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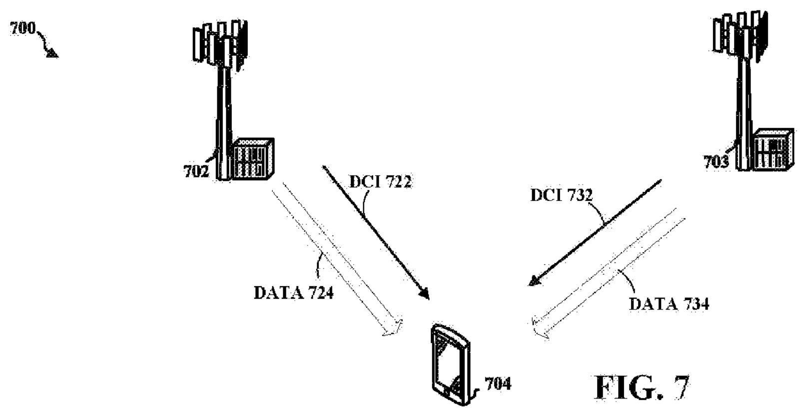

FIG. 7

(57) Abstract: A UE receives a bandwidth part switch command from a first TRP, the bandwidth part switch command instructing the UE to switch from communicating on a first bandwidth part to communicating on a second bandwidth part. The UE (a) determines to accept the bandwidth part switch command based on a priority level of the first TRP among the plurality of TRPs or (b) informs other TRPs of the plurality of TRPs. The UE switches from communicating on the first bandwidth part to communicating on the second bandwidth part. A first TRP determines whether the first TRP is a primary TRP instructing to switch from communicating on a first bandwidth part to communicating on a second bandwidth part. The first TRP communicates with the UE via the first TRP on either the first bandwidth part or the second bandwidth part, when the first TRP is the primary TRP.

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DYNAMIC BWP SWITCHING UNDER MULTI-TRP TRANSMISSIONS

CROSS-REFERENCE TO RELATED APPLICATION(S)

[0001]This application claims the benefits of U.S. Provisional Application Serial No. 62/805,377, entitled "METHODS SUPPORTING DATA TRANSMISSION FROM MULTIPLE TRANSMISSION POINTS and filed on February 14, 2019; and U.S. Provisional Application Serial No. 62/842,657, entitled "ENHANCEMENT FOR MULTI-TRP TRANSMISSION" and filed on May 3, 2019; all of which are expressly incorporated by reference herein in their entirety.

FIELD

[0002]The present disclosure relates generally to communication systems, and more particularly, to techniques of dynamic BWP switching under multi-TRP transmissions.

BACKGROUND

[0003]The statements in this section merely provide background information related to the present disclosure and may not constitute prior art.

[0004]Wireless communication systems are widely deployed to provide various telecommunication services such as telephony, video, data, messaging, and broadcasts. Typical wireless communication systems may employ multiple-access technologies capable of supporting communication with multiple users by sharing available system resources. Examples of such multiple-access technologies 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.

[0005]These multiple access technologies have been adopted in various telecommunication standards to provide a common protocol that enables different wireless devices to communicate on a municipal, national, regional, and even global level. An example telecommunication standard is 5G New Radio (NR). 5G NR is part of a continuous mobile broadband evolution promulgated by Third Generation Partnership Project (3GPP) to meet new requirements associated with latency, reliability, security, scalability (e.g., with Internet of Things (IoT)), and other requirements. Some aspects of 5G NR may be based on the 4G Long Term Evolution (LTE) standard. There exists a need for further improvements in 5G NR technology. These improvements may also be applicable to other multi-access technologies and the telecommunication standards that employ these technologies.

SUMMARY

[0006]The following presents a simplified summary of one or more aspects in order to provide a basic understanding of such aspects. This summary is not an extensive overview of all contemplated aspects, and is intended to neither identify key or critical elements of all aspects nor delineate the scope of any or all aspects.

Its sole purpose is to present some concepts of one or more aspects in a simplified form as a prelude to the more detailed description that is presented later.

[0007]In an aspect of the disclosure, a method, a computer-readable medium, and an apparatus are provided. The apparatus may be a UE. The apparatus may be a UE. The UE determines that a plurality of transmission and reception points (TRPs) transmit data to the UE. The UE receives a bandwidth part switch command from a first TRP of the plurality of TRPs, the bandwidth part switch command instructing the UE to switch from communicating on a first bandwidth part to communicating on a second bandwidth part. In response to receiving the bandwidth part switch command, the UE (a) determines to accept the bandwidth part switch command based on a priority level of the first TRP among the plurality of TRPs or (b) informs other TRPs of the plurality of TRPs. The UE switches from communicating on the first bandwidth part to communicating on the second bandwidth part.

[0008]In another aspect of the disclosure, a method, a computer-readable medium, and an apparatus are provided. The apparatus may be a base station having a first TRP. The first TRP determines that a plurality of TRPs are concurrently transmitting data to a UE, the plurality of TRPs including a first TRP at the base station. The first TRP determines whether the first TRP is a primary TRP that is allowed to instruct the UE to switch from communicating on a first bandwidth part to communicating on a second bandwidth part, wherein a bandwidth of the first bandwidth part contains all bandwidth of the second bandwidth part. The first TRP communicates with the UE via the first TRP on either the first bandwidth part or the second bandwidth part, when the first TRP is the primary TRP.

[0009]To the accomplishment of the foregoing and related ends, the one or more aspects comprise the features hereinafter fully described and particularly pointed out in the claims. The following description and the annexed drawings set forth in detail certain illustrative features of the one or more aspects. These features are indicative, however, of but a few of the various ways in which the principles of various aspects may be employed, and this description is intended to include all such aspects and their equivalents.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]FIG. 1 is a diagram illustrating an example of a wireless communications system and an access network.

[0011]FIG. 2 is a diagram illustrating a base station in communication with a UE in an access network.

[0012]FIG. 3 illustrates an example logical architecture of a distributed access network.

[0013]FIG. 4 illustrates an example physical architecture of a distributed access network.

[0014]FIG. 5 is a diagram showing an example of a DL-centric subframe.

[0015]FIG. 6 is a diagram showing an example of an UL-centric subframe.

[0016]FIG. 7 is a diagram illustrating communications between a UE and two TRPs.

[0017]FIG. 8 is a diagram illustrating techniques of facilitating bandwidth part switching among multiple TRPs.

[0018]FIG. 9 is a flow chart of a method (process) for dynamically switching bandwidth part.

[0019]FIG. 10 is a flow chart of another method (process) for dynamically switching bandwidth part.

[0020]FIG. 11 is a conceptual data flow diagram illustrating the data flow between different components/means in an exemplary apparatus.

[0021]FIG. 12 is a diagram illustrating an example of a hardware implementation for an apparatus employing a processing system.

DETAILED DESCRIPTION

[0022]The detailed description set forth below in connection with the appended drawings is intended as a description of various configurations and is not intended to represent the only configurations in which the concepts described herein may be practiced. The detailed description includes specific details for the purpose of providing a thorough understanding of various concepts. However, it will be apparent to those skilled in the art that these concepts may be practiced without these specific details. In some instances, well known structures and components are shown in block diagram form in order to avoid obscuring such concepts.

[0023]Several aspects of telecommunication systems will now be presented with reference to various apparatus and methods. These apparatus and methods will be described in the following detailed description and illustrated in the accompanying drawings by various blocks, components, circuits, processes, algorithms, etc. (collectively referred to as "elements"). These elements may be implemented using electronic hardware, computer software, or any combination thereof. Whether such elements are implemented as hardware or software depends upon the particular application and design constraints imposed on the overall system.

[0024]By way of example, an element, or any portion of an element, or any combination of elements may be implemented as a "processing system" that includes one or more processors. Examples of processors include microprocessors, microcontrollers, graphics processing units (GPUs), central processing units (CPUs), application processors, digital signal processors (DSPs), reduced instruction set computing (RISC) processors, systems on a chip (SoC), baseband processors, field programmable gate arrays (FPGAs), programmable logic devices (PLDs), state machines, gated logic, discrete hardware circuits, and other suitable hardware configured to perform the various functionality described throughout this disclosure. One or more processors in the processing system may execute software. Software shall be construed broadly to mean instructions, instruction sets, code, code segments, program code, programs, subprograms, software components, applications, software applications, software packages, routines, subroutines, objects, executables, threads of execution, procedures, functions, etc., whether referred to as software, firmware, middleware, microcode, hardware description language, or otherwise.

[0025]Accordingly, in one or more example embodiments, the functions described may be implemented in hardware, software, or any combination thereof. If implemented in software, the functions may be stored on or encoded as one or more instructions or code on a computer-readable medium. Computer-readable media includes computer storage media. Storage media may be any available media that can be accessed by a computer. By way of example, and not limitation, such computer- readable media can comprise a random-access memory (RAM), a read-only memory (ROM), an electrically erasable programmable ROM (EEPROM), optical disk storage, magnetic disk storage, other magnetic storage devices, combinations of the aforementioned types of computer-readable media, or any other medium that can be used to store computer executable code in the form of instructions or data structures that can be accessed by a computer.

[0026]FIG. 1 is a diagram illustrating an example of a wireless communications system and an access network 100. The wireless communications system (also referred to as a wireless wide area network (WWAN)) includes base stations 102, UEs 104, and a core network 160. The base stations 102 may include macro cells (high power cellular base station) and/or small cells (low power cellular base station). The macro cells include base stations. The small cells include femtocells, picocells, and microcells.

[0027]The base stations 102 (collectively referred to as Evolved Universal Mobile Telecommunications System (UMTS) Terrestrial Radio Access Network (E- UTRAN)) interface with the core network 160 through backhaul links 132 (e.g., S1 interface). In addition to other functions, the base stations 102 may perform one or more of the following functions: transfer of user data, radio channel ciphering and deciphering, integrity protection, header compression, mobility control functions (e.g., handover, dual connectivity), inter-cell interference coordination, connection setup and release, load balancing, distribution for non-access stratum (NAS) messages, NAS node selection, synchronization, radio access network (RAN) sharing, multimedia broadcast multicast service (MBMS), subscriber and equipment trace, RAN information management (RIM), paging, positioning, and delivery of warning messages. The base stations 102 may communicate directly or indirectly (e.g., through the core network 160) with each other over backhaul links 134 (e.g., X2 interface). The backhaul links 134 may be wired or wireless.

