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(54) **PHYSICAL RANDOM ACCESS CHANNEL CONFIGURATIONS FOR FULL DUPLEX SYMBOLS**

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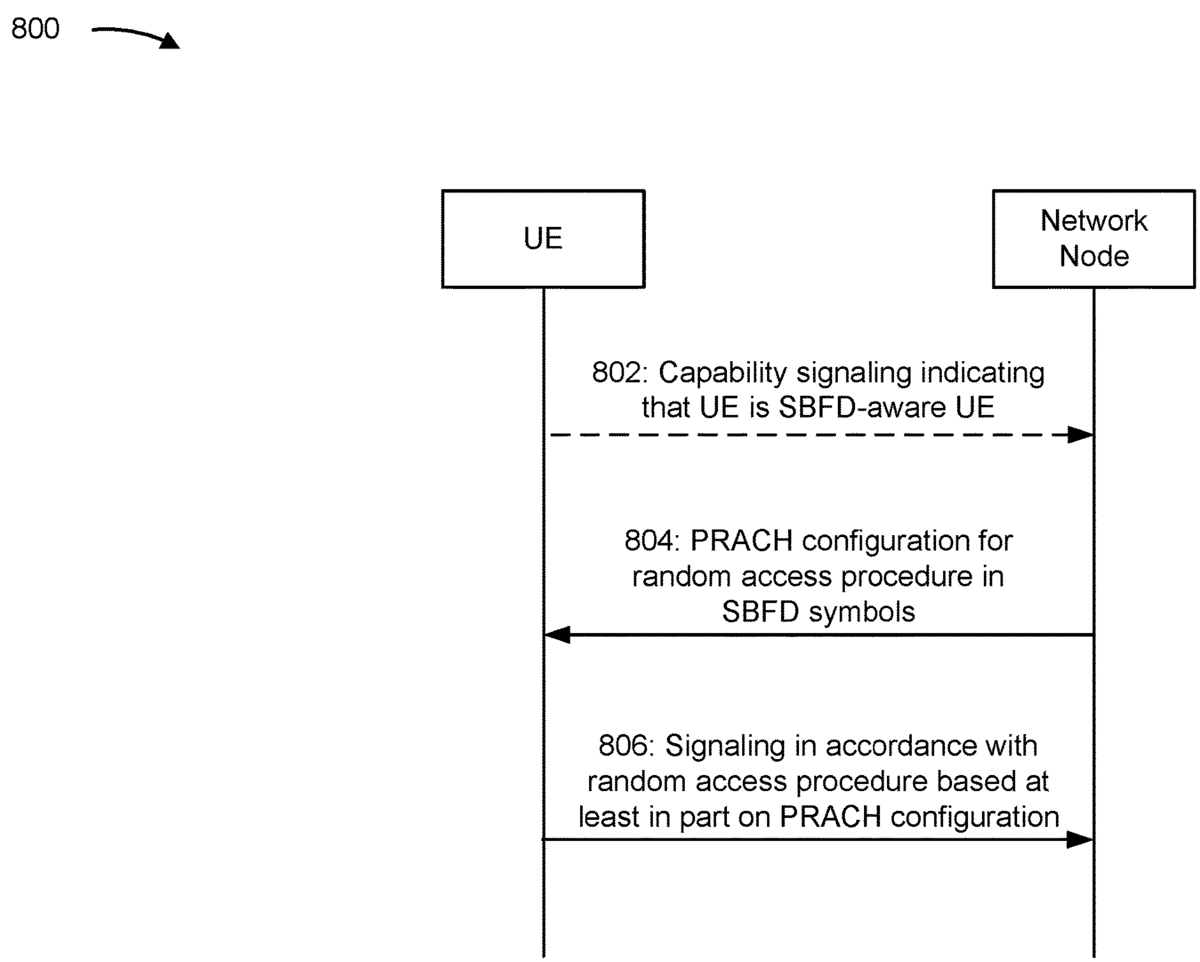
CPC ***H04W 74/0833*** (2013.01); ***H04L 5/14*** (2013.01)

(57) **ABSTRACT**

Various aspects of the present disclosure generally relate to wireless communication. In some aspects, a user equipment (UE) may receive a physical random access channel (PRACH) configuration for a random access procedure in subband full duplex (SBFD) symbols. The UE may transmit signaling in accordance with the random access procedure based at least in part on the PRACH configuration. Numerous other aspects are described.



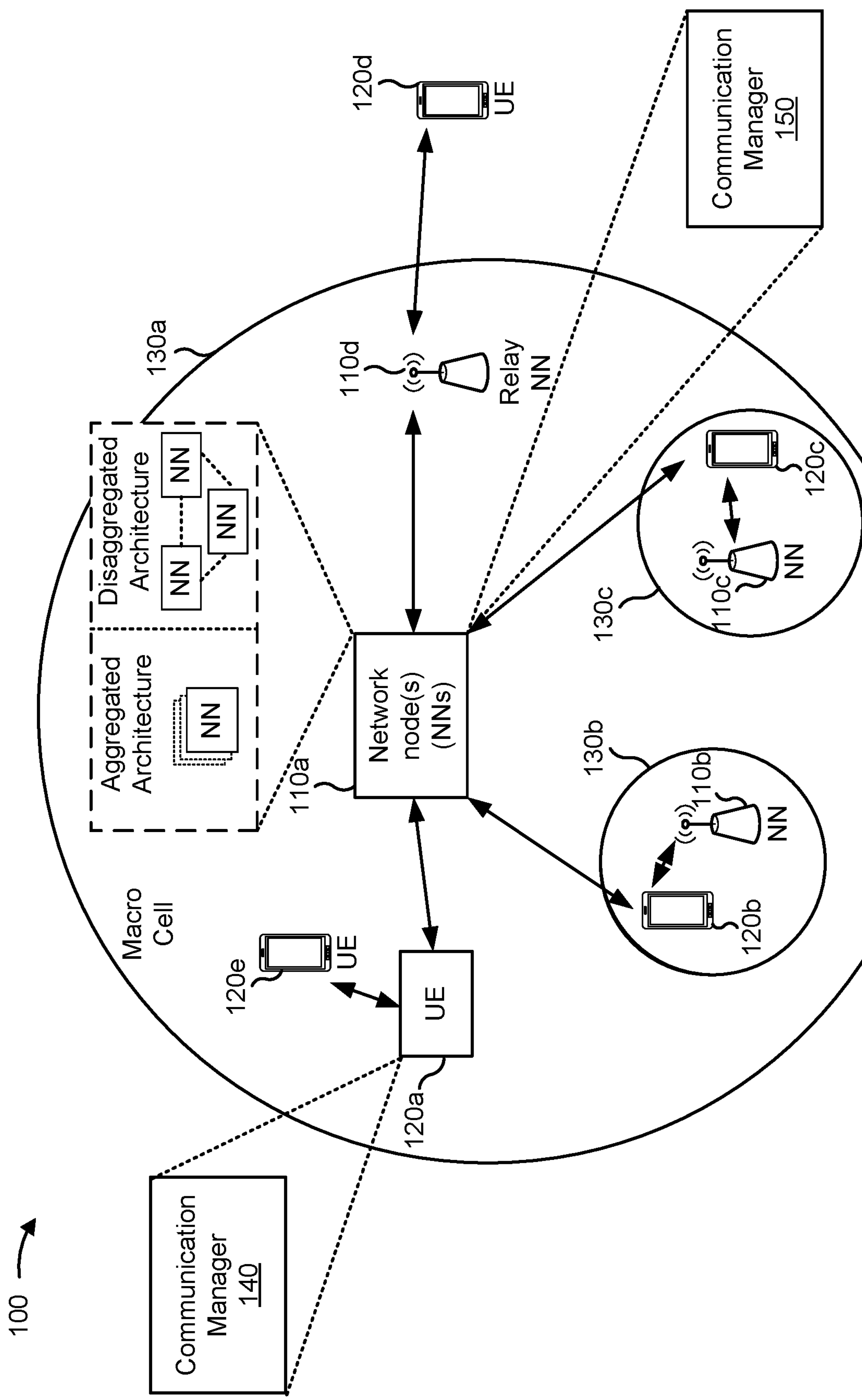

100
Communication Manager 140
120a
UE
120e
UE
Macro Cell
Aggregated Architecture
NN
Disaggregated Architecture
NN
NN
NN
110a
Network node(s) (NNs)
130a
110d
Relay NN
120d
UE
Communication Manager 150
130b
110b
NN
120b
130c
110c
NN
120c

FIG. 1

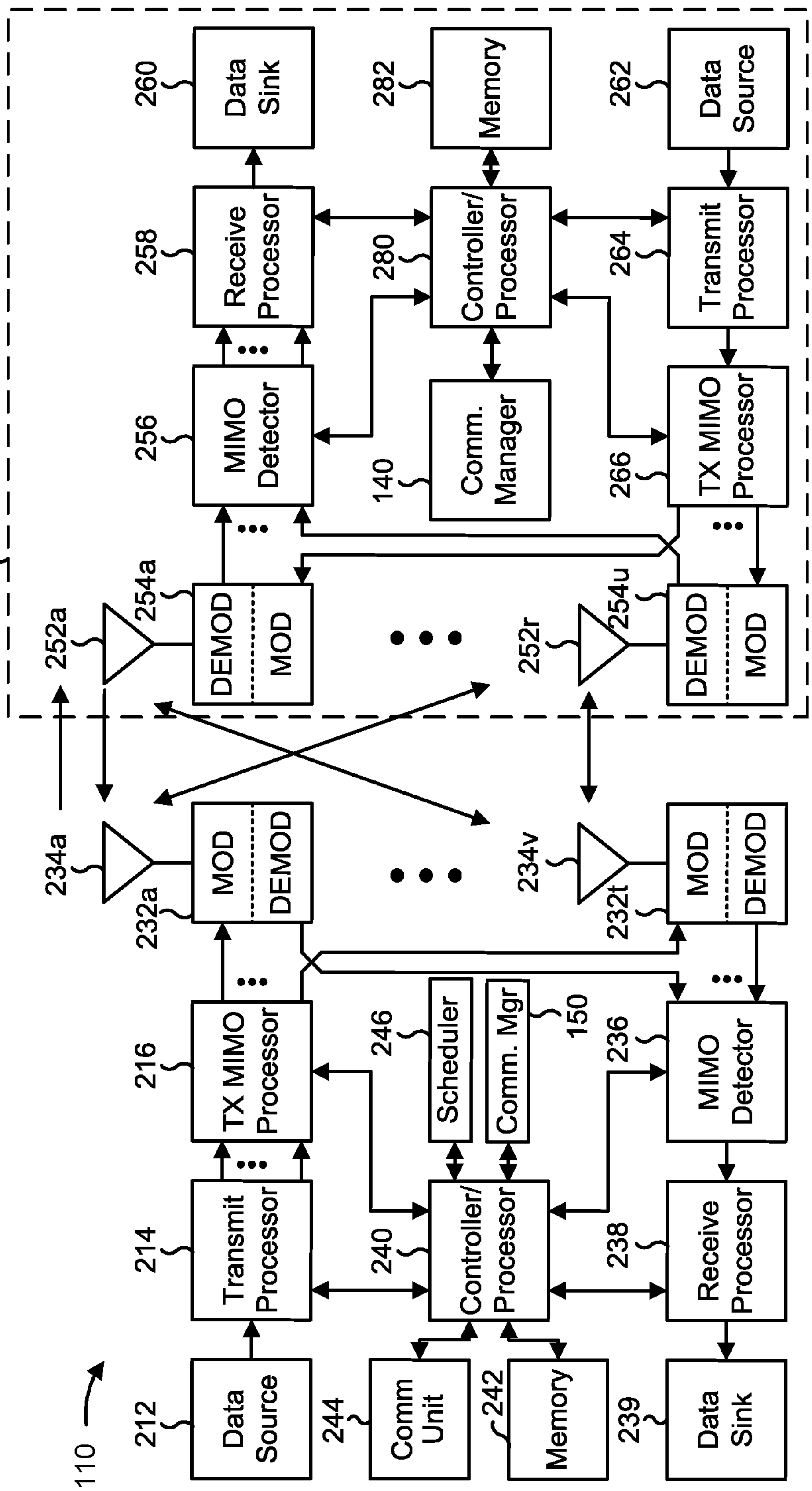
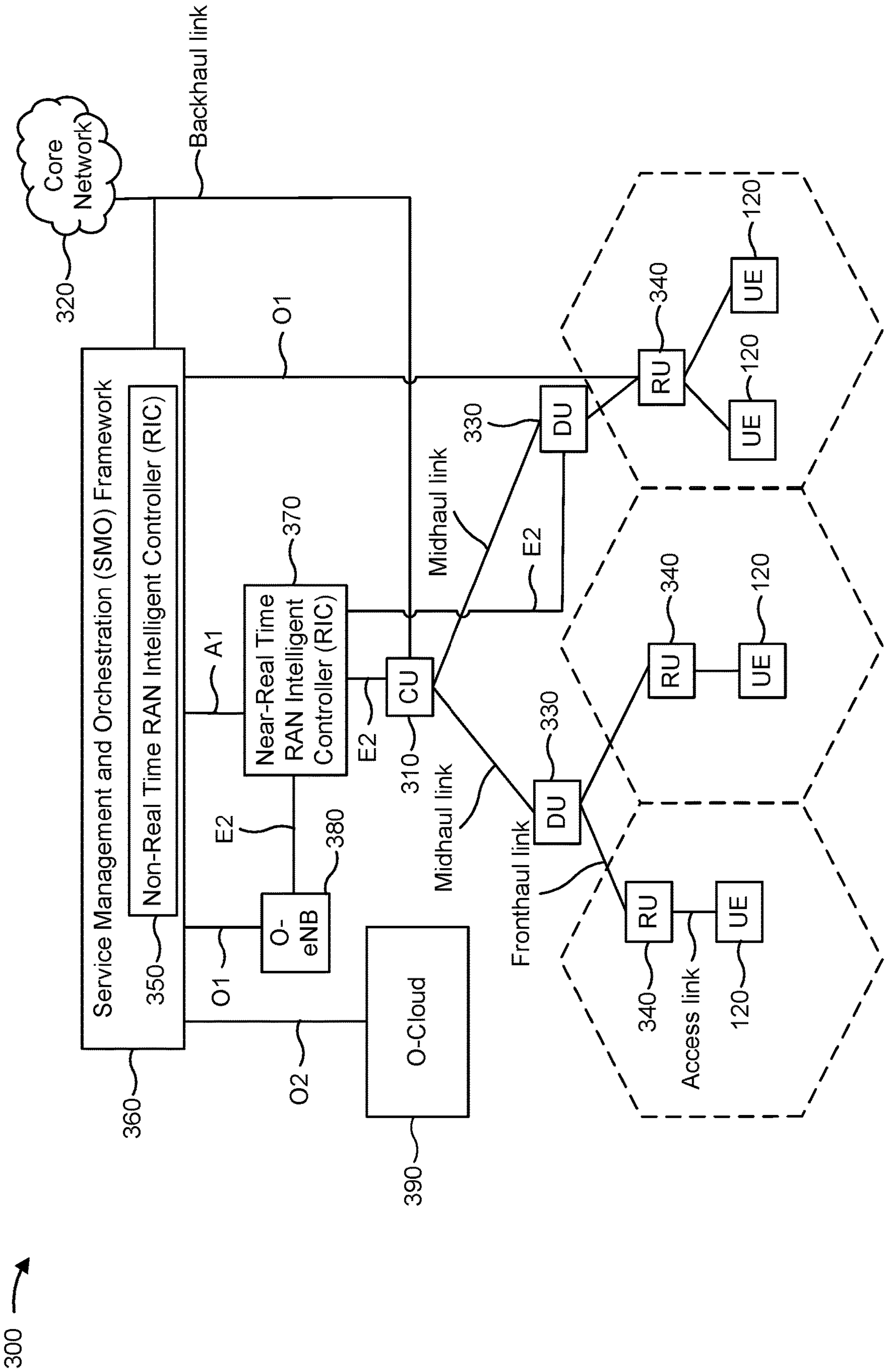

120
284
260
Data Sink
282
Memory
262
Data Source
258
Receive Processor
280
Controller/ Processor
264
Transmit Processor
256
MIMO Detector
140
Comm. Manager
266
TX MIMO Processor
252a
254a
DEMOD
MOD
252r
254u
DEMOD
MOD
234a
232a
MOD
DEMOD
234v
232t
MOD
DEMOD
216
TX MIMO Processor
246
Scheduler
Comm. Mgr
150
236
MIMO Detector
214
Transmit Processor
240
Controller/ Processor
238
Receive Processor
212
Data Source
244
Comm Unit
242
Memory
239
Data Sink
110

FIG. 2



300
Core Network
320
Backhaul link
Service Management and Orchestration (SMO) Framework
Non-Real Time RAN Intelligent Controller (RIC)
350
360
O1
A1
Near-Real Time RAN Intelligent Controller (RIC)
370
E2
CU
310
DU
330
RU
340
UE
120
Midhaul link
Fronthaul link
Access link
O-eNB
380
O-Cloud
390
O2

