with one or more UEs **120**.

[0038] In some aspects, a single network node **110** may include a combination of one or more CUs, one or more DUs, and/or one or more RUs. Additionally or alternatively, a network node **110** may include one or more Near-Real

Time (Near-RT) RAN Intelligent Controllers (RICs) and/or one or more Non-Real Time (Non-RT) RICs. In some examples, a CU, a DU, and/or an RU may be implemented as a virtual unit, such as a virtual central unit (VCU), a virtual distributed unit (VDU), or a virtual radio unit (VRU), among other examples. A virtual unit may be implemented as a virtual network function, such as associated with a cloud deployment.

[0039] Some network nodes 110 (for example, a base station, an RU, or a TRP) may provide communication coverage for a particular geographic area. In the 3GPP, the term “cell” can refer to a coverage area of a network node 110 or to a network node 110 itself, depending on the context in which the term is used. A network node 110 may support one or multiple (for example, three) cells. In some examples, a network node 110 may provide communication coverage for a macro cell, a pico cell, a femto cell, or another type of cell. A macro cell may cover a relatively large geographic area (for example, several kilometers in radius) and may allow unrestricted access by UEs 120 with service subscriptions. A pico cell may cover a relatively small geographic area and may allow unrestricted access by UEs 120 with service subscriptions. A femto cell may cover a relatively small geographic area (for example, a home) and may allow restricted access by UEs 120 having association with the femto cell (for example, UEs 120 in a closed subscriber group (CSG)). A network node 110 for a macro cell may be referred to as a macro network node. A network node 110 for a pico cell may be referred to as a pico network node. A network node 110 for a femto cell may be referred to as a femto network node or an in-home network node. In some examples, a cell may not necessarily be stationary. For example, the geographic area of the cell may move according to the location of an associated mobile network node 110 (for example, a train, a satellite base station, an unmanned aerial vehicle, or an NTN network node).

[0040] The wireless communication network 100 may be a heterogeneous network that includes network nodes 110 of different types, such as macro network nodes, pico network nodes, femto network nodes, relay network nodes, aggregated network nodes, and/or disaggregated network nodes, among other examples. In the example shown in FIG. 1, the network node 110a may be a macro network node for a macro cell 130a, the network node 110b may be a pico network node for a pico cell 130b, and the network node 110c may be a femto network node for a femto cell 130c. Various different types of network nodes 110 may generally transmit at different power levels, serve different coverage areas, and/or have different impacts on interference in the wireless communication network 100 than other types of network nodes 110. For example, macro network nodes may have a high transmit power level (for example, 5 to 40 watts), whereas pico network nodes, femto network nodes, and relay network nodes may have lower transmit power levels (for example, 0.1 to 2 watts).

[0041] In some examples, a network node 110 may be, may include, or may operate as an RU, a TRP, or a base station that communicates with one or more UEs 120 via a radio access link (which may be referred to as a “Uu” link). The radio access link may include a downlink and an uplink. “Downlink” (or “DL”) refers to a communication direction from a network node 110 to a UE 120, and “uplink” (or “UL”) refers to a communication direction from a UE 120 to a network node 110. Downlink channels may include one

or more control channels and one or more data channels. A downlink control channel may be used to transmit downlink control information (DCI) (for example, scheduling information, reference signals, and/or configuration information) from a network node 110 to a UE 120. A downlink data channel may be used to transmit downlink data (for example, user data associated with a UE 120) from a network node 110 to a UE 120. Downlink control channels may include one or more PDCCHs, and downlink data channels may include one or more physical downlink shared channels (PDSCHs). Uplink channels may similarly include one or more control channels and one or more data channels. An uplink control channel may be used to transmit uplink control information (UCI) (for example, reference signals and/or feedback corresponding to one or more downlink transmissions) from a UE 120 to a network node 110. An uplink data channel may be used to transmit uplink data (for example, user data associated with a UE 120) from a UE 120 to a network node 110. Uplink control channels may include one or more physical uplink control channels (PUCCHs), and uplink data channels may include one or more physical uplink shared channels (PUSCHs). The downlink and the uplink may each include a set of resources on which the network node 110 and the UE 120 may communicate.

[0042] Downlink and uplink resources may include time domain resources (frames, subframes, slots, and/or symbols), frequency domain resources (frequency bands, component carriers, subcarriers, resource blocks, and/or resource elements), and/or spatial domain resources (particular transmit directions and/or beam parameters). Frequency domain resources of some bands may be subdivided into bandwidth parts (BWPs). A BWP may be a continuous block of frequency domain resources (for example, a continuous block of resource blocks) that are allocated for one or more UEs 120. A UE 120 may be configured with both an uplink BWP and a downlink BWP (where the uplink BWP and the downlink BWP may be the same BWP or different BWPs). A BWP may be dynamically configured (for example, by a network node 110 transmitting a DCI configuration to the one or more UEs 120) and/or reconfigured, which means that a BWP can be adjusted in real-time (or near-real-time) based on changing network conditions in the wireless communication network 100 and/or based on the specific requirements of the one or more UEs 120. This enables more efficient use of the available frequency domain resources in the wireless communication network 100 because fewer frequency domain resources may be allocated to a BWP for a UE 120 (which may reduce the quantity of frequency domain resources that a UE 120 is required to monitor), leaving more frequency domain resources to be spread across multiple UEs 120. Thus, BWPs may also assist in the implementation of lower-capability UEs 120 by facilitating the configuration of smaller bandwidths for communication by such UEs 120.

[0043] As described above, in some aspects, the wireless communication network 100 may be, may include, or may be included in, an IAB network. In an IAB network, at least one network node 110 is an anchor network node that communicates with a core network. An anchor network node 110 may also be referred to as an IAB donor (or “IAB-donor”). The anchor network node 110 may connect to the core network via a wired backhaul link. For example, an Ng interface of the anchor network node 110 may terminate at the core network. Additionally or alternatively, an anchor

network node **110** may connect to one or more devices of the core network that provide a core access and mobility management function (AMF). An IAB network also generally includes multiple non-anchor network nodes **110**, which may also be referred to as relay network nodes or simply as IAB nodes (or “IAB-nodes”). Each non-anchor network node **110** may communicate directly with the anchor network node **110** via a wireless backhaul link to access the core network, or may communicate indirectly with the anchor network node **110** via one or more other non-anchor network nodes **110** and associated wireless backhaul links that form a backhaul path to the core network. Some anchor network node **110** or other non-anchor network node **110** may also communicate directly with one or more UEs **120** via wireless access links that carry access traffic. In some examples, network resources for wireless communication (such as time resources, frequency resources, and/or spatial resources) may be shared between access links and backhaul links.

[0044] In some examples, any network node **110** that relays communications may be referred to as a relay network node, a relay station, or simply as a relay. A relay may receive a transmission of a communication from an upstream station (for example, another network node **110** or a UE **120**) and transmit the communication to a downstream station (for example, a UE **120** or another network node **110**). In this case, the wireless communication network **100** may include or be referred to as a “multi-hop network.” In the example shown in FIG. 1, the network node **110d** (for example, a relay network node) may communicate with the network node **110a** (for example, a macro network node) and the UE **120d** in order to facilitate communication between the network node **110a** and the UE **120d**. Additionally or alternatively, a UE **120** may be or may operate as a relay station that can relay transmissions to or from other UEs **120**. A UE **120** that relays communications may be referred to as a UE relay or a relay UE, among other examples.

[0045] The UEs **120** may be physically dispersed throughout the wireless communication network **100**, and each UE **120** may be stationary or mobile. A UE **120** may be, may include, or may be included in an access terminal, another terminal, a mobile station, or a subscriber unit. A UE **120** may be, include, or be coupled with a cellular phone (for example, a smart phone), a personal digital assistant (PDA), a wireless modem, a wireless communication device, a handheld device, a laptop computer, a cordless phone, a wireless local loop (WLL) station, a tablet, a camera, a gaming device, a netbook, a smartbook, an ultrabook, a medical device, a biometric device, a wearable device (for example, a smart watch, smart clothing, smart glasses, a smart wristband, and/or smart jewelry, such as a smart ring or a smart bracelet), an entertainment device (for example, a music device, a video device, and/or a satellite radio), an XR device, a vehicular component or sensor, a smart meter or sensor, industrial manufacturing equipment, a Global Navigation Satellite System (GNSS) device (such as a Global Positioning System device or another type of positioning device), a UE function of a network node, and/or any other suitable device or function that may communicate via a wireless medium.

[0046] A UE **120** and/or a network node **110** may include one or more chips, system-on-chips (SoCs), chipsets, packages, or devices that individually or collectively constitute

or comprise a processing system. The processing system includes processor (or “processing”) circuitry in the form of one or multiple processors, microprocessors, processing units (such as central processing units (CPUs), graphics processing units (GPUs), neural processing units (NPUs) and/or digital signal processors (DSPs)), processing blocks, application-specific integrated circuits (ASIC), programmable logic devices (PLDs) (such as field programmable gate arrays (FPGAs)), or other discrete gate or transistor logic or circuitry (all of which may be generally referred to herein individually as “processors” or collectively as “the processor” or “the processor circuitry”). One or more of the processors may be individually or collectively configurable or configured to perform various functions or operations described herein. A group of processors collectively configurable or configured to perform a set of functions may include a first processor configurable or configured to perform a first function of the set and a second processor configurable or configured to perform a second function of the set, or may include the group of processors all being configured or configurable to perform the set of functions.

[0047] The processing system may further include memory circuitry in the form of one or more memory devices, memory blocks, memory elements or other discrete gate or transistor logic or circuitry, each of which may include tangible storage media such as random-access memory (RAM) or read-only memory (ROM), or combinations thereof (all of which may be generally referred to herein individually as “memories” or collectively as “the memory” or “the memory circuitry”). One or more of the memories may be coupled (for example, operatively coupled, communicatively coupled, electronically coupled, or electrically coupled) with one or more of the processors and may individually or collectively store processor-executable code (such as software) that, when executed by one or more of the processors, may configure one or more of the processors to perform various functions or operations described herein. Additionally or alternatively, in some examples, one or more of the processors may be preconfigured to perform various functions or operations described herein without requiring configuration by software. The processing system may further include or be coupled with one or more modems (such as a Wi-Fi (for example, IEEE compliant) modem or a cellular (for example, 3GPP 4G LTE, 5G, or 6G compliant) modem). In some implementations, one or more processors of the processing system include or implement one or more of the modems. The processing system may further include or be coupled with multiple radios (collectively “the radio”), multiple RF chains, or multiple transceivers, each of which may in turn be coupled with one or more of multiple antennas. In some implementations, one or more processors of the processing system include or implement one or more of the radios, RF chains or transceivers. The UE **120** may include or may be included in a housing that houses components associated with the UE **120** including the processing system.

[0048] Some UEs **120** may be considered machine-type communication (MTC) UEs, evolved or enhanced machine-type communication (eMTC), UEs, further enhanced eMTC (feMTC) UEs, or enhanced feMTC (efeMTC) UEs, or further evolutions thereof, all of which may be simply referred to as “MTC UEs”. An MTC UE may be, may include, or may be included in or coupled with a robot, an uncrewed aerial vehicle, a remote device, a sensor, a meter,

a monitor, and/or a location tag. Some UEs **120** may be considered IoT devices and/or may be implemented as NB-IoT (narrowband IoT) devices. An IoT UE or NB-IoT device may be, may include, or may be included in or coupled with an industrial machine, an appliance, a refrigerator, a doorbell camera device, a home automation device, and/or a light fixture, among other examples. Some UEs **120** may be considered Customer Premises Equipment, which may include telecommunications devices that are installed at a customer location (such as a home or office) to enable access to a service provider's network (such as included in or in communication with the wireless communication network **100**).

[0049] Some UEs **120** may be classified according to different categories in association with different complexities and/or different capabilities. UEs **120** in a first category may facilitate massive IoT in the wireless communication network **100**, and may offer low complexity and/or cost relative to UEs **120** in a second category. UEs **120** in a second category may include mission-critical IoT devices, legacy UEs, baseline UEs, high-tier UEs, advanced UEs, full-capability UEs, and/or premium UEs that are capable of URLLC, enhanced mobile broadband (eMBB), and/or precise positioning in the wireless communication network **100**, among other examples. A third category of UEs **120** may have mid-tier complexity and/or capability (for example, a capability between UEs **120** of the first category and UEs **120** of the second category). A UE **120** of the third category may be referred to as a reduced capacity UE ("RedCap UE"), a mid-tier UE, an NR-Light UE, and/or an NR-Lite UE, among other examples. RedCap UEs may bridge a gap between the capability and complexity of NB-IoT devices and/or eMTC UEs, and mission-critical IoT devices and/or premium UEs. RedCap UEs may include, for example, wearable devices, IoT devices, industrial sensors, and/or cameras that are associated with a limited bandwidth, power capacity, and/or transmission range, among other examples. RedCap UEs may support healthcare environments, building automation, electrical distribution, process automation, transport and logistics, and/or smart city deployments, among other examples.