[0028]The base stations 102 may wirelessly communicate with the UEs 104. Each of the base stations 102 may provide communication coverage for a respective geographic coverage area 110. There may be overlapping geographic coverage areas 1 10. For example, the small cell 102' may have a coverage area 110' that overlaps the coverage area 1 10 of one or more macro base stations 102. A network that includes both small cell and macro cells may be known as a heterogeneous network. A heterogeneous network may also include Home Evolved Node Bs (eNBs) (HeNBs), which may provide service to a restricted group known as a closed subscriber group (CSG). The communication links 120 between the base stations 102 and the UEs 104 may include uplink (UL) (also referred to as reverse link) transmissions from a UE 104 to a base station 102 and/or downlink (DL) (also referred to as forward link) transmissions from a base station 102 to a UE 104. The communication links 120 may use multiple-input and multiple-output (MIMO) antenna technology, including spatial multiplexing, beamforming, and/or transmit diversity. The communication links may be through one or more carriers. The base stations 102 / UEs 104 may use spectrum up to Y MHz (e.g., 5, 10, 15, 20, 100 MHz) bandwidth per carrier allocated in a carrier aggregation of up to a total of Yx MHz (x component carriers) used for transmission in each direction. The carriers may or may not be adjacent to each other. Allocation of carriers may be asymmetric with respect to DL and UL (e.g., more or less carriers may be allocated for DL than for UL). The component carriers may include a primary component carrier and one or more secondary component carriers. A primary component carrier may be referred to as a primary cell (PCell) and a secondary component carrier may be referred to as a secondary cell (SCell).

[0029]The wireless communications system may further include a Wi-Fi access point (AP) 150 in communication with Wi-Fi stations (STAs) 152 via communication links 154 in a 5 GHz unlicensed frequency spectrum. When communicating in an unlicensed frequency spectrum, the STAs 152 / AP 150 may perform a clear channel assessment (CCA) prior to communicating in order to determine whether the channel is available.

[0030]The small cell 102' may operate in a licensed and/or an unlicensed frequency spectrum. When operating in an unlicensed frequency spectrum, the small cell 102' may employ NR and use the same 5 GHz unlicensed frequency spectrum as used by the Wi-Fi AP 150. The small cell 102’, employing NR in an unlicensed frequency spectrum, may boost coverage to and/or increase capacity of the access network.

[0031]The gNodeB (gNB) 180 may operate in millimeter wave (mmW) frequencies and/or near mmW frequencies in communication with the UE 104. When the gNB 180 operates in mmW or near mmW frequencies, the gNB 180 may be referred to as an mmW base station. Extremely high frequency (EHF) is part of the RF in the electromagnetic spectrum. EHF has a range of 30 GHz to 300 GHz and a wavelength between 1 millimeter and 10 millimeters. Radio waves in the band may be referred to as a millimeter wave. Near mmW may extend down to a frequency of 3 GHz with a wavelength of 100 millimeters. The super high frequency (SHF) band extends between 3 GHz and 30 GHz, also referred to as centimeter wave. Communications using the mmW / near mmW radio frequency band has extremely high path loss and a short range. The mmW base station 180 may utilize beamforming 184 with the UE 104 to compensate for the extremely high path loss and short range.

[0032]The core network 160 may include a Mobility Management Entity (MME) 162, other MMEs 164, a Serving Gateway 166, a Multimedia Broadcast Multicast Service (MBMS) Gateway 168, a Broadcast Multicast Service Center (BM-SC) 170, and a Packet Data Network (PDN) Gateway 172. The MME 162 may be in communication with a Home Subscriber Server (HSS) 174. The MME 162 is the control node that processes the signaling between the UEs 104 and the core network 160. Generally, the MME 162 provides bearer and connection management. All user Internet protocol (IP) packets are transferred through the Serving Gateway 166, which itself is connected to the PDN Gateway 172. The PDN Gateway 172 provides UE IP address allocation as well as other functions. The PDN Gateway 172 and the BM-SC 170 are connected to the IP Services 176. The IP Services 176 may include the Internet, an intranet, an IP Multimedia Subsystem (IMS), a PS Streaming Service (PSS), and/or other IP services. The BM-SC 170 may provide functions for MBMS user service provisioning and delivery. The BM-SC 170 may serve as an entry point for content provider MBMS transmission, may be used to authorize and initiate MBMS Bearer Services within a public land mobile network (PLMN), and may be used to schedule MBMS transmissions. The MBMS Gateway 168 may be used to distribute MBMS traffic to the base stations 102 belonging to a Multicast Broadcast Single Frequency Network (MBSFN) area broadcasting a particular service, and may be responsible for session management (start/stop) and for collecting eMBMS related charging information.

[0033]The base station may also be referred to as a gNB, Node B, evolved Node B (eNB), an access point, a base transceiver station, a radio base station, a radio transceiver, a transceiver function, a basic service set (BSS), an extended service set (ESS), or some other suitable terminology. The base station 102 provides an access point to the core network 160 for a UE 104. Examples of UEs 104 include a cellular phone, a smart phone, a session initiation protocol (SIP) phone, a laptop, a personal digital assistant (PDA), a satellite radio, a global positioning system, a multimedia device, a video device, a digital audio player (e.g., MP3 player), a camera, a game console, a tablet, a smart device, a wearable device, a vehicle, an electric meter, a gas pump, a toaster, or any other similar functioning device. Some of the UEs 104 may be referred to as IoT devices (e.g., parking meter, gas pump, toaster, vehicles, etc.). The UE 104 may also be referred to as a station, a mobile station, a subscriber station, a mobile unit, a subscriber unit, a wireless unit, a remote unit, a mobile device, a wireless device, a wireless communications device, a remote device, a mobile subscriber station, an access terminal, a mobile terminal, a wireless terminal, a remote terminal, a handset, a user agent, a mobile client, a client, or some other suitable terminology.

[0034]FIG. 2 is a block diagram of a base station 210 in communication with a UE 250 in an access network. In the DL, IP packets from the core network 160 may be provided to a controller/processor 275. The controller/processor 275 implements layer 3 and layer 2 functionality. Layer 3 includes a radio resource control (RRC) layer, and layer 2 includes a packet data convergence protocol (PDCP) layer, a radio link control (RLC) layer, and a medium access control (MAC) layer. The controller/processor 275 provides RRC layer functionality associated with broadcasting of system information (e.g., MIB, SIBs), RRC connection control (e.g., RRC connection paging, RRC connection establishment, RRC connection modification, and RRC connection release), inter radio access technology (RAT) mobility, and measurement configuration for UE measurement reporting; PDCP layer functionality associated with header compression / decompression, security (ciphering, deciphering, integrity protection, integrity verification), and handover support functions; RLC layer functionality associated with the transfer of upper layer packet data units (PDUs), error correction through ARQ, concatenation, segmentation, and reassembly of RLC service data units (SDUs), re-segmentation of RLC data PDUs, and reordering of RLC data PDUs; and MAC layer functionality associated with mapping between logical channels and transport channels, multiplexing of MAC SDUs onto transport blocks (TBs), demultiplexing of MAC SDUs from TBs, scheduling information reporting, error correction through HARQ, priority handling, and logical channel prioritization.

[0035]The transmit (TX) processor 216 and the receive (RX) processor 270 implement layer 1 functionality associated with various signal processing functions. Layer 1, which includes a physical (PHY) layer, may include error detection on the transport channels, forward error correction (FEC) coding/decoding of the transport channels, interleaving, rate matching, mapping onto physical channels, modulation/demodulation of physical channels, and MIMO antenna processing. The TX processor 216 handles mapping to signal constellations based on various modulation schemes (e.g., binary phase-shift keying (BPSK), quadrature phase-shift keying (QPSK), M-phase-shift keying (M-PSK), M-quadrature amplitude modulation (M-QAM)). The coded and modulated symbols may then be split into parallel streams. Each stream may then be mapped to an OFDM subcarrier, multiplexed with a reference signal (e.g., pilot) in the time and/or frequency domain, and then combined together using an Inverse Fast Fourier Transform (IFFT) to produce a physical channel carrying a time domain OFDM symbol stream. The OFDM stream is spatially precoded to produce multiple spatial streams. Channel estimates from a channel estimator 274 may be used to determine the coding and modulation scheme, as well as for spatial processing. The channel estimate may be derived from a reference signal and/or channel condition feedback transmitted by the UE 250. Each spatial stream may then be provided to a different antenna 220 via a separate transmitter 218TX. Each transmitter 218TX may modulate an RF carrier with a respective spatial stream for transmission.

[0036]At the UE 250, each receiver 254RX receives a signal through its respective antenna 252. Each receiver 254RX recovers information modulated onto an RF carrier and provides the information to the receive (RX) processor 256. The TX processor 268 and the RX processor 256 implement layer 1 functionality associated with various signal processing functions. The RX processor 256 may perform spatial processing on the information to recover any spatial streams destined for the UE 250. If multiple spatial streams are destined for the UE 250, they may be combined by the RX processor 256 into a single OFDM symbol stream. The RX processor 256 then converts the OFDM symbol stream from the time-domain to the frequency domain using a Fast Fourier Transform (FFT). The frequency domain signal comprises a separate OFDM symbol stream for each subcarrier of the OFDM signal. The symbols on each subcarrier, and the reference signal, are recovered and demodulated by determining the most likely signal constellation points transmitted by the base station 210. These soft decisions may be based on channel estimates computed by the channel estimator 258. The soft decisions are then decoded and deinterleaved to recover the data and control signals that were originally transmitted by the base station 210 on the physical channel. The data and control signals are then provided to the controller/processor 259, which implements layer 3 and layer 2 functionality.

[0037]The controller/processor 259 can be associated with a memory 260 that stores program codes and data. The memory 260 may be referred to as a computer- readable medium. In the UL, the controller/processor 259 provides demultiplexing between transport and logical channels, packet reassembly, deciphering, header decompression, and control signal processing to recover IP packets from the core network 160. The controller/processor 259 is also responsible for error detection using an ACK and/or NACK protocol to support HARQ operations.

[0038]Similar to the functionality described in connection with the DL transmission by the base station 210, the controller/processor 259 provides RRC layer functionality associated with system information (e.g., MIB, SIBs) acquisition, RRC connections, and measurement reporting; PDCP layer functionality associated with header compression / decompression, and security (ciphering, deciphering, integrity protection, integrity verification); RLC layer functionality associated with the transfer of upper layer PDUs, error correction through ARQ, concatenation, segmentation, and reassembly of RLC SDUs, re-segmentation of RLC data PDUs, and reordering of RLC data PDUs; and MAC layer functionality associated with mapping between logical channels and transport channels, multiplexing of MAC SDUs onto TBs, demultiplexing of MAC SDUs from TBs, scheduling information reporting, error correction through HARQ, priority handling, and logical channel prioritization.