FIG. 3

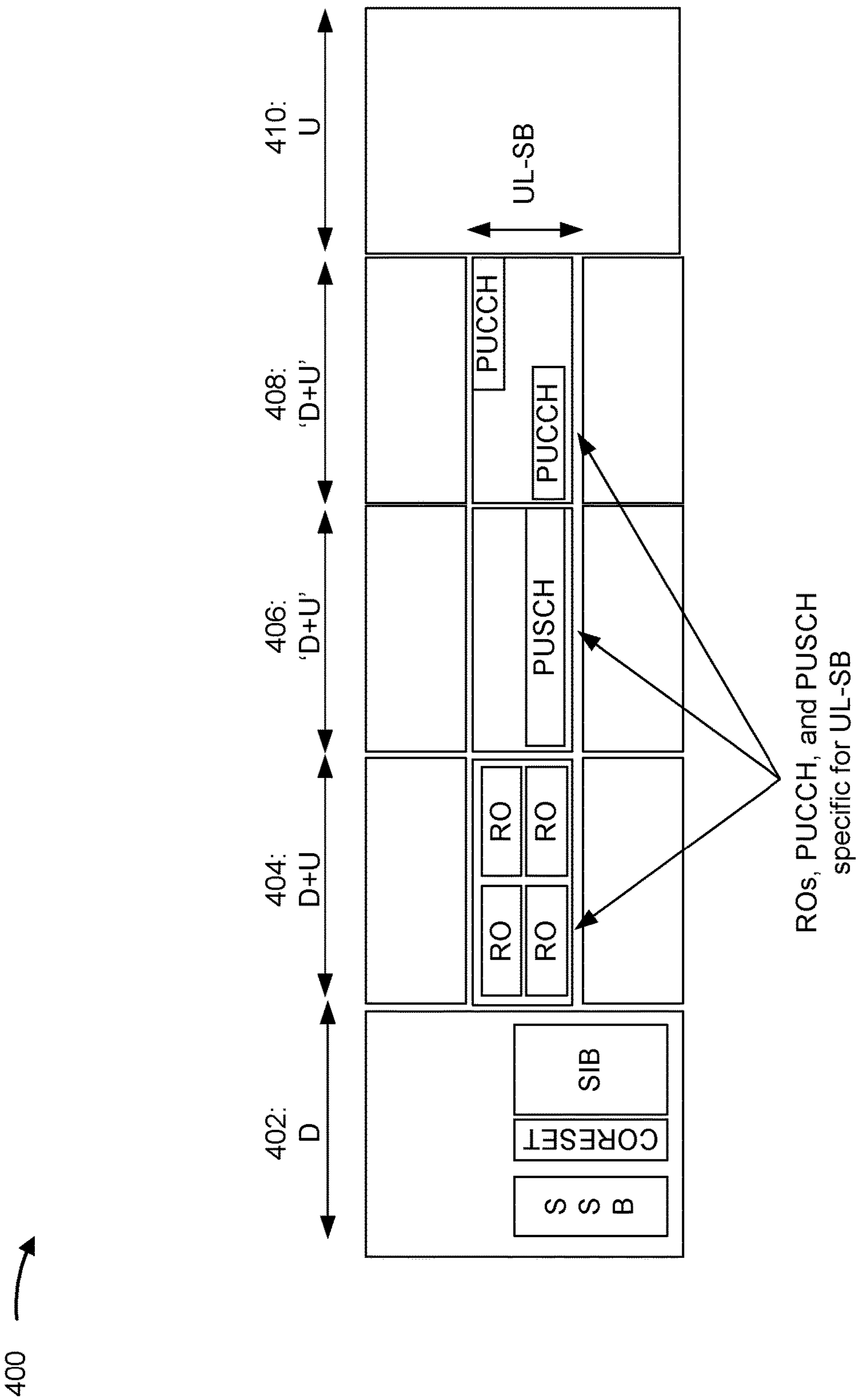
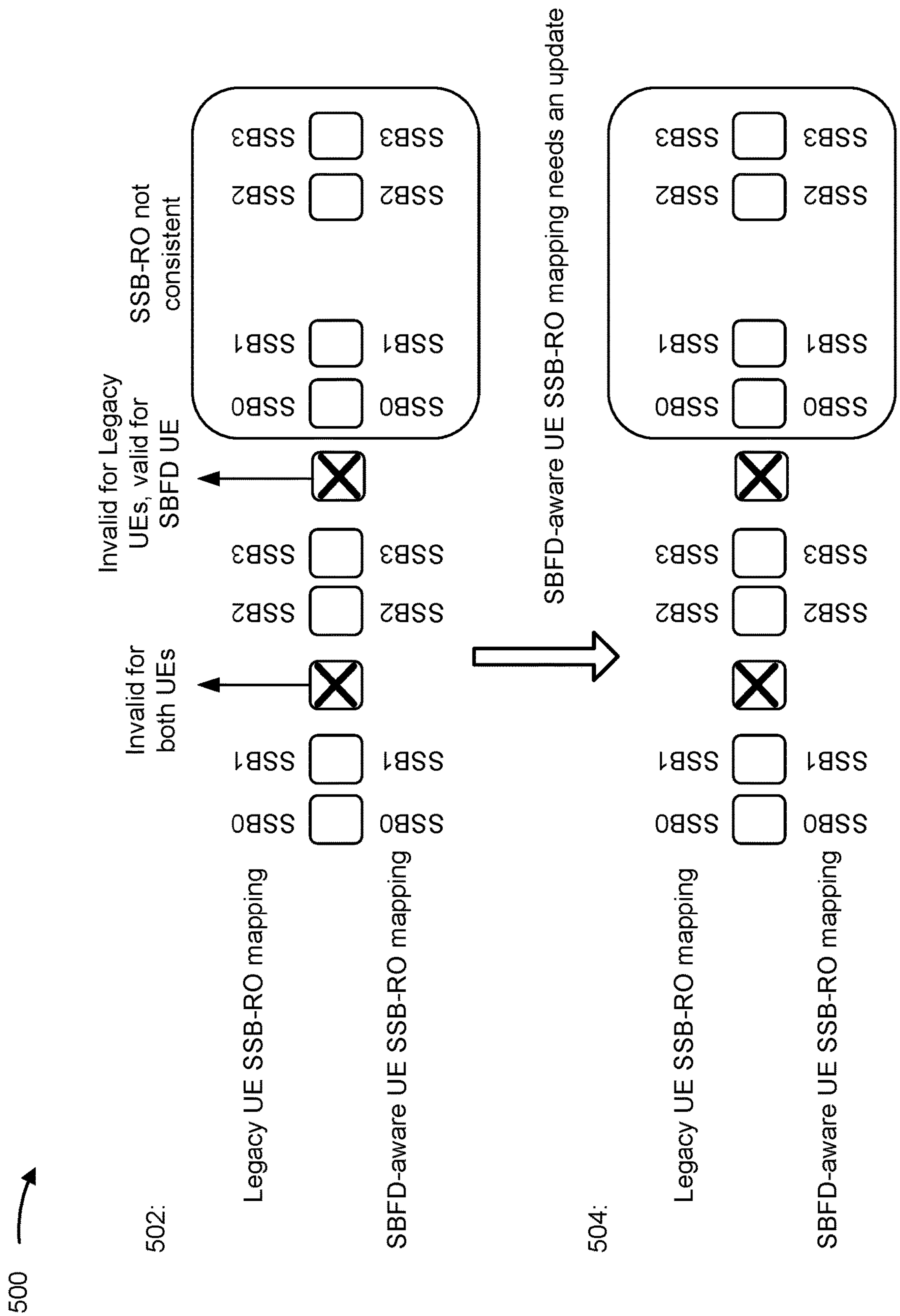

400
402: D
404: D+U
406: 'D+U'
408: 'D+U'
410: U
SSB
CORESET
SIB
RO
RO
RO
RO
PUSCH
PUCCH
PUCCH
UL-SB
ROs, PUCCH, and PUSCH specific for UL-SB

FIG. 4



500
502:
Legacy UE SSB-RO mapping
SBFD-aware UE SSB-RO mapping
SSB0
SSB1
SSB2
SSB3
Invalid for both UEs
Invalid for Legacy UEs, valid for SBFD UE
SSB-RO not consistent
SBFD-aware UE SSB-RO mapping needs an update
504:
Legacy UE SSB-RO mapping
SBFD-aware UE SSB-RO mapping

FIG. 5

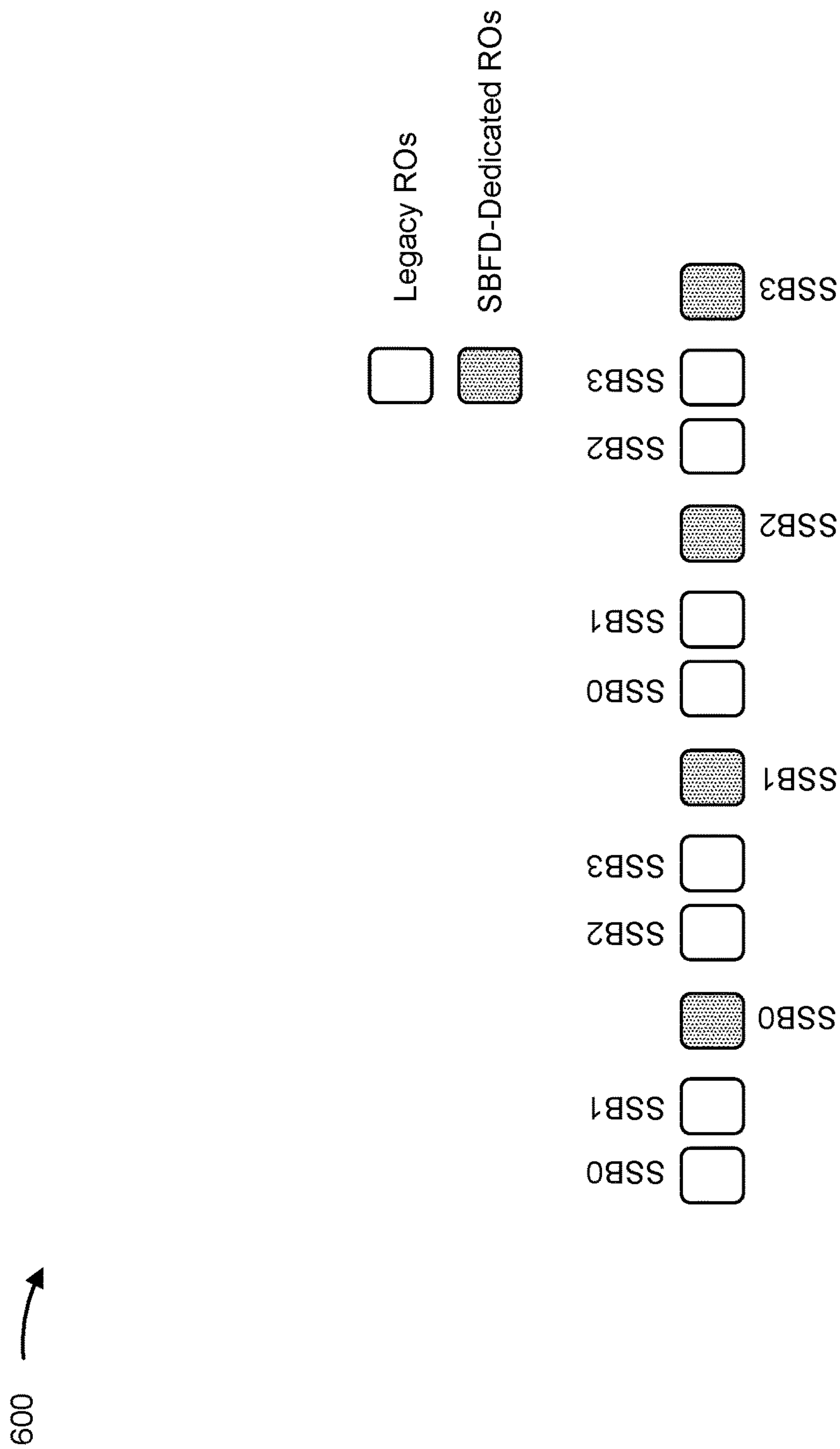

600
Legacy ROs
SBFD-Dedicated ROs
SSB0
SSB1
SSB0
SSB2
SSB3
SSB1
SSB0
SSB1
SSB2
SSB2
SSB3
SSB3

FIG. 6

700

```
RACH-ConfigCommon ::=                          SEQUENCE    {
   rach-ConfigGeneric                             Rach-ConfigGeneric
   totalNumberOfRA-Preamble                       INTEGER  (1...63)
   ssb-perRACH-OccasionAndCB-PreamblesPerSB CHOICE {
      oneEighth                                      ENUMERATED (n4, n8, n12, n16, n20, n24, n28, n32, n36, n40, n44, n48, n52, n60, n64),
      oneFourth                                      ENUMERATED (n4, n8, n12, n16, n20, n24, n28, n32, n36, n40, n44, n48, n52, n60, n64),
      oneHalf                                        ENUMERATED (n4, n8, n12, n16, n20, n24, n28, n32, n36, n40, n44, n48, n52, n60, n64),
      one                                            ENUMERATED (n4, n8, n12, n16, n20, n24, n28, n32, n36, n40, n44, n48, n52, n60, n64),
      two                                            ENUMERATED (n4, n8, n12, n16, n20, n24, n28, n32),
      four                                           INTEGER  (1...16),
      eight                                          INTEGER  (1...8),
      sixteen                                        INTEGER  (1...4),
   }
```

FIG. 7

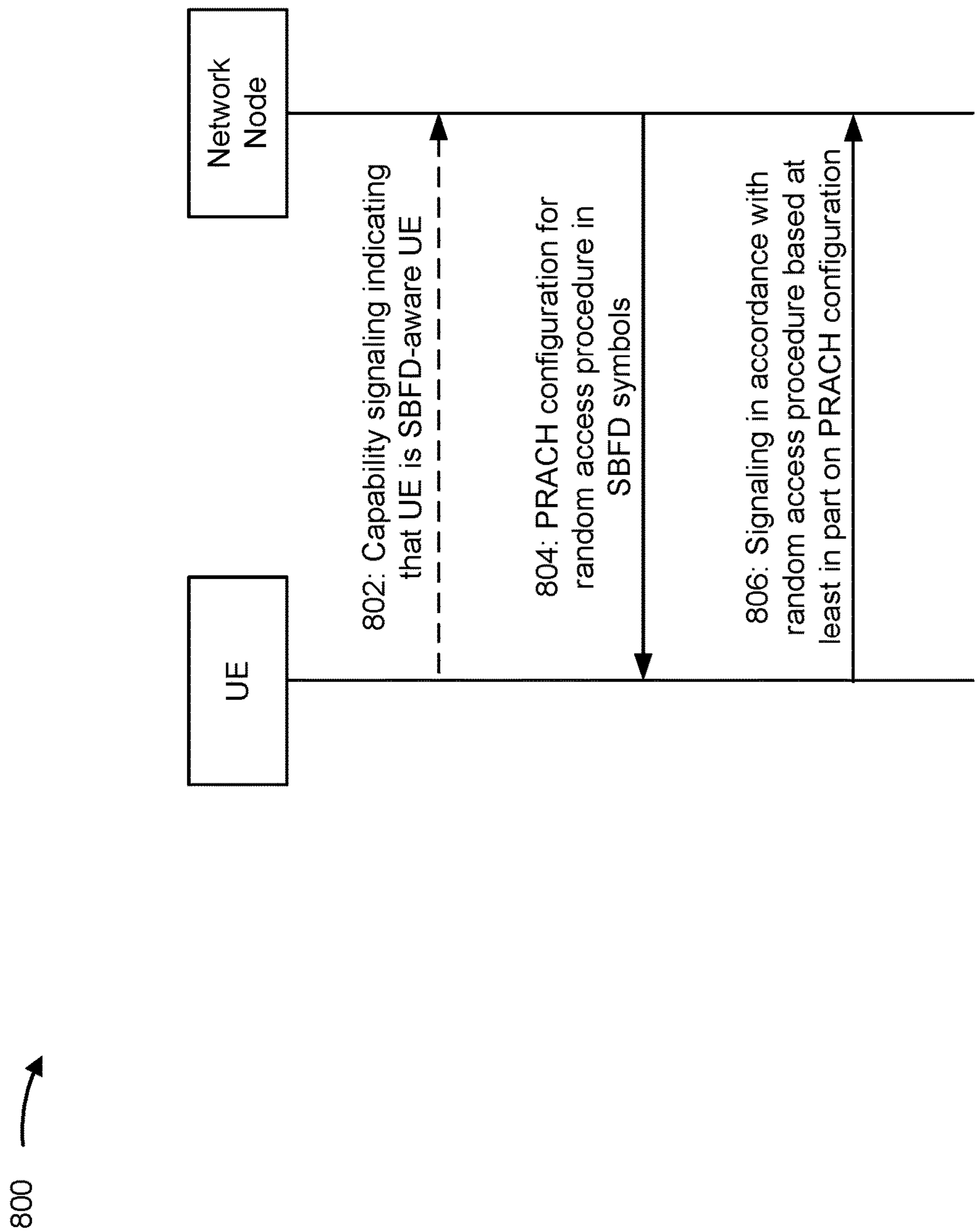

800
UE
Network Node
802: Capability signaling indicating that UE is SBFD-aware UE
804: PRACH configuration for random access procedure in SBFD symbols
806: Signaling in accordance with random access procedure based at least in part on PRACH configuration

FIG. 8

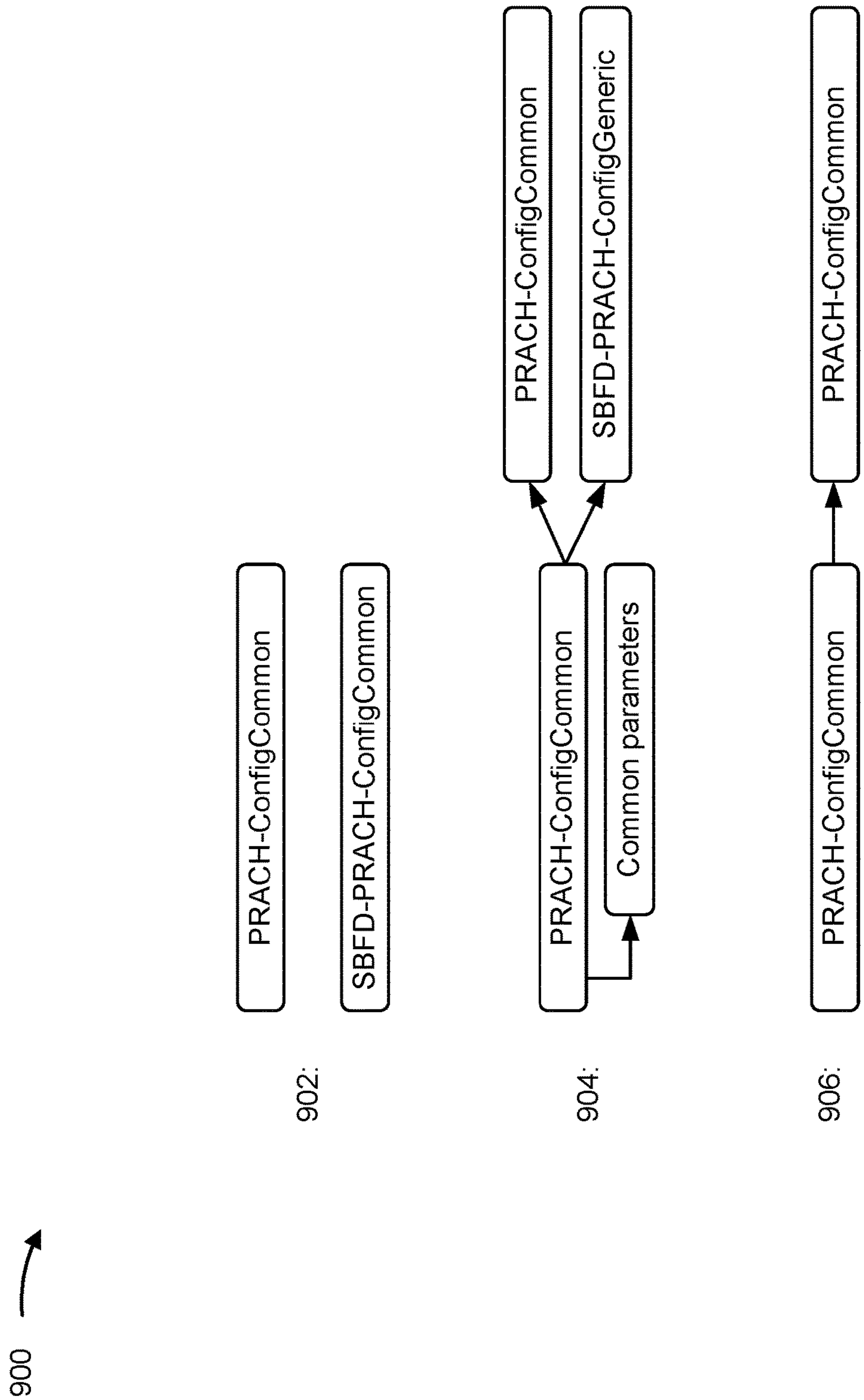

900
902:
PRACH-ConfigCommon
SBFD-PRACH-ConfigCommon
904:
PRACH-ConfigCommon
Common parameters
PRACH-ConfigCommon
SBFD-PRACH-ConfigGeneric
906:
PRACH-ConfigCommon
PRACH-ConfigCommon