[0050] In some examples, two or more UEs **120** (for example, shown as UE **120a** and UE **120e**) may communicate directly with one another using sidelink communications (for example, without communicating by way of a network node **110** as an intermediary). As an example, the UE **120a** may directly transmit data, control information, or other signaling as a sidelink communication to the UE **120e**. This is in contrast to, for example, the UE **120a** first transmitting data in an UL communication to a network node **110**, which then transmits the data to the UE **120e** in a DL communication. In various examples, the UEs **120** may transmit and receive sidelink communications using peer-to-peer (P2P) communication protocols, device-to-device (D2D) communication protocols, vehicle-to-everything (V2X) communication protocols (which may include vehicle-to-vehicle (V2V) protocols, vehicle-to-infrastructure (V2I) protocols, and/or vehicle-to-pedestrian (V2P) protocols), and/or mesh network communication protocols. In some deployments and configurations, a network node **110** may schedule and/or allocate resources for sidelink communications between UEs **120** in the wireless communication network **100**. In some other deployments and configurations, a UE **120** (instead of a network node **110**) may

perform, or collaborate or negotiate with one or more other UEs to perform, scheduling operations, resource selection operations, and/or other operations for sidelink communications.

[0051] In various examples, some of the network nodes **110** and the UEs **120** of the wireless communication network **100** may be configured for full-duplex operation in addition to half-duplex operation. A network node **110** or a UE **120** operating in a half-duplex mode may perform only one of transmission or reception during particular time resources, such as during particular slots, symbols, or other time periods. Half-duplex operation may involve time-division duplexing (TDD), in which DL transmissions of the network node **110** and UL transmissions of the UE **120** do not occur in the same time resources (that is, the transmissions do not overlap in time). In contrast, a network node **110** or a UE **120** operating in a full-duplex mode can transmit and receive communications concurrently (for example, in the same time resources). By operating in a full-duplex mode, network nodes **110** and/or UEs **120** may generally increase the capacity of the network and the radio access link. In some examples, full-duplex operation may involve frequency-division duplexing (FDD), in which DL transmissions of the network node **110** are performed in a first frequency band or on a first component carrier and transmissions of the UE **120** are performed in a second frequency band or on a second component carrier different than the first frequency band or the first component carrier, respectively. In some examples, full-duplex operation may be enabled for a UE **120** but not for a network node **110**. For example, a UE **120** may simultaneously transmit an UL transmission to a first network node **110** and receive a DL transmission from a second network node **110** in the same time resources. In some other examples, full-duplex operation may be enabled for a network node **110** but not for a UE **120**. For example, a network node **110** may simultaneously transmit a DL transmission to a first UE **120** and receive an UL transmission from a second UE **120** in the same time resources. In some other examples, full-duplex operation may be enabled for both a network node **110** and a UE **120**.

[0052] In some examples, the UEs **120** and the network nodes **110** may perform MIMO communication. "MIMO" generally refers to transmitting or receiving multiple signals (such as multiple layers or multiple data streams) simultaneously over the same time and frequency resources. MIMO techniques generally exploit multipath propagation. MIMO may be implemented using various spatial processing or spatial multiplexing operations. In some examples, MIMO may support simultaneous transmission to multiple receivers, referred to as multi-user MIMO (MU-MIMO). Some RATs may employ advanced MIMO techniques, such as mTRP operation (including redundant transmission or reception on multiple TRPs), reciprocity in the time domain or the frequency domain, single-frequency-network (SFN) transmission, or non-coherent joint transmission (NC-JT).

[0053] In some aspects, a UE (e.g., the UE **120**) may include a communication manager **140**. As described in more detail elsewhere herein, the communication manager **140** may receive a plurality of bits corresponding to one or more of an UL-WUS configuration or an RMSI configuration; receive a flag associated with an interpretation of the plurality of bits; transmit an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration; and receive an on-demand SIB based at least

in part on the UL-WUS. Additionally, or alternatively, the communication manager 140 may perform one or more other operations described herein.

[0054] In some aspects, a network node (e.g., the network node 110) may include a communication manager 150. As described in more detail elsewhere herein, the communication manager 150 may transmit a plurality of bits corresponding to one or more of an UL-WUS configuration or an RMSI configuration; transmit a flag associated with an interpretation of the plurality of bits; receive an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration; and transmit an on-demand SIB based at least in part on the UL-WUS. Additionally, or alternatively, the communication manager 150 may perform one or more other operations described herein.

[0055] As indicated above, FIG. 1 is provided as an example. Other examples may differ from what is described with regard to FIG. 1.

[0056] FIG. 2 is a diagram illustrating an example network node 110 in communication with an example UE 120 in a wireless network in accordance with the present disclosure.

[0057] As shown in FIG. 2, the network node 110 may include a data source 212, a transmit processor 214, a transmit (TX) MIMO processor 216, a set of modems 232 (shown as 232a through 232t, where $t \geq 1$), a set of antennas 234 (shown as 234a through 234v, where $v \geq 1$), a MIMO detector 236, a receive processor 238, a data sink 239, a controller/processor 240, a memory 242, a communication unit 244, a scheduler 246, and/or a communication manager 150, among other examples. In some configurations, one or a combination of the antenna(s) 234, the modem(s) 232, the MIMO detector 236, the receive processor 238, the transmit processor 214, and/or the TX MIMO processor 216 may be included in a transceiver of the network node 110. The transceiver may be under control of and used by one or more processors, such as the controller/processor 240, and in some aspects in conjunction with processor-readable code stored in the memory 242, to perform aspects of the methods, processes, and/or operations described herein. In some aspects, the network node 110 may include one or more interfaces, communication components, and/or other components that facilitate communication with the UE 120 or another network node.

[0058] The terms “processor,” “controller,” or “controller/processor” may refer to one or more controllers and/or one or more processors. For example, reference to “a/the processor,” “a/the controller/processor,” or the like (in the singular) should be understood to refer to any one or more of the processors described in connection with FIG. 2, such as a single processor or a combination of multiple different processors. Reference to “one or more processors” should be understood to refer to any one or more of the processors described in connection with FIG. 2. For example, one or more processors of the network node 110 may include transmit processor 214, TX MIMO processor 216, MIMO detector 236, receive processor 238, and/or controller/processor 240. Similarly, one or more processors of the UE 120 may include MIMO detector 256, receive processor 258, transmit processor 264, TX MIMO processor 266, and/or controller/processor 280.

[0059] In some aspects, a single processor may perform all of the operations described as being performed by the one or more processors. In some aspects, a first set of (one or more) processors of the one or more processors may perform a first

operation described as being performed by the one or more processors, and a second set of (one or more) processors of the one or more processors may perform a second operation described as being performed by the one or more processors. The first set of processors and the second set of processors may be the same set of processors or may be different sets of processors. Reference to “one or more memories” should be understood to refer to any one or more memories of a corresponding device, such as the memory described in connection with FIG. 2. For example, operation described as being performed by one or more memories can be performed by the same subset of the one or more memories or different subsets of the one or more memories.

[0060] For downlink communication from the network node 110 to the UE 120, the transmit processor 214 may receive data (“downlink data”) intended for the UE 120 (or a set of UEs that includes the UE 120) from the data source 212 (such as a data pipeline or a data queue). In some examples, the transmit processor 214 may select one or more MCSs for the UE 120 in accordance with one or more channel quality indicators (CQIs) received from the UE 120. The network node 110 may process the data (for example, including encoding the data) for transmission to the UE 120 on a downlink in accordance with the MCS(s) selected for the UE 120 to generate data symbols. The transmit processor 214 may process system information (for example, semi-static resource partitioning information (SRPI)) and/or control information (for example, CQI requests, grants, and/or upper layer signaling) and provide overhead symbols and/or control symbols. The transmit processor 214 may generate reference symbols for reference signals (for example, a cell-specific reference signal (CRS), a DMRS, or a channel state information (CSI) reference signal (CSI-RS)) and/or synchronization signals (for example, a PSS or an SSS).

[0061] The TX MIMO processor 216 may perform spatial processing (for example, precoding) on the data symbols, the control symbols, the overhead symbols, and/or the reference symbols, if applicable, and may provide a set of output symbol streams (for example, T output symbol streams) to the set of modems 232. For example, each output symbol stream may be provided to a respective modulator component (shown as MOD) of a modem 232. Each modem 232 may use the respective modulator component to process (for example, to modulate) a respective output symbol stream (for example, for orthogonal frequency division multiplexing (OFDM)) to obtain an output sample stream. Each modem 232 may further use the respective modulator component to process (for example, convert to analog, amplify, filter, and/or upconvert) the output sample stream to obtain a time domain downlink signal. The modems 232a through 232t may together transmit a set of downlink signals (for example, T downlink signals) via the corresponding set of antennas 234.

[0062] A downlink signal may include a DCI communication, a MAC control element (MAC-CE) communication, an RRC communication, a downlink reference signal, or another type of downlink communication. Downlink signals may be transmitted on a PDCCH, a PDSCH, and/or on another downlink channel. A downlink signal may carry one or more transport blocks (TBs) of data. A TB may be a unit of data that is transmitted over an air interface in the wireless communication network 100. A data stream (for example, from the data source 212) may be encoded into multiple TBs for transmission over the air interface. The quantity of TBs

used to carry the data associated with a particular data stream may be associated with a TB size common to the multiple TBs. The TB size may be based on or otherwise associated with radio channel conditions of the air interface, the MCS used for encoding the data, the downlink resources allocated for transmitting the data, and/or another parameter. In general, the larger the TB size, the greater the amount of data that can be transmitted in a single transmission, which reduces signaling overhead. However, larger TB sizes may be more prone to transmission and/or reception errors than smaller TB sizes, but such errors may be mitigated by more robust error correction techniques.

[0063] For uplink communication from the UE 120 to the network node 110, uplink signals from the UE 120 may be received by an antenna 234, may be processed by a modem 232 (for example, a demodulator component, shown as DEMOD, of a modem 232), may be detected by the MIMO detector 236 (for example, a receive (Rx) MIMO processor) if applicable, and/or may be further processed by the receive processor 238 to obtain decoded data and/or control information. The receive processor 238 may provide the decoded data to a data sink 239 (which may be a data pipeline, a data queue, and/or another type of data sink) and provide the decoded control information to a processor, such as the controller/processor 240.

[0064] The network node 110 may use the scheduler 246 to schedule one or more UEs 120 for downlink or uplink communications. In some aspects, the scheduler 246 may use DCI to dynamically schedule DL transmissions to the UE 120 and/or UL transmissions from the UE 120. In some examples, the scheduler 246 may allocate recurring time domain resources and/or frequency domain resources that the UE 120 may use to transmit and/or receive communications using an RRC configuration (for example, a semi-static configuration), for example, to perform semi-persistent scheduling (SPS) or to configure a configured grant (CG) for the UE 120.

[0065] One or more of the transmit processor 214, the TX MIMO processor 216, the modem 232, the antenna 234, the MIMO detector 236, the receive processor 238, and/or the controller/processor 240 may be included in an RF chain of the network node 110. An RF chain may include one or more filters, mixers, oscillators, amplifiers, analog-to-digital converters (ADCs), and/or other devices that convert between an analog signal (such as for transmission or reception via an air interface) and a digital signal (such as for processing by one or more processors of the network node 110). In some aspects, the RF chain may be or may be included in a transceiver of the network node 110.

[0066] In some examples, the network node 110 may use the communication unit 244 to communicate with a core network and/or with other network nodes. The communication unit 244 may support wired and/or wireless communication protocols and/or connections, such as Ethernet, optical fiber, common public radio interface (CPRI), and/or a wired or wireless backhaul, among other examples. The network node 110 may use the communication unit 244 to transmit and/or receive data associated with the UE 120 or to perform network control signaling, among other examples. The communication unit 244 may include a transceiver and/or an interface, such as a network interface.

