US 20230276527A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2023/0276527 A1**

Karampatsis et al. (43) **Pub. Date: Aug. 31, 2023**

(54) **DISCONTINUOUS RECEPTION CONFIGURATION PARAMETERS FOR COMMUNICATION**

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(21) Appl. No.: **18/016,119**

(22) PCT Filed: **Jul. 10, 2021**

(86) PCT No.: **PCT/IB2021/056211**

§ 371 (c)(1),
(2) Date: **Jan. 13, 2023**

Related U.S. Application Data

(60) Provisional application No. 63/051,233, filed on Jul. 13, 2020, provisional application No. 63/051,217, filed on Jul. 13, 2020, provisional application No. 63/051,207, filed on Jul. 13, 2020, provisional application No. 63/051,184, filed on Jul. 13, 2020.

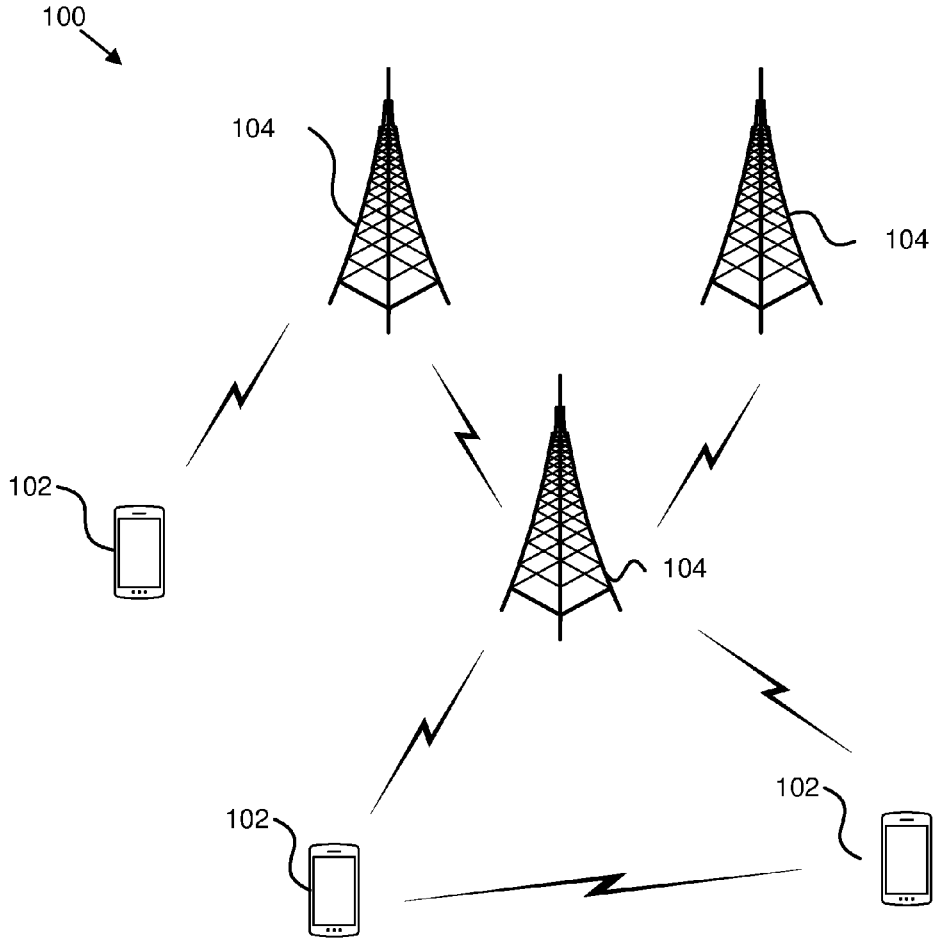
Publication Classification

(51) **Int. Cl.**
H04W 76/28 (2006.01)
H04W 28/02 (2006.01)

(52) **U.S. Cl.**
CPC ***H04W 76/28*** (2018.02); ***H04W 28/0268*** (2013.01)

(57) **ABSTRACT**

Apparatuses, methods, and systems are disclosed for discontinuous reception configuration parameters for communication. One method (**1000**) includes receiving (**1002**), at a first user equipment and over a first radio interface, discontinuous reception configuration parameters for communication over a second radio interface. The method (**1000**) includes receiving (**1004**) quality of service requirements for transmission over the second radio interface. The method (**1000**) includes determining (**1006**) discontinuous reception communication parameters based on the discontinuous reception configuration parameters and based on the quality of service requirements. The method (**1000**) includes transmitting (**1008**) and receiving communications over the second radio interface based on the discontinuous reception communication parameters.