[0039]Channel estimates derived by a channel estimator 258 from a reference signal or feedback transmitted by the base station 210 may be used by the TX processor 268 to select the appropriate coding and modulation schemes, and to facilitate spatial processing. The spatial streams generated by the TX processor 268 may be provided to different antenna 252 via separate transmitters 254TX. Each transmitter 254TX may modulate an RF carrier with a respective spatial stream for transmission. The UL transmission is processed at the base station 210 in a manner similar to that described in connection with the receiver function at the UE 250. Each receiver 218RX receives a signal through its respective antenna 220. Each receiver 218RX recovers information modulated onto an RF carrier and provides the information to a RX processor 270.

[0040]The controller/processor 275 can be associated with a memory 276 that stores program codes and data. The memory 276 may be referred to as a computer- readable medium. In the UL, the controller/processor 275 provides demultiplexing between transport and logical channels, packet reassembly, deciphering, header decompression, control signal processing to recover IP packets from the UE 250. IP packets from the controller/processor 275 may be provided to the core network 160. The controller/processor 275 is also responsible for error detection using an ACK and/or NACK protocol to support HARQ operations.

[0041]New radio (NR) may refer to radios configured to operate according to a new air interface (e.g., other than Orthogonal Frequency Divisional Multiple Access (OFDMA)-based air interfaces) or fixed transport layer (e.g., other than Internet Protocol (IP)). NR may utilize OFDM with a cyclic prefix (CP) on the uplink and downlink and may include support for half-duplex operation using time division duplexing (TDD). NR may include Enhanced Mobile Broadband (eMBB) service targeting wide bandwidth (e.g. 80 MHz beyond), millimeter wave (mmW) targeting high carrier frequency (e.g. 60 GHz), massive MTC (mMTC) targeting non-backward compatible MTC techniques, and/or mission critical targeting ultra-reliable low latency communications (URLLC) service.

[0042]A single component carrier bandwidth of 100 MHZ may be supported. In one example, NR resource blocks (RBs) may span 12 sub-carriers with a sub-carrier bandwidth of 60 kHz over a 0.125 ms duration or a bandwidth of 15 kHz over a 0.5 ms duration. Each radio frame may consist of 20 or 80 subframes (or NR slots) with a length of 10 ms. Each subframe may indicate a link direction (i.e., DL or UL) for data transmission and the link direction for each subframe may be dynamically switched. Each subframe may include DL/UL data as well as DL/UL control data. UL and DL subframes for NR may be as described in more detail below with respect to FIGs. 5 and 6.

[0043]The NR RAN may include a central unit (CU) and distributed units (DUs). A NR BS (e.g., gNB, 5G Node B, Node B, transmission reception point (TRP), access point (AP)) may correspond to one or multiple BSs. NR cells can be configured as access cells (ACells) or data only cells (DCells). For example, the RAN (e.g., a central unit or distributed unit) can configure the cells. DCells may be cells used for carrier aggregation or dual connectivity and may not be used for initial access, cell selection/reselection, or handover. In some cases, DCells may not transmit synchronization signals (SS) in some cases DCells may transmit SS. NR BSs may transmit downlink signals to UEs indicating the cell type. Based on the cell type indication, the UE may communicate with the NR BS. For example, the UE may determine NR BSs to consider for cell selection, access, handover, and/or measurement based on the indicated cell type.

[0044]FIG. 3 illustrates an example logical architecture 300 of a distributed RAN, according to aspects of the present disclosure. A 5G access node 306 may include an access node controller (ANC) 302. The ANC may be a central unit (CU) of the distributed RAN 300. The backhaul interface to the next generation core network (NG- CN) 304 may terminate at the ANC. The backhaul interface to neighboring next generation access nodes (NG-ANs) may terminate at the ANC. The ANC may include one or more TRPs 308 (which may also be referred to as BSs, NR BSs, Node Bs, 5G NBs, APs, or some other term). As described above, a TRP may be used interchangeably with “cell.”

[0045]The TRPs 308 may be a distributed unit (DU). The TRPs may be connected to one ANC (ANC 302) or more than one ANC (not illustrated). For example, for RAN sharing, radio as a service (RaaS), and service specific AND deployments, the TRP may be connected to more than one ANC. A TRP may include one or more antenna ports. The TRPs may be configured to individually (e.g., dynamic selection) or jointly (e.g., joint transmission) serve traffic to a UE.

[0046]The local architecture of the distributed RAN 300 may be used to illustrate fronthaul definition. The architecture may be defined that support fronthauling solutions across different deployment types. For example, the architecture may be based on transmit network capabilities (e.g., bandwidth, latency, and/or jitter).

The architecture may share features and/or components with LTE. According to aspects, the next generation AN (NG-AN) 310 may support dual connectivity with NR. The NG-AN may share a common fronthaul for LTE and NR.

[0047]The architecture may enable cooperation between and among TRPs 308. For example, cooperation may be preset within a TRP and/or across TRPs via the ANC 302. According to aspects, no inter-TRP interface may be needed/present.

[0048]According to aspects, a dynamic configuration of split logical functions may be present within the architecture of the distributed RAN 300. The PDCP, RLC, MAC protocol may be adaptably placed at the ANC or TRP.

[0049]FIG. 4 illustrates an example physical architecture of a distributed RAN 400, according to aspects of the present disclosure. A centralized core network unit (C-CU) 402 may host core network functions. The C-CU may be centrally deployed. C-CU functionality may be offloaded (e.g., to advanced wireless services (AWS)), in an effort to handle peak capacity. A centralized RAN unit (C-RU) 404 may host one or more ANC functions. Optionally, the C-RU may host core network functions locally. The C- RU may have distributed deployment. The C-RU may be closer to the network edge. A distributed unit (DU) 406 may host one or more TRPs. The DU may be located at edges of the network with radio frequency (RF) functionality.

[0050]FIG. 5 is a diagram 500 showing an example of a DL-centric subframe. The DL-centric subframe may include a control portion 502. The control portion 502 may exist in the initial or beginning portion of the DL-centric subframe. The control portion 502 may include various scheduling information and/or control information corresponding to various portions of the DL-centric subframe. In some configurations, the control portion 502 may be a physical DL control channel (PDCCH), as indicated in FIG. 5. The DL-centric subframe may also include a DL data portion 504. The DL data portion 504 may sometimes be referred to as the payload of the DL-centric subframe. The DL data portion 504 may include the communication resources utilized to communicate DL data from the scheduling entity (e.g., UE or BS) to the subordinate entity (e.g., UE). In some configurations, the DL data portion 504 may be a physical DL shared channel (PDSCH).

[0051]The DL-centric subframe may also include a common UL portion 506. The common UL portion 506 may sometimes be referred to as an UL burst, a common UL burst, and/or various other suitable terms. The common UL portion 506 may include feedback information corresponding to various other portions of the DL-centric subframe. For example, the common UL portion 506 may include feedback information corresponding to the control portion 502. Non-limiting examples of feedback information may include an ACK signal, a NACK signal, a HARQ indicator, and/or various other suitable types of information. The common UL portion 506 may include additional or alternative information, such as information pertaining to random access channel (RACH) procedures, scheduling requests (SRs), and various other suitable types of information.

[0052]As illustrated in FIG. 5, the end of the DL data portion 504 may be separated in time from the beginning of the common UL portion 506. This time separation may sometimes be referred to as a gap, a guard period, a guard interval, and/or various other suitable terms. This separation provides time for the switch-over from DL communication (e.g., reception operation by the subordinate entity (e.g., UE)) to UL communication (e.g., transmission by the subordinate entity (e.g., UE)). One of ordinary skill in the art will understand that the foregoing is merely one example of a DL-centric subframe and alternative structures having similar features may exist without necessarily deviating from the aspects described herein.

[0053]FIG. 6 is a diagram 600 showing an example of an UL-centric subframe. The UL-centric subframe may include a control portion 602. The control portion 602 may exist in the initial or beginning portion of the UL-centric subframe. The control portion 602 in FIG. 6 may be similar to the control portion 502 described above with reference to FIG. 5. The UL-centric subframe may also include an UL data portion 604. The UL data portion 604 may sometimes be referred to as the pay load of the UL-centric subframe. The UL portion may refer to the communication resources utilized to communicate UL data from the subordinate entity (e.g., UE) to the scheduling entity (e.g., UE or BS). In some configurations, the control portion 602 may be a physical DL control channel (PDCCH).

[0054]As illustrated in FIG. 6, the end of the control portion 602 may be separated in time from the beginning of the UL data portion 604. This time separation may sometimes be referred to as a gap, guard period, guard interval, and/or various other suitable terms. This separation provides time for the switch-over from DL communication (e.g., reception operation by the scheduling entity) to UL communication (e.g., transmission by the scheduling entity). The UL-centric subframe may also include a common UL portion 606. The common UL portion 606 in FIG. 6 may be similar to the common UL portion 606 described above with reference to FIG. 6. The common UL portion 606 may additionally or alternatively include information pertaining to channel quality indicator (CQI), sounding reference signals (SRSs), and various other suitable types of information. One of ordinary skill in the art will understand that the foregoing is merely one example of an UL-centric subframe and alternative structures having similar features may exist without necessarily deviating from the aspects described herein.

[0055]In some circumstances, two or more subordinate entities (e.g., UEs) may communicate with each other using sidelink signals. Real-world applications of such sidelink communications may include public safety, proximity services, UE-to-network relaying, vehicle-to-vehicle (V2V) communications, Internet of Everything (IoE) communications, IoT communications, mission-critical mesh, and/or various other suitable applications. Generally, a sidelink signal may refer to a signal communicated from one subordinate entity (e.g., UE1) to another subordinate entity (e.g., UE2) without relaying that communication through the scheduling entity (e.g., UE or BS), even though the scheduling entity may be utilized for scheduling and/or control purposes. In some examples, the sidelink signals may be communicated using a licensed spectrum (unlike wireless local area networks, which typically use an unlicensed spectrum).

[0056]FIG. 7 is a diagram 700 illustrating communications between a UE 704 and a TRP 702 and a TRP 703. The TRP 702 and the TRP 703 may be coordinated TRPs. The UE 704 supports multiple-PDCCH based multi TRP/panel transmission. In this example, the TRP 702 may transmit downlink control information 722 (*e.g.*, in a PDCCH) and data 724 (*e.g.*, in a PDSCH), and the TRP 703 may transmit downlink control information 732 (*e.g.*, in a PDCCH) and data 734 (*e.g.*, in a PDSCH), simultaneously to the UE 704. The TRP 702 and the TRP 703 may transmit control and data signals on the same resource grid. Further, the TRP 702 and the TRP 703 each may be located at a different base station.