[0067] The UE 120 may include a set of antennas 252 (shown as antennas 252a through 252r, where $r \geq 1$), a set of modems 254 (shown as modems 254a through 254u, where

$u \geq 1$), a MIMO detector 256, a receive processor 258, a data sink 260, a data source 262, a transmit processor 264, a TX MIMO processor 266, a controller/processor 280, a memory 282, and/or a communication manager 140, among other examples. One or more of the components of the UE 120 may be included in a housing 284. In some aspects, one or a combination of the antenna(s) 252, the modem(s) 254, the MIMO detector 256, the receive processor 258, the transmit processor 264, or the TX MIMO processor 266 may be included in a transceiver that is included in the UE 120. The transceiver may be under control of and used by one or more processors, such as the controller/processor 280, and in some aspects in conjunction with processor-readable code stored in the memory 282, to perform aspects of the methods, processes, or operations described herein. In some aspects, the UE 120 may include another interface, another communication component, and/or another component that facilitates communication with the network node 110 and/or another UE 120.

[0068] For downlink communication from the network node 110 to the UE 120, the set of antennas 252 may receive the downlink communications or signals from the network node 110 and may provide a set of received downlink signals (for example, R received signals) to the set of modems 254. For example, each received signal may be provided to a respective demodulator component (shown as DEMOD) of a modem 254. Each modem 254 may use the respective demodulator component to condition (for example, filter, amplify, downconvert, and/or digitize) a received signal to obtain input samples. Each modem 254 may use the respective demodulator component to further demodulate or process the input samples (for example, for OFDM) to obtain received symbols. The MIMO detector 256 may obtain received symbols from the set of modems 254, may perform MIMO detection on the received symbols if applicable, and may provide detected symbols. The receive processor 258 may process (for example, decode) the detected symbols, may provide decoded data for the UE 120 to the data sink 260 (which may include a data pipeline, a data queue, and/or an application executed on the UE 120), and may provide decoded control information and system information to the controller/processor 280.

[0069] For uplink communication from the UE 120 to the network node 110, the transmit processor 264 may receive and process data ("uplink data") from a data source 262 (such as a data pipeline, a data queue, and/or an application executed on the UE 120) and control information from the controller/processor 280. The control information may include one or more parameters, feedback, one or more signal measurements, and/or other types of control information. In some aspects, the receive processor 258 and/or the controller/processor 280 may determine, for a received signal (such as received from the network node 110 or another UE), one or more parameters relating to transmission of the uplink communication. The one or more parameters may include a reference signal received power (RSRP) parameter, a received signal strength indicator (RSSI) parameter, a reference signal received quality (RSRQ) parameter, a CQI parameter, or a transmit power control (TPC) parameter, among other examples. The control information may include an indication of the RSRP parameter, the RSSI parameter, the RSRQ parameter, the CQI parameter, the TPC parameter, and/or another parameter. The

control information may facilitate parameter selection and/or scheduling for the UE 120 by the network node 110.

[0070] The transmit processor 264 may generate reference symbols for one or more reference signals, such as an uplink DMRS, an uplink sounding reference signal (SRS), and/or another type of reference signal. The symbols from the transmit processor 264 may be precoded by the TX MIMO processor 266, if applicable, and further processed by the set of modems 254 (for example, for DFT-s-OFDM or CP-OFDM). The TX MIMO processor 266 may perform spatial processing (for example, precoding) on the data symbols, the control symbols, the overhead symbols, and/or the reference symbols, if applicable, and may provide a set of output symbol streams (for example, U output symbol streams) to the set of modems 254. For example, each output symbol stream may be provided to a respective modulator component (shown as MOD) of a modem 254. Each modem 254 may use the respective modulator component to process (for example, to modulate) a respective output symbol stream (for example, for OFDM) to obtain an output sample stream. Each modem 254 may further use the respective modulator component to process (for example, convert to analog, amplify, filter, and/or upconvert) the output sample stream to obtain an uplink signal.

[0071] The modems 254a through 254u may transmit a set of uplink signals (for example, R uplink signals or U uplink signals) via the corresponding set of antennas 252. An uplink signal may include a UCI communication, a MAC-CE communication, an RRC communication, or another type of uplink communication. Uplink signals may be transmitted on a PUSCH, a PUCCH, and/or another type of uplink channel. An uplink signal may carry one or more TBs of data. Sidelink data and control transmissions (that is, transmissions directly between two or more UEs 120) may generally use similar techniques as were described for uplink data and control transmission, and may use sidelink-specific channels such as a physical sidelink shared channel (PSSCH), a physical sidelink control channel (PSCCH), and/or a physical sidelink feedback channel (PSFCH).

[0072] One or more antennas of the set of antennas 252 or the set of antennas 234 may include, or may be included within, one or more antenna panels, one or more antenna groups, one or more sets of antenna elements, or one or more antenna arrays, among other examples. An antenna panel, an antenna group, a set of antenna elements, or an antenna array may include one or more antenna elements (within a single housing or multiple housings), a set of coplanar antenna elements, a set of non-coplanar antenna elements, or one or more antenna elements coupled with one or more transmission or reception components, such as one or more components of FIG. 2. As used herein, “antenna” can refer to one or more antennas, one or more antenna panels, one or more antenna groups, one or more sets of antenna elements, or one or more antenna arrays. “Antenna panel” can refer to a group of antennas (such as antenna elements) arranged in an array or panel, which may facilitate beamforming by manipulating parameters of the group of antennas. “Antenna module” may refer to circuitry including one or more antennas, which may also include one or more other components (such as filters, amplifiers, or processors) associated with integrating the antenna module into a wireless communication device.

[0073] In some examples, each of the antenna elements of an antenna 234 or an antenna 252 may include one or more sub-elements for radiating or receiving radio frequency

signals. For example, a single antenna element may include a first sub-element cross-polarized with a second sub-element that can be used to independently transmit cross-polarized signals. The antenna elements may include patch antennas, dipole antennas, and/or other types of antennas arranged in a linear pattern, a two-dimensional pattern, or another pattern. A spacing between antenna elements may be such that signals with a desired wavelength transmitted separately by the antenna elements may interact or interfere constructively and destructively along various directions (such as to form a desired beam). For example, given an expected range of wavelengths or frequencies, the spacing may provide a quarter wavelength, a half wavelength, or another fraction of a wavelength of spacing between neighboring antenna elements to allow for the desired constructive and destructive interference patterns of signals transmitted by the separate antenna elements within that expected range.

[0074] The amplitudes and/or phases of signals transmitted via antenna elements and/or sub-elements may be modulated and shifted relative to each other (such as by manipulating phase shift, phase offset, and/or amplitude) to generate one or more beams, which is referred to as beamforming. The term “beam” may refer to a directional transmission of a wireless signal toward a receiving device or otherwise in a desired direction. “Beam” may also generally refer to a direction associated with such a directional signal transmission, a set of directional resources associated with the signal transmission (for example, an angle of arrival, a horizontal direction, and/or a vertical direction), and/or a set of parameters that indicate one or more aspects of a directional signal, a direction associated with the signal, and/or a set of directional resources associated with the signal. In some implementations, antenna elements may be individually selected or deselected for directional transmission of a signal (or signals) by controlling amplitudes of one or more corresponding amplifiers and/or phases of the signal(s) to form one or more beams. The shape of a beam (such as the amplitude, width, and/or presence of side lobes) and/or the direction of a beam (such as an angle of the beam relative to a surface of an antenna array) can be dynamically controlled by modifying the phase shifts, phase offsets, and/or amplitudes of the multiple signals relative to each other.

[0075] Different UEs 120 or network nodes 110 may include different numbers of antenna elements. For example, a UE 120 may include a single antenna element, two antenna elements, four antenna elements, eight antenna elements, or a different number of antenna elements. As another example, a network node 110 may include eight antenna elements, 24 antenna elements, 64 antenna elements, 128 antenna elements, or a different number of antenna elements. Generally, a larger number of antenna elements may provide increased control over parameters for beam generation relative to a smaller number of antenna elements, whereas a smaller number of antenna elements may be less complex to implement and may use less power than a larger number of antenna elements. Multiple antenna elements may support multiple-layer transmission, in which a first layer of a communication (which may include a first data stream) and a second layer of a communication (which may include a second data stream) are transmitted using the same time and frequency resources with spatial multiplexing.

[0076] While blocks in FIG. 2 are illustrated as distinct components, the functions described above with respect to

the blocks may be implemented in a single hardware, software, or combination component or in various combinations of components. For example, the functions described with respect to the transmit processor 264, the receive processor 258, and/or the TX MIMO processor 266 may be performed by or under the control of the controller/processor 280.

[0077] As indicated above, FIG. 2 is provided as an example. Other examples may differ from what is described with regard to FIG. 2.

[0078] FIG. 3 is a diagram illustrating an example disaggregated base station architecture 300 in accordance with the present disclosure. One or more components of the example disaggregated base station architecture 300 may be, may include, or may be included in one or more network nodes (such one or more network nodes 110). The disaggregated base station architecture 300 may include a CU 310 that can communicate directly with a core network 320 via a backhaul link, or that can communicate indirectly with the core network 320 via one or more disaggregated control units, such as a Non-RT RIC 350 associated with a Service Management and Orchestration (SMO) Framework 360 and/or a Near-RT RIC 370 (for example, via an E2 link). The CU 310 may communicate with one or more DUs 330 via respective midhaul links, such as via F1 interfaces. Each of the DUs 330 may communicate with one or more RUs 340 via respective fronthaul links. Each of the RUs 340 may communicate with one or more UEs 120 via respective RF access links. In some deployments, a UE 120 may be simultaneously served by multiple RUs 340.

[0079] Each of the components of the disaggregated base station architecture 300, including the CUs 310, the DUs 330, the RUs 340, the Near-RT RICs 370, the Non-RT RICs 350, and the SMO Framework 360, may include one or more interfaces or may be coupled with one or more interfaces for receiving or transmitting signals, such as data or information, via a wired or wireless transmission medium.

[0080] In some aspects, the CU 310 may be logically split into one or more CU user plane (CU-UP) units and one or more CU control plane (CU-CP) units. A CU-UP unit may communicate bidirectionally with a CU-CP unit via an interface, such as the E1 interface when implemented in an O-RAN configuration. The CU 310 may be deployed to communicate with one or more DUs 330, as necessary, for network control and signaling. Each DU 330 may correspond to a logical unit that includes one or more base station functions to control the operation of one or more RUs 340. For example, a DU 330 may host various layers, such as an RLC layer, a MAC layer, or one or more PHY layers, such as one or more high PHY layers or one or more low PHY layers. Each layer (which also may be referred to as a module) may be implemented with an interface for communicating signals with other layers (and modules) hosted by the DU 330, or for communicating signals with the control functions hosted by the CU 310. Each RU 340 may implement lower layer functionality. In some aspects, real-time and non-real-time aspects of control and user plane communication with the RU(s) 340 may be controlled by the corresponding DU 330.

[0081] The SMO Framework 360 may support RAN deployment and provisioning of non-virtualized and virtualized network elements. For non-virtualized network elements, the SMO Framework 360 may support the deployment of dedicated physical resources for RAN coverage

requirements, which may be managed via an operations and maintenance interface, such as an O1 interface. For virtualized network elements, the SMO Framework 360 may interact with a cloud computing platform (such as an open cloud (O-Cloud) platform 390) to perform network element life cycle management (such as to instantiate virtualized network elements) via a cloud computing platform interface, such as an O2 interface. A virtualized network element may include, but is not limited to, a CU 310, a DU 330, an RU 340, a non-RT RIC 350, and/or a Near-RT RIC 370. In some aspects, the SMO Framework 360 may communicate with a hardware aspect of a 4G RAN, a 5G NR RAN, and/or a 6G RAN, such as an open eNB (O-eNB) 380, via an O1 interface. Additionally or alternatively, the SMO Framework 360 may communicate directly with each of one or more RUs 340 via a respective O1 interface. In some deployments, this configuration can enable each DU 330 and the CU 310 to be implemented in a cloud-based RAN architecture, such as a vRAN architecture.

[0082] The Non-RT RIC 350 may include or may implement a logical function that enables non-real-time control and optimization of RAN elements and resources, AI/ML workflows including model training and updates, and/or policy-based guidance of applications and/or features in the Near-RT RIC 370. The Non-RT RIC 350 may be coupled to or may communicate with (such as via an A1 interface) the Near-RT RIC 370. The Near-RT RIC 370 may include or may implement a logical function that enables near-real-time control and optimization of RAN elements and resources via data collection and actions via an interface (such as via an E2 interface) connecting one or more CUs 310, one or more DUs 330, and/or an O-eNB with the Near-RT RIC 370.