FIG. 9

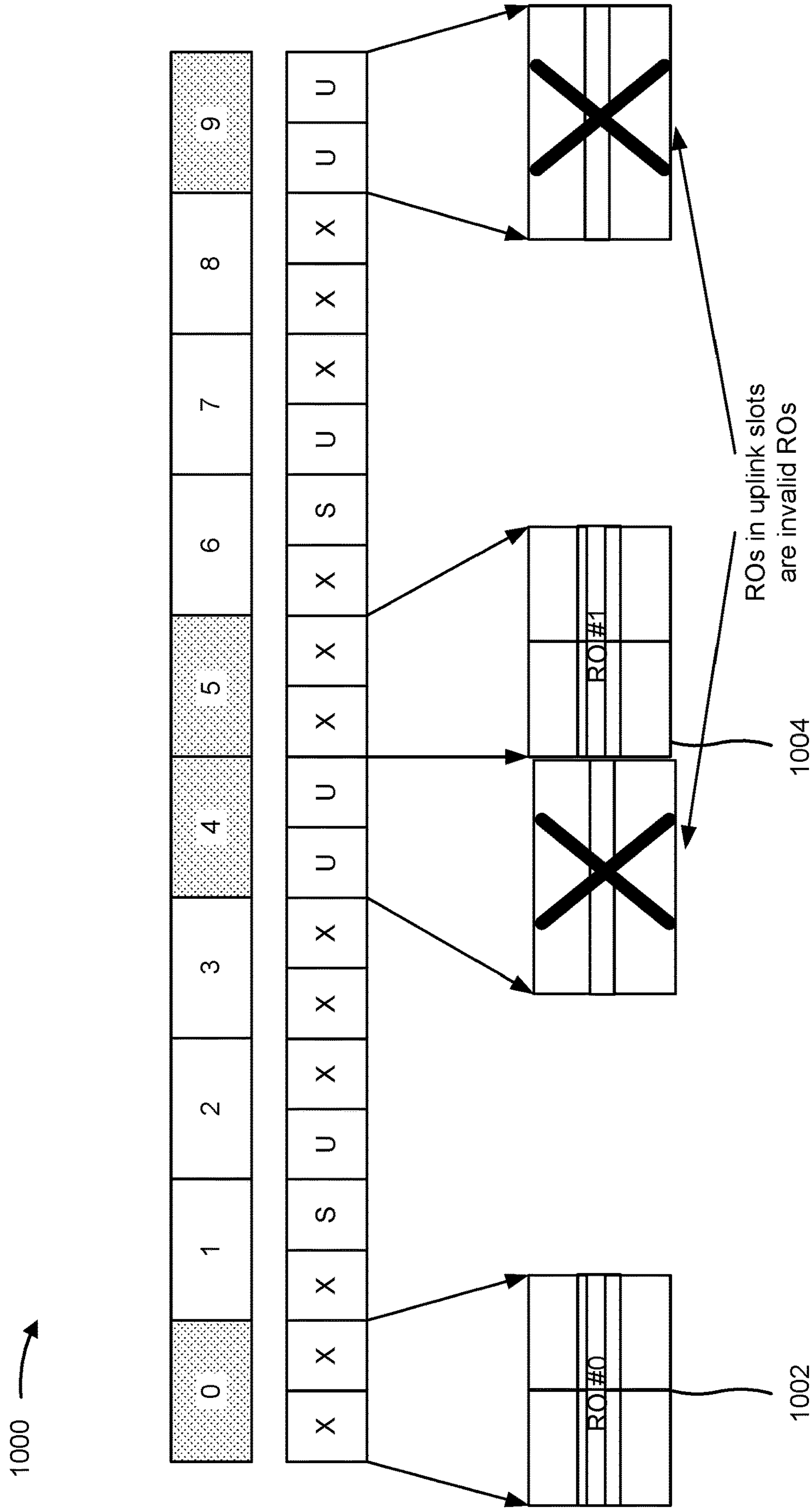

1000
0
1
2
3
4
5
6
7
8
9
X X X S U X X X U U X X X S U X X X U U
RO#0
RO#1
1002
1004
ROs in uplink slots
are invalid ROs

FIG. 10

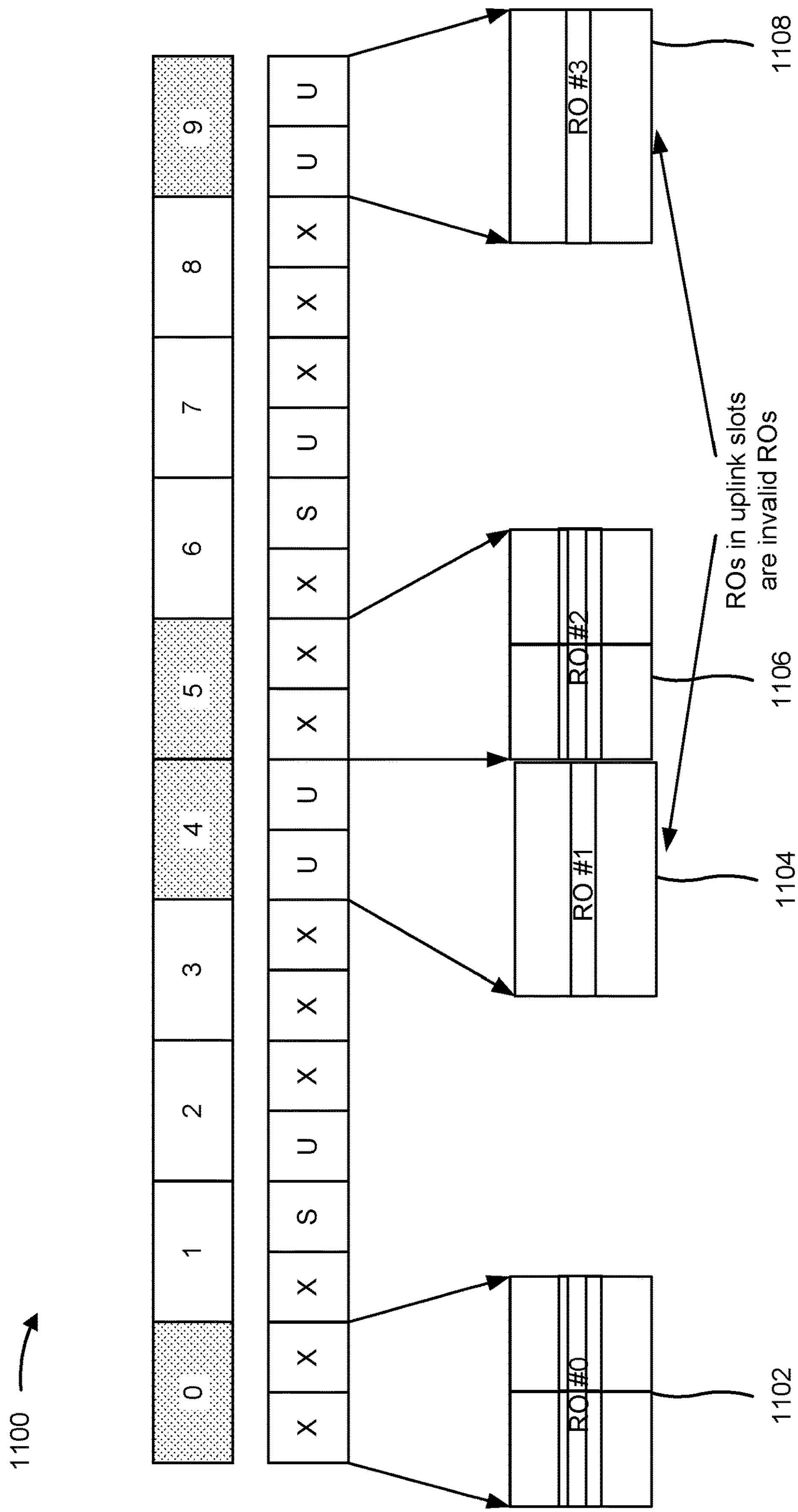

1100
0
1
2
3
4
5
6
7
8
9
X
X
X
S
U
X
X
X
U
U
X
X
X
S
U
X
X
X
U
U
RO #0
RO #1
RO #2
RO #3
1102
1104
1106
1108
ROs in uplink slots
are invalid ROs

FIG. 11

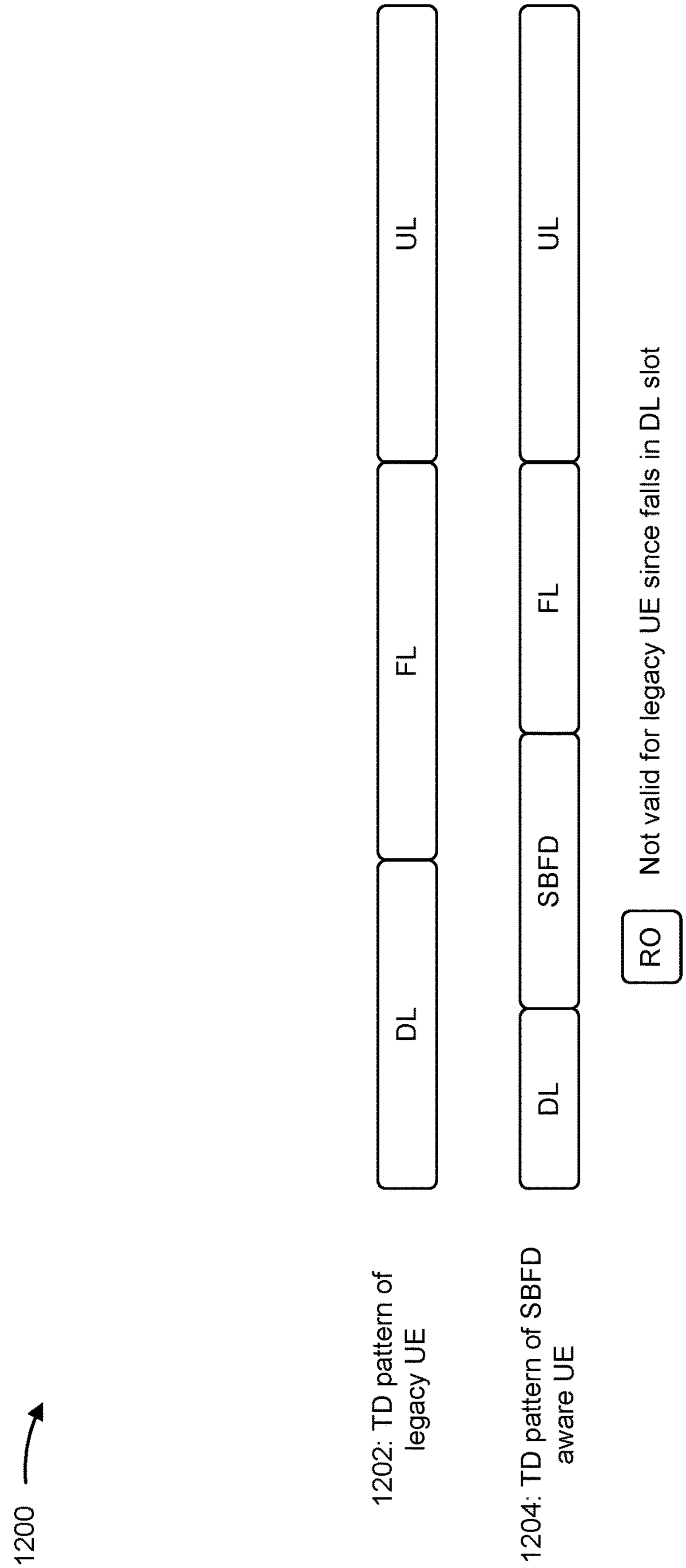

1200
1202: TD pattern of legacy UE
1204: TD pattern of SBFD aware UE
DL
FL
UL
DL
SBFD
FL
UL
RO
Not valid for legacy UE since falls in DL slot

FIG. 12

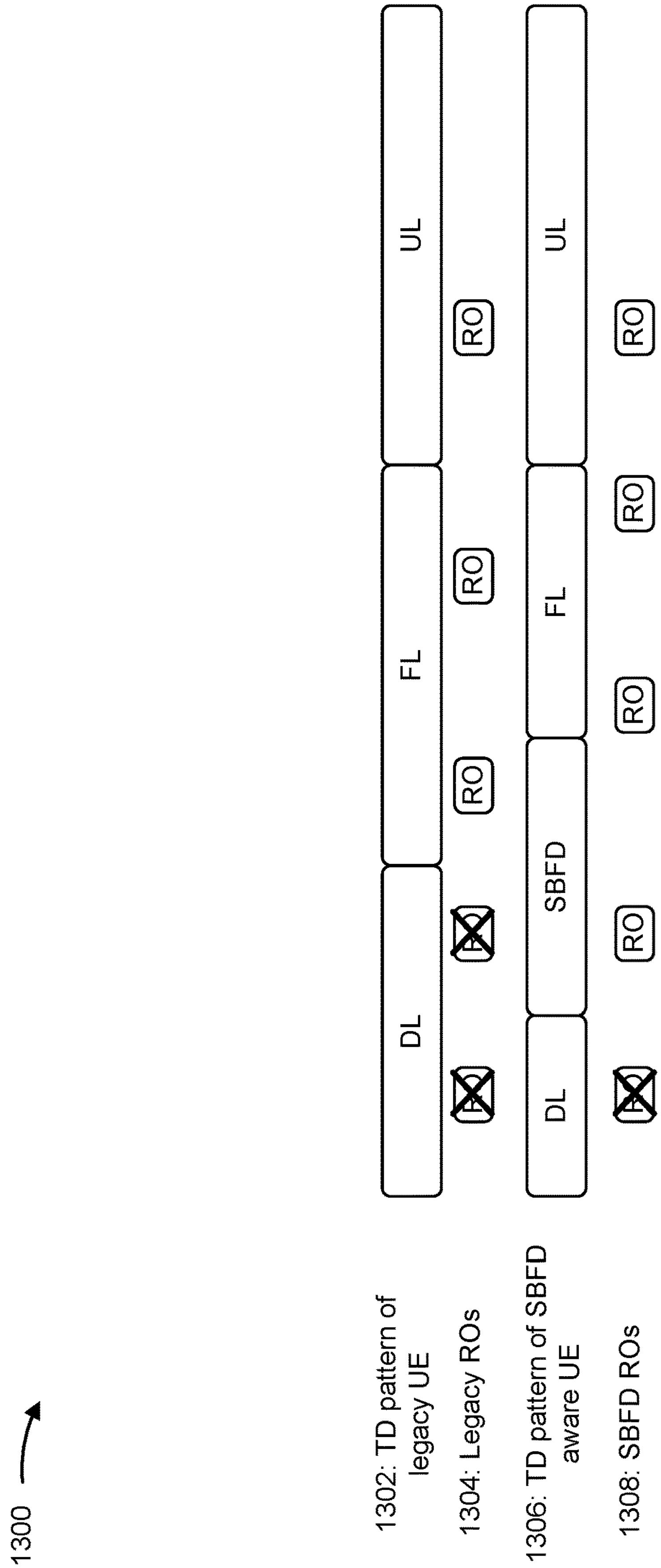

1300
1302: TD pattern of legacy UE
1304: Legacy ROs
1306: TD pattern of SBFD aware UE
1308: SBFD ROs
DL
FL
UL
SBFD
DL
FL
UL
RO
RO
RO
RO
RO
RO
RO
RO

FIG. 13

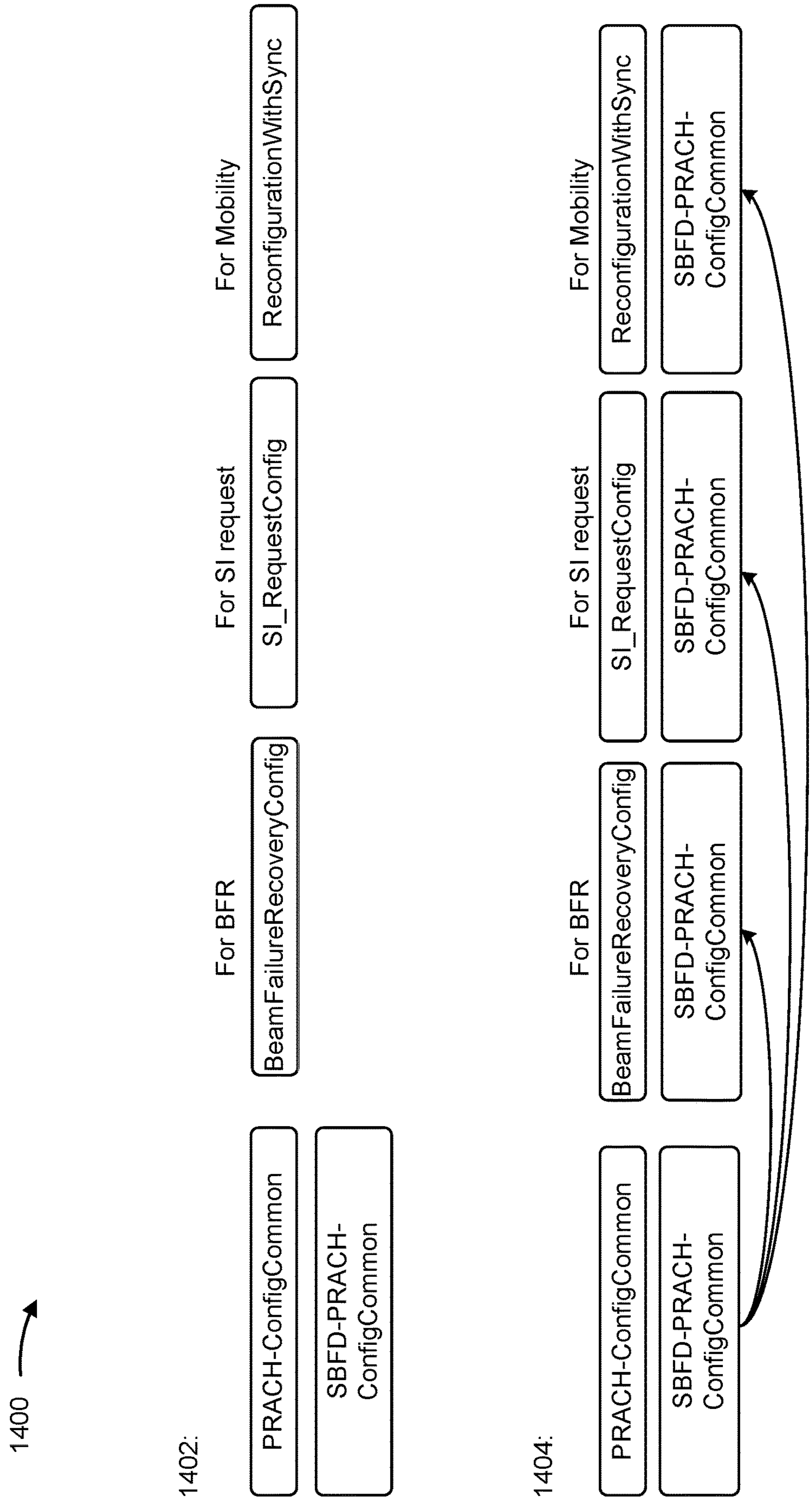

1400
1402:
PRACH-ConfigCommon
SBFD-PRACH-ConfigCommon
For BFR
BeamFailureRecoveryConfig
For SI request
SI_RequestConfig
For Mobility
ReconfigurationWithSync
1404:
PRACH-ConfigCommon
SBFD-PRACH-ConfigCommon
For BFR
BeamFailureRecoveryConfig
SBFD-PRACH-ConfigCommon
For SI request
SI_RequestConfig
SBFD-PRACH-ConfigCommon
For Mobility
ReconfigurationWithSync
SBFD-PRACH-ConfigCommon