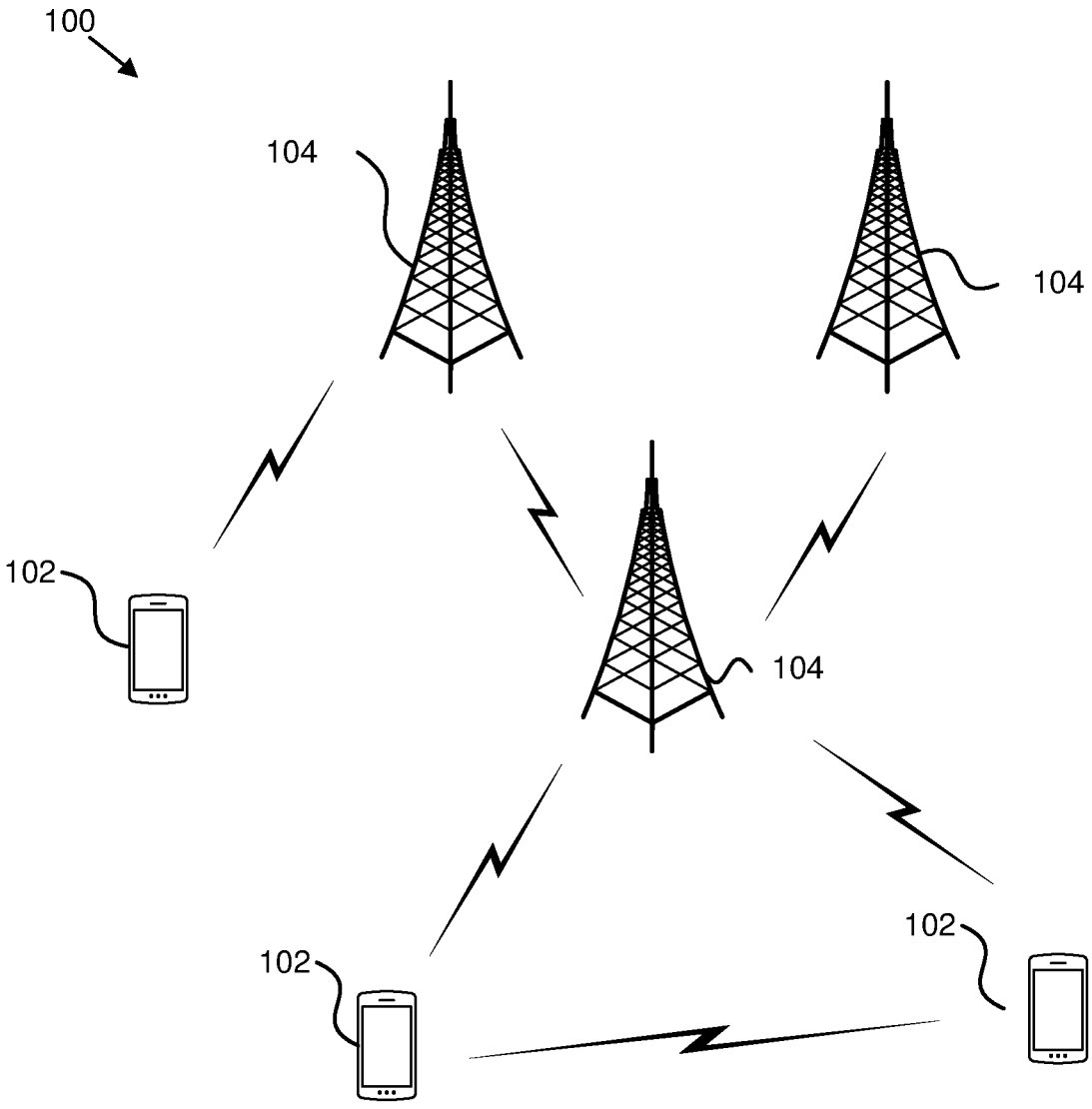


FIG. 1

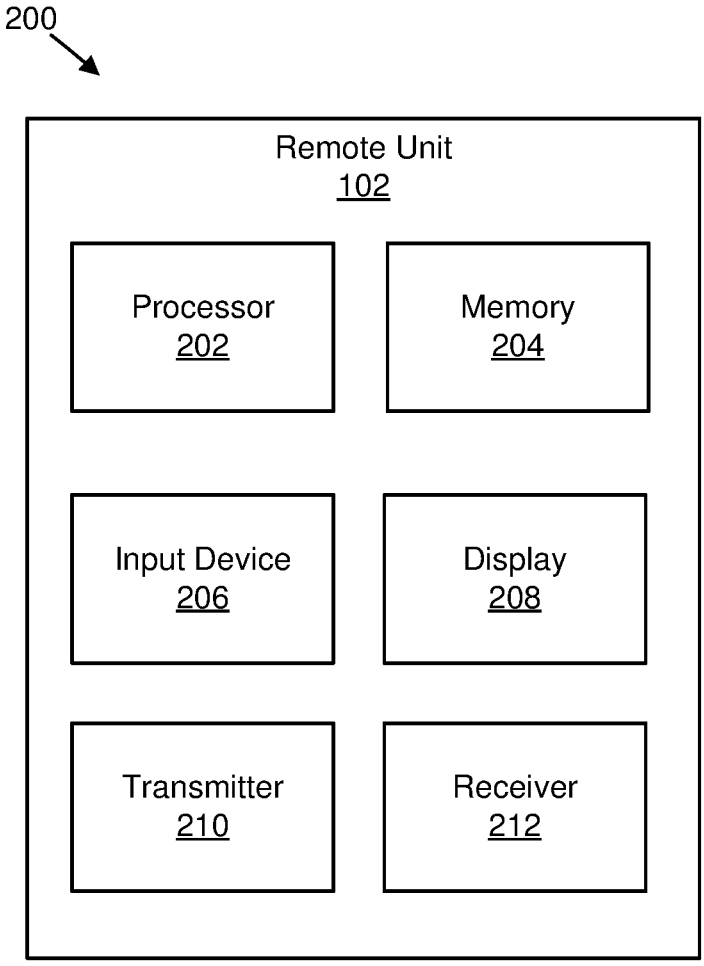

200
Remote Unit
102
Processor
202
Memory
204
Input Device
206
Display
208
Transmitter
210
Receiver
212

FIG. 2

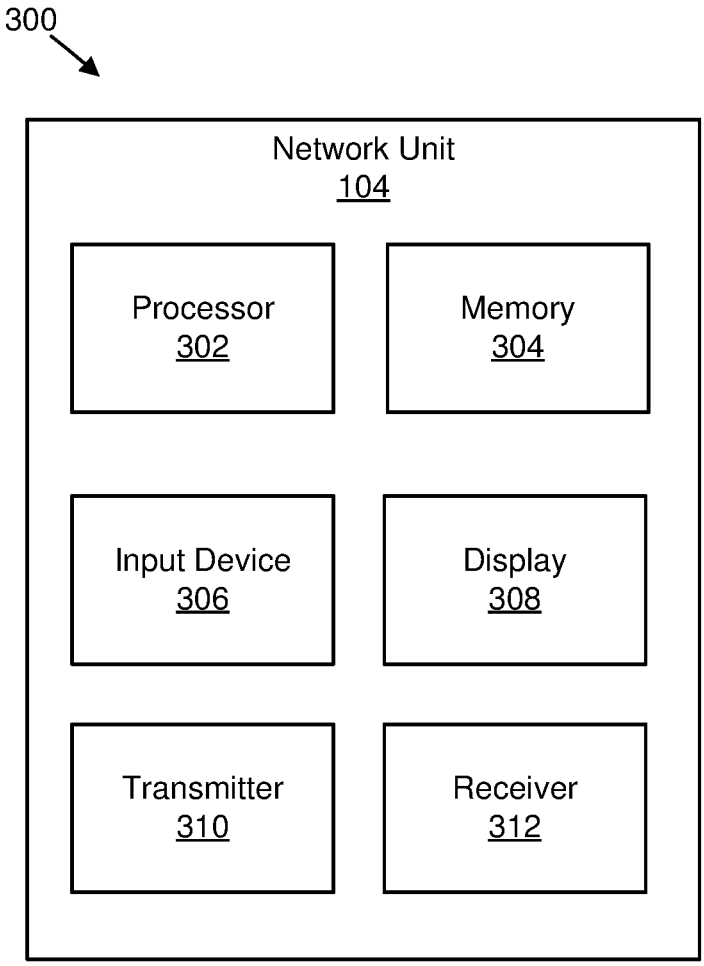

300
Network Unit