[0083] In some aspects, to generate AI/ML models to be deployed in the Near-RT RIC 370, the Non-RT RIC 350 may receive parameters or external enrichment information from external servers. Such information may be utilized by the Near-RT RIC 370 and may be received at the SMO Framework 360 or the Non-RT RIC 350 from non-network data sources or from network functions. In some examples, the Non-RT RIC 350 or the Near-RT RIC 370 may tune RAN behavior or performance. For example, the Non-RT RIC 350 may monitor long-term trends and patterns for performance and may employ AI/ML models to perform corrective actions via the SMO Framework 360 (such as reconfiguration via an O1 interface) or via creation of RAN management policies (such as A1 interface policies).

[0084] The network node 110, the controller/processor 240 of the network node 110, the UE 120, the controller/processor 280 of the UE 120, the CU 310, the DU 330, the RU 340, or any other component(s) of FIG. 1, 2, or 3 may implement one or more techniques or perform one or more operations associated with configuring UL-WUSs for on-demand SIBs, as described in more detail elsewhere herein. For example, the controller/processor 240 of the network node 110, the controller/processor 280 of the UE 120, any other component(s) of FIG. 2, the CU 310, the DU 330, or the RU 340 may perform or direct operations of, for example, process 1200 of FIG. 12, process 1300 of FIG. 13, or other processes as described herein (alone or in conjunction with one or more other processors). The memory 242 may store data and program codes for the network node 110, the network node 110, the CU 310, the DU 330, or the RU 340. The memory 282 may store data and program codes for

the UE 120. In some examples, the memory 242 or the memory 282 may include a non-transitory computer-readable medium storing a set of instructions (for example, code or program code) for wireless communication. The memory 242 may include one or more memories, such as a single memory or multiple different memories (of the same type or of different types). The memory 282 may include one or more memories, such as a single memory or multiple different memories (of the same type or of different types). For example, the set of instructions, when executed (for example, directly, or after compiling, converting, or interpreting) by one or more processors of the network node 110, the UE 120, the CU 310, the DU 330, or the RU 340, may cause the one or more processors to perform process 1200 of FIG. 12, process 1300 of FIG. 13, or other processes as described herein. In some examples, executing instructions may include running the instructions, converting the instructions, compiling the instructions, and/or interpreting the instructions, among other examples.

[0085] In some aspects, a UE (e.g., the UE 120) includes means for receiving a plurality of bits corresponding to one or more of an UL-WUS configuration or an RMSI configuration; means for receiving a flag associated with an interpretation of the plurality of bits; means for transmitting an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration; and/or means for receiving an on-demand SIB based at least in part on the UL-WUS. The means for the UE to perform operations described herein may include, for example, one or more of communication manager 140, antenna 252, modem 254, MIMO detector 256, receive processor 258, transmit processor 264, TX MIMO processor 266, controller/processor 280, or memory 282.

[0086] In some aspects, a network node (e.g., the network node 110) includes means for transmitting a plurality of bits corresponding to one or more of an UL-WUS configuration or an RMSI configuration; means for transmitting a flag associated with an interpretation of the plurality of bits; means for receiving an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration; and/or means for transmitting an on-demand SIB based at least in part on the UL-WUS. The means for the network node to perform operations described herein may include, for example, one or more of communication manager 150, transmit processor 214, TX MIMO processor 216, modem 232, antenna 234, MIMO detector 236, receive processor 238, controller/processor 240, memory 242, or scheduler 246.

[0087] As indicated above, FIG. 3 is provided as an example. Other examples may differ from what is described with regard to FIG. 3.

[0088] In a wireless network that supports NES, a cell may not always periodically broadcast its SIB1 and/or RMSI. An anchor cell may provide a copy of the cell's SIB1 (e.g., an NES cell's SIB1), or alternatively, the cell may transmit its SIB1 in response to a request (e.g., from a UE). The cell that transmits its SIB1 in response to the request may be a non-anchor-cell. NES may involve an on-demand SIB1 transmission by the cell for idle/inactive UEs, which may be based at least in part on a triggering mechanism (e.g., an uplink demand signal such as a UE UL-WUS using an existing signal/channel, a cell on/off indication via a backhaul, and/or SCell activation/deactivation signaling).

[0089] An NES feature in which the cell does not always periodically broadcast its SIB1/RMSI may rely on help from the anchor node, but supporting the NES feature in a standalone manner may be desirable. The standalone manner may involve no (or minimal) reliance on the anchor/assisting cell (e.g., to support direct access to a sixth generation (6G) cell without requiring any information from a 5G cell). However, one issue with the standalone manner may relate to the configuration of the uplink demand signal (e.g., the UL-WUS) that the idle/inactive UE needs to transmit to the cell when requesting for the cell's SIB1. For assisted access, the anchor cell may provide such configuration information for the uplink demand signal (e.g., an indication of time-frequency resources, type of sequence, and/or subcarrier spacing for the uplink demand signal). The configuration information for the uplink demand signal should be provided to the UE prior to the on-demand SIB1 transmission. For non-assisted access, preconfiguring/fixing the configuration information for the uplink demand signal may be limiting (e.g., fixing a cell-specific configuration in a specification may not be possible). The cell may indicate, via an MIB transmitted over a PBCH, the configuration information for the uplink demand signal, but such an approach may be prohibitive due to a limited payload that the PBCH is able to carry. The MIB may have limited bits (or no additional available bits) to carry the configuration information for the uplink demand signal.

[0090] In various aspects of techniques and apparatuses described herein, a UE may receive, from a network node, a plurality of bits corresponding to an UL-WUS configuration and/or an RMSI configuration. For example, the UE may receive an MIB in an SSB or a PDCCCH transmission, where the MIB or the PDCCCH transmission may indicate the plurality of bits based at least in part on no RMSI transmission being triggered. When no RMSI transmission is triggered, bits that would otherwise be used to convey the RMSI configuration may be repurposed to convey the UL-WUS configuration, thereby not adding additional overhead to the MIB. The UE may be in an idle or inactive state. The UE may receive, from the network node, a flag associated with an interpretation of the plurality of bits. For example, the UE may receive the flag in the MIB, a PSS, an SSS, or a DMRS. The UE may determine, based at least in part on the flag, that the plurality of bits correspond to the UL-WUS configuration. The UE may transmit, to the network node, an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration. The UE may transmit the UL-WUS in order to request an on-demand SIB1. The UE may receive, from the network node, the on-demand SIB based at least in part on the UL-WUS.

[0091] In some aspects, by configuring the UL-WUS for the on-demand SIB1 by repurposing the bits that would otherwise be used to convey the RMSI configuration when no RMSI transmission is triggered, the UE may receive the UL-WUS configuration without adding additional overhead to the MIB. The MIB may have a limited payload and incorporating additional bits into the MIB solely for the purpose of conveying the UL-WUS configuration may be prohibitive and increase a signaling overhead, so repurposing the bits that are not needed may not negatively affect the signaling overhead, thereby improving an overall system performance. On the other hand, when the RMSI transmission is triggered, the bits may not be used to convey the UL-WUS configuration.

[0092] FIG. 4 is a diagram illustrating an example 400 associated with configuring UL-WUSs for on-demand SIBs, in accordance with the present disclosure. As shown in FIG. 4, example 400 includes communication between a UE (e.g., UE 120) and a network node (e.g., network node 110). In some aspects, the UE and the network node may be included in a wireless network, such as wireless network 100.

[0093] As shown by reference number 402, the UE may receive, from the network node, a plurality of bits corresponding to an UL-WUS configuration and/or an RMSI configuration. In some aspects, the UE may receive, from the network node, an MIB in an SSB that includes the plurality of bits. The plurality of bits may convey the UL-WUS configuration based at least in part on no RMSI transmission being triggered. The UL-WUS configuration may be based at least in part on a set of preconfigured or indicated configurations. In some aspects, the UE may receive, from the network node, a PDCCH transmission that includes the plurality of bits. The plurality of bits may convey the UL-WUS configuration based at least in part on no RMSI transmission being triggered. In some aspects, a PDCCH carrying an UL-WUS configuration and a PDCCH carrying a SIB may be associated with same PDCCH monitoring occasions or different PDCCH monitoring occasions.

[0094] In some aspects, the UE may receive, from the network node, a PDCCH transmission that includes the plurality of bits, where the plurality of bits may convey the UL-WUS configuration and the RMSI configuration, and the RMSI configuration may indicate a conditional grant for an RMSI transmission. The UE may receive, from the network node, an indication that indicates whether the RMSI transmission is triggered. The indication may activate or deactivate the UL-WUS, or the indication may be implicitly indicated based at least in part on the UL-WUS configuration being provided in the PDCCH transmission.

[0095] In some aspects, the UE may receive, from the network node, a PDCCH transmission that includes the plurality of bits. The PDCCH transmission may indicate minimum required information for determining whether a cell is suitable for camping by the UE. The minimum required information may be associated with a public land mobile network (PLMN) identifier (ID) and access related information. In some aspects, the PDCCH transmission may include a hashed version of the PLMN ID. The cell may be suitable for camping by the UE based at least in part on the hashed version of the PLMN ID corresponding to a UE registered ID. The UE may transmit the UL-WUS to request full information based at least in part on the cell being suitable for camping by the UE. The UE may receive at least a portion of the full information in a PDSCH transmission.

[0096] As shown by reference number 404, the UE may receive, from the network node, a flag associated with an interpretation of the plurality of bits. In some aspects, the UE may receive, from the network node, the flag in an MIB, a PSS, an SSS, a DMRS, or via an implicit index modulation, based at least in part on the plurality of bits being conveyed via the MIB. In some aspects, the UE may receive, from the network node, the flag in the PSS, the SSS, the DMRS, or a PBCH, based at least in part on the plurality of bits being conveyed via the PDCCH transmission. In one example, the flag may be indicated using a reserved value of an SSB parameter.

[0097] As shown by reference number 406, the UE may transmit, to the network node, an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration. The UE may transmit the UL-WUS using time-frequency resources indicated by the UL-WUS configuration. The UE may transmit the UL-WUS using a type of sequence and/or subcarrier spacing indicated by the UL-WUS configuration.

[0098] As shown by reference number 408, the UE may receive, from the network node, an on-demand SIB based at least in part on the UL-WUS. The UE may receive the on-demand SIB for a preconfigured or indicated number of periods. The UE may receive the on-demand SIB in a requested beam direction.

[0099] As indicated above, FIG. 4 is provided as an example. Other examples may differ from what is described with regard to FIG. 4.

[0100] In some aspects, a network node may transmit, to a UE, an UL-WUS configuration. The UL-WUS configuration may indicate resources/configurations for transmitting an UL-WUS. The UE may be able to transmit the UL-WUS based at least in part on the UL-WUS configuration indicated by the network node. In some aspects, in an assisted access scenario, the resources/configurations may be provided by system information, which may be transmitted by a neighbor/anchor cell.

[0101] In some aspects, in a non-assisted access scenario, the network node may transmit (e.g., broadcast) a MIB, which may be received by the UE (e.g., as shown in FIGS. 5-6). The network node may transmit an SSB, which may include a PBCH block that conveys the MIB. The MIB may carry some fields that can indicate an RMSI PDCCH configuration. When no RMSI PDCCH transmission is triggered, those bits (e.g., 8 bits) may be repurposed to indicate the UL-WUS configuration. In other words, bits that would otherwise be used to indicate the RMSI PDCCH configuration may be repurposed to indicate the UL-WUS configuration. For cycles in which RMSI is transmitted/triggered, the MIB may indicate the RMSI PDCCH configuration (as in a legacy approach). For cycles in which RMSI is not transmitted/triggered, the MIB may indicate the UL-WUS configuration. In some aspects, a flag in the MIB and/or other channels/signals like PSS/SSS/DMRS, or via an implicit index modulation, may indicate an interpretation of MIB content. In other words, the flag may indicate that the UE should interpret the MIB content as corresponding to the RMSI PDCCH configuration, or the flag may indicate that the UE should interpret the MIB content as corresponding to the UL-WUS configuration. In some aspects, an indication of the UL-WUS configuration may be based at least in part on a set of preconfigured or indicated (via other cells) configurations. For example, the MIB may provide an index to one or multiple elements in such a set, which may support a hybrid mode in which the neighbor/anchor cell may provide some minimal information.

[0102] FIG. 5 is a diagram illustrating an example 500 associated with configuring UL-WUSs for on-demand SIBs, in accordance with the present disclosure.