FIG. 14

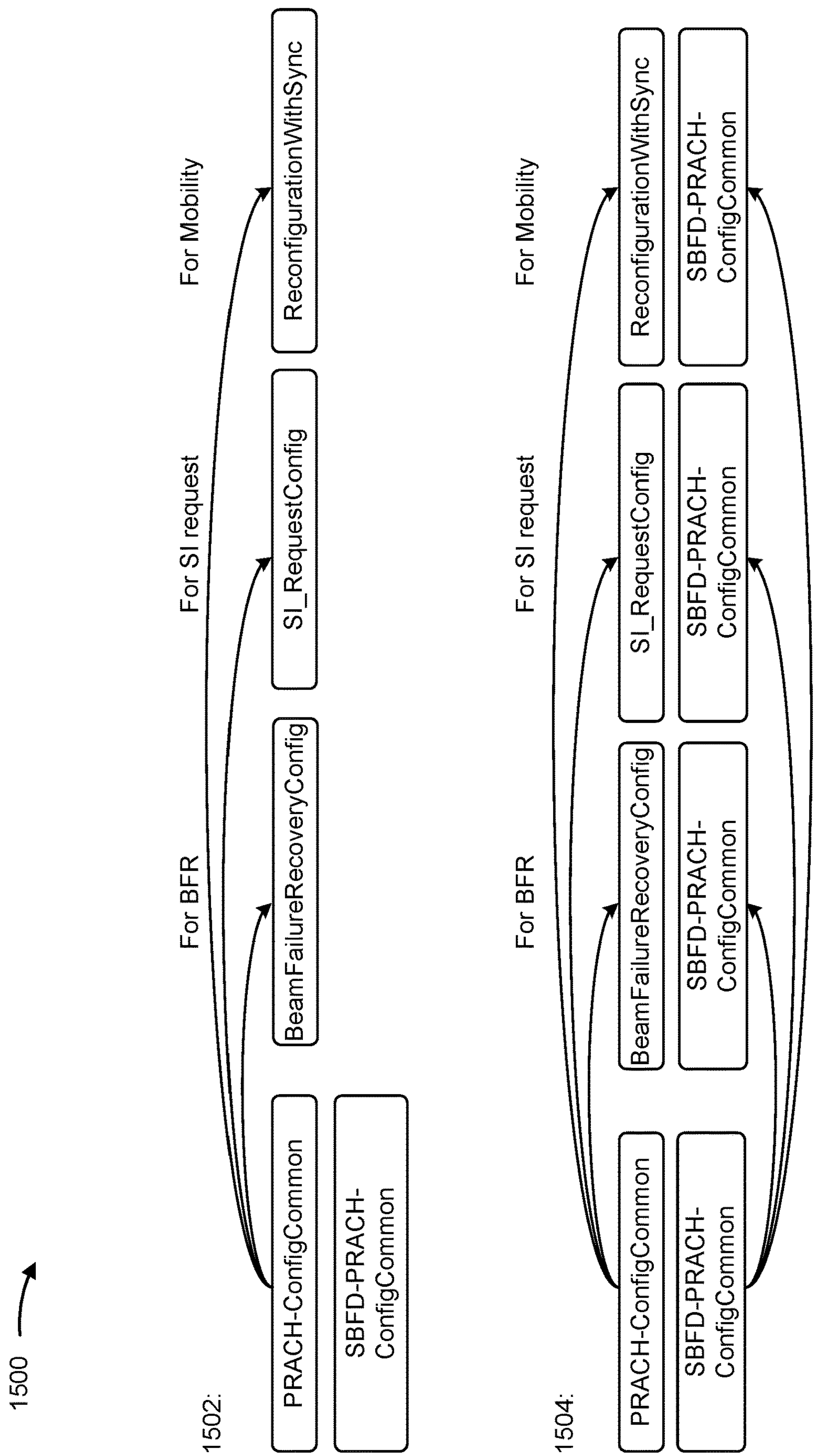

1500
1502:
PRACH-ConfigCommon
SBFD-PRACH-ConfigCommon
For BFR
BeamFailureRecoveryConfig
For SI request
SI_RequestConfig
For Mobility
ReconfigurationWithSync
1504:
PRACH-ConfigCommon
SBFD-PRACH-ConfigCommon
For BFR
BeamFailureRecoveryConfig
SBFD-PRACH-ConfigCommon
For SI request
SI_RequestConfig
SBFD-PRACH-ConfigCommon
For Mobility
ReconfigurationWithSync
SBFD-PRACH-ConfigCommon

FIG. 15

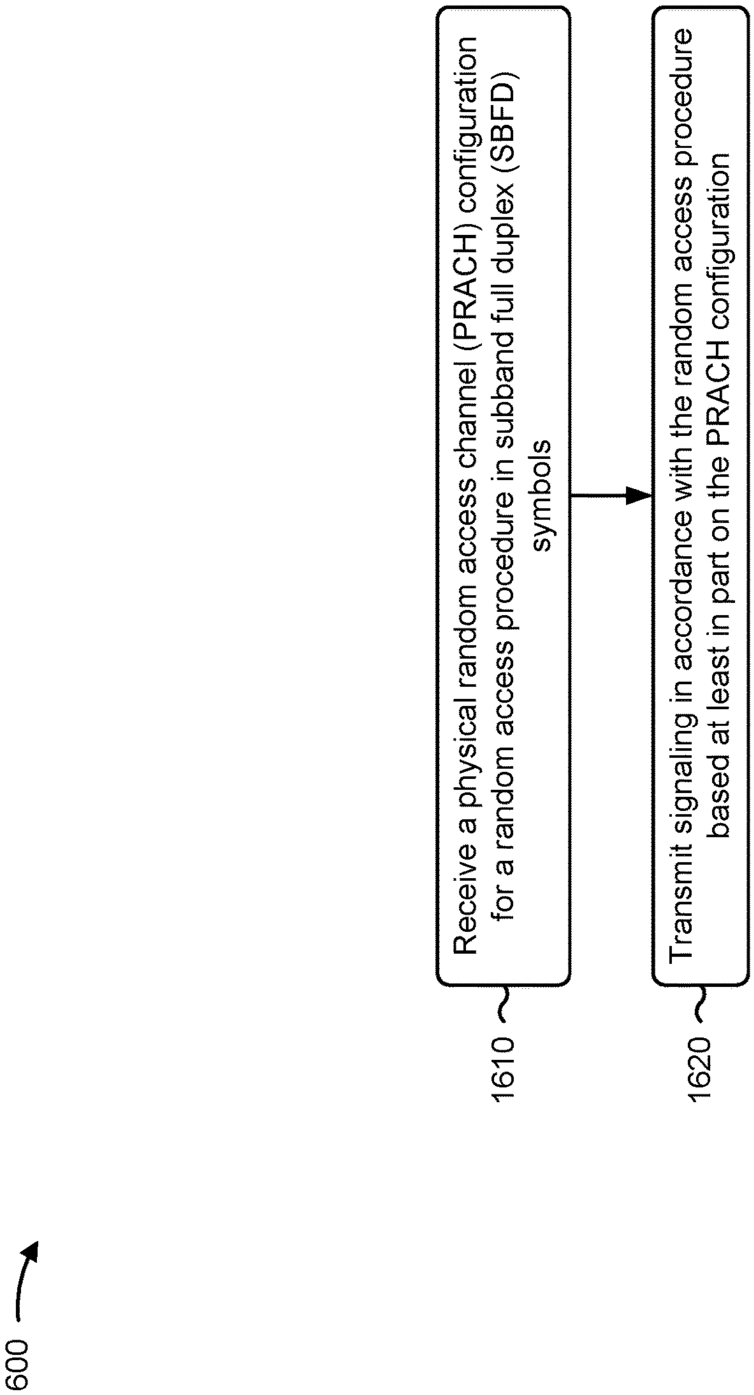

1600
Receive a physical random access channel (PRACH) configuration for a random access procedure in subband full duplex (SBFD) symbols
1610
Transmit signaling in accordance with the random access procedure based at least in part on the PRACH configuration
1620

FIG. 16

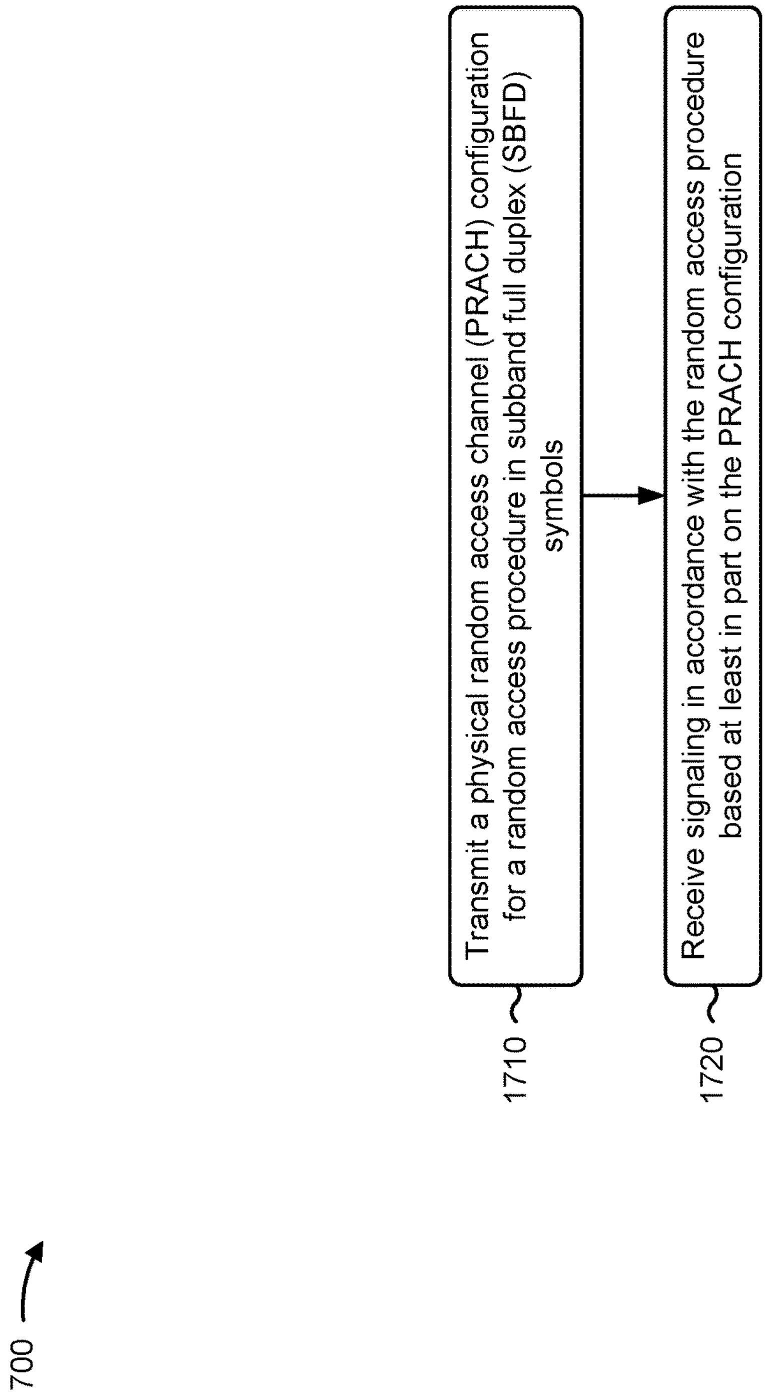

1700
Transmit a physical random access channel (PRACH) configuration for a random access procedure in subband full duplex (SBFD) symbols
1710
Receive signaling in accordance with the random access procedure based at least in part on the PRACH configuration
1720

FIG. 17

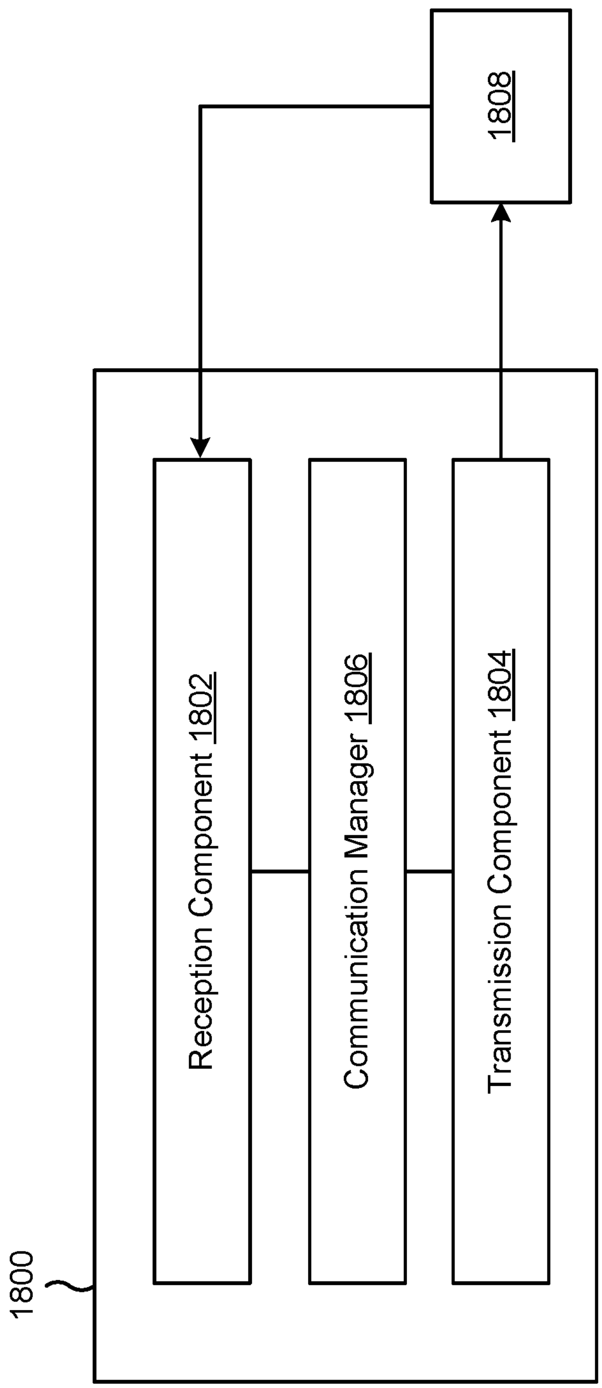

1800
Reception Component 1802
Communication Manager 1806
Transmission Component 1804
1808

FIG. 18

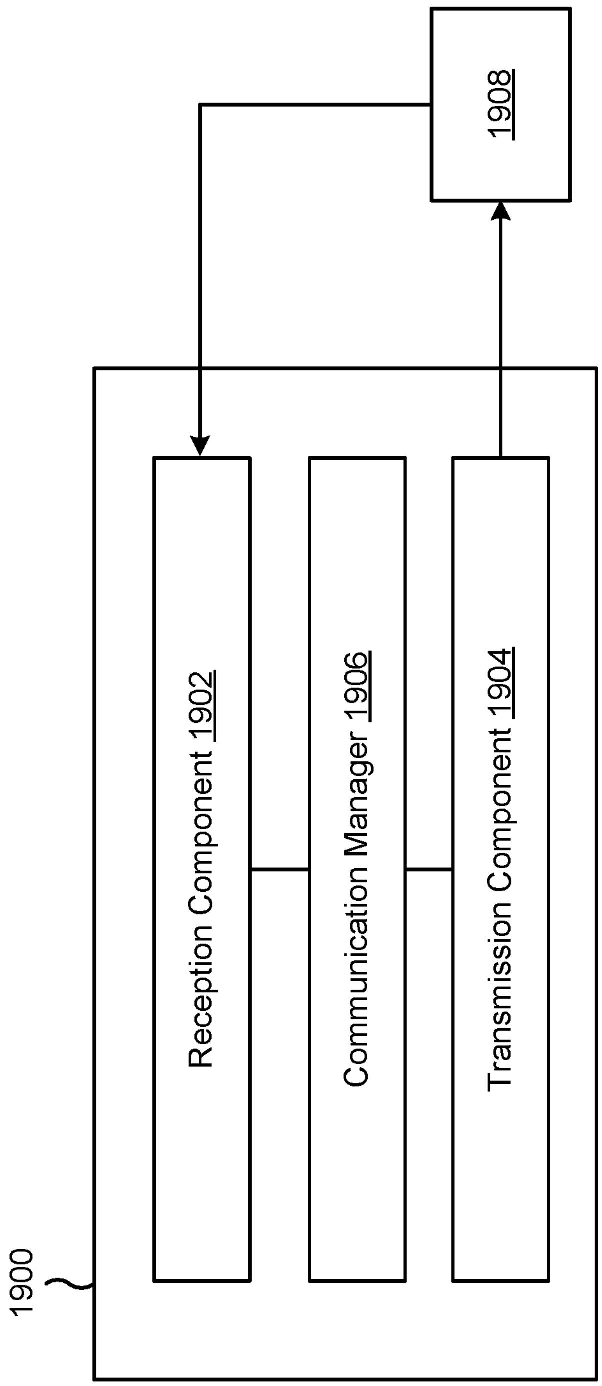

1908
Reception Component 1902
Communication Manager 1906
Transmission Component 1904
1900

FIG. 19

PHYSICAL RANDOM ACCESS CHANNEL CONFIGURATIONS FOR FULL DUPLEX SYMBOLS

FIELD OF THE DISCLOSURE

[0001] Aspects of the present disclosure generally relate to wireless communication and specifically relate to techniques, apparatuses, and methods for physical random access channel (PRACH) configurations for full duplex symbols.