104
Processor
302
Memory
304
Input Device
306
Display
308
Transmitter
310
Receiver
312

FIG. 3

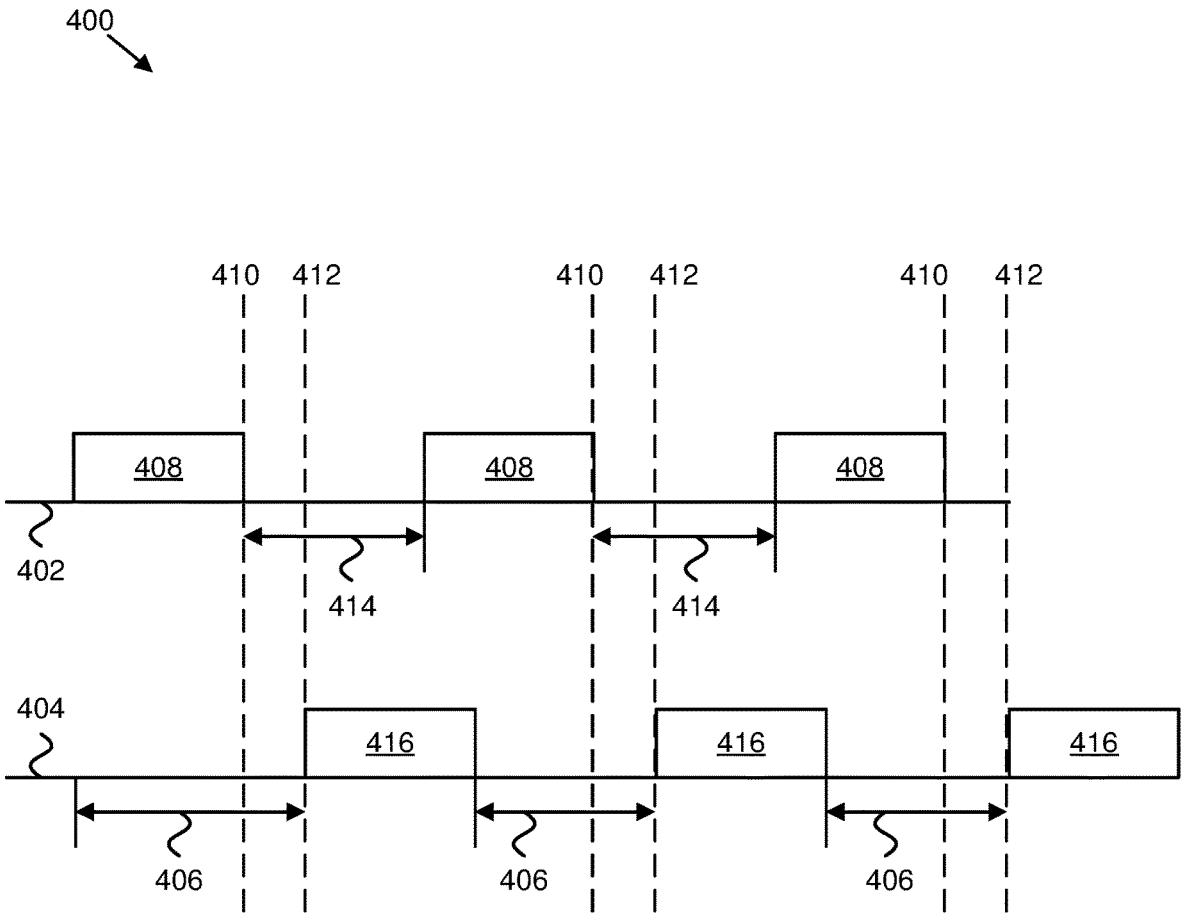

400
410
412
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402
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406