[0057]FIG. 8 is a diagram 800 illustrating techniques of facilitating bandwidth part switching among multiple TRPs. In one example, the TRP 702 may send a bandwidth part switch command to the UE 704 instructing the UE 704 to communicate in a bandwidth part 812; the TRP 703 may send a bandwidth part switch command to the UE 704 instructing the UE 704 to communicate in a bandwidth part 822.

[0058]In principle, a multi-TRP transmission scheme should not complicate the legacy BWP operation. In this example, allowing BWP switch commands from both of the TRP 702 and the TRP 703 without any constraints may result in that PDSCHs from the TRP 702 may reside in non-overlapping areas 832. In such a case, the UE 704 is required to adjust its RF receiving bandwidth to be large enough to receive signals from both the bandwidth part 812 and the bandwidth part 822. Such a behavior does not satisfy the motivation of introducing BWP switching.

[0059]Further, after the UE 704 receives the bandwidth part switch command from the TRP 702 for switching to the bandwidth part 822, the TRP 703 also needs to know the BWP that is switched to so that the PDSCH transmission from the TRP 703 can reside in the bandwidth part 822.

[0060]In certain configurations, the UE 704 is scheduled with the same active BWP bandwidth and the same subcarrier spacing if the UE 704 is expected to receive multiple PDSCHs simultaneously in certain symbol periods. If the TRP 702 and the TRP 703 are connected with an ideal backhaul (with no information delay or loss), the requirement of the same active BWP bandwidth can be achieved by network's implementation. However, for scenarios with a non-ideal backhaul, relying on network implementation may lead to less opportunity for BWP switching.

[0061]In one technique for throughput enhancement, one of the TRP 702 and the TRP 703, which are coordinated, may be configured as a master TRP (or primary TRP) and the other may be configured as a slave TRP (or secondary TRP). The BWP switch operation at the UE 704 is only controlled by the master TRP. BWP configurations for the UE 704 is the same for each coordinated TRP. For example, both the TRP 702 and the TRP 703 configure the bandwidth part 812 and the bandwidth part 822 for the UE 704 and instruct the UE 704 to switch from one BWP to another BWP. Only the master TRP (*e.g.*, the TRP 702) is allowed to send a bandwidth part switch command to the UE 704. The BWP used by the master TRP may always contain the BWP used by the slave TRP. For example, the bandwidth part 812 used by the TRP 702 contains the bandwidth part 822 used by the TRP 703. As such, the UE 704 can follow the legacy BWP switch procedure, and the slave TRP does not need to know which BWP the UE resides in. In addition, in this example, the TRP 702 (*i.e.*, the master TRP) is allowed to switch the communication with UE 704 from one of the bandwidth part 812 and the bandwidth part 822 to another. The TRP 703 (*i.e.*, the slave TRP) is only allowed to communicate with the UE 704 on the bandwidth part 822, but not on the bandwidth part 812.

[0062]In summary, for a UE expected to receive two PDCCHs from two TRPs, configuration of BWPs for the UE is the same for each coordinated TRP. BWP switch commands are allowed only from a master TRP. The BWP used by the master TRP may contain or be the same as the BWP used by the slave TRP.

[0063]In another technique, each of the TRP 702 and the TRP 703 (and other TRPs) may be assigned a priority level. The UE 704 is also configured with the information of the priority levels of the TRPs. When the UE 704 receives more than one bandwidth part switch commands at the same time, the UE 704 may select one bandwidth part switch command to execute and discard the other bandwidth part switch commands in accordance with a predetermined rule based on the priority levels. In particular, the UE 704 may execute the bandwidth part switch command from a TRP having a priority level higher than the priority levels of the other

TRPs.

[0064]In yet another technique, when the UE 704 executes or commits a particular bandwidth part switch command from a particular TRP, the UE 704 informs all other coordinated TRPs information related to the BWP switching. For example, when the UE 704 receives from the TRP 702 and executes a bandwidth part switch command for switching from the bandwidth part 812 to the bandwidth part 822, the UE 704 informs the TRP 703, which is a coordinated TRP of the TRP 702. The information from the TRP 702 to the TRP 703 may be an indicator of a BWP ID of the bandwidth part 822 so that all other TRPs can know the BWP to which the UE 704 is switched to. As such, the TRP 703 (and other TRPs) can determine the transition period used by the TRP 702 to switch from the bandwidth part 812 to the bandwidth part 822. During the BWP transition period (or switching delay) and/or the period for signaling from the UE 704 to the TRP 703 (and other coordinated TRPs), the UE 704 may not execute or commit another bandwidth part switch command.

[0065]In yet another technique, only one TRP from the coordinated TRPs (*e.g.*, the TRP 702 and the TRP 703) is allowed to send bandwidth part switch commands to the UE 704.-

[0066]FIG. 9 is a flow chart 900 of a method (process) for dynamically switching bandwidth part. The method may be performed by a UE (*e.g.*, the UE 704, the apparatus 1102, and the apparatus 1102').

[0067]At operation 902, the UE determines that a plurality of transmission and reception points (TRPs) transmit data to the UE. At operation 904, the UE receives a bandwidth part switch command from a first TRP of the plurality of TRPs. The bandwidth part switch command instructs the UE to switch from communicating on a first bandwidth part to communicating on a second bandwidth part. In response to receiving the bandwidth part switch command, at operation 906, the UE (a) determines to accept the bandwidth part switch command based on a priority level of the first TRP among the plurality of TRPs or (b) informs other TRPs of the plurality of TRPs. At operation 908, the UE switches from communicating on the first bandwidth part to communicating on the second bandwidth part.

[0068]In certain configurations, each of the plurality of TRPs is associated with a respective priority level for requesting a bandwidth part switch, wherein the priority level of the first TRP is the highest among priority levels of the plurality of TRPs. In certain configurations, to inform the other TRPs, the UE sends, to the other TRPs, an indication indicating the second bandwidth part. The UE discards any additional bandwidth part switch command received during the informing the other TRPs and during the switching from communicating on the first bandwidth part to communicating on the second bandwidth part.

[0069]FIG. 10 is a flow chart 1000 of a method (process) for dynamically switching bandwidth part. The method may be performed by a base station having a first TRP (*e.g.*, the TRP 702 and/or the TRP 703). At operation 1002, the first TRP determines that a plurality of transmission and reception points (TRPs) are concurrently transmitting data to a UE, the plurality of TRPs including a first TRP at the base station. At operation 1004, the first TRP determines whether the first TRP is a primary TRP that is allowed to instruct the UE to switch from communicating on a first bandwidth part to communicating on a second bandwidth part. A bandwidth of the first bandwidth part contains all bandwidth of the second bandwidth part.

[0070]When the first TRP is the primary TRP, at operation 1006, the first TRP communicates with the UE via the first TRP on either the first bandwidth part or the second bandwidth part. At operation 1008, the first TRP sends a bandwidth part switch command from the first TRP to the UE, the bandwidth part switch command instructing the UE to switch from communicating on the first bandwidth part to communicating on the second bandwidth part. The first TRP is a primary TRP.

[0071]When the first TRP is not the primary TRP, at operation 1010, the first TRP communicates with the UE via the first TRP on the second bandwidth part. At operation 1012, the first TRP determines that the first TRP is not allowed to send a bandwidth part switch command to the UE, when the first TRP is not the primary TRP.

[0072]FIG. 11 is a conceptual data flow diagram 1100 illustrating the data flow between different components/means in an exemplary apparatus 1102. The apparatus 1102 may be a UE. The apparatus 1102 includes a reception component 1104, a TRP coordination component 1106, a bandwidth part component 1108, and a transmission component 1110. The TRP coordination component 1106 determines that a plurality of TRPs transmit data to the UE. The bandwidth part component 1108 receives a bandwidth part switch command from a first TRP of the plurality of TRPs. The bandwidth part switch command instructs the UE to switch from communicating on a first bandwidth part to communicating on a second bandwidth part. In response to receiving the bandwidth part switch command, the bandwidth part component 1108 (a) determines to accept the bandwidth part switch command based on a priority level of the first TRP among the plurality of TRPs or (b) informs other TRPs of the plurality of TRPs. The bandwidth part component 1108 switches from communicating on the first bandwidth part to communicating on the second bandwidth part.

[0073]In certain configurations, each of the plurality of TRPs is associated with a respective priority level for requesting a bandwidth part switch, wherein the priority level of the first TRP is the highest among priority levels of the plurality of TRPs. In certain configurations, to inform the other TRPs, the TRP coordination component 1106 sends, to the other TRPs, an indication indicating the second bandwidth part. The bandwidth part component 1108 discards any additional bandwidth part switch command received during the informing the other TRPs and during the switching from communicating on the first bandwidth part to communicating on the second bandwidth part.

[0074]FIG. 12 is a diagram 1200 illustrating an example of a hardware implementation for an apparatus 1102' employing a processing system 1214. The apparatus 1102' may be a UE. The processing system 1214 may be implemented with a bus architecture, represented generally by a bus 1224. The bus 1224 may include any number of interconnecting buses and bridges depending on the specific application of the processing system 1214 and the overall design constraints. The bus 1224 links together various circuits including one or more processors and/or hardware components, represented by one or more processors 1204, the reception component 1104, the TRP coordination component 1106, the bandwidth part component 1108, the transmission component 1110, and a computer-readable medium / memory 1206. The bus 1224 may also link various other circuits such as timing sources, peripherals, voltage regulators, and power management circuits, *etc.*

[0075]The processing system 1214 may be coupled to a transceiver 1210, which may be one or more of the transceivers 354. The transceiver 1210 is coupled to one or more antennas 1220, which may be the communication antennas 352.

[0076]The transceiver 1210 provides a means for communicating with various other apparatus over a transmission medium. The transceiver 1210 receives a signal from the one or more antennas 1220, extracts information from the received signal, and provides the extracted information to the processing system 1214, specifically the reception component 1104. In addition, the transceiver 1210 receives information from the processing system 1214, specifically the transmission component 1110, and based on the received information, generates a signal to be applied to the one or more antennas 1220.

[0077]The processing system 1214 includes one or more processors 1204 coupled to a computer-readable medium / memory 1206. The one or more processors 1204 are responsible for general processing, including the execution of software stored on the computer-readable medium / memory 1206. The software, when executed by the one or more processors 1204, causes the processing system 1214 to perform the various functions described supra for any particular apparatus. The computer-readable medium / memory 1206 may also be used for storing data that is manipulated by the one or more processors 1204 when executing software. The processing system 1214 further includes at least one of the reception component 1104, the TRP coordination component 1106, the bandwidth part component 1108, and the transmission component 1110. The components may be software components running in the one or more processors 1204, resident/stored in the computer readable medium / memory 1206, one or more hardware components coupled to the one or more processors 1204, or some combination thereof. The processing system 1214 may be a component of the UE 350 and may include the memory 360 and/or at least one of the TX processor 368, the RX processor 356, and the communication processor 359.