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] A full duplex operation may involve a subband full duplex (SBFD) operation, in which a transmission and a reception may occur at the same time but on different frequency resources. A downlink resource may be separated from an uplink resource in a frequency domain. The downlink resource and the uplink resource may be associated with a same time but different frequencies. In the SBFD operation, no downlink and uplink overlap in frequency may occur. One or more physical random access channel (PRACH) configurations may be defined in an SBFD network. In a first approach, one PRACH configuration may be defined for all duplex type slots. In a second approach, separate PRACH configurations may be defined for each duplex type.

[0005] When two PRACH configurations are provided, a legacy PRACH configuration and an SBFD PRACH configuration may be provided for SBFD-aware user equipment (UEs) (e.g., a separate PRACH configuration dedicated for SBFD-aware UEs). However, whether the legacy PRACH configuration and the SBFD PRACH configuration are separate configurations having completely separate parameters or some common parameters may not be defined, whether the SBFD PRACH configuration is applicable to various use cases may not be defined, and when the UE-dedicated SBFD PRACH configuration is not provided for a use case such as beam failure recovery (BFR), whether a UE should use a cell-common legacy configuration or a cell-common SBFD configuration may not be defined. In these cases, the UE may be unable to support the SBFD PRACH configuration for various use cases, which may degrade an overall performance of the UE.

[0006] Different tables may be defined for PRACH configurations based on duplexing and frequency range. In accordance with the tables, random access channel (RACH) occasions (ROs) may only occur at a certain subframes of a frame, where the certain subframes may be associated with uplink symbols. A subframe for PRACH may be configured to target an uplink slot in a time division duplexing (TDD) pattern, which may not allow utilization of ROs in SBFD symbols (e.g., downlink symbols concerted in SBFD). A limitation that the ROs may only occur at certain subframes of the frame may not allow the utilization of ROs in SBFD symbols, which may degrade an overall system performance.

[0007] Various aspects relate generally to PRACH configurations for full duplex slots. Some aspects more specifically relate to SBFD-specific PRACH configurations for SBFD in an unpaired spectrum. In some examples, a UE may transmit, to a network node, capability signaling indicating that the UE is an SBFD-aware UE. The UE may receive, from the network node, a PRACH configuration for a random access procedure in SBFD symbols. The PRACH configuration may be an SBFD-specific PRACH configuration. In other words, the PRACH configuration may be full duplex slots. The SBFD-specific PRACH configuration may be based at least in part on a TDD frequency range 1/2 (FR1/2) table that includes one or more PRACH configurations to allow one or more subframe configurations specific for SBFD, a table for SBFD that is separate from the TDD FR1/2 table and a frequency division duplexing (FDD) FR1/2 table, or the FDD FR1/2 table. The PRACH configuration may be a separate PRACH configuration that is dedicated for SBFD-aware UEs and separate from a legacy PRACH configuration. The separate PRACH configuration may be based at least in part on a separate common PRACH configuration as compared to legacy PRACH. The separate PRACH configuration may be based at least in part on a common PRACH configuration having a modified structure to support more than one value for one or more parameters.

The separate PRACH configuration may be based at least in part on a single common PRACH configuration with an independent synchronization signal block (SSB)-to-RO mapping for ROs that fall within SBFD slots. The UE may transmit, to the network node, signaling in accordance with the random access procedure based at least in part on the PRACH configuration.

[0008] 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 modifying PRACH configuration tables in a specification, the described techniques may allow the UE to utilize ROs in SBFD symbols. The UE may be able to use ROs that occur at other subframes of a frame, such as subframe 3 or subframe 7, in addition to subframe 4 or subframe 9. An ability to utilize ROs in SBFD symbols may improve an overall UE performance in terms of random access latency reduction and reducing the probability of collision of PRACH with other UEs. Further, the UE May be able to distinguish between two different PRACH configurations, where one PRACH configuration may be a legacy PRACH configuration and another PRACH configuration may be an SBFD-specific PRACH configuration that is provided for SBFD-aware UEs. An ability for the UE to utilize the SBFD-specific PRACH configuration, which may be different than the legacy PRACH configuration, may allow the UE to perform PRACH during an SBFD operation, which may improve the overall UE performance.

[0009] In some implementations, an apparatus for wireless communication at a UE includes one or more memories; and one or more processors, coupled to the one or more memories, configured to cause the UE to: receive a PRACH configuration for a random access procedure in SBFD symbols; and transmit signaling in accordance with the random access procedure based at least in part on the PRACH configuration.

[0010] In some implementations, an apparatus for wireless communication at a network node includes one or more memories; and one or more processors, coupled to the one or more memories, configured to cause the network node to: transmit a PRACH configuration for a random access procedure in SBFD symbols; and receive signaling in accordance with the random access procedure based at least in part on the PRACH configuration.

[0011] In some implementations, a method of wireless communication performed by a UE includes receiving a PRACH configuration for a random access procedure in SBFD symbols; and transmitting signaling in accordance with the random access procedure based at least in part on the PRACH configuration.

[0012] In some implementations, a method of wireless communication performed by a network node includes transmitting a PRACH configuration for a random access procedure in SBFD symbols; and receiving signaling in accordance with the random access procedure based at least in part on the PRACH configuration.

[0013] 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 PRACH configuration for a random access procedure in SBFD symbols; and transmit signaling in accordance with the random access procedure based at least in part on the PRACH configuration.

[0014] 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 PRACH configuration for a random access procedure in SBFD symbols; and receive signaling in accordance with the random access procedure based at least in part on the PRACH configuration.

[0015] In some implementations, an apparatus for wireless communication includes means for receiving a PRACH configuration for a random access procedure in SBFD symbols; and means for transmitting signaling in accordance with the random access procedure based at least in part on the PRACH configuration.

[0016] In some implementations, an apparatus for wireless communication includes means for transmitting a PRACH configuration for a random access procedure in SBFD symbols; and means for receiving signaling in accordance with the random access procedure based at least in part on the PRACH configuration.

[0017] 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.

[0018] 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

[0019] 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.

[0020] FIG. **1** is a diagram illustrating an example of a wireless network, in accordance with the present disclosure.

[0021] 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.

[0022] FIG. **3** is a diagram illustrating an example disaggregated base station architecture, in accordance with the present disclosure.

[0023] FIG. **4** is a diagram illustrating an example associated with random access in subband full duplex (SBFD) symbols, in accordance with the present disclosure.

[0024] FIG. **5** is a diagram illustrating an example associated with a synchronization signal block (SSB) random access channel (RACH) occasions (ROs) mapping, in accordance with the present disclosure.

[0025] FIG. **6** is a diagram illustrating an example associated with an SSB-ROs mapping, in accordance with the present disclosure.

[0026] FIG. **7** is a diagram illustrating an example associated with a common physical random access channel (PRACH) configuration, in accordance with the present disclosure.

[0027] FIGS. **8-15** are diagrams illustrating examples associated with PRACH configurations for full duplex symbols, in accordance with the present disclosure.

[0028] FIGS. **16-17** are diagrams illustrating example processes associated with PRACH configurations for full duplex symbols, in accordance with the present disclosure.

[0029] FIGS. **18-19** are diagrams of example apparatuses for wireless communication, in accordance with the present disclosure.

DETAILED DESCRIPTION

[0030] 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.

[0031] 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.

[0032] 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).

[0033] 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.

[0034] 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) **110***a*, a network node **110***b*, a network node **110***c*, and a network node **110***d*. The network nodes **110** may support communications with multiple UEs **120**, shown as a UE **120***a*, a UE **120***b*, a UE **120***c*, a UE **120***d*, and a UE **120***e*.

[0035] The network nodes **110** and the UEs **120** of the wireless communication network **100** may communicate using the electromagnetic spectrum, which may be subdivided 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.

[0036] 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.

[0037] 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).

[0038] 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**.

[0039] 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.

[0040] 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, 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**.

[0041] 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.

[0042] 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).

[0043] 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 **110***a* may be a macro network node for a macro cell **130***a*, the network node **110***b* may be a pico network node for a pico cell **130***b*, and the network node **110***c* may be a femto network node for a femto cell **130***c*. 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).

[0044] 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 physical downlink control channels (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.

[0045] 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**.

[0046] 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.

[0047] 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 **110***d* (for example, a relay network node) may communicate with the network node **110***a* (for example, a macro network node) and the UE **120***d* in order to facilitate communication between the network node **110***a* and the UE **120***d*. 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.

[0048] 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.

[0049] 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.

[0050] 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.

[0051] Some UEs **120** may be considered machine-type communication (MTC) UEs, evolved or enhanced machine-type communication (eMTC), UEs, further enhanced cMTC (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**).

[0052] 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 capability). 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 cMTC 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.

[0053] In some examples, two or more UEs **120** (for example, shown as UE **120***a* and UE **120***c*) 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 **120***a* may directly transmit data, control information, or other signaling as a sidelink communication to the UE **120***c*. This is in contrast to, for example, the UE **120***a* first transmitting data in an UL communication to a network node **110**, which then transmits the data to the UE **120***e* 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.

[0054] 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**.

[0055] 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).

[0056] 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 physical random access channel (PRACH) configuration for a random access procedure in subband full duplex (SBFD) symbols; and transmit signaling in accordance with the random access procedure based at least in part on the PRACH configuration. Additionally, or alternatively, the communication manager **140** may perform one or more other operations described herein.

[0057] 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 PRACH configuration for a random access procedure in SBFD symbols; and receive signaling in accordance with the random access procedure based at least in part on the PRACH configuration. Additionally, or alternatively, the communication manager **150** may perform one or more other operations described herein.

[0058] As indicated above, FIG. **1** is provided as an example. Other examples may differ from what is described with regard to FIG. **1**.

[0059] 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.

[0060] 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 **232***a* through **232***t*, where t≥1), a set of antennas **234** (shown as **234***a* through **234***v*, where v≥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.

[0061] 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**.

[0062] 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.

[0063] 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 demodulation reference signal (DMRS), or a channel state information (CSI) reference signal (CSI-RS)) and/or synchronization signals (for example, a primary synchronization signal (PSS) or a secondary synchronization signals (SSS)).

[0064] 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 **232***a* through **232***t* may together transmit a set of downlink signals (for example, T downlink signals) via the corresponding set of antennas **234**.

[0065] 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.

[0066] 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**.

[0067] 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**.

[0068] 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**.

[0069] 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.

[0070] The UE **120** may include a set of antennas **252** (shown as antennas **252***a* through **252***r*, where r≥1), a set of modems **254** (shown as modems **254***a* through **254***u*, where u≥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**.

[0071] 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**.

[0072] 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**.

[0073] 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.

[0074] The modems **254***a* through **254***u* may transmit a set of uplink signals (for example, R uplink signals or U uplink symbols) 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).

[0075] 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.

[0076] 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.

[0077] 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.

[0078] 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.

[0079] 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**.

[0080] As indicated above, FIG. **2** is provided as an example. Other examples may differ from what is described with regard to FIG. **2**.

[0081] 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**.

[0082] 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.

[0083] 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**.

[0084] 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.

[0085] 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**.

[0086] 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).

[0087] 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 PRACH configurations for full duplex symbols, 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 **1600** of FIG. **16**, process **1700** of FIG. **17**, 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 **1600** of FIG. **16**, process **1700** of FIG. **17**, 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.

[0088] In some aspects, a UE (e.g., the UE **120**) includes means for receiving a PRACH configuration for a random access procedure in SBFD symbols; and/or means for transmitting signaling in accordance with the random access procedure based at least in part on the PRACH configuration. 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**.

[0089] In some aspects, a network node (e.g., the network node **110**) includes means for transmitting a PRACH configuration for a random access procedure in SBFD symbols; and/or means for receiving signaling in accordance with the random access procedure based at least in part on the PRACH configuration. 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**.

[0090] As indicated above, FIG. **3** is provided as an example. Other examples may differ from what is described with regard to FIG. **3**.

[0091] A full duplex operation may involve an SBFD operation (or flexible duplex), in which a transmission and a reception may occur at the same time but on different frequency resources. A downlink resource may be separated from an uplink resource in a frequency domain. The downlink resource and the uplink resource may be associated with a same time but different frequencies. In the SBFD operation, no downlink and uplink overlap in frequency may occur.

[0092] An SBFD operation may increase an uplink duty cycle, which may result in a latency reduction (e.g., a downlink signal may be received in uplink-only slots, which may enable latency savings) and uplink coverage improvement. The SBFD operation may improve a system capacity, resource utilization, and/or spectrum efficiency. The SBFD operation may enable a flexible and dynamic uplink/downlink resource adaptation according to uplink/downlink traffic in a robust manner.

[0093] Random access may be associated with SBFD symbols. When random access is allowed in SBFD symbols for SBFD-aware UEs, a random access latency may be reduced, a PRACH collision probability may be reduced, and/or a coverage of PRACH and message 3 (Msg3) may be improved. The coverage of PRACH can be improved by using a long PRACH sequence or PRACH repetition. PRACH and Msg3 transmissions in an uplink subband in SBFD symbols may cause UE-to-UE cross-link interference (CLI). Random access may be allowed in SBFD symbols at least for PRACH and Msg3 transmissions in symbols configured as downlink in a TDD uplink-downlink common configuration (TDD-UL-DL-ConfigCommon).

[0094] Random access in SBFD symbols may provide an uplink coverage enhancement. A UE may utilize an uplink subband in consecutive SBFD slots to enable message 1 (Msg1) and Msg3 repetition and frequency hopping, which may enhance an uplink coverage for initial access. Random access in SBFD symbols may improve a PRACH capacity. Additional PRACH occasions may be enabled within an uplink subband, which may improve the PRACH capacity and reduce a contention-based collision probability while enabling more UEs to access the network. Random access in SBFD symbols may provide a random access latency reduction. Latency may be reduced for a random access procedure, initial access, and/or handover, especially with respect to layer 1 (L1)/layer 2 (L2) (L1/L2) mobility.

[0095] FIG. **4** is a diagram illustrating an example **400** associated with random access in SBFD symbols, in accordance with the present disclosure.

[0096] As shown in FIG. **4**, a first symbol/slot **402** may be a downlink symbol/slot. The first symbol/slot **402** may be associated with a synchronization symbol block (SSB), a control resource set (CORESET), and a system information block (SIB). A second symbol/slot **404** may be an SBFD symbol/slot, where the SBFD symbol/slot may include both downlink resources and uplink resources. The second symbol/slot **404** may include one or more PRACH occasions (ROs). A third symbol/slot **406** may be an SBFD symbol/slot. The third symbol/slot **406** may include PUSCH resources. A fourth symbol/slot **408** may be an SBFD symbol/slot. The fourth symbol/slot **408** may include PUCCH resources. The one or more ROs, the PUSCH resources, and the PUCCH resources may be specific for an uplink subband. A fifth symbol/slot **410** may be an uplink symbol/slot. The fifth symbol/slot **410** may be associated with the uplink subband.

[0097] As indicated above, FIG. **4** is provided as an example. Other examples may differ from what is described with regard to FIG. **4**.

[0098] For subband non-overlapping full duplex operation (e.g., SBFD operation) at a network node within a TDD carrier, a semi-static indication of time location of SBFD subbands to UEs in RRC connected mode may be defined (e.g., an indication of time location of SBFD subbands in a SIB may not be precluded), a semi-static indication of frequency domain location of SBFD subbands to UEs in RRC connected mode may be defined (e.g., an indication of frequency domain location of SBFD subbands in a SIB may not be precluded), an SBFD operation to support random access in SBFD symbols by UEs in RRC connected mode may be defined, and/or an SBFD operation to UEs in RRC idle/inactive mode for random access may be defined.

[0099] One or more PRACH configurations may be defined in an SBFD network. In a first approach, one PRACH configuration may be defined for all duplex type slots. For an SBFD-aware UE, validity rules may be defined in SBFD slots configured in downlink symbols by TDD uplink/downlink. The one PRACH configuration may be associated with a single configuration, which may translate to less system information and/or overhead. The one PRACH configuration may cause an SSB-RO mapping ambiguity between a legacy UE and an SBFD-aware UE. Further, when an uplink subband is in a middle of a slot, a PRACH frequency resource may cause resource fragmentation in uplink slots. In a second approach, separate PRACH configurations may be defined for each duplex type

(TDD and SBFD). In addition to a legacy PRACH configuration, another separate PRACH configuration may be dedicated for SBFD-aware UEs. The separate PRACH configurations may create independent PRACH configurations (e.g., no SSB-RO mapping ambiguity) and each PRACH configuration may have its own parameters. The separate PRACH configurations may create additional configurations/overhead, and validity rules may need to be defined differently for the separate PRACH configuration dedicated for SBFD-aware UEs.

[0100] FIG. **5** is a diagram illustrating an example **500** associated with an SSB-ROs mapping, in accordance with the present disclosure.

[0101] As shown by reference number **502**, for a single PRACH configuration, a legacy UE SSB-RO mapping and an SBFD-aware UE SSB-RO mapping may be defined. Some ROs may be invalid for both a legacy UE and an SBFD-aware UE, whereas some ROs may be invalid for the legacy UE and valid for the SBFD-aware UE. The legacy UE SSB-RO mapping and the SBFD-aware UE SSB-RO mapping may not be consistent with each other, which may be based at least in part on some ROs being invalid for the legacy UE but valid for the SBFD-aware UE. As shown by reference number **504**, the SBFD-aware UE SSB-RO mapping may be updated, which may resolve a consistency issue with the legacy UE SSB-RO mapping. However, some ROs may still be invalid for both the legacy UE and the SBFD-aware UE, and/or valid for only the SBFD-aware UE.

[0102] As indicated above, FIG. **5** is provided as an example. Other examples may differ from what is described with regard to FIG. **5**.

[0103] FIG. **6** is a diagram illustrating an example **600** associated with an SSB-ROs mapping, in accordance with the present disclosure.