FIG. 4

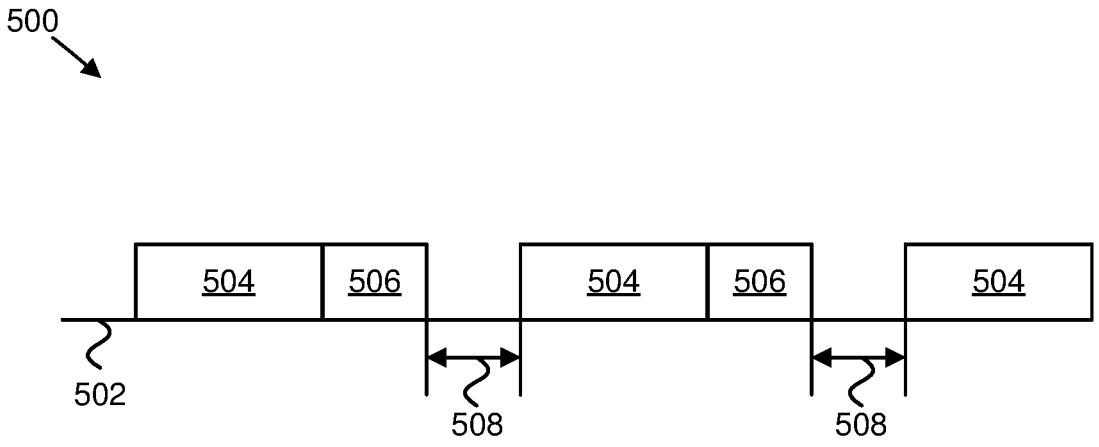


FIG. 5

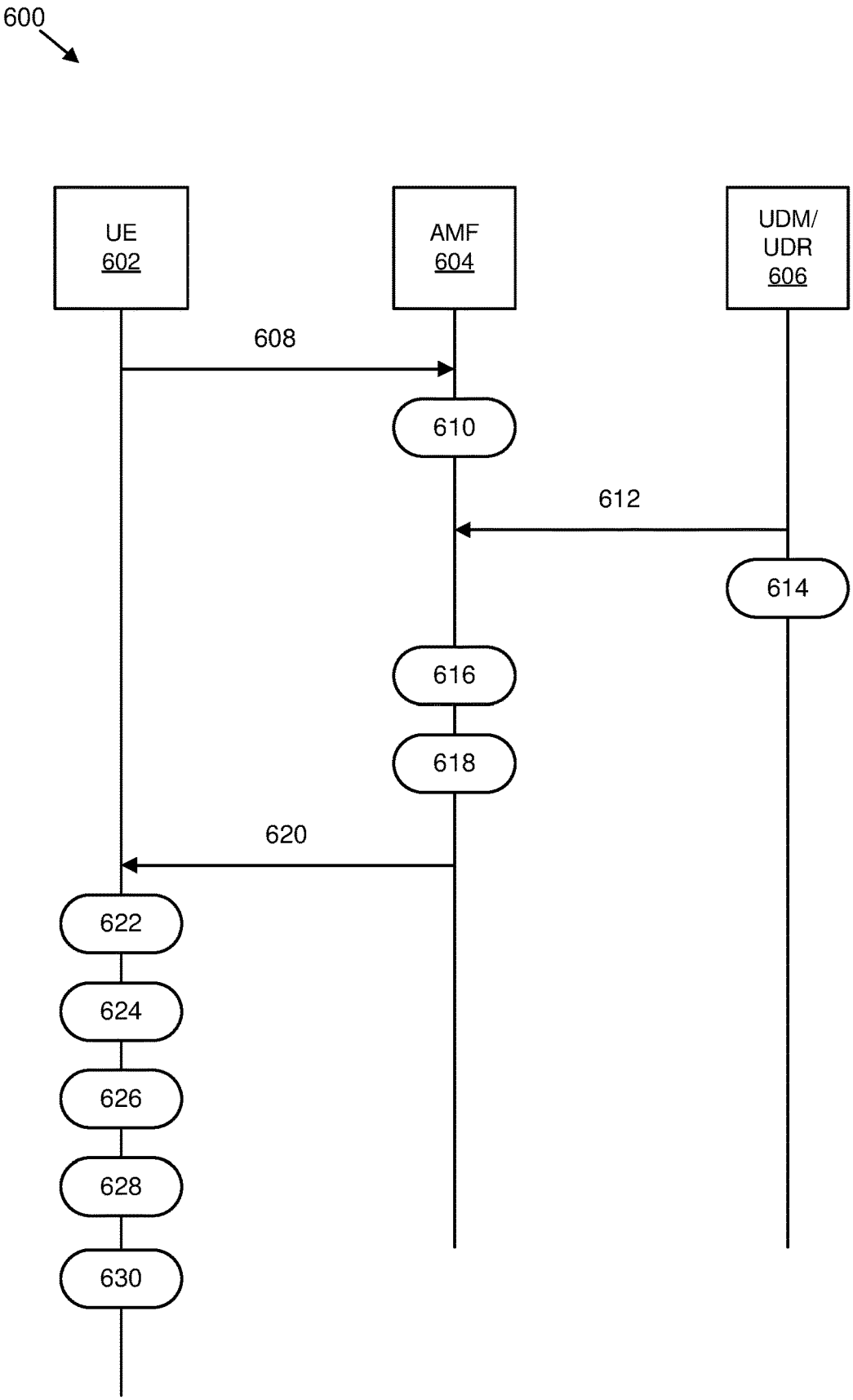

600
UE
602
AMF
604
UDM/
UDR
606
608
610
612
614
616
618
620
622
624
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628
630