[0103] As shown in FIG. 5, in an RMSI-SSB frequency division multiplexing (FDM) pattern, a cell may transmit an SSB (containing a PBCH block that conveys a MIB), which may be multiplexed with RMSI. When no RMSI transmission is triggered, some fields in the MIB that would otherwise be used to indicate an RMSI PDCCH configuration

may be repurposed to indicate an UL-WUS configuration. In this case, the cell may transmit the MIB, which may indicate the UL-WUS configuration, where the MIB may be received by a UE. The UE may transmit an UL-WUS based at least in part on the UL-WUS configuration. The UL-WUS configuration may be for RMSI. In a next cycle, the cell may transmit an RMSI PDCCH/PDSCH transmission.

[0104] As indicated above, FIG. 5 is provided as an example. Other examples may differ from what is described with regard to FIG. 5.

[0105] FIG. 6 is a diagram illustrating an example 600 associated with configuring UL-WUSs for on-demand SIBs, in accordance with the present disclosure.

[0106] As shown in FIG. 6, in an RMSI-SSB time division multiplexing (TDM) pattern, a cell may transmit an SSB (containing a PBCH block that conveys a MIB). When no RMSI transmission is triggered, some fields in the MIB that would otherwise be used to indicate an RMSI PDCCH configuration may be repurposed to indicate an UL-WUS configuration. In this case, the cell may transmit the MIB, which may indicate the UL-WUS configuration, where the MIB may be received by a UE. The UE may transmit an UL-WUS based at least in part on the UL-WUS configuration. The UL-WUS configuration may be for RMSI. The cell may transmit an RMSI PDCCH/PDSCH transmission. The UE may initiate a random access channel (RACH) procedure, which may be based at least in part on the UL-WUS.

[0107] As indicated above, FIG. 6 is provided as an example. Other examples may differ from what is described with regard to FIG. 6.

[0108] In some aspects, a network node may transmit, to a UE, a PDCCH transmission that indicates a grant for an RMSI PDSCH transmission or an UL-WUS configuration (e.g., as shown in FIGS. 7-8). For cycles in which the RMSI PDSCH transmission is triggered, the network node may transmit a PDCCH transmission that indicates the grant for the RMSI PDSCH transmission. For cycles in which the RMSI PDSCH transmission is not triggered, the network node may transmit a PDCCH transmission that indicates the UL-WUS configuration. In some aspects, a flag may be used to indicate an interpretation of PDCCH content. In other words, the flag may indicate that the UE should interpret the PDCCH content as the grant for the RMSI PDSCH transmission, or the flag may indicate that the UE should interpret the PDCCH content as corresponding to the UL-WUS configuration. The flag may be implicit/explicit in a PSS, SSS, DMRS, and/or PBCH. The flag may be associated with resources or scrambling sequences. For example, two different radio network temporary identifiers (RNTIs), such as system information RNTIs (SI-RNTIs) or wakeup RNTIs (W-RNTIs) may be used for such purposes.

[0109] In some aspects, PDCCH monitoring occasions for a PDCCH with the UL-WUS configuration and PDCCH monitoring occasions for a PDCCH with a SIB1 may be defined. In one option, the same PDCCH monitoring occasions may be supported. In another option, different PDCCH monitoring occasions may be supported. For example, PDCCH monitoring occasions for the PDCCH with the UL-WUS configuration may be a subset of PDCCH monitoring occasions for the PDCCH with the SIB1, which may result in network/UE power savings when no UEs request for the SIB1 but such an approach may have an impact on UE access latency.

[0110] FIG. 7 is a diagram illustrating an example 700 associated with configuring UL-WUSs for on-demand SIBs, in accordance with the present disclosure.

[0111] As shown in FIG. 7, in an RMSI-SSB FDM pattern, a cell may transmit an SSB, which may be multiplexed with a PDCCH transmission. The PDCCH transmission may be associated with control resource set (CORESET) 0. When no RMSI PDSCH transmission is triggered, the PDCCH transmission may indicate an UL-WUS configuration, which may be received by a UE. The UE may transmit an UL-WUS based at least in part on the UL-WUS configuration. The UL-WUS configuration may be for RMSI. In a next cycle, the cell may transmit an RMSI PDCCH/PDSCH transmission. The RMSI-SSB FDM pattern may provide the network node with additional flexibility to configure and dynamically activate/deactivate the UL-WUS, as compared to an RMSI-SSB TDM pattern.

[0112] As indicated above, FIG. 7 is provided as an example. Other examples may differ from what is described with regard to FIG. 7.

[0113] FIG. 8 is a diagram illustrating an example 800 associated with configuring UL-WUSs for on-demand SIBs, in accordance with the present disclosure.

[0114] As shown in FIG. 8, in an RMSI-SSB TDM pattern, a cell may transmit an SSB. The cell may transmit a PDCCH transmission. When no RMSI PDSCH transmission is triggered, the PDCCH transmission may indicate an UL-WUS configuration, which may be received by a UE. The UE may transmit an UL-WUS based at least in part on the UL-WUS configuration. The UL-WUS configuration may be for RMSI. In a next cycle, the cell may transmit an RMSI PDCCH/PDSCH transmission. The UE may initiate a RACH procedure, which may be based at least in part on the UL-WUS.

[0115] As indicated above, FIG. 8 is provided as an example. Other examples may differ from what is described with regard to FIG. 8.

[0116] In some aspects, a network node may transmit, to a UE, a PDCCH transmission that indicates an UL-WUS configuration and a conditional grant for an RMSI PDSCH transmission (e.g., the RMSI PDSCH transmission may be transmitted on indicated resources only when an UL-WUS is present) (e.g., as shown in FIG. 9). The PDCCH transmission may indicate whether the RMSI PDSCH transmission is triggered (e.g., no need to transmit UL-WUS), which may be indicated via a flag that would effectively activate/deactivate the UL-WUS, or which may be implicitly indicated depending on whether an UL-WUS configuration indication is provided in a PDCCH payload. Such an approach may provide the network node with the same level of flexibility to configure and dynamically activate/deactivate the UL-WUS, provide less NES, and provide lower access latency to UEs.

[0117] In some aspects, when another cell (e.g., an anchor cell) provides a copy of all or a portion of a SIB1 for a cell (e.g., an NES cell) and/or the UL-WUS configuration for demodulating the SIB1 from the cell, a flag in the cell's SSB may indicate a mode of operation (e.g., no always-on/broadcast RMSI transmission on the cell, but RMSI may be transmitted on-demand and/or transmitted by another cell).

[0118] In some aspects, a MIB may have 8 bits to indicate an RMSI PDCCH configuration. In a legacy approach, when no associated RMSI is present for non-cell-defining (CD) SSBs, the 8 bits may be repurposed to help the UE find

another sync raster potentially with CD-SSBs. The UE may determine from the MIB that a CORESET for Type0-PDCCH common search space (CSS) set is not present when $k_{SSB} > 23$ for FR1 or if $k_{SSB} > 11$ for FR2. However, $k_{SSB} = 30$ and 14 may be reserved for FR1 and FR2 respectively. Thus, the reserved values of K_{SSB} may be used to indicate information, such as the flag.

[0119] FIG. 9 is a diagram illustrating an example 900 associated with configuring UL-WUSs for on-demand SIBs, in accordance with the present disclosure.

[0120] As shown in FIG. 9, in an RMSI-SSB TDM pattern, a cell may transmit an SSB. The cell may transmit a PDCCH transmission. The PDCCH transmission may be associated with CORESET 0. The PDCCH transmission may indicate an UL-WUS configuration and a conditional grant for an RMSI PDSCH transmission, which may be received by a UE. The UE may transmit an UL-WUS based at least in part on the UL-WUS configuration. The UL-WUS configuration may be for RMSI. The cell may transmit the RMSI PDSCH transmission, which may be based at least in part on the conditional grant.

[0121] As indicated above, FIG. 9 is provided as an example. Other examples may differ from what is described with regard to FIG. 9.

[0122] In some aspects, when an on-demand SIB is triggered and transmitted by a cell (e.g., an NES cell), the on-demand SIB may be transmitted for a preconfigured or indicated number of periods (e.g., 2 or 4 times), or the on-demand SSB may be transmitted only in a requested beam direction (and a few nearby beams).

[0123] In a legacy approach, a cell selection or cell reselection may be based at least in part on a strength/quality of a target cell, as well as information that should be acquired from a SIB1. A UE may detect a potential target cell (with relatively strong quality/strength), but the UE may need to send a request for the SIB1 to determine whether the UE should select and camp on the cell, which may cause additional UE power consumption in case the cell is not suitable for camping.

[0124] In some aspects, an RMSI PDCCH transmission may indicate minimum required information needed to determine whether or not the cell is suitable for camping. The minimum required information may be associated with a PLMN ID and access-related information. The access-related information may indicate whether access to the cell is reserved, and whether the cell supports specific types of UEs and/or operations. The operations specific types of UEs and/or operations may include NES-capable, non-assisted/assisted access, IAB support, network controlled repeater (NCR) support, and/or support of any future type of network nodes or capability. In some aspects, a PDCCH payload may have insufficient space to provide all minimum required information, so a hashed version of PLMN ID(s) may be provided in the PDCCH payload. When a hashed ID matches a UE's registered ID, the UE may transmit an UL-WUS and request full information. When the hashed ID does not match the UE's registered ID, the cell may not be suitable for the UE, and the UE may skip any further communication with the cell. When some information has already been provided in a PDCCH, a SIB1 PDCCH payload may provide only the delta or remaining information.

[0125] FIG. 10 is a diagram illustrating an example 1000 associated with a PLMN identity information list information element (IE), in accordance with the present disclosure.

[0126] As shown in FIG. 10, the PLMN identity information list (PLMN-IdentityInfoList) IE may indicate a PLMN identity list, a tracking area code, a RAN area code, a cell identity, a cell reserved for operator use parameter, an IAB support parameter, a tracking area list, and/or a gNB ID length. The PLMN identity list may be associated with a PLMN identity IE (e.g., as shown in FIG. 11). The PLMN identity IE may indicate minimum required information needed to determine whether or not a cell is suitable for camping. The PLMN identity list may be associated with a PDCCH payload.

[0127] As indicated above, FIG. 10 is provided as an example. Other examples may differ from what is described with regard to FIG. 10.

[0128] FIG. 11 is a diagram illustrating an example 1100 associated with a PLMN identity IE, in accordance with the present disclosure.

[0129] As shown in FIG. 11, the PLMN identity (PLMN-Identity) IE may indicate one or more mobile country codes (MCCs) and/or one or more mobile network codes (MNCs). The PLMN identity IE may be associated with minimum required information needed to determine whether or not a cell is suitable for camping. The PLMN identity IE may be associated with a PDCCH payload.

[0130] As indicated above, FIG. 11 is provided as an example. Other examples may differ from what is described with regard to FIG. 11.

[0131] FIG. 12 is a diagram illustrating an example process 1200 performed, for example, at a UE or an apparatus of a UE, in accordance with the present disclosure. Example process 1200 is an example where the apparatus or the UE (e.g., UE 120) performs operations associated with configuring UL-WUSs for on-demand SIBs.

[0132] As shown in FIG. 12, in some aspects, process 1200 may include receiving a plurality of bits corresponding to one or more of an UL-WUS configuration or an RMSI configuration (block 1210). For example, the UE (e.g., using reception component 1402 and/or communication manager 1406, depicted in FIG. 14) may receive a plurality of bits corresponding to one or more of an UL-WUS configuration or an RMSI configuration, as described above.

[0133] As further shown in FIG. 12, in some aspects, process 1200 may include receiving a flag associated with an interpretation of the plurality of bits (block 1220). For example, the UE (e.g., using reception component 1402 and/or communication manager 1406, depicted in FIG. 14) may receive a flag associated with an interpretation of the plurality of bits, as described above.

[0134] As further shown in FIG. 12, in some aspects, process 1200 may include transmitting an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration (block 1230). For example, the UE (e.g., using transmission component 1404 and/or communication manager 1406, depicted in FIG. 14) may transmit an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration, as described above.

[0135] As further shown in FIG. 12, in some aspects, process 1200 may include receiving an on-demand SIB based at least in part on the UL-WUS (block 1240). For example, the UE (e.g., using reception component 1402 and/or communication manager 1406, depicted in FIG. 14) may receive an on-demand SIB based at least in part on the UL-WUS, as described above.

[0136] Process 1200 may include additional aspects, such as any single aspect or any combination of aspects described below and/or in connection with one or more other processes described elsewhere herein.