[0078]In one configuration, the apparatus 1102/apparatus 1102' for wireless communication includes means for performing each of the operations of FIG. 9. The aforementioned means may be one or more of the aforementioned components of the apparatus 1102 and/or the processing system 1214 of the apparatus 1102' configured to perform the functions recited by the aforementioned means.

[0079]As described *supra*, the processing system 1214 may include the TX Processor 368, the RX Processor 356, and the communication processor 359. As such, in one configuration, the aforementioned means may be the TX Processor 368, the RX Processor 356, and the communication processor 359 configured to perform the functions recited by the aforementioned means.

[0080]It is understood that the specific order or hierarchy of blocks in the processes / flowcharts disclosed is an illustration of exemplary approaches. Based upon design preferences, it is understood that the specific order or hierarchy of blocks in the processes / flowcharts may be rearranged. Further, some blocks may be combined or omitted. The accompanying method claims present elements of the various blocks in a sample order, and are not meant to be limited to the specific order or hierarchy presented.

[0081]The previous description is provided to enable any person skilled in the art to practice the various aspects described herein. Various modifications to these aspects will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other aspects. Thus, the claims are not intended to be limited to the aspects shown herein, but is to be accorded the full scope consistent with the language claims, wherein reference to an element in the singular is not intended to mean "one and only one" unless specifically so stated, but rather "one or more." The word "exemplary" is used herein to mean "serving as an example, instance, or illustration." Any aspect described herein as "exemplary" is not necessarily to be construed as preferred or advantageous over other aspects. Unless specifically stated otherwise, the term "some" refers to one or more. Combinations such as "at least one of A, B, or C," "one or more of A, B, or C," "at least one of A, B, and C," "one or more of A, B, and C," and "A, B, C, or any combination thereof" include any combination of A, B, and/or C, and may include multiples of A, multiples of B, or multiples of C. Specifically, combinations such as "at least one of A, B, or C," "one or more of A, B, or C," "at least one of A, B, and C," "one or more of A, B, and C," and "A, B, C, or any combination thereof" may be A only, B only, C only, A and B, A and C, B and C, or A and B and C, where any such combinations may contain one or more member or members of A, B, or C. All structural and functional equivalents to the elements of the various aspects described throughout this disclosure that are known or later come to be known to those of ordinary skill in the art are expressly incorporated herein by reference and are intended to be encompassed by the claims. Moreover, nothing disclosed herein is intended to be dedicated to the public regardless of whether such disclosure is explicitly recited in the claims. The words "module," "mechanism," "element," "device," and the like may not be a substitute for the word "means." As such, no claim element is to be construed as a means plus function unless the element is expressly recited using the phrase "means for."

CLAIMS

1. A method of wireless communication of a user equipment (UE), comprising:

determining that a plurality of transmission and reception points (TRPs) transmit data to the UE;

receiving a bandwidth part switch command from a first TRP of the plurality of TRPs, the bandwidth part switch command instructing the UE to switch from communicating on a first bandwidth part to communicating on a second bandwidth part;

in response to receiving the bandwidth part switch command, (a) determining to accept the bandwidth part switch command based on a priority level of the first TRP among the plurality of TRPs or (b) informing other TRPs of the plurality of TRPs; and

switching from communicating on the first bandwidth part to communicating on the second bandwidth part.

2. The method of claim 1, wherein each of the plurality of TRPs is associated with a respective priority level for requesting a bandwidth part switch, wherein the priority level of the first TRP is the highest among priority levels of the plurality of TRPs.

3. The method of claim 1, wherein informing the other TRPs further comprises:

sending, to the other TRPs, an indication indicating the second bandwidth part;

the method further comprising:

discarding any additional bandwidth part switch command received during the informing the other TRPs and during the switching from communicating on the first bandwidth part to communicating on the second bandwidth part.

4. A method of wireless communication of a base station, comprising:

determining that a plurality of transmission and reception points (TRPs) are concurrently transmitting data to a UE, the plurality of TRPs including a first TRP at the base station;

determining whether the first TRP is a primary TRP that is allowed to instruct the UE to switch from communicating on a first bandwidth part to communicating on a second bandwidth part, wherein a bandwidth of the first bandwidth part contains all bandwidth of the second bandwidth part; and

communicating with the UE via the first TRP on either the first bandwidth part or the second bandwidth part, when the first TRP is the primary TRP.

5. The method of claim 4, further comprising:

sending a bandwidth part switch command from the first TRP to the UE, the bandwidth part switch command instructing the UE to switch from communicating on the first bandwidth part to communicating on the second bandwidth part, when the first TRP is a primary TRP.

6. The method of claim 4, further comprising:

communicating with the UE via the first TRP on the second bandwidth part, when the first TRP is not the primary TRP.

7. The method of claim 4, further comprising:

determining that the first TRP is not allowed to send a bandwidth part switch command to the UE, when the first TRP is not the primary TRP.

8. An apparatus for wireless communication, the apparatus being a user equipment (UE), comprising:

a memory; and

at least one processor coupled to the memory and configured to:

determine that a plurality of transmission and reception points (TRPs) transmit data to the UE;

receive a bandwidth part switch command from a first TRP of the plurality of TRPs, the bandwidth part switch command instructing the UE to switch from communicating on a first bandwidth part to communicating on a second bandwidth part;

in response to receiving the bandwidth part switch command, (a) determine to accept the bandwidth part switch command based on a priority level of the first TRP among the plurality of TRPs or (b) inform other TRPs of the plurality of TRPs; and

switch from communicating on the first bandwidth part to communicating on the second bandwidth part.

9. The apparatus of claim 8, wherein each of the plurality of TRPs is associated with a respective priority level for requesting a bandwidth part switch, wherein the priority level of the first TRP is the highest among priority levels of the plurality of TRPs.

10. The apparatus of claim 8, wherein to inform the other TRPs. the at least one processor is further configured to:

send, to the other TRPs, an indication indicating the second bandwidth part;

wherein the at least one processor is further configured to:

discard any additional bandwidth part switch command received during the informing the other TRPs and during the switching from communicating on the first bandwidth part to communicating on the second bandwidth part.

11. An apparatus for wireless communication, the apparatus being a base station having a first transmission and reception point (TRP), comprising:

a memory; and

at least one processor coupled to the memory and configured to:

determine that a plurality of TRP are concurrently transmitting data to a UE, the plurality of TRPs including the first TRP at the base station;

determine whether the first TRP is a primary TRP that is allowed to instruct the UE to switch from communicating on a first bandwidth part to communicating on a second bandwidth part, wherein a bandwidth of the first bandwidth part contains all bandwidth of the second bandwidth part; and

communicate with the UE via the first TRP on either the first bandwidth part or the second bandwidth part, when the first TRP is the primary TRP.

12. The apparatus of claim 11, wherein the at least one processor is further configured to:

send a bandwidth part switch command from the first TRP to the UE, the bandwidth part switch command instructing the UE to switch from communicating on the first bandwidth part to communicating on the second bandwidth part, when the first TRP is a primary TRP.

13. The apparatus of claim 11, wherein the at least one processor is further configured to:

communicate with the UE via the first TRP on the second bandwidth part, when the first TRP is not the primary TRP.

14. The apparatus of claim 11, wherein the at least one processor is further configured to:

determine that the first TRP is not allowed to send a bandwidth part switch command to the UE, when the first TRP is not the primary TRP.

15. A computer-readable medium storing computer executable code for wireless communication of a user equipment (UE), comprising code to:

determine that a plurality of transmission and reception points (TRPs) transmit data to the UE;

receive a bandwidth part switch command from a first TRP of the plurality of TRPs, the bandwidth part switch command instructing the UE to switch from communicating on a first bandwidth part to communicating on a second bandwidth part;

in response to receiving the bandwidth part switch command, (a) determine to accept the bandwidth part switch command based on a priority level of the first TRP among the plurality of TRPs or (b) inform other TRPs of the plurality of TRPs; and

switch from communicating on the first bandwidth part to communicating on the second bandwidth part.

16.The computer-readable medium of claim 15, wherein each of the plurality of TRPs is associated with a respective priority level for requesting a bandwidth part switch, wherein the priority level of the first TRP is the highest among priority levels of the plurality of TRPs.

17. The computer-readable medium of claim 15, wherein to inform the other TRPs. the code is further configured to:

send, to the other TRPs, an indication indicating the second bandwidth part;

wherein the code is further configured to:

discard any additional bandwidth part switch command received during the informing the other TRPs and during the switching from communicating on the first bandwidth part to communicating on the second bandwidth part.

18. A computer-readable medium storing computer executable code for wireless communication of a base station having a first transmission and reception point (TRP), comprising code to:

determine that a plurality of TRPs are concurrently transmitting data to a UE, the plurality of TRPs including the first TRP at the base station;

determine whether the first TRP is a primary TRP that is allowed to instruct the UE to switch from communicating on a first bandwidth part to communicating on a second bandwidth part, wherein a bandwidth of the first bandwidth part contains all bandwidth of the second bandwidth part; and

communicate with the UE via the first TRP on either the first bandwidth part or the second bandwidth part, when the first TRP is the primary TRP.

19. The computer-readable medium of claim 18, wherein the code is further configured to:

send a bandwidth part switch command from the first TRP to the UE, the bandwidth part switch command instructing the UE to switch from communicating on the first bandwidth part to communicating on the second bandwidth part, when the first TRP is a primary TRP.

20. The computer-readable medium of claim 18, wherein the code is further configured to:

communicate with the UE via the first TRP on the second bandwidth part, when the first TRP is not the primary TRP.

21. The computer-readable medium of claim 18, wherein the code is further configured to:

determine that the first TRP is not allowed to send a bandwidth part switch command to the UE, when the first TRP is not the primary TRP.