FIG. 6

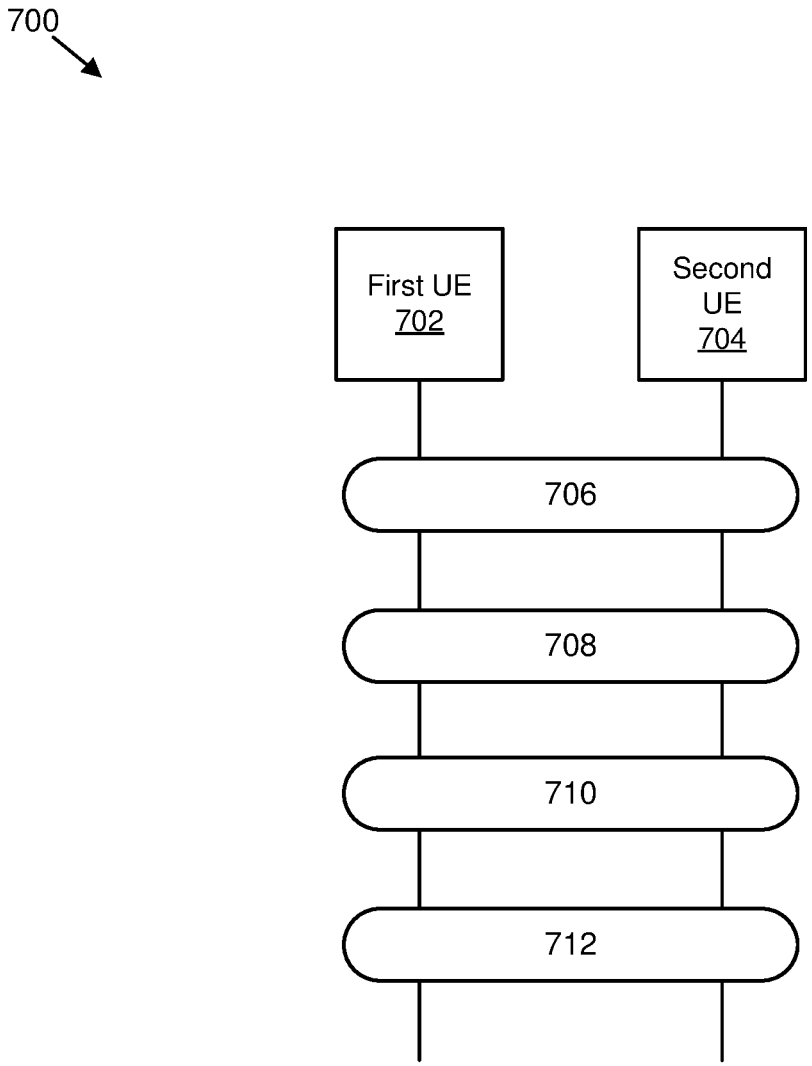


FIG. 7

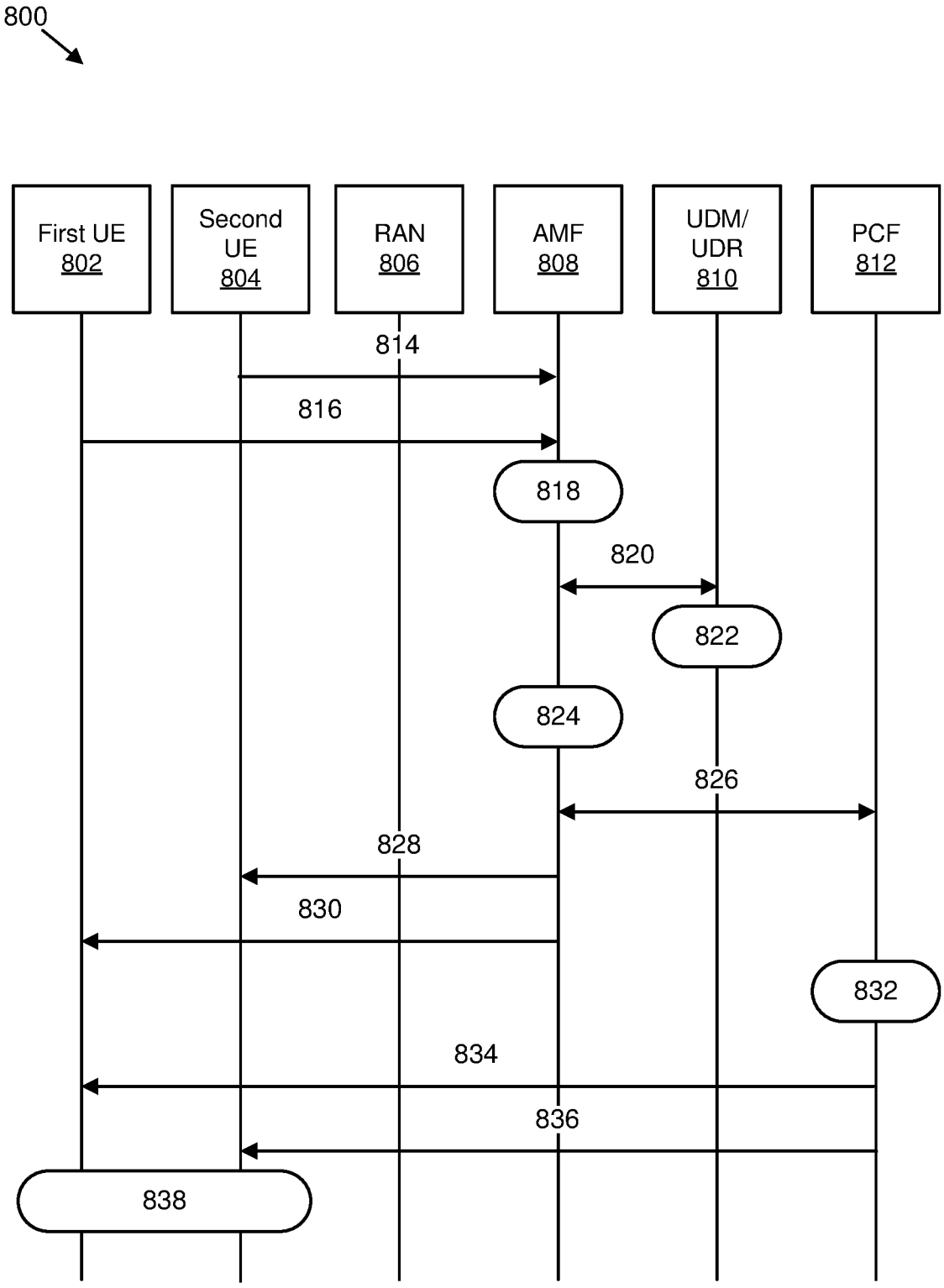

800
First UE
802
Second
UE
804
RAN
806
AMF
808
UDM/
UDR
810
PCF
812
814
816
818
820
822
824
826
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830
832
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836
838