[0137] In a first aspect, process 1200 includes receiving an MIB in an SSB that includes the plurality of bits, wherein the plurality of bits conveys the UL-WUS configuration based at least in part on no RMSI transmission being triggered.

[0138] In a second aspect, alone or in combination with the first aspect, process 1200 includes receiving the flag in an MIB, a PSS, an SSS, a DMRS, or via an implicit index modulation.

[0139] In a third aspect, alone or in combination with one or more of the first and second aspects, the UL-WUS configuration is based at least in part on a set of preconfigured or indicated configurations.

[0140] In a fourth aspect, alone or in combination with one or more of the first through third aspects, process 1200 includes receiving a PDCCH transmission that includes the plurality of bits, wherein the plurality of bits conveys the UL-WUS configuration based at least in part on no RMSI transmission being triggered.

[0141] In a fifth aspect, alone or in combination with one or more of the first through fourth aspects, process 1200 includes receiving the flag in a PSS, an SSS, a DMRS, or a PBCH.

[0142] In a sixth aspect, alone or in combination with one or more of the first through fifth aspects, a PDCCH carrying an UL-WUS configuration and a PDCCH carrying a SIB are associated with same PDCCH monitoring occasions.

[0143] In a seventh aspect, alone or in combination with one or more of the first through sixth aspects, a PDCCH carrying an UL-WUS configuration and a PDCCH carrying a SIB are associated with different PDCCH monitoring occasions.

[0144] In an eighth aspect, alone or in combination with one or more of the first through seventh aspects, process 1200 includes receiving a PDCCH transmission that includes the plurality of bits, the plurality of bits conveys the UL-WUS configuration and the RMSI configuration, and the RMSI configuration indicates a conditional grant for an RMSI transmission.

[0145] In a ninth aspect, alone or in combination with one or more of the first through eighth aspects, process 1200 includes receiving an indication that indicates whether the RMSI transmission is triggered, wherein the indication activates or deactivates the UL-WUS, or the indication is implicitly indicated based at least in part on the UL-WUS configuration being provided in the PDCCH transmission.

[0146] In a tenth aspect, alone or in combination with one or more of the first through ninth aspects, the on-demand SIB is received for a preconfigured or indicated number of periods, or the on-demand SIB is received in a requested beam direction.

[0147] In an eleventh aspect, alone or in combination with one or more of the first through tenth aspects, process 1200 includes receiving a PDCCH transmission that includes the plurality of bits, wherein the PDCCH transmission further indicates minimum required information for determining whether a cell is suitable for camping by the UE, and the minimum required information is associated with a PLMN ID and access related information.

[0148] In a twelfth aspect, alone or in combination with one or more of the first through eleventh aspects, the

PDCCH transmission includes a hashed version of the PLMN ID, the cell is suitable for camping by the UE based at least in part on the hashed version of the PLMN ID corresponding to a UE registered ID, the UL-WUS is transmitted to request full information based at least in part on the cell being suitable for camping by the UE, and at least a portion of the full information is received in a PDSCH transmission.

[0149] In a thirteenth aspect, alone or in combination with one or more of the first through twelfth aspects, the flag is indicated using a reserved value of an SSB parameter.

[0150] Although FIG. 12 shows example blocks of process 1200, in some aspects, process 1200 may include additional blocks, fewer blocks, different blocks, or differently arranged blocks than those depicted in FIG. 12. Additionally, or alternatively, two or more of the blocks of process 1200 may be performed in parallel.

[0151] FIG. 13 is a diagram illustrating an example process 1300 performed, for example, at a network node or an apparatus of a network node, in accordance with the present disclosure. Example process 1300 is an example where the apparatus or the network node (e.g., network node 110) performs operations associated with configuring UL-WUSs for on-demand SIBs.

[0152] As shown in FIG. 13, in some aspects, process 1300 may include transmitting a plurality of bits corresponding to one or more of an UL-WUS configuration or an RMSI configuration (block 1310). For example, the network node (e.g., using transmission component 1504 and/or communication manager 1506, depicted in FIG. 15) may transmit a plurality of bits corresponding to one or more of an UL-WUS configuration or an RMSI configuration, as described above.

[0153] As further shown in FIG. 13, in some aspects, process 1300 may include transmitting a flag associated with an interpretation of the plurality of bits (block 1320). For example, the network node (e.g., using transmission component 1504 and/or communication manager 1506, depicted in FIG. 15) may transmit a flag associated with an interpretation of the plurality of bits, as described above.

[0154] As further shown in FIG. 13, in some aspects, process 1300 may include receiving an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration (block 1330). For example, the network node (e.g., using reception component 1502 and/or communication manager 1506, depicted in FIG. 15) may receive an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration, as described above.

[0155] As further shown in FIG. 13, in some aspects, process 1300 may include transmitting an on-demand SIB based at least in part on the UL-WUS (block 1340). For example, the network node (e.g., using transmission component 1504 and/or communication manager 1506, depicted in FIG. 15) may transmit an on-demand SIB based at least in part on the UL-WUS, as described above.

[0156] Process 1300 may include additional aspects, such as any single aspect or any combination of aspects described below and/or in connection with one or more other processes described elsewhere herein.

[0157] In a first aspect, process 1300 includes transmitting an MIB in an SSB that includes the plurality of bits, wherein

the plurality of bits conveys the UL-WUS configuration based at least in part on no RMSI transmission being triggered.

[0158] In a second aspect, alone or in combination with the first aspect, process **1300** includes transmitting the flag in an MIB, a PSS, an SSS, a DMRS, or via an implicit index modulation.

[0159] In a third aspect, alone or in combination with one or more of the first and second aspects, the UL-WUS configuration is based at least in part on a set of preconfigured or indicated configurations.

[0160] In a fourth aspect, alone or in combination with one or more of the first through third aspects, process **1300** includes transmitting a PDCCH transmission that includes the plurality of bits, wherein the plurality of bits conveys the UL-WUS configuration based at least in part on no RMSI transmission being triggered.

[0161] In a fifth aspect, alone or in combination with one or more of the first through fourth aspects, process **1300** includes transmitting the flag in a PSS, an SSS, a DMRS, or a PBCH.

[0162] In a sixth aspect, alone or in combination with one or more of the first through fifth aspects, a PDCCH carrying an UL-WUS configuration and a PDCCH carrying a SIB are associated with same PDCCH monitoring occasions.

[0163] In a seventh aspect, alone or in combination with one or more of the first through sixth aspects, a PDCCH carrying an UL-WUS configuration and a PDCCH carrying a SIB are associated with different PDCCH monitoring occasions.

[0164] In an eighth aspect, alone or in combination with one or more of the first through seventh aspects, process **1300** includes transmitting a PDCCH transmission that includes the plurality of bits, the plurality of bits conveys the UL-WUS configuration and the RMSI configuration, and the RMSI configuration indicates a conditional grant for an RMSI transmission.

[0165] In a ninth aspect, alone or in combination with one or more of the first through eighth aspects, process **1300** includes transmitting an indication that indicates whether the RMSI transmission is triggered, wherein the indication activates or deactivates the UL-WUS, or the indication is implicitly indicated based at least in part on the UL-WUS configuration being provided in the PDCCH transmission.

[0166] In a tenth aspect, alone or in combination with one or more of the first through ninth aspects, the on-demand SIB is transmitted for a preconfigured or indicated number of periods, or the on-demand SIB is transmitted in a requested beam direction.

[0167] In an eleventh aspect, alone or in combination with one or more of the first through tenth aspects, process **1300** includes transmitting a PDCCH transmission that includes the plurality of bits, wherein the PDCCH transmission further indicates minimum required information for determining whether a cell is suitable for camping by a UE, and the minimum required information is associated with a PLMN ID and access related information.

[0168] In a twelfth aspect, alone or in combination with one or more of the first through eleventh aspects, the PDCCH transmission includes a hashed version of the PLMN ID, the cell is suitable for camping by the UE based at least in part on the hashed version of the PLMN ID corresponding to a UE registered ID, the UL-WUS is received to request full information based at least in part on

the cell being suitable for camping by the UE, and at least a portion of the full information is transmitted in a PDSCH transmission.

[0169] In a thirteenth aspect, alone or in combination with one or more of the first through twelfth aspects, the flag is indicated using a reserved value of an SSB parameter.

[0170] Although FIG. **13** shows example blocks of process **1300**, in some aspects, process **1300** may include additional blocks, fewer blocks, different blocks, or differently arranged blocks than those depicted in FIG. **13**. Additionally, or alternatively, two or more of the blocks of process **1300** may be performed in parallel.

[0171] FIG. **14** is a diagram of an example apparatus **1400** for wireless communication, in accordance with the present disclosure. The apparatus **1400** may be a UE, or a UE may include the apparatus **1400**. In some aspects, the apparatus **1400** includes a reception component **1402**, a transmission component **1404**, and/or a communication manager **1406**, which may be in communication with one another (for example, via one or more buses and/or one or more other components). In some aspects, the communication manager **1406** is the communication manager **140** described in connection with FIG. **1**. As shown, the apparatus **1400** may communicate with another apparatus **1408**, such as a UE or a network node (such as a CU, a DU, an RU, or a base station), using the reception component **1402** and the transmission component **1404**.

[0172] In some aspects, the apparatus **1400** may be configured to perform one or more operations described herein in connection with FIGS. **4-11**. Additionally, or alternatively, the apparatus **1400** may be configured to perform one or more processes described herein, such as process **1200** of FIG. **12**, or a combination thereof. In some aspects, the apparatus **1400** and/or one or more components shown in FIG. **14** may include one or more components of the UE described in connection with FIG. **2**. Additionally, or alternatively, one or more components shown in FIG. **14** may be implemented within one or more components described in connection with FIG. **2**. Additionally, or alternatively, one or more components of the set of components may be implemented at least in part as software stored in one or more memories. For example, a component (or a portion of a component) may be implemented as instructions or code stored in a non-transitory computer-readable medium and executable by one or more controllers or one or more processors to perform the functions or operations of the component.

[0173] The reception component **1402** may receive communications, such as reference signals, control information, data communications, or a combination thereof, from the apparatus **1408**. The reception component **1402** may provide received communications to one or more other components of the apparatus **1400**. In some aspects, the reception component **1402** may perform signal processing on the received communications (such as filtering, amplification, demodulation, analog-to-digital conversion, demultiplexing, deinterleaving, de-mapping, equalization, interference cancellation, or decoding, among other examples), and may provide the processed signals to the one or more other components of the apparatus **1400**. In some aspects, the reception component **1402** may include one or more antennas, one or more modems, one or more demodulators, one or more MIMO detectors, one or more receive processors,

one or more controllers/processors, one or more memories, or a combination thereof, of the UE described in connection with FIG. 2.

[0174] The transmission component 1404 may transmit communications, such as reference signals, control information, data communications, or a combination thereof, to the apparatus 1408. In some aspects, one or more other components of the apparatus 1400 may generate communications and may provide the generated communications to the transmission component 1404 for transmission to the apparatus 1408. In some aspects, the transmission component 1404 may perform signal processing on the generated communications (such as filtering, amplification, modulation, digital-to-analog conversion, multiplexing, interleaving, mapping, or encoding, among other examples), and may transmit the processed signals to the apparatus 1408. In some aspects, the transmission component 1404 may include one or more antennas, one or more modems, one or more modulators, one or more transmit MIMO processors, one or more transmit processors, one or more controllers/processors, one or more memories, or a combination thereof, of the UE described in connection with FIG. 2. In some aspects, the transmission component 1404 may be co-located with the reception component 1402 in one or more transceivers.

[0175] The communication manager 1406 may support operations of the reception component 1402 and/or the transmission component 1404. For example, the communication manager 1406 may receive information associated with configuring reception of communications by the reception component 1402 and/or transmission of communications by the transmission component 1404. Additionally, or alternatively, the communication manager 1406 may generate and/or provide control information to the reception component 1402 and/or the transmission component 1404 to control reception and/or transmission of communications.

[0176] The reception component 1402 may receive a plurality of bits corresponding to one or more of an UL-WUS configuration or an RMSI configuration. The reception component 1402 may receive a flag associated with an interpretation of the plurality of bits. The transmission component 1404 may transmit an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration. The reception component 1402 may receive an on-demand SIB based at least in part on the UL-WUS.