[0104] As shown in FIG. **6**, for an SBFD-dedicated PRACH configuration, legacy ROs and SBFD-dedicated ROs may be separately defined, which may result in no SSB-RO mapping ambiguity.

[0105] As indicated above, FIG. **6** is provided as an example. Other examples may differ from what is described with regard to FIG. **6**.

[0106] FIG. **7** is a diagram illustrating an example **700** associated with a common PRACH configuration, in accordance with the present disclosure.

[0107] As shown in FIG. **7**, a common PRACH configuration (PRACH-ConfigCommon) may be indicated in a SIB type 1 (SIB1). The common PRACH configuration may be used for initial access and for other random access scenarios, such as BFR when no UE-dedicated BFR configurations are available. The common PRACH configuration may include one or more parameters associated with a total number of preambles, an association between SSB and ROs, and a generic PRACH configuration, which may indicate information regarding a time domain allocation and periodicity of ROs.

[0108] As indicated above, FIG. **7** is provided as an example. Other examples may differ from what is described with regard to FIG. **7**.

[0109] A PRACH configuration may indicate various types of information. For example, the PRACH configuration may indicate a common BWP uplink configuration (BWP-UplinkCommon), a cell-common PRACH configuration (PRACH-ConfigCommon), random access parameters plus a generic PRACH configuration (PRACH-ConfigGeneric), a BWP uplink dedicated (BWP-UplinkDedicated) configuration, a beam failure recovery configuration (BeamFailureRecoveryConfig), a BFR PRACH configuration (PRACH-configBFR), a system information request configuration (SI_RequestConfig), PRACH occasion system information (PRACH-OccasionSI), a PRACH configuration system information (PRACH-ConfigSI), a reconfiguration with synchronization (Reconfiguration WithSync), a dedicated PRACH configuration (PRACH-ConfigDedicated), a generic PRACH configuration (PRACH-ConfigGeneric), and/or a PDCCH order (DCI 1_0). For contention-based random access (CBRA), a UE may use a PRACH configuration from SIB1. For contention-free random access (CFRA), the UE may use the beam failure recovery configuration. When a network node configures the UE with dedicated PRACH resources for a system information request, CFRA may be used, or otherwise CBRA may be used. A PDCCH order may trigger CFRA, and the UE may obtain CFRA parameters (e.g., preamble index) from a target field in the DCI payload. When a random access preamble index provided in a PDCCH order is all zeros, the UE may apply CBRA.

[0110] When two PRACH configurations are provided, a legacy PRACH configuration and an additional SBFD PRACH configuration may be provided for SBFD-aware UEs (e.g., a separate PRACH configuration dedicated for SBFD-aware UEs). However, whether the legacy PRACH configuration and the SBFD PRACH configuration are separate configurations having completely separate parameters or some common parameters may not be defined, whether the SBFD PRACH configuration is applicable to various use cases (e.g., random-access triggering events) may not be defined, and when the UE-dedicated SBFD PRACH configuration is not provided for a use case such as BFR, whether a UE should use a cell-common legacy PRACH configuration or a cell-common SBFD configuration may not be defined. In these cases, the UE may be unable to support the SBFD PRACH configuration for various use cases (e.g., random-access triggering events, such as BFR, mobility, or an SI request), which may degrade an overall performance of the UE.

[0111] Different tables may be defined for PRACH configurations based on duplexing (e.g., TDD or FDD) and frequency range (e.g., FR1 and FR2). The different tables may include a first table associated with TDD-FR1, a second table associated with FDD-FR1, and a third table associated with TDD-FR2. For example, a table may indicate values for a PRACH configuration index, a preamble format, a subframe number, a starting symbol, a number of PRACH slots within a subframe, a number of time-domain PRACH occasions within a PRACH slot, and/or a PRACH duration.

[0112] For example, in a long sequency Format 1 in an FR1 TDD band and a DDDSUDDSUU pattern in an FR1 30 KHz subcarrier spacing (SCS), where D is a downlink symbol, S is a flexible symbol, and U is an uplink symbol, a 20 ms ROs periodicity may be determined using a PRACH configuration index 3-6 (e.g., a 20 ms PRACH occasions periodicity). ROs may only occur at a fourth subframe or a ninth subframe of a frame, where the fourth subframe and the ninth subframe may be associated with uplink symbols. A subframe for PRACH may be configured to target an uplink slot in a TDD pattern, which may not allow utilization of ROs in SBFD symbols (e.g., downlink symbols concerted in SBFD, such as DDDDXXXXU). A limitation that the

ROs may only occur at certain subframes of the frame may not allow the utilization of ROs in SBFD symbols, which may degrade an overall system performance.

PRACH Config Index	Preamble Format	n_{SFN} mode x = y: x	y	Subframe Number	Starting Symbol	Number for PRACH slots within subframe	Time Domain PRACH Occasions within PRACH Slot	PRACH duration
0	0	16	1	9	0	—	—	0
1	0	8	8	9	0	—	—	0
2	0	4	41	9	0	—	—	0
3	0	2	0	9	0	—	—	0
4	0	2	1	4	0	—	—	0
5	0	2	0	9	0	—	—	0
6	0	2	1	4	0	—	—	0
7	0	1	0	9	0	—	—	0

0	1	2	3	4	5	6	7	8	9
D D	D S	U D	D S	U U	D D	D S	U D	D S	U U

[0113] In various aspects of techniques and apparatuses described herein, a UE may transmit, to a network node, capability signaling indicating that the UE is an SBFD-aware UE. The UE may receive, from the network node, a PRACH configuration for a random access procedure in SBFD symbols. The PRACH configuration may be an SBFD-specific PRACH configuration. In other words, the PRACH configuration may be full duplex slots. The SBFD-specific PRACH configuration may be based at least in part on a TDD frequency range 1/2 (FR1/2) table that includes one or more PRACH configurations to allow one or more subframe configurations specific for SBFD, a table for SBFD that is separate from the TDD FR1/2 table and an FDD FR1/2 table, or the FDD FR1/2 table. The PRACH configuration may be a separate PRACH configuration that is dedicated for SBFD-aware UEs and separate from a legacy PRACH configuration. The PRACH configuration may be a cell-common configuration or may be a UE-dedicated configuration. The separate PRACH configuration may be based at least in part on a separate cell-common (or cell-specific) PRACH configuration as compared to legacy cell-common PRACH. The separate PRACH configuration may be based at least in part on a cell-common PRACH configuration having a modified structure to support more than one value for one or more parameters. The separate PRACH configuration may be based at least in part on a single common PRACH configuration with an independent SSB-to-RO mapping for ROs that fall within SBFD slots. The UE may transmit, to the network node, signaling in accordance with the random access procedure based at least in part on the PRACH configuration.

[0114] In some aspects, by modifying PRACH configuration tables in a specification, the UE may be able to utilize ROs in SBFD symbols. The UE may be able to use ROs that occur at other subframes of a frame, such as subframe 3 or subframe 7, in addition to subframe 4 or subframe 9. An ability to utilize ROs in SBFD symbols may improve an overall UE performance. Further, the UE may be able to distinguish between two different PRACH configurations, where one PRACH configuration may be a legacy PRACH configuration and another PRACH configuration may be an SBFD-specific PRACH configuration that is provided for SBFD-aware UEs. An ability for the UE to utilize the SBFD-specific PRACH configuration, which may be different than the legacy PRACH configuration, may allow the UE to perform PRACH during an SBFD operation, which may improve the overall UE performance.

[0115] FIG. **8** is a diagram illustrating an example **800** associated with PRACH configurations for full duplex symbols, in accordance with the present disclosure. As shown in FIG. **8**, example **800** 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**.

[0116] As shown by reference number **802**, the UE may transmit, to the network node, capability signaling indicating that the UE is an SBFD-aware UE. In other words, the UE may transmit an SBFD-aware UE signal capability to the network node, which may indicate that the UE is able to support a PRACH configuration for a random access procedure in SBFD symbols. The UE may transmit the capability signaling via RRC signaling.

[0117] As shown by reference number **804**, the UE may receive, from the network node, the PRACH configuration for the random access procedure in SBFD symbols. The PRACH configuration may be an SBFD-specific PRACH configuration. The UE may receive the PRACH configuration via RRC signaling, in which case the PRACH configuration may be based at least in part on the capability signaling. Alternatively, the UE may receive the PRACH configuration via a SIB (e.g., via a broadcast), in which case the UE may not transmit the capability signaling to the network node.

[0118] In some aspects, the SBFD-specific PRACH configuration may be based at least in part on a TDD FR1/2 random access table that includes one or more PRACH configurations to allow one or more subframe configurations specific in SBFD symbols. The SBFD-specific PRACH configuration may be based at least in part on a random access table for SBFD that is separate from the TDD FR1/2 random access table and an FDD FR1/2 random access table. The SBFD-specific PRACH configuration may be based at least in part on the FDD FR1/2 random access table.

[0119] In some aspects, as part of an SBFD-specific PRACH configuration, a PRACH configuration may be specific for SBFD in an unpaired spectrum. In a first option, TDD-FR1/FR2 PRACH tables may be utilized and additional PRACH configurations (e.g., extra rows) may be added to allow other subframe configurations. For example, a new PRACH configuration may be added to allow ROs to occur at subframe 3 or subframe 7 of a frame. In a second option, new tables may be defined for SBFD duplexing (e.g., SBFD-FR1 and SBFD-FR2 tables), in addition to TDD and FDD for each frequency ranges (e.g., FR1, FR2, and so on). In a third option, FDD tables (e.g., FFD-FR1 or FDD-FR2) may be reused.

[0120] In some aspects, the PRACH configuration may be a separate cell-specific PRACH configuration that is dedicated for SBFD-aware UEs and separate from a legacy cell-specific PRACH configuration (e.g., as shown in FIG. **9**). The separate PRACH configuration may be based at least in part on a separate cell-common PRACH configuration as compared to a legacy cell-common PRACH configuration. The separate PRACH configuration may be based at least in part on a single cell-common PRACH configuration having a modified structure to support more than one value for one or more parameters, and the single cell-common PRACH configuration may include more than one generic PRACH configuration parameter. The separate PRACH configuration may be based at least in part on a single cell-common PRACH configuration with an independent SSB-to-RO mapping for ROs that fall within SBFD slots. Further, power control parameters for a PRACH in SBFD symbols may override power control parameters in the legacy PRACH configuration.

[0121] In some aspects, the PRACH configuration may be an SBFD-dedicated PRACH configuration for SBFD operation in a TDD band, ROs within SBFD downlink symbols or SBFD flexible symbols may be valid, and ROs within uplink slots may not be valid (e.g., as shown in FIGS. **10-11**). ROs in TDD flexible symbols may be valid. ROs in TDD uplink symbols may be valid. ROs in uplink symbols and flexible symbols may be valid.

[0122] In some aspects, the UE may identify legacy ROs that overlap in time with SBFD ROs, where the legacy ROs may be associated with a time domain pattern of a legacy UE and the SBFD ROs may be associated with a time domain pattern of an SBFD-aware UE (e.g., as shown in FIG. **13**). The legacy ROs or the SBFD ROs may be considered as valid occasions based at least in part on the overlap. In some aspects, the UE may identify legacy ROs that overlap in time and not frequency with SBFD ROS, where the legacy ROs may be associated with a time domain pattern of a legacy UE and the SBFD ROs may be associated with a time domain pattern of an SBFD-aware UE, and both legacy ROs and SBFD ROs may be considered as valid RACH occasions. The UE may refrain from dropping the legacy ROs and the SBFD ROs based at least in part on the overlap. The UE may drop the legacy ROs or the SBFD ROs based at least in part on the overlap. The UE may apply a frequency offset to the SBFD ROs. Further, SBFD ROs or SBFD slots converted from flexible slots may be invalid.

[0123] In some aspects, the UE may receive, from the network node, a single PRACH configuration compromising a set of RACH occasions (ROs) in both SBFD and non-SBFD symbols. The single PRACH configuration may indicate a BFR PRACH configuration, a system information request PRACH configuration, and/or a UE dedicated PRACH configuration. In some aspects, the UE may receive, from the network node, a first PRACH configuration comprising a set of RACH occasions in TDD symbols for the legacy random-access operation and a second PRACH configuration comprising a set of ROs in SBFD symbols for the SBFD random access operation. Each of the first PRACH configuration and the second PRACH configuration may indicate a common PRACH configuration, a BFR PRACH configuration, a system information PRACH configuration, and/or a dedicated PRACH configuration.

[0124] As shown by reference number **806**, the UE may transmit, to the network node, signaling in accordance with the random access procedure based at least in part on the PRACH configuration. The UE may use one or more parameters in the PRACH configuration for performing the random access procedure with the network node.

[0125] As indicated above, FIG. **8** is provided as an example. Other examples may differ from what is described with regard to FIG. **8**.

[0126] FIG. **9** is a diagram illustrating an example **900** associated with PRACH configurations for full duplex symbols, in accordance with the present disclosure.

[0127] A network node may transmit a separate PRACH configuration for an SBFD-aware UE. As shown by reference number **902**, the separate PRACH configuration may be a separate cell-common PRACH configuration, such as an SBFD common PRACH configuration (e.g., SBFD-PRACH-ConfigCommon or PRACH-ConfigCommon-r19). The SBFD common PRACH configuration may have all parameters as included in a legacy cell-common PRACH configuration (e.g., PRACH-ConfigCommon), but with potentially different values. Validity rules may be different between the separate PRACH configurations. For example, an RO defined by SBFD-PRACH-ConfigCommon may only be valid in SBFD slots. As shown by reference number **904**, the separate PRACH configuration may use a new structure of PRACH-ConfigCommon with potentially more than one value for each/some of the parameters. The separate PRACH configuration may be a new information element (IE) because a legacy UE may not be able to decode this new configuration. In some cases, the separate PRACH configuration may include more than one generic PRACH configuration (PRACH-ConfigGeneric) parameter, such as PRACH-ConfigGeneric and SBFD-PRACH-ConfigGeneric. As shown by reference number **906**, the separate PRACH configuration may be a single PRACH-ConfigGeneric with an independent SSB-to-RO mapping for occasions that fall in SBFD slots. The SBFD-aware UE may be scheduled with power control parameters for PRACH in SBFD symbols that override a power control in a common PRACH configuration.

[0128] In some aspects, the separate PRACH configuration may be signaled to the SBFD-aware UE by RRC messages after an RRC connection, which may enable random access in SBFD symbols for RRC-connected UEs. Alternatively, the separate PRACH configuration may be signaled to the SBFD-aware UE by a SIB1 or SIBx message to additionally enable random access in SBFD symbols for RRC-idle/inactive UEs.

[0129] As indicated above, FIG. **9** is provided as an example. Other examples may differ from what is described with regard to FIG. **9**.

[0130] In some aspects, time resources of ROs may be defined using a PRACH configuration index (prach-ConfigurationIndex) that indicates time resources of selected ROs (e.g., subframe(s) number, a number of PRACH slots per subframe, a number of ROs per slot, and/or a PRACH duration in symbols). Since a periodicity of the ROs may not align with a periodicity of SBFD symbols, some ROs may not occur in SBFD symbols but may occur in non-SBFD symbols (e.g., uplink symbols or flexible symbols without an uplink subband). SBFD ROs that occur in non-SBFD symbols may be valid or invalid ROs.

[0131] In some aspects, validity rules may be defined for SBFD-dedicated PRACH configurations that includes SBFD-dedicated PRACH occasions. For an SBFD operation in a TDD band, a PRACH occasion of an SBFD-dedicated PRACH configuration may be valid. In a first option, the PRACH occasion of the SBFD-dedicated PRACH configuration may be valid only within SBFD downlink and SBFD flexible symbols (e.g., as shown in FIG. 10). A PRACH occasion in non-SBFD symbols, e.g. an uplink slot or a flexible/downlink slot without an uplink subband may not be a valid PRACH occasion. In a second option, in addition to the PRACH occasion of the SBFD-dedicated PRACH configuration being valid within SBFD downlink and SBFD flexible symbols, PRACH occasions in TDD flexible symbols may be valid. In a third option, in addition to the PRACH occasion of the SBFD-dedicated PRACH configuration being valid within SBFD downlink and SBFD flexible symbols, PRACH occasions in TDD uplink symbols may be valid. In a fourth option, in addition to the PRACH occasion of the SBFD-dedicated PRACH configuration being valid within SBFD downlink and SBFD flexible symbols, PRACH occasions in both uplink and flexible symbols may be valid (e.g., as shown in FIG. **11**).

[0132] FIG. **10** is a diagram illustrating an example **1000** associated with PRACH configurations for full duplex symbols, in accordance with the present disclosure.

[0133] As shown in FIG. **10**, ROs may be only valid in SBFD symbols. An XXXSUXXXUU format may be based at least in part on a DDDSUDDSUU slot format where all DL symbols are SBFD symbols. The PRACH configuration may be based at least in part on a long PRACH sequency (e.g., format 0 with a 1 ms sequence). ROs may occur in subframes 0, 4, 5, and 9 of a frame for an SBFD-dedicated PRACH configuration. Subframe 0, which may be associated with SBFD symbols, may be associated with a first RO **1002** (RO #0). Subframe 4, which may be associated with uplink symbols, may be associated with an invalid RO. Subframe 5, which may be associated with SBFD symbols, may be associated with a second RO **1004** (RO #1). Subframe 9, which may be associated with uplink symbols, may be associated with an invalid RO. Thus, ROs in uplink symbols/slots may be invalid ROs.

[0134] As indicated above, FIG. **10** is provided as an example. Other examples may differ from what is described with regard to FIG. **10**.

[0135] FIG. **11** is a diagram illustrating an example **1100** associated with PRACH configurations for full duplex symbols, in accordance with the present disclosure.

[0136] As shown in FIG. **11**, ROs may be valid in SBFD symbols and uplink symbols. An XXXSUXXXUU format may be based at least in part on a DDDSUDDSUU slot format where all DL symbols are SBFD symbols. The PRACH configuration may be based at least in part on a long PRACH sequency (e.g., format 0 with a 1 ms sequence). ROs may occur in subframes 0, 4, 5, and 9 of a frame for an SBFD-dedicated PRACH configuration. Subframe 0, which may be associated with SBFD symbols, may be associated with a first RO **1102** (RO #0). Subframe 4, which may be associated with uplink symbols, may be associated with a second RO **1104** (RO #1). Subframe 5, which may be associated with SBFD symbols, may be associated with a third RO **1106** (RO #2). Subframe 9, which may be associated with uplink symbols, may be associated with a fourth RO **1108** (RO #3).

[0137] As indicated above, FIG. **11** is provided as an example. Other examples may differ from what is described with regard to FIG. **11**.