FIG. 8

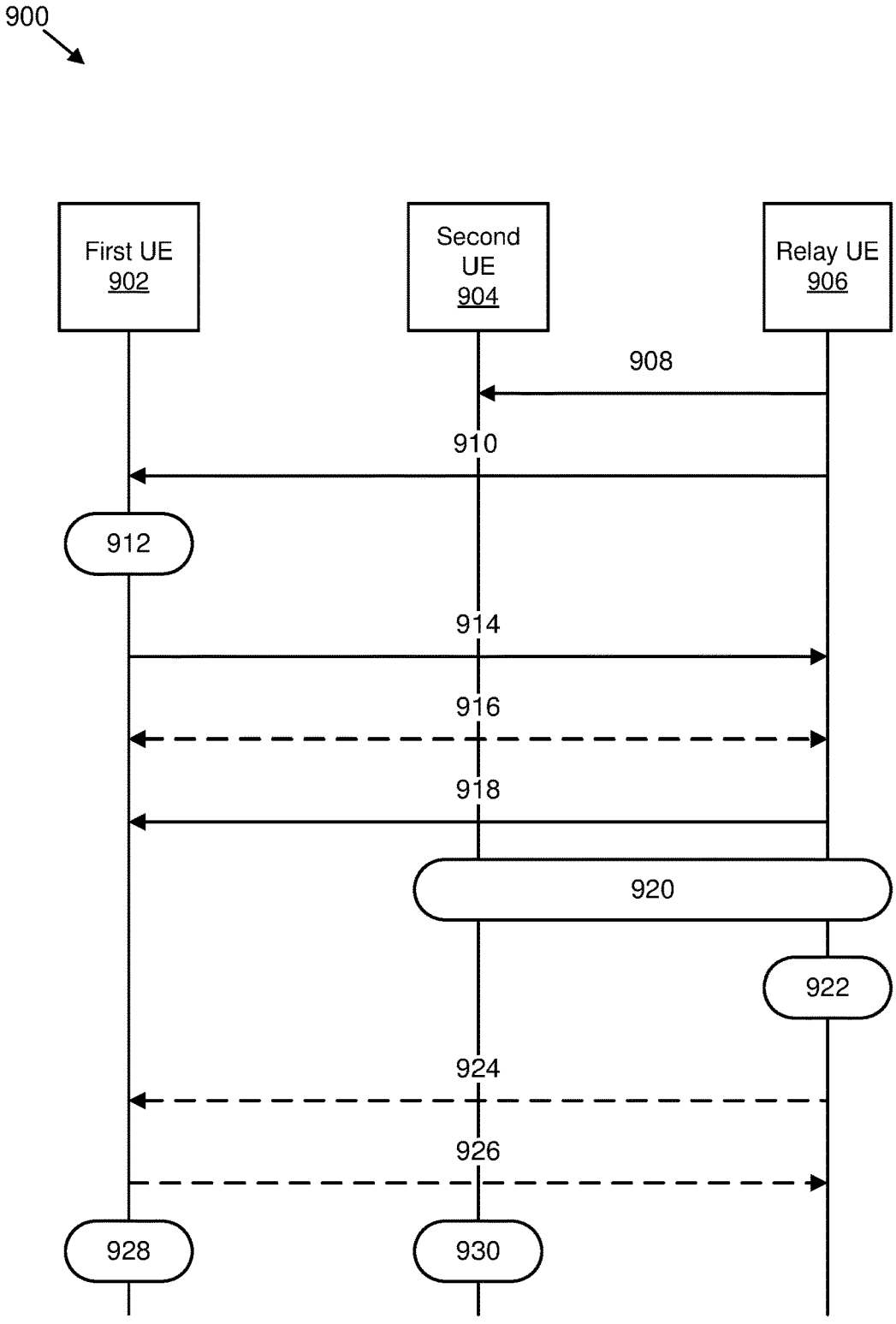

900
First UE
902
Second
UE
904
Relay UE
906
908
910
912
914
916
918
920
922
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926
928
930