[0177] The number and arrangement of components shown in FIG. 14 are provided as an example. In practice, there may be additional components, fewer components, different components, or differently arranged components than those shown in FIG. 14. Furthermore, two or more components shown in FIG. 14 may be implemented within a single component, or a single component shown in FIG. 14 may be implemented as multiple, distributed components. Additionally, or alternatively, a set of (one or more) components shown in FIG. 14 may perform one or more functions described as being performed by another set of components shown in FIG. 14.

[0178] FIG. 15 is a diagram of an example apparatus 1500 for wireless communication, in accordance with the present disclosure. The apparatus 1500 may be a network node, or a network node may include the apparatus 1500. In some aspects, the apparatus 1500 includes a reception component 1502, a transmission component 1504, and/or a communication manager 1506, which may be in communication with

one another (for example, via one or more buses and/or one or more other components). In some aspects, the communication manager 1506 is the communication manager 150 described in connection with FIG. 1. As shown, the apparatus 1500 may communicate with another apparatus 1508, such as a UE or a network node (such as a CU, a DU, an RU, or a base station), using the reception component 1502 and the transmission component 1504.

[0179] In some aspects, the apparatus 1500 may be configured to perform one or more operations described herein in connection with FIGS. 4-11. Additionally, or alternatively, the apparatus 1500 may be configured to perform one or more processes described herein, such as process 1300 of FIG. 13, or a combination thereof. In some aspects, the apparatus 1500 and/or one or more components shown in FIG. 15 may include one or more components of the network node described in connection with FIG. 2. Additionally, or alternatively, one or more components shown in FIG. 15 may be implemented within one or more components described in connection with FIG. 2. Additionally, or alternatively, one or more components of the set of components may be implemented at least in part as software stored in one or more memories. For example, a component (or a portion of a component) may be implemented as instructions or code stored in a non-transitory computer-readable medium and executable by one or more controllers or one or more processors to perform the functions or operations of the component.

[0180] The reception component 1502 may receive communications, such as reference signals, control information, data communications, or a combination thereof, from the apparatus 1508. The reception component 1502 may provide received communications to one or more other components of the apparatus 1500. In some aspects, the reception component 1502 may perform signal processing on the received communications (such as filtering, amplification, demodulation, analog-to-digital conversion, demultiplexing, deinterleaving, de-mapping, equalization, interference cancellation, or decoding, among other examples), and may provide the processed signals to the one or more other components of the apparatus 1500. In some aspects, the reception component 1502 may include one or more antennas, one or more modems, one or more demodulators, one or more MIMO detectors, one or more receive processors, one or more controllers/processors, one or more memories, or a combination thereof, of the network node described in connection with FIG. 2. In some aspects, the reception component 1502 and/or the transmission component 1504 may include or may be included in a network interface. The network interface may be configured to obtain and/or output signals for the apparatus 1500 via one or more communications links, such as a backhaul link, a midhaul link, and/or a fronthaul link.

[0181] The transmission component 1504 may transmit communications, such as reference signals, control information, data communications, or a combination thereof, to the apparatus 1508. In some aspects, one or more other components of the apparatus 1500 may generate communications and may provide the generated communications to the transmission component 1504 for transmission to the apparatus 1508. In some aspects, the transmission component 1504 may perform signal processing on the generated communications (such as filtering, amplification, modulation, digital-to-analog conversion, multiplexing, interleaving,

mapping, or encoding, among other examples), and may transmit the processed signals to the apparatus 1508. In some aspects, the transmission component 1504 may include one or more antennas, one or more modems, one or more modulators, one or more transmit MIMO processors, one or more transmit processors, one or more controllers/processors, one or more memories, or a combination thereof, of the network node described in connection with FIG. 2. In some aspects, the transmission component 1504 may be co-located with the reception component 1502 in one or more transceivers.

[0182] The communication manager 1506 may support operations of the reception component 1502 and/or the transmission component 1504. For example, the communication manager 1506 may receive information associated with configuring reception of communications by the reception component 1502 and/or transmission of communications by the transmission component 1504. Additionally, or alternatively, the communication manager 1506 may generate and/or provide control information to the reception component 1502 and/or the transmission component 1504 to control reception and/or transmission of communications.

[0183] The transmission component 1504 may transmit a plurality of bits corresponding to one or more of an UL-WUS configuration or an RMSI configuration. The transmission component 1504 may transmit a flag associated with an interpretation of the plurality of bits. The reception component 1502 may receive an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration. The transmission component 1504 may transmit an on-demand SIB based at least in part on the UL-WUS.

[0184] The number and arrangement of components shown in FIG. 15 are provided as an example. In practice, there may be additional components, fewer components, different components, or differently arranged components than those shown in FIG. 15. Furthermore, two or more components shown in FIG. 15 may be implemented within a single component, or a single component shown in FIG. 15 may be implemented as multiple, distributed components. Additionally, or alternatively, a set of (one or more) components shown in FIG. 15 may perform one or more functions described as being performed by another set of components shown in FIG. 15.

[0185] The following provides an overview of some Aspects of the present disclosure:

[0186] Aspect 1: A method of wireless communication performed by a user equipment (UE), comprising: receiving a plurality of bits corresponding to one or more of an uplink wakeup signal (UL-WUS) configuration or a remaining minimum system information (RMSI) configuration; receiving a flag associated with an interpretation of the plurality of bits; transmitting an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration; and receiving an on-demand system information block (SIB) based at least in part on the UL-WUS.

[0187] Aspect 2: The method of Aspect 1, wherein receiving the plurality of bits comprises receiving a master information block (MIB) in a synchronization signal block (SSB) that includes the plurality of bits, wherein the plurality of bits conveys the UL-WUS configuration based at least in part on no RMSI transmission being triggered.

[0188] Aspect 3: The method of any of Aspects 1-2, wherein receiving the flag comprises receiving the flag in a

master information block (MIB), a primary synchronization signal (PSS), a secondary synchronization signal (SSS), a demodulation reference signal (DMRS), or via an implicit index modulation.

[0189] Aspect 4: The method of any of Aspects 1-3, wherein the UL-WUS configuration is based at least in part on a set of preconfigured or indicated configurations.

[0190] Aspect 5: The method of any of Aspects 1-4, wherein receiving the plurality of bits comprises receiving a physical downlink control channel (PDCCH) transmission that includes the plurality of bits, wherein the plurality of bits conveys the UL-WUS configuration based at least in part on no RMSI transmission being triggered.

[0191] Aspect 6: The method of any of Aspects 1-5, wherein receiving the flag comprises receiving the flag in a primary synchronization signal (PSS), a secondary synchronization signal (SSS), a demodulation reference signal (DMRS), or a physical broadcast channel (PBCH).

[0192] Aspect 7: The method of any of Aspects 1-6, wherein a physical downlink control channel (PDCCH) carrying an UL-WUS configuration and a PDCCH carrying a SIB are associated with same PDCCH monitoring occasions.

[0193] Aspect 8: The method of any of Aspects 1-7, wherein a physical downlink control channel (PDCCH) carrying an UL-WUS configuration and a PDCCH carrying a SIB are associated with different PDCCH monitoring occasions.

[0194] Aspect 9: The method of any of Aspects 1-8, wherein receiving the plurality of bits comprises receiving a physical downlink control channel (PDCCH) transmission that includes the plurality of bits, the plurality of bits conveys the UL-WUS configuration and the RMSI configuration, and the RMSI configuration indicates a conditional grant for an RMSI transmission.

[0195] Aspect 10: The method of Aspect 9, further comprising: receiving an indication that indicates whether the RMSI transmission is triggered, wherein the indication activates or deactivates the UL-WUS, or the indication is implicitly indicated based at least in part on the UL-WUS configuration being provided in the PDCCH transmission.

[0196] Aspect 11: The method of any of Aspects 1-10, wherein: the on-demand SIB is received for a preconfigured or indicated number of periods; or the on-demand SIB is received in a requested beam direction.

[0197] Aspect 12: The method of any of Aspects 1-11, wherein receiving the plurality of bits comprises receiving a physical downlink control channel (PDCCH) transmission that includes the plurality of bits, wherein the PDCCH transmission further indicates minimum required information for determining whether a cell is suitable for camping by the UE, and the minimum required information is associated with a public land mobile network (PLMN) identifier (ID) and access related information.

[0198] Aspect 13: The method of Aspect 12, wherein the PDCCH transmission includes a hashed version of the PLMN ID, the cell is suitable for camping by the UE based at least in part on the hashed version of the PLMN ID corresponding to a UE registered ID, the UL-WUS is transmitted to request full information based at least in part on the cell being suitable for camping by the UE, and at least a portion of the full information is received in a physical downlink shared channel (PDSCH) transmission.

[0199] Aspect 14: The method of any of Aspects 1-13, wherein the flag is indicated using a reserved value of an SSB parameter.

[0200] Aspect 15: A method of wireless communication performed by a network node, comprising: transmitting a plurality of bits corresponding to one or more of an uplink wakeup signal (UL-WUS) configuration or a remaining minimum system information (RMSI) configuration; transmitting a flag associated with an interpretation of the plurality of bits; receiving an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration; and transmitting an on-demand system information block (SIB) based at least in part on the UL-WUS.

[0201] Aspect 16: The method of Aspect 15, wherein transmitting the plurality of bits comprises transmitting a master information block (MIB) in a synchronization signal block (SSB) that includes the plurality of bits, wherein the plurality of bits conveys the UL-WUS configuration based at least in part on no RMSI transmission being triggered.

[0202] Aspect 17: The method of any of Aspects 15-16, wherein transmitting the flag comprises transmitting the flag in a master information block (MIB), a primary synchronization signal (PSS), a secondary synchronization signal (SSS), a demodulation reference signal (DMRS), or via an implicit index modulation.

[0203] Aspect 18: The method of any of Aspects 15-17, wherein the UL-WUS configuration is based at least in part on a set of preconfigured or indicated configurations.

[0204] Aspect 19: The method of any of Aspects 15-18, wherein transmitting the plurality of bits comprises transmitting a physical downlink control channel (PDCCH) transmission that includes the plurality of bits, wherein the plurality of bits conveys the UL-WUS configuration based at least in part on no RMSI transmission being triggered.

[0205] Aspect 20: The method of any of Aspects 15-19, wherein transmitting the flag comprises transmitting the flag in a primary synchronization signal (PSS), a secondary synchronization signal (SSS), a demodulation reference signal (DMRS), or a physical broadcast channel (PBCH).

[0206] Aspect 21: The method of any of Aspects 15-20, wherein a physical downlink control channel (PDCCH) carrying an UL-WUS configuration and a PDCCH carrying a SIB are associated with same PDCCH monitoring occasions.

[0207] Aspect 22: The method of any of Aspects 15-21, wherein a physical downlink control channel (PDCCH) carrying an UL-WUS configuration and a PDCCH carrying a SIB are associated with different PDCCH monitoring occasions.

[0208] Aspect 23: The method of any of Aspects 15-22, wherein transmitting the plurality of bits comprises transmitting a physical downlink control channel (PDCCH) transmission that includes the plurality of bits, the plurality of bits conveys the UL-WUS configuration and the RMSI configuration, and the RMSI configuration indicates a conditional grant for an RMSI transmission.

[0209] Aspect 24: The method of Aspect 23, further comprising: transmitting an indication that indicates whether the RMSI transmission is triggered, wherein the indication activates or deactivates the UL-WUS, or the indication is implicitly indicated based at least in part on the UL-WUS configuration being provided in the PDCCH transmission.

[0210] Aspect 25: The method of any of Aspects 15-24, wherein: the on-demand SIB is transmitted for a preconfig-

ured or indicated number of periods; or the on-demand SIB is transmitted in a requested beam direction.

[0211] Aspect 26: The method of any of Aspects 15-25, wherein transmitting the plurality of bits comprises transmitting a physical downlink control channel (PDCCH) transmission that includes the plurality of bits, wherein the PDCCH transmission further indicates minimum required information for determining whether a cell is suitable for camping by a user equipment (UE), and the minimum required information is associated with a public land mobile network (PLMN) identifier (ID) and access related information.

[0212] Aspect 27: The method of Aspect 26, wherein the PDCCH transmission includes a hashed version of the PLMN ID, the cell is suitable for camping by the UE based at least in part on the hashed version of the PLMN ID corresponding to a UE registered ID, the UL-WUS is received to request full information based at least in part on the cell being suitable for camping by the UE, and at least a portion of the full information is transmitted in a physical downlink shared channel (PDSCH) transmission.

[0213] Aspect 28: The method of any of Aspects 15-27, wherein the flag is indicated using a reserved value of an SSB parameter.