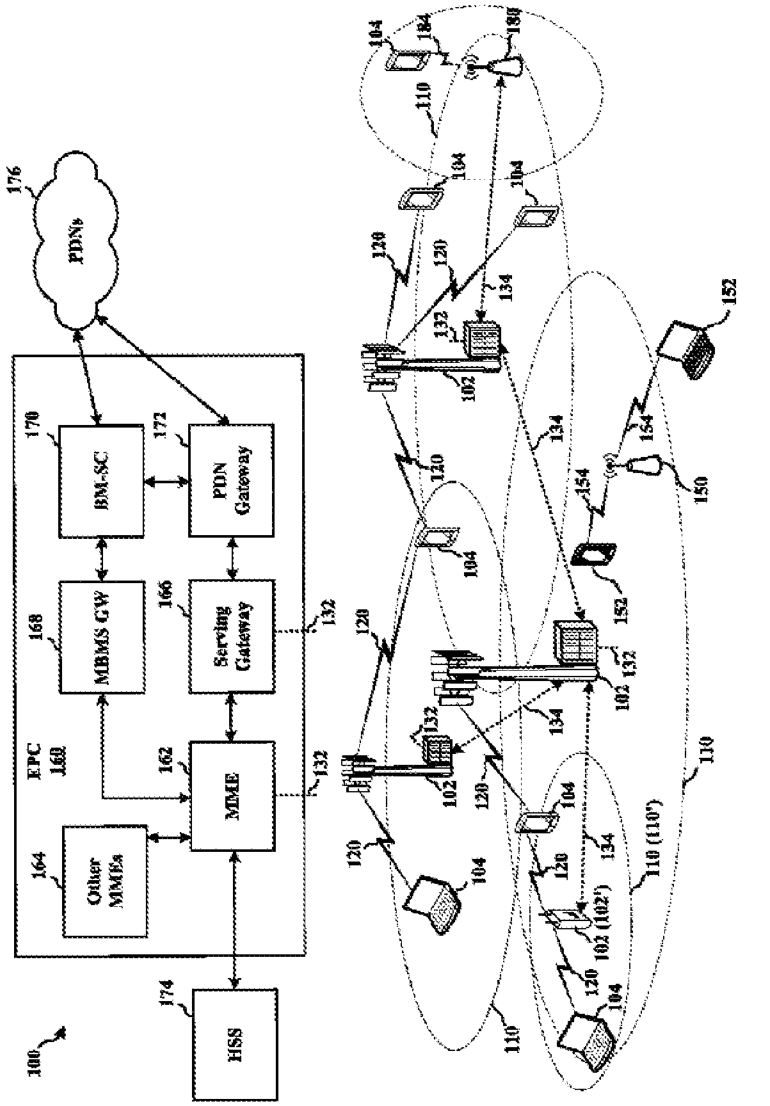
100
EPC
160
Other MMEs
164
MME
162
MBMS GW
168
Serving Gateway
166
BM-SC
170
PDN Gateway
172
PDNs
176
HSS
174
132
120
104
102
110
134
102 (102')
110 (110')
130
150
152
154
180
184

FIG. 1

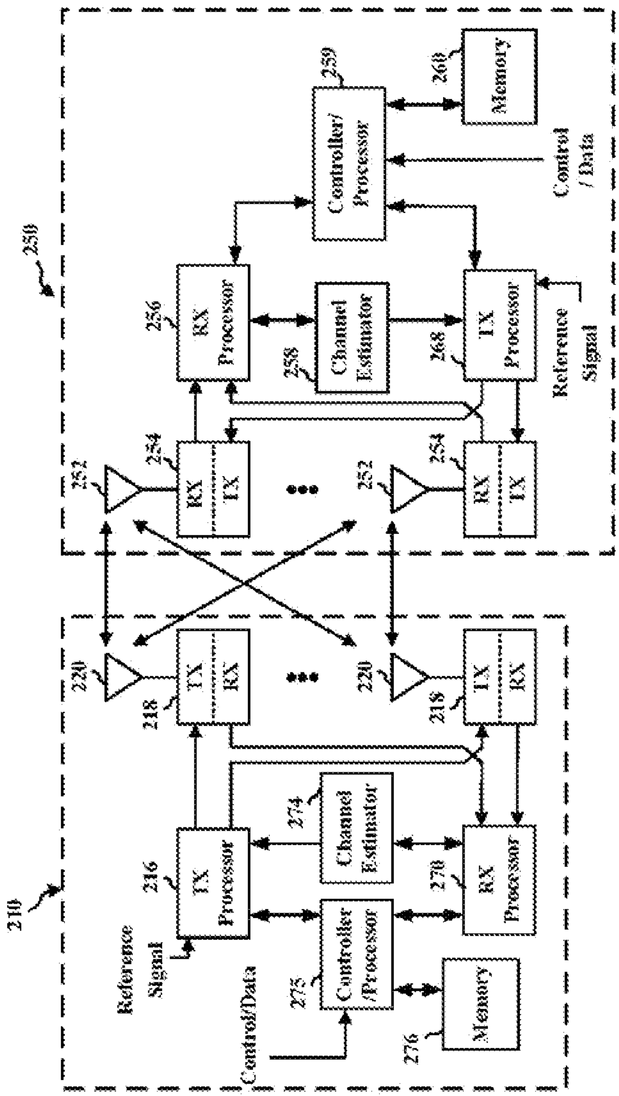
250
259
Controller/ Processor
260
Memory
Control / Data
256
RX Processor
258
Channel Estimator
268
TX Processor
Reference Signal
252
254
RX
TX
210
216
TX Processor
Reference Signal
Control/Data
275
Controller /Processor
276
Memory
274
Channel Estimator
270
RX Processor
218
220

FIG. 2

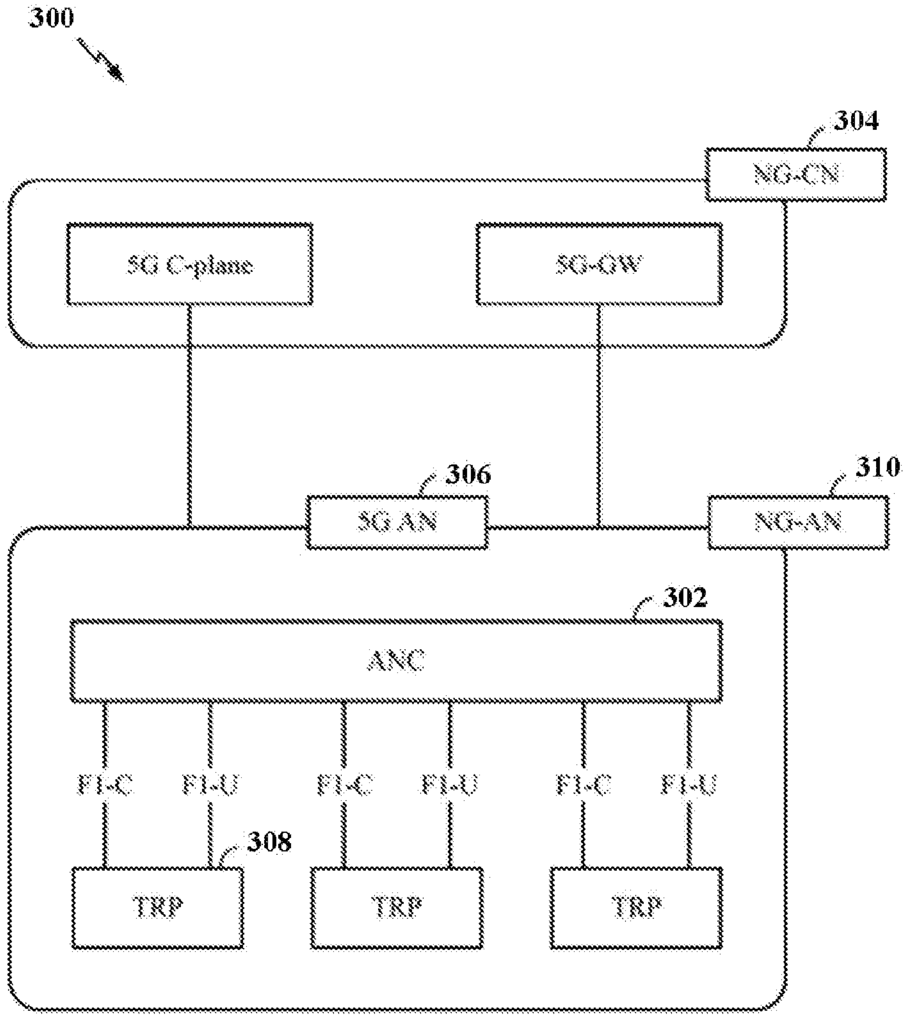
300
304
NG-CN
5G C-plane
5G-GW
306
5G AN
310
NG-AN
302
ANC
F1-C
F1-U
F1-C
F1-U
F1-C
F1-U
308
TRP
TRP
TRP