[0138] FIG. **12** is a diagram illustrating an example **1200** associated with PRACH configurations for full duplex symbols, in accordance with the present disclosure.

[0139] As shown in FIG. **12**, a time domain pattern of a legacy UE **1202** may be defined. The time domain pattern **1202** may be associated with a downlink slot, a flexible slot, and an uplink slot. A time domain pattern for an SBFD-aware UE **1204** may be defined. The time domain pattern **1204** may be associated with a downlink slot, an SBFD slot, a flexible slot, and an uplink slot. A RO may not be valid for the legacy UE when the RO falls within the downlink slot, but the RO may be valid for the SBFD-aware UE. Valid ROs for the SBFD-aware UE that are invalid for the legacy UE may be mapped to SSBs independently according to a legacy mapping.

[0140] As indicated above, FIG. **12** is provided as an example. Other examples may differ from what is described with regard to FIG. **12**.

[0141] FIG. **13** is a diagram illustrating an example **1300** associated with PRACH configurations for full duplex symbols, in accordance with the present disclosure.

[0142] In some aspects, legacy ROs may overlap with SBFD-aware ROs. Rules for an SBFD aware UE may be defined. When legacy ROs overlap in time with SBFD ROs (or within a specific time duration), either one of the PRACH may be dropped or considering one of the ROs as invalid ROs, which may be based at least in part on a specification or signaled in system information. When legacy ROs overlap in time with SBFD ROs but are separated in a frequency domain, SBFD-dedicated ROs may be considered valid and none of the ROs may be dropped. Otherwise, one of the ROs may be dropped or a frequency offset may be applied to the SBFD ROs. The SBFD-aware UE may check a validity for legacy ROs, and then check a validity for SBFD-aware ROs. In some cases, overlap may be avoided by invalidating all ROs in flexible slots converted to SBFD slots leaving only downlink slots converted to SBFD slots. In some aspects, SBFD ROs in flexible slots or SBFD slots converted from flexible slots may all be invalid.

[0143] As shown in FIG. **13**, an overlap between legacy ROs **1304** and SBFD ROs **1308** may occur. A time domain pattern of a legacy UE **1302** may be associated with the legacy ROs **1304**. A time domain pattern of an SBFD-aware UE **1306** may be associated with the SBFD ROs **1308**. Legacy ROs **1304** that occur within a downlink slot of the time domain pattern of the legacy UE **1302** may be invalid. SBFD ROs **1308** that occur within a downlink slot of the time domain pattern of the SBFD-aware UE **1306** may be invalid. Legacy ROs **1304** that occur within a flexible slot of the time domain pattern of the legacy UE **1302** may not overlap with SBFD ROs **1308** that occur within a flexible slot of the time domain pattern of the SBFD-aware UE **1306**. Legacy ROs **1304** that occur within an uplink slot of the time domain pattern of the legacy UE **1302** may overlap in time with SBFD ROs **1308** that occur within an uplink slot of the time domain pattern of the SBFD-aware UE **1306**, but such ROs may not overlap in frequency so may not be dropped.

[0144] As indicated above, FIG. **13** is provided as an example. Other examples may differ from what is described with regard to FIG. **13**.

[0145] In some aspects, multiple PRACH configurations may be signaled to a UE for different random-access triggering events (e.g., BFR, handover, or system information request). The UE may be configured/indicated with one or two sets of configurations, one for legacy operation and another for SBFD-aware ROs, for PRACH-ConfigCommon, PRACH-ConfigBFR, PRACH-ConfigSI, and/or PRACH-ConfigDedicated. When PRACH-ConfigBFR is not configured, the UE may use PRACH-ConfigCommon.

[0146] FIG. **14** is a diagram illustrating an example **1400** associated with PRACH configurations for full duplex symbols, in accordance with the present disclosure.

[0147] As shown by reference number **1402**, when a UE has two PRACH ConfigCommon configurations (e.g., PRACH-ConfigCommon and SBFD-PRACH-ConfigCommon (or PRACH-ConfigCommon-r19)) and only a legacy UE-dedicated PRACH-ConfigBFR, PRACH-ConfigSI, and/or PRACH-ConfigDedicated is provided, the UE may only use a legacy UE-dedicated configuration for PRACH-ConfigBFR, PRACH-ConfigSI, and/or PRACH-ConfigDedicated. As shown by reference number **1404**, when the UE has two ConfigCommon configurations (e.g., PRACH-ConfigCommon and SBFD-PRACH-ConfigCommon) and only the legacy PRACH-ConfigBFR, PRACH-ConfigSI, and/or PRACH-ConfigDedicated is provided, the UE may use provided legacy configurations and SBFD ConfigCommon configurations.

[0148] As indicated above, FIG. **14** is provided as an example. Other examples may differ from what is described with regard to FIG. **14**.

[0149] FIG. **15** is a diagram illustrating an example **1500** associated with PRACH configurations for full duplex symbols, in accordance with the present disclosure.

[0150] As shown by reference number **1502**, when a UE has two ConfigCommon configurations (e.g., PRACH-ConfigCommon and SBFD-PRACH-ConfigCommon (or PRACH-ConfigCommon-r19)) and no PRACH-ConfigBFR, PRACH-ConfigSI, and/or PRACH-ConfigDedicated, the UE may only use a legacy ConfigCommon configuration for BFR, system information, and/or dedicated configurations. As shown by reference number **1504**, when the UE has two ConfigCommon configurations (e.g., PRACH-ConfigCommon and SBFD-PRACH-ConfigCommon (or PRACH-ConfigCommon-r19)) and no PRACH-ConfigBFR, PRACH-ConfigSI, and/or PRACH-ConfigDedicated, the UE may use both a legacy ConfigCommon configuration and an SBFD ConfigCommon configuration for BFR, system information, and/or dedicated configurations.

[0151] As indicated above, FIG. **15** is provided as an example. Other examples may differ from what is described with regard to FIG. **15**.

[0152] FIG. **16** is a diagram illustrating an example process **1600** performed, for example, at a UE or an apparatus of a UE, in accordance with the present disclosure. Example process **1600** is an example where the apparatus or the UE (e.g., UE **120**) performs operations associated with PRACH configurations for full duplex symbols.

[0153] As shown in FIG. **16**, in some aspects, process **1600** may include receiving a PRACH configuration for a random access procedure in SBFD symbols (block **1610**). For example, the UE (e.g., using reception component **1802** and/or communication manager **1806**, depicted in FIG. **18**) may receive a PRACH configuration for a random access procedure in SBFD symbols, as described above.

[0154] As further shown in FIG. **16**, in some aspects, process **1600** may include transmitting signaling in accordance with the random access procedure based at least in part on the PRACH configuration (block **1620**). For example, the UE (e.g., using transmission component **1804** and/or communication manager **1806**, depicted in FIG. **18**) may transmit signaling in accordance with the random access procedure based at least in part on the PRACH configuration, as described above.

[0155] Process **1600** 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.

[0156] In a first aspect, process **1600** includes transmitting capability signaling indicating that the UE is an SBFD-aware UE, wherein the PRACH configuration is received based at least in part on the capability signaling.

[0157] In a second aspect, alone or in combination with the first aspect, the PRACH configuration is an SBFD-specific PRACH configuration, and the SBFD-specific PRACH configuration is based at least in part on a TDD FR1/2 random access table that includes one or more PRACH configurations to allow one or more subframe configurations specific in SBFD symbols, a random access table for SBFD that is separate from the TDD FR1/2 random access table and an FDD FR1/2 random access table, or the FDD FR1/2 random access table.

[0158] In a third aspect, alone or in combination with one or more of the first and second aspects, the PRACH configuration is a separate cell-specific PRACH configuration that is dedicated for SBFD-aware UEs and separate from a legacy cell-specific PRACH configuration, and the separate PRACH configuration is based at least in part on a separate cell-common PRACH configuration as compared to a legacy PRACH configuration, a single-cell common PRACH configuration having a modified structure to support more than one value for one or more parameters, and the cell-common PRACH configuration includes more than one generic PRACH configuration parameter, or a single cell-common PRACH configuration with an independent SSB-to-RO mapping for ROs that fall within SBFD slots, wherein power control parameters for a PRACH in SBFD symbols override power control parameters in the legacy PRACH configuration.

[0159] In a fourth aspect, alone or in combination with one or more of the first through third aspects, process **1600** includes receiving the PRACH configuration via RRC signaling or via a system information block (SIB).

[0160] In a fifth aspect, alone or in combination with one or more of the first through fourth aspects, the PRACH configuration is an SBFD-dedicated PRACH configuration for SBFD operation in a TDD band, ROs within SBFD downlink symbols or SBFD flexible symbols are valid, and ROs within uplink slots are not valid.

[0161] In a sixth aspect, alone or in combination with one or more of the first through fifth aspects, ROs in TDD flexible symbols are valid, ROs in TDD uplink symbols are valid, or ROs in uplink symbols and flexible symbols are valid.

[0162] In a seventh aspect, alone or in combination with one or more of the first through sixth aspects, process **1600** includes identifying legacy ROs that overlap in time with SBFD ROs, wherein the legacy ROs are associated with a time domain pattern of a legacy UE and the SBFD ROs are associated with a time domain pattern of an SBFD-aware UE, and the legacy ROs or the SBFD ROs are considered valid occasions based at least in part on the overlap.

[0163] In an eighth aspect, alone or in combination with one or more of the first through seventh aspects, process **1600** includes identifying legacy ROs that overlap in time and not frequency with SBFD ROs, wherein the legacy ROs are associated with a time domain pattern of a legacy UE and the SBFD ROs are associated with a time domain pattern of an SBFD-aware UE, and both legacy ROs and SBFD ROs are considered valid RACH occasions, and refraining from dropping the legacy ROs and the SBFD ROs based at least in part on the overlap, dropping the legacy ROs or the SBFD ROs based at least in part on the overlap, or applying a frequency offset to the SBFD ROS.

[0164] In a ninth aspect, alone or in combination with one or more of the first through eighth aspects, SBFD ROs or SBFD slots converted from flexible slots are invalid.

[0165] In a tenth aspect, alone or in combination with one or more of the first through ninth aspects, process **1600** includes receiving a single PRACH configuration compromising a set of RACH occasions (ROs) in both SBFD and non-SBFD symbols, wherein the single PRACH configuration indicates one or more of: a beam failure recovery (BFR) RACH configuration, a system information request RACH configuration, or a UE dedicated PRACH configuration, or receiving a first PRACH configuration comprising a set of RACH occasions in TDD symbols for the legacy random-access operation and a second PRACH configuration comprising a set of ROs in SBFD symbols for the SBFD random access operation, wherein each of the first PRACH configuration and the second PRACH configuration indicate one or more of: a common RACH configuration, a BFR RACH configuration, a system information RACH configuration, or a dedicated RACH configuration.

[0166] Although FIG. **16** shows example blocks of process **1600**, in some aspects, process **1600** may include additional blocks, fewer blocks, different blocks, or differently arranged blocks than those depicted in FIG. **16**. Additionally, or alternatively, two or more of the blocks of process **1600** may be performed in parallel.

[0167] FIG. **17** is a diagram illustrating an example process **1700** performed, for example, at a network node or an apparatus of a network node, in accordance with the present disclosure. Example process **1700** is an example where the apparatus or the network node (e.g., network node **110**) performs operations associated with PRACH configurations for full duplex symbols.

[0168] As shown in FIG. **17**, in some aspects, process **1700** may include transmitting a PRACH configuration for a random access procedure in SBFD symbols (block **1710**). For example, the network node (e.g., using transmission component **1904** and/or communication manager **1906**, depicted in FIG. **19**) may transmit a PRACH configuration for a random access procedure in SBFD symbols, as described above.

[0169] As further shown in FIG. **17**, in some aspects, process **1700** may include receiving signaling in accordance with the random access procedure based at least in part on the PRACH configuration (block **1720**). For example, the network node (e.g., using reception component **1902** and/or communication manager **1906**, depicted in FIG. **19**) may receive signaling in accordance with the random access procedure based at least in part on the PRACH configuration, as described above.

[0170] Process **1700** 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.

[0171] In a first aspect, process **1700** includes receiving capability signaling indicating that a UE is an SBFD-aware UE, wherein the PRACH configuration is transmitted based at least in part on the capability signaling.

[0172] In a second aspect, alone or in combination with the first aspect, the PRACH configuration is an SBFD-specific PRACH configuration, and the SBFD-specific PRACH configuration is based at least in part on a TDD FR1/2 random access table that includes one or more PRACH configurations to allow one or more subframe configurations specific in SBFD symbols, a random access table for SBFD that is separate from the TDD FR1/2 random access table and an FDD FR1/2 random access table, or the FDD FR1/2 random access table.

[0173] In a third aspect, alone or in combination with one or more of the first and second aspects, the PRACH configuration is a separate cell-specific PRACH configuration that is dedicated for SBFD-aware UEs and separate from a legacy cell-specific PRACH configuration, and the separate PRACH configuration is based at least in part on a separate cell-common PRACH configuration as compared to a legacy PRACH configuration, a single-cell common PRACH configuration having a modified structure to support more than one value for one or more parameters, and the cell-common PRACH configuration includes more than one generic PRACH configuration parameter, or a single cell-common PRACH configuration with an independent SSB-to-RO mapping for ROs that fall within SBFD slots, wherein power control parameters for a PRACH in SBFD symbols override power control parameters in the legacy PRACH configuration.

[0174] In a fourth aspect, alone or in combination with one or more of the first through third aspects, process **1700** includes transmitting the PRACH configuration via RRC signaling or via a SIB.

[0175] In a fifth aspect, alone or in combination with one or more of the first through fourth aspects, the PRACH configuration is an SBFD-dedicated PRACH configuration for SBFD operation in a TDD band, ROs within SBFD downlink symbols or SBFD flexible symbols are valid, and ROs within uplink slots are not valid.

[0176] In a sixth aspect, alone or in combination with one or more of the first through fifth aspects, ROs in TDD flexible symbols are valid, ROs in TDD uplink symbols are valid, or ROs in uplink symbols and flexible symbols are valid.

[0177] In a seventh aspect, alone or in combination with one or more of the first through sixth aspects, process **1700** includes transmitting a single PRACH configuration compromising a set of RACH occasions (ROs) in both SBFD and non-SBFD symbols, wherein the single PRACH configuration indicates one or more of: a beam failure recovery (BFR) RACH configuration, a system information request RACH configuration, or a UE dedicated PRACH configuration, or transmitting a first PRACH configuration comprising a set of RACH occasions in TDD symbols for the legacy random-access operation and a second PRACH configuration comprising a set of ROs in SBFD symbols for the SBFD random access operation, wherein each of the first PRACH configuration and the second PRACH configuration indicate one or more of: a common RACH configuration, a BFR RACH configuration, a system information RACH configuration, or a dedicated RACH configuration.

[0178] Although FIG. **17** shows example blocks of process **1700**, in some aspects, process **1700** may include additional blocks, fewer blocks, different blocks, or differently arranged blocks than those depicted in FIG. **17**. Additionally, or alternatively, two or more of the blocks of process **1700** may be performed in parallel.

[0179] FIG. **18** is a diagram of an example apparatus **1800** for wireless communication, in accordance with the present disclosure. The apparatus **1800** may be a UE, or a UE may include the apparatus **1800**. In some aspects, the apparatus **1800** includes a reception component **1802**, a transmission component **1804**, and/or a communication manager **1806**, 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 **1806** is the communication manager **140** described in connection with FIG. **1**. As shown, the apparatus **1800** may communicate with another apparatus **1808**, such as a UE or a network node (such as a CU, a DU, an RU, or a base station), using the reception component **1802** and the transmission component **1804**.

[0180] In some aspects, the apparatus **1800** may be configured to perform one or more operations described herein in connection with FIGS. **8-15**. Additionally, or alternatively, the apparatus **1800** may be configured to perform one or more processes described herein, such as process **1600** of FIG. **16**, or a combination thereof. In some aspects, the apparatus **1800** and/or one or more components shown in FIG. **18** 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. **18** 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.

[0181] The reception component **1802** may receive communications, such as reference signals, control information, data communications, or a combination thereof, from the apparatus **1808**. The reception component **1802** may provide received communications to one or more other components of the apparatus **1800**. In some aspects, the reception component **1802** 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 **1800**. In some aspects, the reception component **1802** 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**.

[0182] The transmission component **1804** may transmit communications, such as reference signals, control information, data communications, or a combination thereof, to the apparatus **1808**. In some aspects, one or more other components of the apparatus **1800** may generate communications and may provide the generated communications to the transmission component **1804** for transmission to the apparatus **1808**. In some aspects, the transmission component **1804** 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 **1808**. In some aspects, the transmission component **1804** 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 **1804** may be co-located with the reception component **1802** in one or more transceivers.

[0183] The communication manager **1806** may support operations of the reception component **1802** and/or the transmission component **1804**. For example, the communication manager **1806** may receive information associated with configuring reception of communications by the reception component **1802** and/or transmission of communications by the transmission component **1804**. Additionally, or alternatively, the communication manager **1806** may generate and/or provide control information to the reception component **1802** and/or the transmission component **1804** to control reception and/or transmission of communications.

[0184] The reception component **1802** may receive a PRACH configuration for a random access procedure in SBFD symbols. The transmission component **1804** may transmit signaling in accordance with the random access procedure based at least in part on the PRACH configuration.

[0185] The transmission component **1804** may transmit capability signaling indicating that the UE is an SBFD-aware UE, wherein the PRACH configuration is received based at least in part on the capability signaling. The communication manager **1806** may identify legacy ROs that overlap in time with SBFD ROs, wherein the legacy ROs are associated with a time domain pattern of a legacy UE and the SBFD ROs are associated with a time domain pattern of an SBFD-aware UE. The communication manager **1806** may drop the legacy ROs or the SBFD ROs based at least in part on the overlap. The communication manager **1806** may identify legacy ROs that overlap in time and not frequency with SBFD ROs, wherein the legacy ROs are associated with a time domain pattern of a legacy UE and the SBFD ROs are associated with a time domain pattern of an SBFD-aware UE.

[0186] The number and arrangement of components shown in FIG. **18** 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. **18**. Furthermore, two or more components shown in FIG. **18** may be implemented within a single component, or a single component shown in FIG. **18** may be implemented as multiple, distributed components. Additionally, or alternatively, a set of (one or more) components shown in FIG. **18** may perform one or more functions described as being performed by another set of components shown in FIG. **18**.

[0187] FIG. **19** is a diagram of an example apparatus **1900** for wireless communication, in accordance with the present disclosure. The apparatus **1900** may be a network node, or a network node may include the apparatus **1900**. In some aspects, the apparatus **1900** includes a reception component **1902**, a transmission component **1904**, and/or a communication manager **1906**, 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 **1906** is the communication manager **150** described in connection with FIG. **1**. As shown, the apparatus **1900** may communicate with another apparatus **1908**, such as a UE or a network node (such as a CU, a DU, an RU, or a base station), using the reception component **1902** and the transmission component **1904**.