FIG. 9

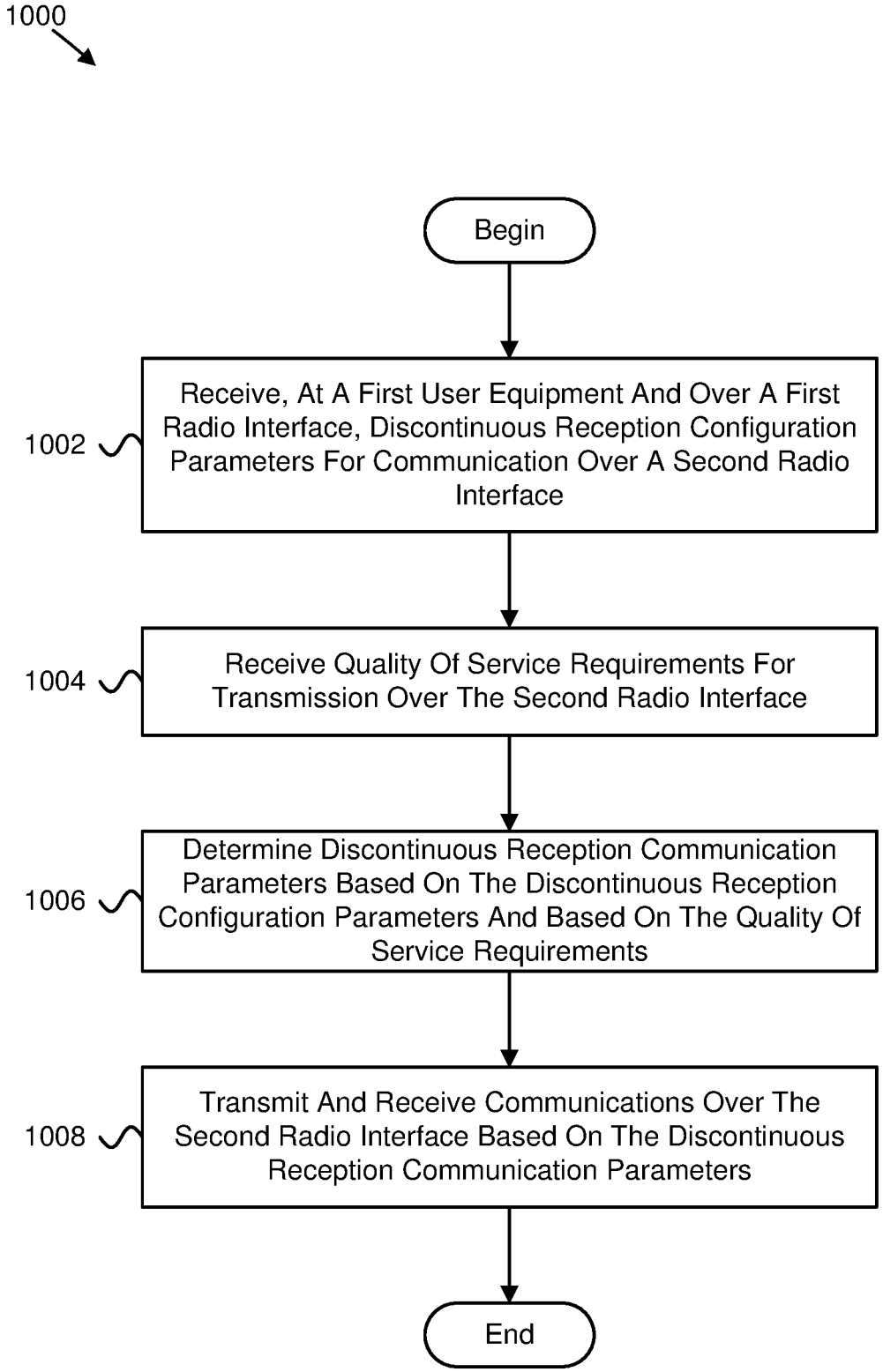

1000
Begin
Receive, At A First User Equipment And Over A First Radio Interface, Discontinuous Reception Configuration Parameters For Communication Over A Second Radio Interface
1002
Receive Quality Of Service Requirements For Transmission Over The Second Radio Interface
1004
Determine Discontinuous Reception Communication Parameters Based On The Discontinuous Reception Configuration Parameters And Based On The Quality Of Service Requirements
1006
Transmit And Receive Communications Over The Second Radio Interface Based On The Discontinuous Reception Communication Parameters
1008
End

FIG. 10

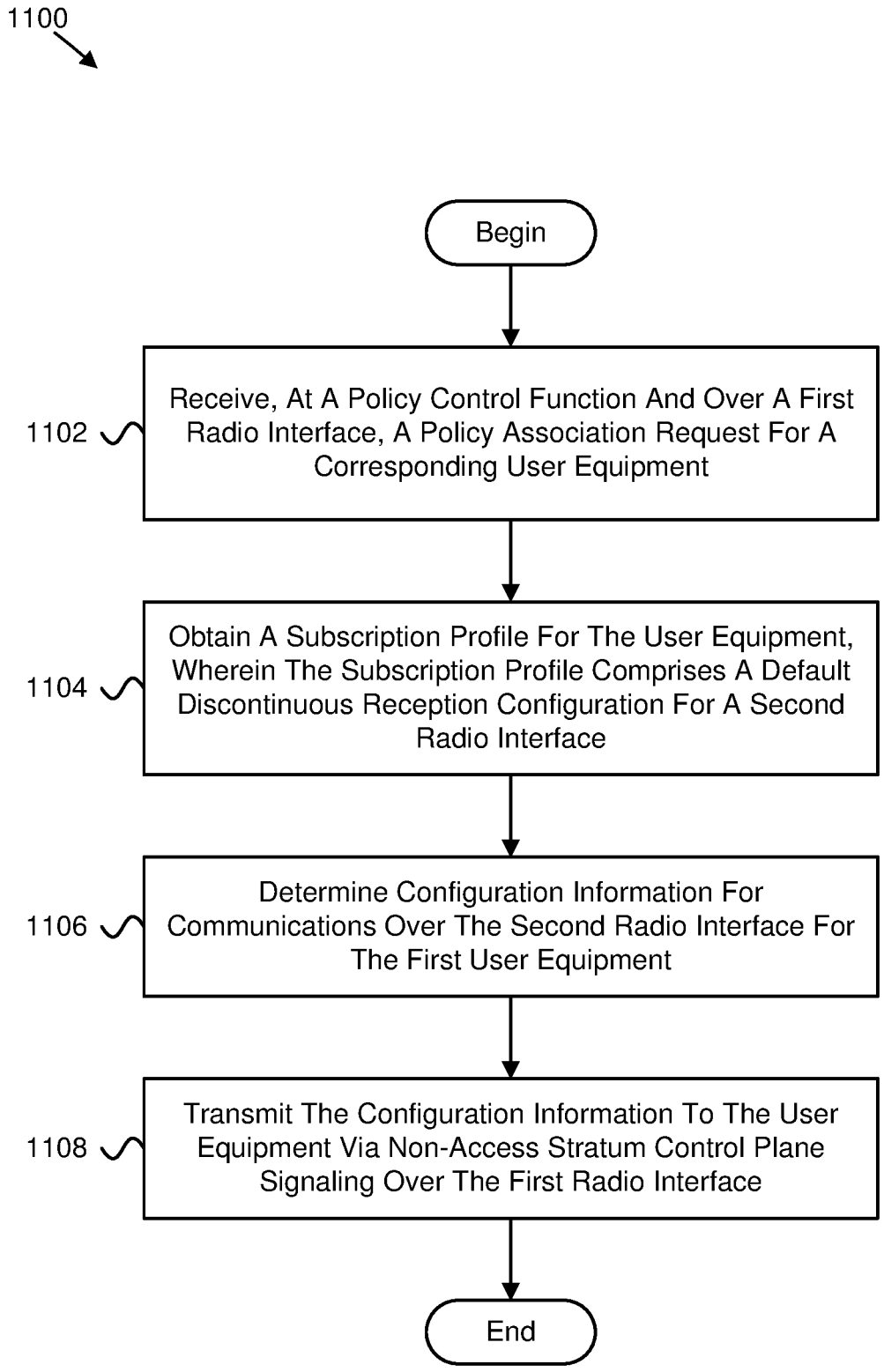

1100
Begin
1102
Receive, At A Policy Control Function And Over A First Radio Interface, A Policy Association Request For A Corresponding User Equipment
1104
Obtain A Subscription Profile For The User Equipment, Wherein The Subscription Profile Comprises A Default Discontinuous Reception Configuration For A Second Radio Interface
1106
Determine Configuration Information For Communications Over The Second Radio Interface For The First User Equipment
1108
Transmit The Configuration Information To The User Equipment Via Non-Access Stratum Control Plane Signaling Over The First Radio Interface
End

FIG. 11

DISCONTINUOUS RECEPTION CONFIGURATION PARAMETERS FOR COMMUNICATION

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Patent Application Ser. No. 63/051,184 entitled "APPARATUSES, METHODS, AND SYSTEMS FOR A SIDELINK DRX MECHANISM-INTERACTION WITH UU DRX OPERATION" and filed on Jul. 13, 2020 for Joachim Loehr, U.S. Patent Application Ser. No. 63/051,207 entitled "APPARATUSES, METHODS, AND SYSTEMS FOR SIDELINK POWER SAVING USING A DRX MECHANISM AND MINIMIZING ENSUING HALF DUPLEX ISSUES" and filed on Jul. 13, 2020 for Prateek Basu Mallick, U.S. Patent Application Ser. No. 63/051,217 entitled "APPARATUSES, METHODS, AND SYSTEMS FOR SUPPORTING POWER SAVING FOR PC5 COMMUNICATIONS" and filed on Jul. 13, 2020 for Dimitrios Karampatsis, and U.S. Patent Application Serial Number **63/051,233** entitled "APPARATUSES, METHODS, AND SYSTEMS FOR ENHANCEMENT FOR SL POWER SAVING" and filed on Jul. 13, 2020 for Karthikeyan Ganesan, all of which are incorporated herein by reference in their entirety.