FIG. 3

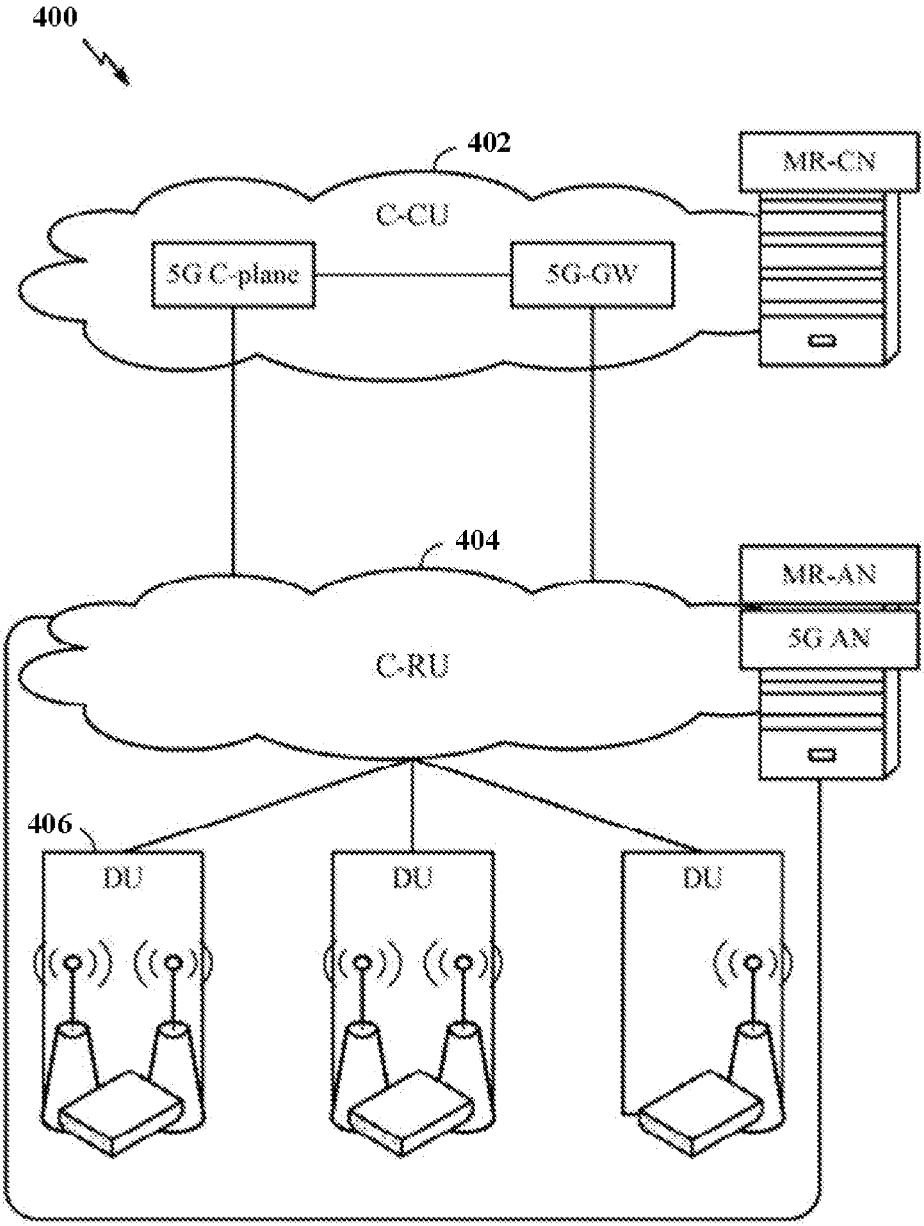

FIG. 4

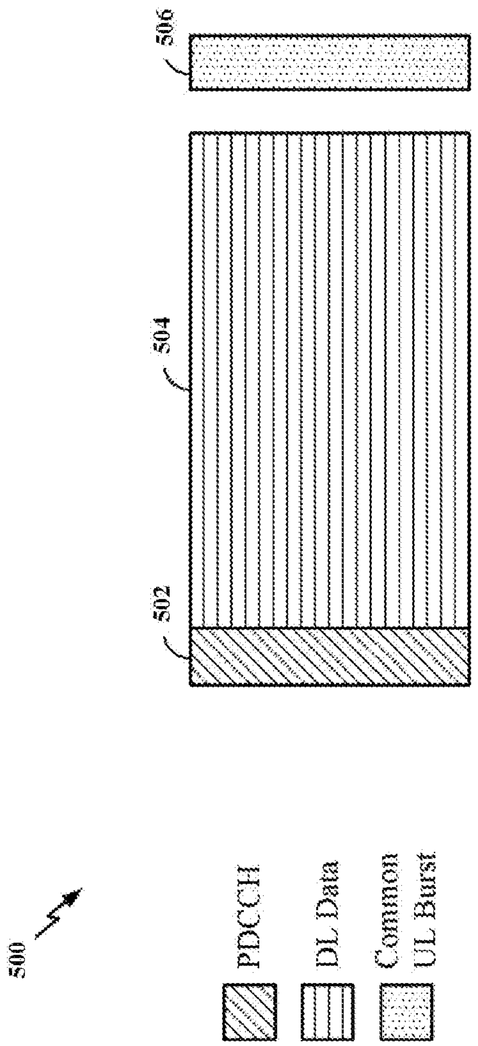

FIG. 5

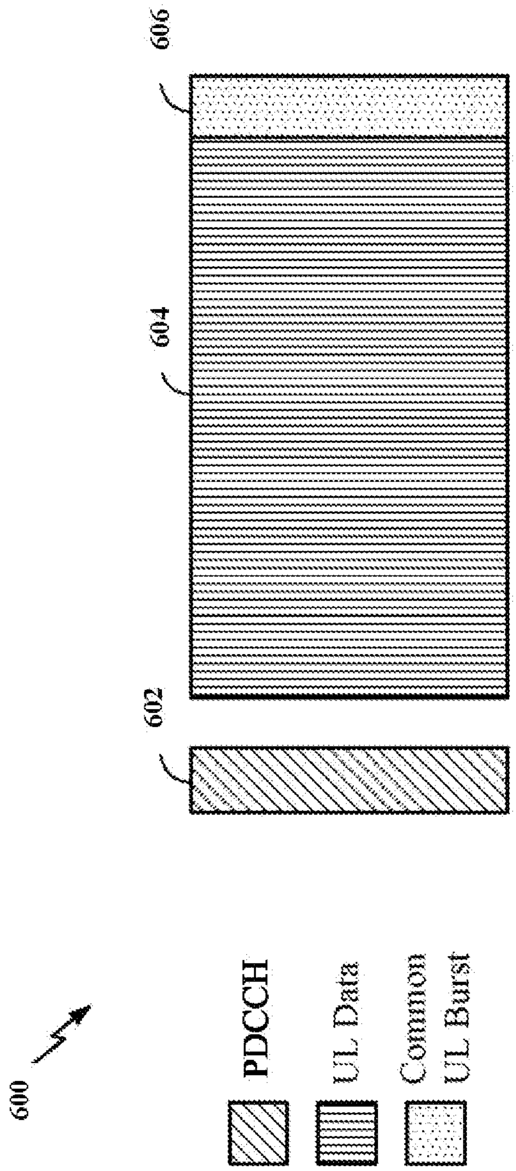

FIG. 6

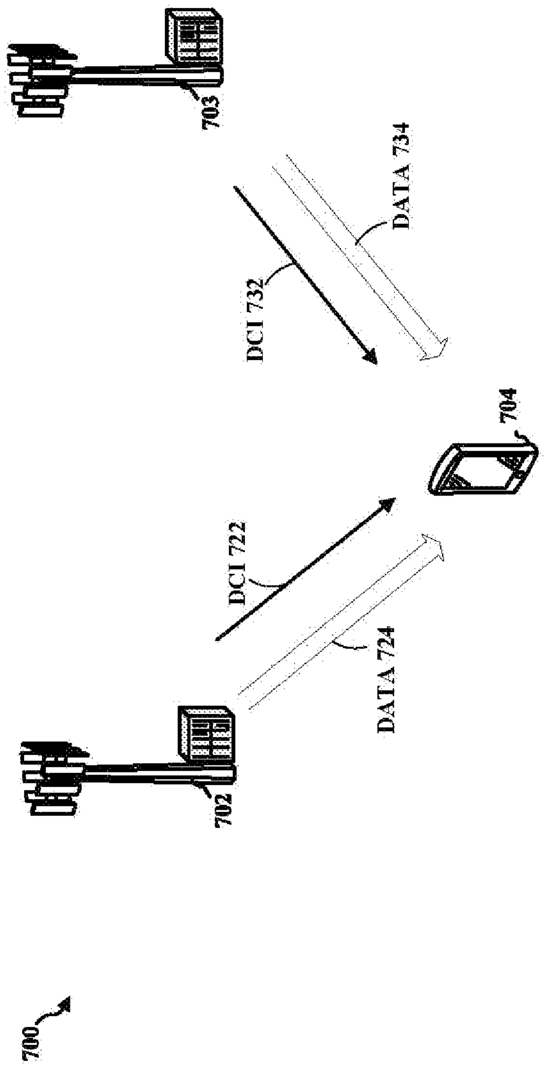

FIG. 7

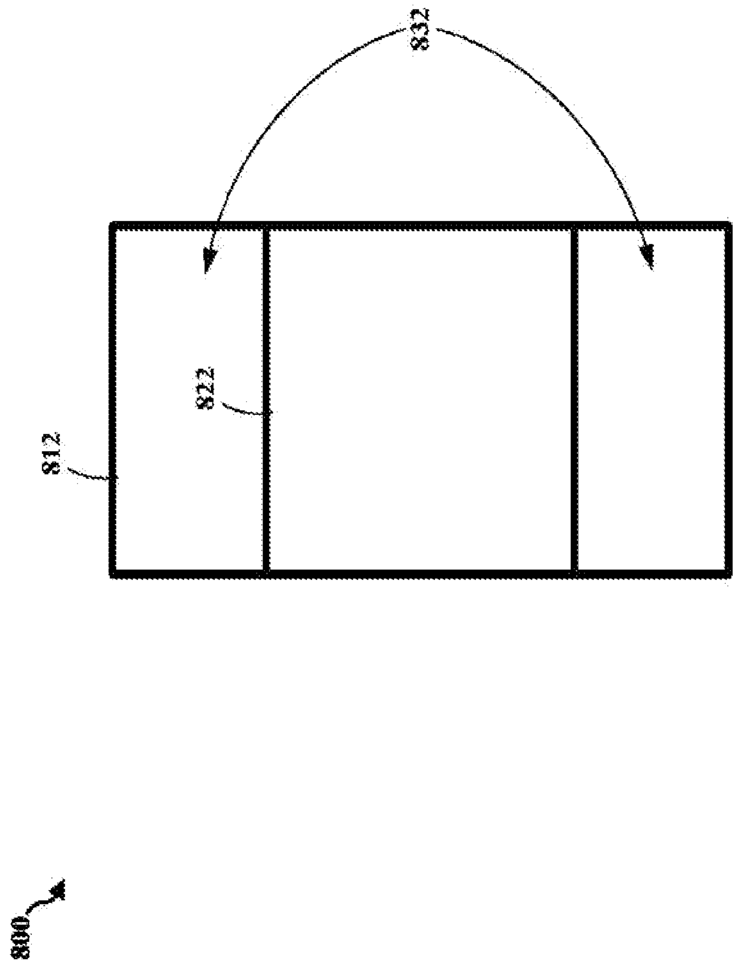

FIG. 8

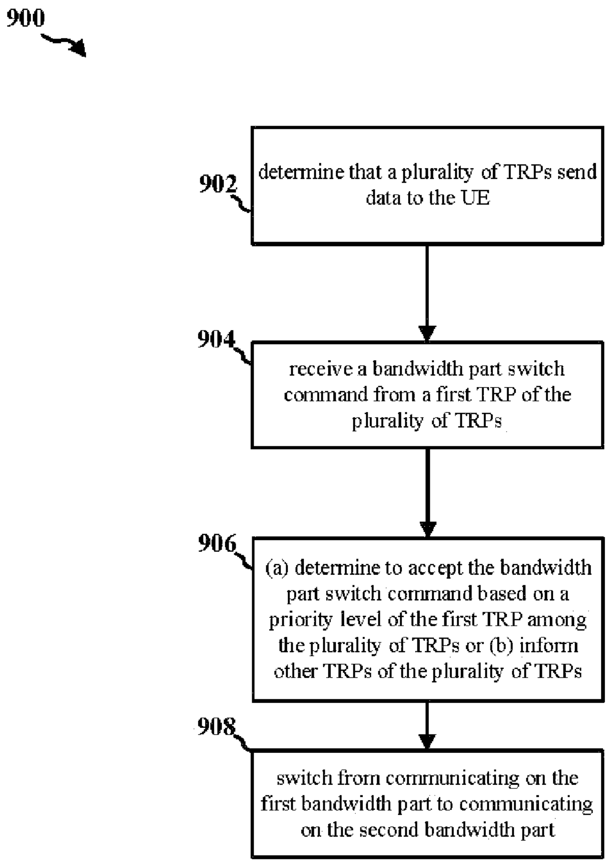
900
902
determine that a plurality of TRPs send data to the UE
904
receive a bandwidth part switch command from a first TRP of the plurality of TRPs
906
(a) determine to accept the bandwidth part switch command based on a priority level of the first TRP among the plurality of TRPs or (b) inform other TRPs of the plurality of TRPs
908
switch from communicating on the first bandwidth part to communicating on the second bandwidth part