[0188] In some aspects, the apparatus **1900** may be configured to perform one or more operations described herein in connection with FIGS. **8-15**. Additionally, or alternatively, the apparatus **1900** may be configured to perform one or more processes described herein, such as process **1700** of FIG. **17**, or a combination thereof. In some aspects, the apparatus **1900** and/or one or more components shown in FIG. **19** 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. **19** 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.

[0189] The reception component **1902** may receive communications, such as reference signals, control information, data communications, or a combination thereof, from the apparatus **1908**. The reception component **1902** may provide received communications to one or more other components of the apparatus **1900**. In some aspects, the reception component **1902** 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 **1900**. In some aspects, the reception component **1902** 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 **1902** and/or the transmission component **1904** 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 **1900** via one or more communications links, such as a backhaul link, a midhaul link, and/or a fronthaul link.

[0190] The transmission component **1904** may transmit communications, such as reference signals, control information, data communications, or a combination thereof, to the apparatus **1908**. In some aspects, one or more other components of the apparatus **1900** may generate communications and may provide the generated communications to the transmission component **1904** for transmission to the apparatus **1908**. In some aspects, the transmission component **1904** 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 **1908**. In some aspects, the transmission component **1904** 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 **1904** may be co-located with the reception component **1902** in one or more transceivers.

[0191] The communication manager **1906** may support operations of the reception component **1902** and/or the transmission component **1904**. For example, the communication manager **1906** may receive information associated with configuring reception of communications by the reception component **1902** and/or transmission of communications by the transmission component **1904**. Additionally, or alternatively, the communication manager **1906** may generate and/or provide control information to the reception component **1902** and/or the transmission component **1904** to control reception and/or transmission of communications.

[0192] The transmission component **1904** may transmit a PRACH configuration for a random access procedure in SBFD symbols. The reception component **1902** may receive signaling in accordance with the random access procedure based at least in part on the PRACH configuration.

[0193] The number and arrangement of components shown in FIG. **19** 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. **19**. Furthermore, two or more components shown in FIG. **19** may be implemented within a single component, or a single component shown in FIG. **19** may be implemented as multiple, distributed components. Additionally, or alternatively, a set of (one or more) components shown in FIG. **19** may perform one or more functions described as being performed by another set of components shown in FIG. **19**.

[0194] The following provides an overview of some Aspects of the present disclosure:

[0195] Aspect 1: A method of wireless communication performed by a user equipment (UE), comprising: receiving a physical random access channel (PRACH) configuration for a random access procedure in subband full duplex (SBFD) symbols; and transmitting signaling in accordance with the random access procedure based at least in part on the PRACH configuration.

[0196] Aspect 2: The method of Aspect 1, further comprising: transmitting capability signaling indicating that the UE is an SBFD-aware UE, wherein the PRACH configuration is received based at least in part on the capability signaling.

[0197] Aspect 3: The method of any of Aspects 1-2, wherein the PRACH configuration is an SBFD-specific PRACH configuration, and the SBFD-specific PRACH configuration is based at least in part on: a time division duplexing (TDD) frequency range 1/2 (FR1/2) random access table that includes one or more PRACH configurations to allow one or more subframe configurations specific for SBFD, a random access table for SBFD that is separate from the TDD FR1/2 random access table and a frequency division duplexing (FDD) FR1/2 random access table, or the FDD FR1/2 random access table.

[0198] Aspect 4: The method of any of Aspects 1-3, wherein the PRACH configuration is a separate cell-specific PRACH configuration that is dedicated for SBFD-aware UEs and separate from a legacy cell-specific PRACH configuration, and the separate PRACH configuration is based at least in part on: a separate cell-common PRACH configuration as compared to a legacy PRACH configuration, a single cell-common PRACH configuration having a modified structure to support more than one value for one or more parameters, and the single cell-common PRACH configuration includes more than one generic PRACH configuration parameter, or a single cell-common PRACH configuration with an independent synchronization signal block (SSB)-to-PRACH-occasion (RO) mapping for ROs that fall within SBFD slots, wherein power control parameters for a PRACH in SBFD symbols override power control parameters in the legacy PRACH configuration.

[0199] Aspect 5: The method of any of Aspects 1-4, wherein receiving the PRACH configuration comprises receiving the PRACH configuration via radio resource control (RRC) signaling or via a system information block (SIB).

[0200] Aspect 6: The method of any of Aspects 1-5, wherein the PRACH configuration is an SBFD-dedicated PRACH configuration for SBFD operation in a time division duplexing (TDD) band, random access channel (RACH) occasions (ROs) within SBFD downlink symbols or SBFD flexible symbols are valid, and ROs within uplink slots are not valid.

[0201] Aspect 7: The method of Aspect 6, wherein: ROs in TDD flexible symbols are valid, ROs in TDD uplink symbols are valid, or ROs in uplink symbols and flexible symbols are valid.

[0202] Aspect 8: The method of any of Aspects 1-7, further comprising: identifying legacy random access channel (RACH) occasions (ROs) that overlap in time with SBFD ROs, wherein the legacy ROs are associated with a time domain pattern of a legacy UE and the SBFD ROs are associated with a time domain pattern of an SBFD-aware UE, and the legacy ROs or the SBFD ROs are considered valid occasions based at least in part on the overlap.

[0203] Aspect 9: The method of any of Aspects 1-8, further comprising: identifying legacy random access channel (RACH) occasions (ROs) that overlap in time and not frequency with SBFD ROs, wherein the legacy ROs are associated with a time domain pattern of a legacy UE and the SBFD ROs are associated with a time domain pattern of an SBFD-aware UE, and both legacy ROs and SBFD ROs are considered valid RACH occasions; and refraining from dropping the legacy ROs and the SBFD ROs based at least in part on the overlap, dropping the legacy ROs or the SBFD ROs based at least in part on the overlap, or applying a frequency offset to the SBFD ROs.

[0204] Aspect 10: The method of any of Aspects 1-9, wherein SBFD random access channel (RACH) occasions (ROs) or SBFD slots converted from flexible slots are invalid.

[0205] Aspect 11: The method of any of Aspects 1-10, further comprising: receiving a single PRACH configuration compromising a set of RACH occasions (ROs) in both SBFD and non-SBFD symbols, wherein the single PRACH configuration indicates one or more of: a beam failure recovery (BFR) RACH configuration, a system information request RACH configuration, or a UE dedicated PRACH configuration; or receiving a first PRACH configuration comprising a set of RACH occasions in TDD symbols for the legacy random-access operation and a second PRACH configuration comprising a set of ROs in SBFD symbols for the SBFD random access operation, wherein each of the first PRACH configuration and the second PRACH configuration indicate one or more of: a common RACH configuration, a BFR RACH configuration, a system information RACH configuration, or a dedicated RACH configuration.

[0206] Aspect 12: A method of wireless communication performed by a network node, comprising: transmitting a physical random access channel (PRACH) configuration for a random access procedure in subband full duplex (SBFD) symbols; and receiving signaling in accordance with the random access procedure based at least in part on the PRACH configuration.

[0207] Aspect 13: The method of Aspect 12, further comprising: receiving capability signaling indicating that a user equipment (UE) is an SBFD-aware UE, wherein the PRACH configuration is transmitted based at least in part on the capability signaling.

[0208] Aspect 14: The method of any of Aspects 12-13, wherein the PRACH configuration is an SBFD-specific PRACH configuration, and the SBFD-specific PRACH configuration is based at least in part on: a time division duplexing (TDD) frequency range 1/2 (FR1/2) random access table that includes one or more PRACH configurations to allow one or more subframe configurations specific for SBFD, a random access table for SBFD that is separate from the TDD FR1/2 random access table and a frequency division duplexing (FDD) FR1/2 random access table, or the FDD FR1/2 random access table.

[0209] Aspect 15: The method of any of Aspects 12-14, wherein the PRACH configuration is a separate cell-specific PRACH configuration that is dedicated for SBFD-aware UEs and separate from a legacy cell-specific PRACH configuration, and the separate PRACH configuration is based at least in part on: a separate cell-common PRACH configuration as compared to a legacy PRACH configuration, a single cell-common PRACH configuration having a modified structure to support more than one value for one or more parameters, and the single cell-common PRACH configuration includes more than one generic PRACH configuration parameter, or a single cell-common PRACH configuration with an independent synchronization signal block (SSB)-to-PRACH-occasion (RO) mapping for ROs that fall within SBFD slots, wherein power control parameters for a PRACH in SBFD symbols override power control parameters in the legacy PRACH configuration.

[0210] Aspect 16: The method of any of Aspects 12-15, wherein transmitting the PRACH configuration comprises transmitting the PRACH configuration via radio resource control (RRC) signaling or via a system information block (SIB).

[0211] Aspect 17: The method of any of Aspects 12-16, wherein the PRACH configuration is an SBFD-dedicated PRACH configuration for SBFD operation in a time division duplexing (TDD) band, random access channel (RACH) occasions (ROs) within SBFD downlink symbols or SBFD flexible symbols are valid, and ROs within uplink slots are not valid.

[0212] Aspect 18: The method of Aspect 17, wherein: ROs in TDD flexible symbols are valid, ROs in TDD uplink symbols are valid, or ROs in uplink symbols and flexible symbols are valid.

[0213] Aspect 19: The method of any of Aspects 12-18, further comprising: transmitting a single PRACH configuration compromising a set of RACH occasions (ROs) in both SBFD and non-SBFD symbols, wherein the single PRACH configuration indicates one or more of: a beam failure recovery (BFR) RACH configuration, a system information request RACH configuration, or a UE dedicated PRACH configuration; or transmitting a first PRACH configuration comprising a set of RACH occasions in TDD symbols for the legacy random-access operation and a second PRACH configuration comprising a set of ROs in SBFD symbols for the SBFD random access operation, wherein each of the first PRACH configuration and the second PRACH configuration indicate one or more of: a common RACH configuration, a BFR RACH configuration, a system information RACH configuration, or a dedicated RACH configuration.

[0214] Aspect 20: 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 1-11.

[0215] Aspect 21: 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 1-11.

[0216] Aspect 22: An apparatus for wireless communication, the apparatus comprising at least one means for performing the method of one or more of Aspects 1-11.

[0217] Aspect 23: 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 1-11.

[0218] Aspect 24: 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 1-11.

[0219] Aspect 25: 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 1-11.

[0220] Aspect 26: 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 1-11.

[0221] Aspect 27: 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 12-19.

[0222] Aspect 28: 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 12-19.

[0223] Aspect 29: An apparatus for wireless communication, the apparatus comprising at least one means for performing the method of one or more of Aspects 12-19.

[0224] Aspect 30: 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 12-19.

[0225] Aspect 31: 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 12-19.

[0226] Aspect 32: 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 12-19.

[0227] Aspect 33: 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 12-19.

[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 at a user equipment (UE), comprising:
- one or more memories; and
- one or more processors, coupled to the one or more memories, configured to cause the UE to:
  - receive a physical random access channel (PRACH) configuration for a random access procedure in sub-band full duplex (SBFD) symbols; and
  - transmit signaling in accordance with the random access procedure based at least in part on the PRACH configuration.

2. The apparatus of claim **1**, wherein the one or more processors are further configured to cause the UE to:
- transmit capability signaling indicating that the UE is an SBFD-aware UE, wherein the PRACH configuration is received based at least in part on the capability signaling.

3. The apparatus of claim **1**, wherein the PRACH configuration is an SBFD-specific PRACH configuration, and the SBFD-specific PRACH configuration is based at least in part on:
- a time division duplexing (TDD) frequency range 1/2 (FR1/2) random access table that includes one or more PRACH configurations to allow one or more subframe configurations specific in SBFD symbols,
- a random access table for SBFD that is separate from the TDD FR1/2 random access table and a frequency division duplexing (FDD) FR1/2 random access table, or
- the FDD FR1/2 random access table.

4. The apparatus of claim **1**, wherein the PRACH configuration is a separate cell-specific PRACH configuration that is dedicated for SBFD-aware UEs and separate from a legacy cell-specific PRACH configuration, and the separate PRACH configuration is based at least in part on:
- a separate cell-common PRACH configuration as compared to a legacy cell-common PRACH configuration,
- a single cell-common PRACH configuration having a modified structure to support more than one value for one or more parameters, and the single cell-common PRACH configuration includes more than one generic PRACH configuration parameter, or
- a single cell-common PRACH configuration with an independent synchronization signal block (SSB)-to-PRACH-occasion (RO) mapping for ROs that fall within SBFD slots,
- wherein power control parameters for a PRACH in SBFD symbols override power control parameters in the legacy PRACH configuration.

5. The apparatus of claim **1**, wherein the one or more processors are further configured to cause the UE to:
- receive the PRACH configuration via radio resource control (RRC) signaling or via a system information block (SIB).

6. The apparatus of claim **1**, wherein the PRACH configuration is an SBFD-dedicated PRACH configuration for SBFD operation in a time division duplexing (TDD) band, random access channel (RACH) occasions (ROs) within

SBFD downlink symbols or SBFD flexible symbols are valid, and ROs within uplink slots are not valid.

7. The apparatus of claim **6**, wherein:

ROs in TDD flexible symbols are valid,

ROs in TDD uplink symbols are valid, or

ROs in uplink symbols and flexible symbols are valid.

8. The apparatus of claim **1**, wherein the one or more processors are further configured to cause the UE to:

identify legacy random access channel (RACH) occasions (ROs) that overlap in time with SBFD ROs, wherein the legacy ROs are associated with a time domain pattern of a legacy UE and the SBFD ROs are associated with a time domain pattern of an SBFD-aware UE, and the legacy ROs or the SBFD ROs are considered valid occasion based at least in part on the overlap.

9. The apparatus of claim **1**, wherein the one or more processors are further configured to cause the UE to:

identify legacy random access channel (RACH) occasions (ROs) that overlap in time and not frequency with SBFD ROs, wherein the legacy ROs are associated with a time domain pattern of a legacy UE and the SBFD ROs are associated with a time domain pattern of an SBFD-aware UE, and both legacy ROs and SBFD ROs are considered valid RACH occasions; and

refrain from dropping the legacy ROs and the SBFD ROs based at least in part on the overlap, drop the legacy ROs or the SBFD ROs based at least in part on the overlap, or apply a frequency offset to the SBFD ROs.

10. The apparatus of claim **1**, wherein SBFD random access channel (RACH) occasions (ROs) or SBFD slots converted from flexible slots are invalid.

11. The apparatus of claim **1**, wherein the one or more processors are further configured to cause the UE to:

receive a single PRACH configuration compromising a set of random access channel (RACH) occasions (ROs) in both SBFD and non-SBFD symbols, wherein the single PRACH configuration indicates one or more of: a beam failure recovery (BFR) RACH configuration, a system information request RACH configuration, or a UE dedicated PRACH configuration; or

receive a first PRACH configuration comprising a set of RACH occasions in TDD symbols for the legacy random-access operation and a second PRACH configuration comprising a set of ROs in SBFD symbols for the SBFD random access operation, wherein each of the first PRACH configuration and the second PRACH configuration indicate one or more of: a common RACH configuration, a BFR RACH configuration, a system information RACH configuration, or a dedicated RACH configuration.

12. An apparatus for wireless communication at a network node, comprising:

one or more memories; and

one or more processors, coupled to the one or more memories, configured to cause the network node to:

transmit a physical random access channel (PRACH) configuration for a random access procedure in sub-band full duplex (SBFD) symbols; and

receive signaling in accordance with the random access procedure based at least in part on the PRACH configuration.

13. The apparatus of claim **12**, wherein the one or more processors are further configured to cause the network node to:

receive capability signaling indicating that a user equipment (UE) is an SBFD-aware UE, wherein the PRACH configuration is transmitted based at least in part on the capability signaling.

14. The apparatus of claim **12**, wherein the PRACH configuration is an SBFD-specific PRACH configuration, and the SBFD-specific PRACH configuration is based at least in part on:

a time division duplexing (TDD) frequency range 1/2 (FR1/2) random access table that includes one or more PRACH configurations to allow one or more subframe configurations specific in SBFD symbols,

a random access table for SBFD that is separate from the TDD FR1/2 random access table and a frequency division duplexing (FDD) FR1/2 random access table, or

the FDD FR1/2 random access table.

15. The apparatus of claim **12**, wherein the PRACH configuration is a separate cell-specific PRACH configuration that is dedicated for SBFD-aware user equipments (UEs) and separate from a legacy cell-specific PRACH configuration, and the separate PRACH configuration is based at least in part on:

a separate cell-common PRACH configuration as compared to a legacy cell-common PRACH configuration,

a single cell-common PRACH configuration having a modified structure to support more than one value for one or more parameters, and the single cell-common PRACH configuration includes more than one generic PRACH configuration parameter, or

a single cell-common PRACH configuration with an independent synchronization signal block (SSB)-to-PRACH-occasion (RO) mapping for ROs that fall within SBFD slots,

wherein power control parameters for a PRACH in SBFD symbols override power control parameters in the legacy PRACH configuration.

16. The apparatus of claim **12**, wherein the one or more processors are further configured to cause the network node to:

transmit the PRACH configuration via radio resource control (RRC) signaling or via a system information block (SIB).

17. The apparatus of claim **12**, wherein the PRACH configuration is an SBFD-dedicated PRACH configuration for SBFD operation in a time division duplexing (TDD) band, random access channel (RACH) occasions (ROs) within SBFD downlink symbols or SBFD flexible symbols are valid, and ROs within uplink slots are not valid.

18. The apparatus of claim **17**, wherein:

ROs in TDD flexible symbols are valid,

ROs in TDD uplink symbols are valid, or

ROs in uplink symbols and flexible symbols are valid.

19. The apparatus of claim **12**, wherein the one or more processors are further configured to cause the network node to:

transmit a single PRACH configuration compromising a set of random access channel (RACH) occasions (ROs) in both SBFD and non-SBFD symbols, wherein the single PRACH configuration indicates one or more of: a beam failure recovery (BFR) RACH configuration, a system information request RACH configuration, or a UE dedicated PRACH configuration; or transmit a first PRACH configuration comprising a set of RACH occasions in TDD symbols for the legacy random-access operation and a second PRACH configuration comprising a set of ROs in SBFD symbols for the SBFD random access operation, wherein each of the first PRACH configuration and the second PRACH configuration indicate one or more of: a common RACH configuration, a BFR RACH configuration, a system information RACH configuration, or a dedicated RACH configuration.

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

receiving a physical random access channel (PRACH) configuration for a random access procedure in subband full duplex (SBFD) symbols; and

transmitting signaling in accordance with the random access procedure based at least in part on the PRACH configuration.

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