[0214] Aspect 29: An apparatus for wireless communication at a device, the apparatus comprising one or more processors; one or more memories coupled with the one or more processors; and instructions stored in the one or more memories and executable by the one or more processors to cause the apparatus to perform the method of one or more of Aspects 1-14.

[0215] Aspect 30: An apparatus for wireless communication at a device, the apparatus comprising one or more memories and one or more processors coupled to the one or more memories, the one or more processors configured to cause the device to perform the method of one or more of Aspects 1-14.

[0216] Aspect 31: An apparatus for wireless communication, the apparatus comprising at least one means for performing the method of one or more of Aspects 1-14.

[0217] Aspect 32: A non-transitory computer-readable medium storing code for wireless communication, the code comprising instructions executable by one or more processors to perform the method of one or more of Aspects 1-14.

[0218] Aspect 33: A non-transitory computer-readable medium storing a set of instructions for wireless communication, the set of instructions comprising one or more instructions that, when executed by one or more processors of a device, cause the device to perform the method of one or more of Aspects 1-14.

[0219] Aspect 34: A device for wireless communication, the device comprising a processing system that includes one or more processors and one or more memories coupled with the one or more processors, the processing system configured to cause the device to perform the method of one or more of Aspects 1-14.

[0220] Aspect 35: An apparatus for wireless communication at a device, the apparatus comprising one or more memories and one or more processors coupled to the one or more memories, the one or more processors individually or collectively configured to cause the device to perform the method of one or more of Aspects 1-14.

[0221] Aspect 36: An apparatus for wireless communication at a device, the apparatus comprising one or more

processors; one or more memories coupled with the one or more processors; and instructions stored in the one or more memories and executable by the one or more processors to cause the apparatus to perform the method of one or more of Aspects 15-28.

[0222] Aspect 37: An apparatus for wireless communication at a device, the apparatus comprising one or more memories and one or more processors coupled to the one or more memories, the one or more processors configured to cause the device to perform the method of one or more of Aspects 15-28.

[0223] Aspect 38: An apparatus for wireless communication, the apparatus comprising at least one means for performing the method of one or more of Aspects 15-28.

[0224] Aspect 39: A non-transitory computer-readable medium storing code for wireless communication, the code comprising instructions executable by one or more processors to perform the method of one or more of Aspects 15-28.

[0225] Aspect 40: A non-transitory computer-readable medium storing a set of instructions for wireless communication, the set of instructions comprising one or more instructions that, when executed by one or more processors of a device, cause the device to perform the method of one or more of Aspects 15-28.

[0226] Aspect 41: A device for wireless communication, the device comprising a processing system that includes one or more processors and one or more memories coupled with the one or more processors, the processing system configured to cause the device to perform the method of one or more of Aspects 15-28.

[0227] Aspect 42: An apparatus for wireless communication at a device, the apparatus comprising one or more memories and one or more processors coupled to the one or more memories, the one or more processors individually or collectively configured to cause the device to perform the method of one or more of Aspects 15-28.

[0228] The foregoing disclosure provides illustration and description but is not intended to be exhaustive or to limit the aspects to the precise forms disclosed. Modifications and variations may be made in light of the above disclosure or may be acquired from practice of the aspects.

[0229] As used herein, the term “component” is intended to be broadly construed as hardware or a combination of hardware and at least one of software or firmware. “Software” shall be construed broadly to mean instructions, instruction sets, code, code segments, program code, programs, subprograms, software modules, applications, software applications, software packages, routines, subroutines, objects, executables, threads of execution, procedures, or functions, among other examples, whether referred to as software, firmware, middleware, microcode, hardware description language, or otherwise. As used herein, a “processor” is implemented in hardware or a combination of hardware and software. It will be apparent that systems or methods described herein may be implemented in different forms of hardware or a combination of hardware and software. The actual specialized control hardware or software code used to implement these systems or methods is not limiting of the aspects. Thus, the operation and behavior of the systems or methods are described herein without reference to specific software code, because those skilled in the art will understand that software and hardware can be designed to implement the systems or methods based, at least in part, on the description herein. A component being

configured to perform a function means that the component has a capability to perform the function, and does not require the function to be actually performed by the component, unless noted otherwise.

[0230] As used herein, “satisfying a threshold” may, depending on the context, refer to a value being greater than the threshold, greater than or equal to the threshold, less than the threshold, less than or equal to the threshold, equal to the threshold, or not equal to the threshold, among other examples.

[0231] As used herein, a phrase referring to “at least one of” a list of items refers to any combination of those items, including single members. As an example, “at least one of: a, b, or c” is intended to cover a, b, c, a+b, a+c, b+c, and a+b+c, as well as any combination with multiples of the same element (for example, a+a, a+a+a, a+a+b, a+a+c, a+b+b, a+c+c, b+b, b+b+b, b+b+c, c+c, and c+c+c, or any other ordering of a, b, and c).

[0232] No element, act, or instruction used herein should be construed as critical or essential unless explicitly described as such. Also, as used herein, the articles “a” and “an” are intended to include one or more items and may be used interchangeably with “one or more.” Further, as used herein, the article “the” is intended to include one or more items referenced in connection with the article “the” and may be used interchangeably with “the one or more.” Furthermore, as used herein, the terms “set” and “group” are intended to include one or more items and may be used interchangeably with “one or more.” Where only one item is intended, the phrase “only one” or similar language is used. Also, as used herein, the terms “has,” “have,” “having,” and similar terms are intended to be open-ended terms that do not limit an element that they modify (for example, an element “having” A may also have B). Further, the phrase “based on” is intended to mean “based on or otherwise in association with” unless explicitly stated otherwise. Also, as used herein, the term “or” is intended to be inclusive when used in a series and may be used interchangeably with “and/or,” unless explicitly stated otherwise (for example, if used in combination with “either” or “only one of”). It should be understood that “one or more” is equivalent to “at least one.”

[0233] Even though particular combinations of features are recited in the claims or disclosed in the specification, these combinations are not intended to limit the disclosure of various aspects. Many of these features may be combined in ways not specifically recited in the claims or disclosed in the specification. The disclosure of various aspects includes each dependent claim in combination with every other claim in the claim set.

What is claimed is:

1. An apparatus for wireless communication, comprising:
 - one or more memories; and
 - one or more processors coupled to the one or more memories, the one or more processors individually or collectively configured to:
 - receive a plurality of bits corresponding to one or more of an uplink wakeup signal (UL-WUS) configuration or a remaining minimum system information (RMSI) configuration;
 - receive a flag associated with an interpretation of the plurality of bits;

- transmit an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration; and
 receive an on-demand system information block (SIB) based at least in part on the UL-WUS.
2. The apparatus of claim 1, wherein the one or more processors are individually or collectively configured to:
 receive a master information block (MIB) in a synchronization signal block (SSB) that includes the plurality of bits, wherein the plurality of bits conveys the UL-WUS configuration based at least in part on no RMSI transmission being triggered.
3. The apparatus of claim 1, wherein the one or more processors are individually or collectively configured to:
 receive the flag in a master information block (MIB), a primary synchronization signal (PSS), a secondary synchronization signal (SSS), a demodulation reference signal (DMRS), or via an implicit index modulation.
4. The apparatus of claim 1, wherein the UL-WUS configuration is based at least in part on a set of preconfigured or indicated configurations.
5. The apparatus of claim 1, wherein the one or more processors are individually or collectively configured to:
 receive a physical downlink control channel (PDCCH) transmission that includes the plurality of bits, wherein the plurality of bits conveys the UL-WUS configuration based at least in part on no RMSI transmission being triggered.
6. The apparatus of claim 1, wherein the one or more processors are individually or collectively configured to:
 receive the flag in a primary synchronization signal (PSS), a secondary synchronization signal (SSS), a demodulation reference signal (DMRS), or a physical broadcast channel (PBCH).
7. The apparatus of claim 1, wherein a physical downlink control channel (PDCCH) carrying an UL-WUS configuration and a PDCCH carrying a SIB are associated with same PDCCH monitoring occasions.
8. The apparatus of claim 1, wherein a physical downlink control channel (PDCCH) carrying an UL-WUS configuration and a PDCCH carrying a SIB are associated with different PDCCH monitoring occasions.
9. The apparatus of claim 1, wherein the one or more processors are individually or collectively configured to:
 receive a physical downlink control channel (PDCCH) transmission that includes the plurality of bits, the plurality of bits conveys the UL-WUS configuration and the RMSI configuration, and the RMSI configuration indicates a conditional grant for an RMSI transmission.
10. The apparatus of claim 9, wherein the one or more processors are individually or collectively configured to:
 receive an indication that indicates whether the RMSI transmission is triggered, wherein the indication activates or deactivates the UL-WUS, or the indication is implicitly indicated based at least in part on the UL-WUS configuration being provided in the PDCCH transmission.
11. The apparatus of claim 1, wherein:
 the on-demand SIB is received for a preconfigured or indicated number of periods; or
 the on-demand SIB is received in a requested beam direction.
12. The apparatus of claim 1, wherein the one or more processors are individually or collectively configured to:
 receive a physical downlink control channel (PDCCH) transmission that includes the plurality of bits, wherein the PDCCH transmission further indicates minimum required information for determining whether a cell is suitable for camping by a user equipment (UE), and the minimum required information is associated with a public land mobile network (PLMN) identifier (ID) and access related information.
13. The apparatus of claim 12, wherein the PDCCH transmission includes a hashed version of the PLMN ID, the cell is suitable for camping by the UE based at least in part on the hashed version of the PLMN ID corresponding to a UE registered ID, the UL-WUS is transmitted to request full information based at least in part on the cell being suitable for camping by the UE, and at least a portion of the full information is received in a physical downlink shared channel (PDSCH) transmission.
14. The apparatus of claim 1, wherein the flag is indicated using a reserved value of an SSB parameter.
15. An apparatus for wireless communication, comprising:
 one or more memories; and
 one or more processors coupled to the one or more memories, the one or more processors individually or collectively configured to:
 transmit a plurality of bits corresponding to one or more of an uplink wakeup signal (UL-WUS) configuration or a remaining minimum system information (RMSI) configuration;
 transmit a flag associated with an interpretation of the plurality of bits;
 receive an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration; and
 transmit an on-demand system information block (SIB) based at least in part on the UL-WUS.
16. The apparatus of claim 15, wherein the one or more processors are individually or collectively configured to:
 transmit a master information block (MIB) in a synchronization signal block (SSB) that includes the plurality of bits, wherein the plurality of bits conveys the UL-WUS configuration based at least in part on no RMSI transmission being triggered; and
 transmit the flag in a master information block (MIB), a primary synchronization signal (PSS), a secondary synchronization signal (SSS), a demodulation reference signal (DMRS), or via an implicit index modulation.
17. The apparatus of claim 15, wherein the one or more processors are individually or collectively configured to:
 transmit a physical downlink control channel (PDCCH) transmission that includes the plurality of bits, wherein the plurality of bits conveys the UL-WUS configuration based at least in part on no RMSI transmission being triggered; and
 transmit the flag in a primary synchronization signal (PSS), a secondary synchronization signal (SSS), a demodulation reference signal (DMRS), or a physical broadcast channel (PBCH).
18. The apparatus of claim 15, wherein the one or more processors are individually or collectively configured to:

transmit a physical downlink control channel (PDCCH) transmission that includes the plurality of bits, the plurality of bits conveys the UL-WUS configuration and the RMSI configuration, and the RMSI configuration indicates a conditional grant for an RMSI transmission; and

transmit an indication that indicates whether the RMSI transmission is triggered, wherein the indication activates or deactivates the UL-WUS, or the indication is implicitly indicated based at least in part on the UL-WUS configuration being provided in the PDCCH transmission.

19. The apparatus of claim **15**, wherein the one or more processors are individually or collectively configured to:

transmit a physical downlink control channel (PDCCH) transmission that includes the plurality of bits, wherein the PDCCH transmission further indicates minimum required information for determining whether a cell is

suitable for camping by a user equipment (UE), and the minimum required information is associated with a public land mobile network (PLMN) identifier (ID) and access related information.

20. A method of wireless communication performed by a user equipment (UE), comprising:

receiving a plurality of bits corresponding to one or more of an uplink wakeup signal (UL-WUS) configuration or a remaining minimum system information (RMSI) configuration;

receiving a flag associated with an interpretation of the plurality of bits;

transmitting an UL-WUS based at least in part on the plurality of bits corresponding to the UL-WUS configuration; and

receiving an on-demand system information block (SIB) based at least in part on the UL-WUS.

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