FIG. 9

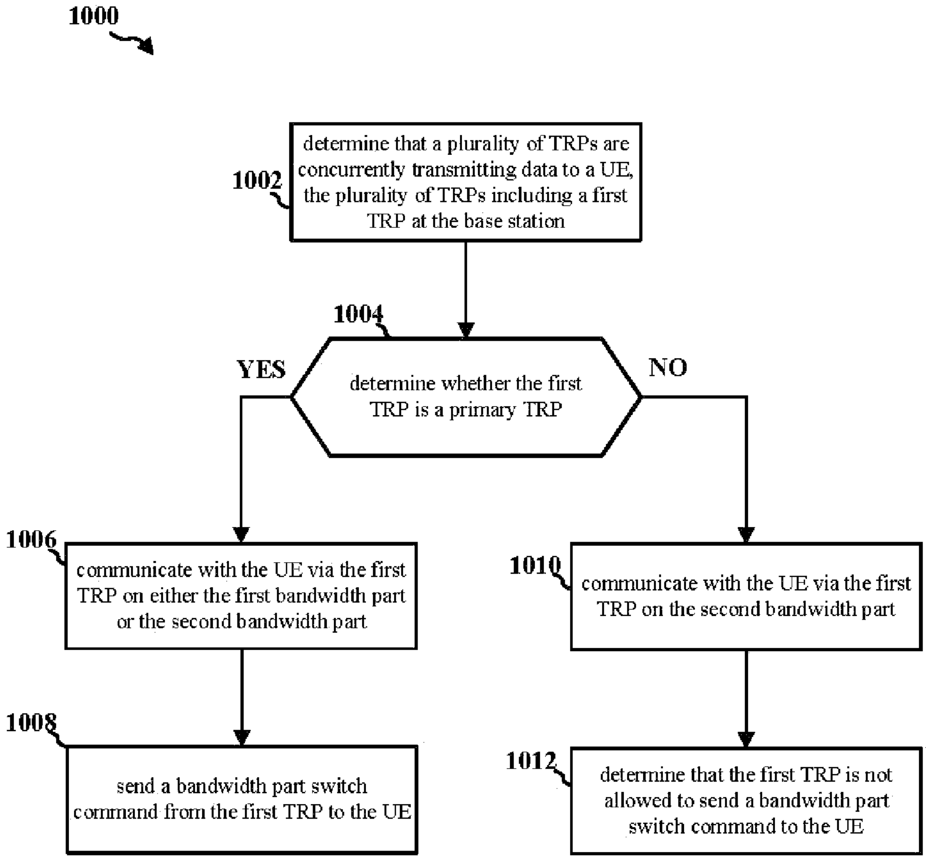
1000
1002
determine that a plurality of TRPs are concurrently transmitting data to a UE, the plurality of TRPs including a first TRP at the base station
1004
determine whether the first TRP is a primary TRP
YES
NO
1006
communicate with the UE via the first TRP on either the first bandwidth part or the second bandwidth part
1008
send a bandwidth part switch command from the first TRP to the UE
1010
communicate with the UE via the first TRP on the second bandwidth part
1012
determine that the first TRP is not allowed to send a bandwidth part switch command to the UE

FIG. 10

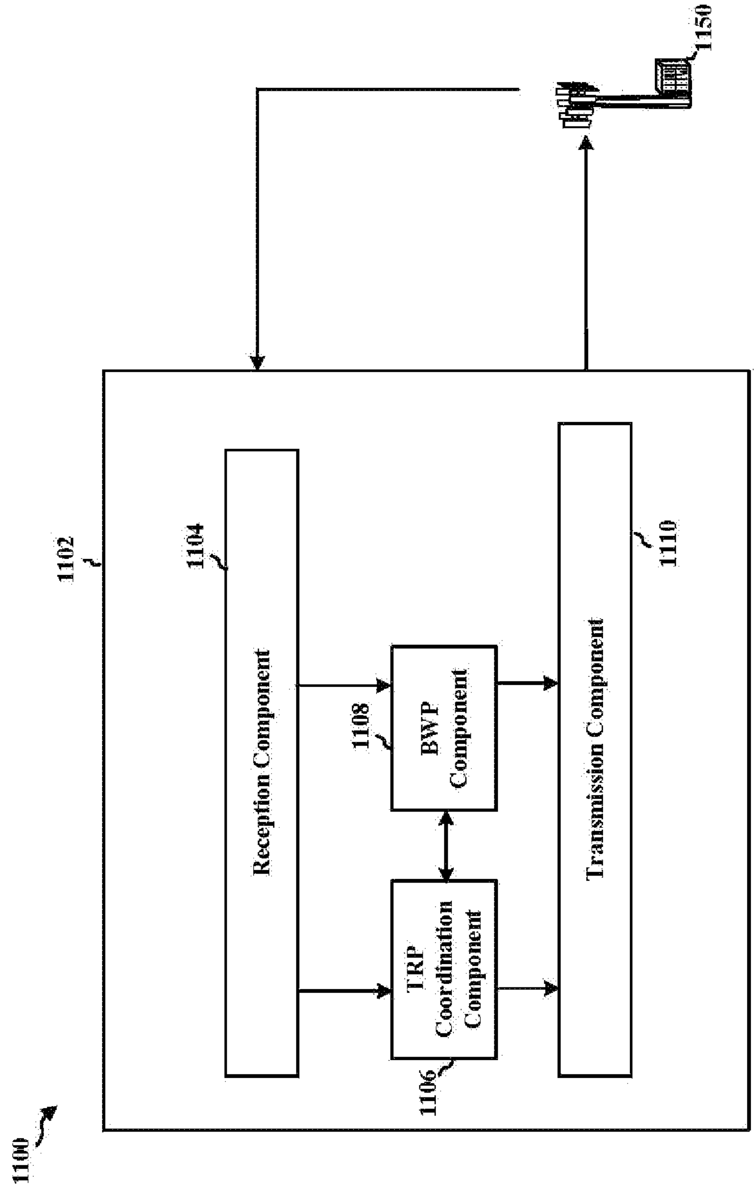
1150
1102
1104
1110
Reception Component
1108
BWP Component
Transmission Component
TRP Coordination Component
1106
1100

FIG. 11

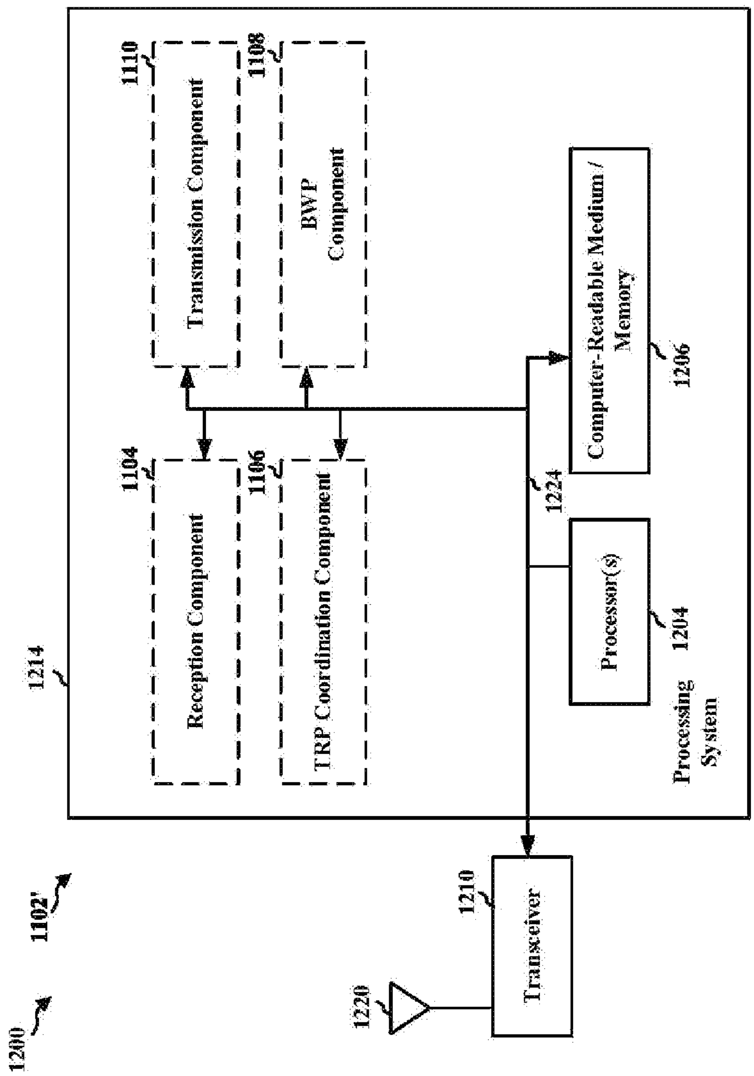
1200
1102'
1214
Reception Component
1104
TRP Coordination Component
1106
Transmission Component
1110
BWP Component
1108
Computer-Readable Medium / Memory
1206
Processor(s)
1204
1224
Processing System
Transceiver
1210
1220

FIG. 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2020/075268

A. CLASSIFICATION OF SUBJECT MATTER

H04W 72/06(2009.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04W

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNPAT,CNKI,WPI,EPODOC,3GPP: bandwidth, part, BWP, TRP, gNB, priorit+， switch+， primary

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	XIAOMI. "Discussion on DL signals for NR-U" *3GPP TSG RAN WG1 Meeting #95， R1-1813361,* 02 November 2018 (2018-11-02), section 2	1-21
X	CN 109314972 A (BEIJING XIAOMI MOBILE SOFTWARE CO.， LTD.) 05 February 2019 (2019-02-05) description， paragraphs [0094]-[0118]	1-21
A	OPPO. "Remaining issues on bandwidth part configuration and activation" *3GPP TSG RAN WG1 Meeting 91 R1-1719975,* 18 November 2017 (2017-11-18), the whole document	1-21
A	VIVO. "Discussion on the channel access procedures" *3GPP TSG RAN WG1 Meeting #92bis R1-1803857,* 06 April 2018 (2018-04-06), the whole document	1-21

☐ Further documents are listed in the continuation of Box C.　　☑ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 April 2020	**26 April 2020**

Name and mailing address of the ISA/CN	Authorized officer
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Facsimile No. **(86-10)62019451**	Telephone No. **86-10-53961754**

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2020/075268

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 109314972 A	05 February 2019	None	