FIELD

[0002] The subject matter disclosed herein relates generally to wireless communications and more particularly relates to discontinuous reception configuration parameters for communication.

BACKGROUND

[0003] In certain wireless communications networks, discontinuous reception may be used. In such embodiments, the devices in the network may be configured in a variety of ways.

BRIEF SUMMARY

[0004] Methods for discontinuous reception configuration parameters for communication are disclosed. Apparatuses and systems also perform the functions of the methods. One embodiment of a method includes receiving, at a first user equipment and over a first radio interface, discontinuous reception configuration parameters for communication over a second radio interface. In some embodiments, the method includes receiving quality of service requirements for transmission over the second radio interface. In certain embodiments, the method includes determining discontinuous reception communication parameters based on the discontinuous reception configuration parameters and based on the quality of service requirements. In various embodiments, the method includes transmitting and receiving communications over the second radio interface based on the discontinuous reception communication parameters.

[0005] One apparatus for discontinuous reception configuration parameters for communication includes a first user equipment. In some embodiments, the apparatus includes a receiver that: receives, over a first radio interface, discontinuous reception configuration parameters for communication over a second radio interface; and receives quality of service requirements for transmission over the second radio interface. In various embodiments, the apparatus includes a processor that determines discontinuous reception communication parameters based on the discontinuous reception configuration parameters and based on the quality of service requirements. In certain embodiments, the apparatus includes a transmitter. The transmitter transmits communications and the receiver receives communications over the second radio interface based on the discontinuous reception communication parameters.

[0006] Another embodiment of a method for discontinuous reception configuration parameters for communication includes receiving, at a policy control function and over a first radio interface, a policy association request for a corresponding user equipment. In some embodiments, the method includes obtaining a subscription profile for the user equipment. The subscription profile includes a default discontinuous reception configuration for a second radio interface. In certain embodiments, the method includes determining configuration information for communications over the second radio interface for the first user equipment. In various embodiments, the method includes transmitting the configuration information to the user equipment via non-access stratum control plane signaling over the first radio interface.

[0007] Another apparatus for discontinuous reception configuration parameters for communication includes a policy and control function. In some embodiments, the apparatus includes a receiver that receives, over a first radio interface, a policy association request for a corresponding user equipment. In various embodiments, the apparatus includes a processor that: obtains a subscription profile for the user equipment, wherein the subscription profile includes a default discontinuous reception configuration for a second radio interface; and determines configuration information for communications over the second radio interface for the first user equipment. In certain embodiments, the apparatus includes a transmitter that transmits the configuration information to the user equipment via non-access stratum control plane signaling over the first radio interface.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] A more particular description of the embodiments briefly described above will be rendered by reference to specific embodiments that are illustrated in the appended drawings. Understanding that these drawings depict only some embodiments and are not therefore to be considered to be limiting of scope, the embodiments will be described and explained with additional specificity and detail through the use of the accompanying drawings, in which:

[0009] FIG. **1** is a schematic block diagram illustrating one embodiment of a wireless communication system for discontinuous reception configuration parameters for communication;

[0010] FIG. **2** is a schematic block diagram illustrating one embodiment of an apparatus that may be used for discontinuous reception configuration parameters for communication;

[0011] FIG. **3** is a schematic block diagram illustrating one embodiment of an apparatus that may be used for discontinuous reception configuration parameters for communication;

[0012] FIG. **4** is a timing diagram illustrating one embodiment of a system for transmitting a message over a PC5 interface based on a DRX configuration;

[0013] FIG. **5** is a schematic block diagram illustrating one embodiment of a system for extending DRX to support a required QoS;

[0014] FIG. **6** is a network communications diagram illustrating one embodiment of a DRX configuration via NAS (e.g., AMF based);

[0015] FIG. **7** is a network communications diagram illustrating another embodiment of a DRX configuration between UEs for unicast sidelink communication over PC5;

[0016] FIG. **8** is a network communications diagram illustrating one embodiment of a DRX configuration via NAS (e.g., PCF based);

[0017] FIG. **9** is a network communications diagram illustrating one embodiment of a DRX configuration via a relay UE (e.g., RSU);

[0018] FIG. **10** is a flow chart diagram illustrating one embodiment of a method for discontinuous reception configuration parameters for communication; and

[0019] FIG. **11** is a flow chart diagram illustrating another embodiment of a method for discontinuous reception configuration parameters for communication.

DETAILED DESCRIPTION

[0020] As will be appreciated by one skilled in the art, aspects of the embodiments may be embodied as a system, apparatus, method, or program product. Accordingly, embodiments may take the form of an entirely hardware embodiment, an entirely software embodiment (including firmware, resident software, micro-code, etc.) or an embodiment combining software and hardware aspects that may all generally be referred to herein as a "circuit," "module" or "system." Furthermore, embodiments may take the form of a program product embodied in one or more computer readable storage devices storing machine readable code, computer readable code, and/or program code, referred hereafter as code. The storage devices may be tangible, non-transitory, and/or non-transmission. The storage devices may not embody signals. In a certain embodiment, the storage devices only employ signals for accessing code.

[0021] Certain of the functional units described in this specification may be labeled as modules, in order to more particularly emphasize their implementation independence. For example, a module may be implemented as a hardware circuit comprising custom very-large-scale integration ("VLSI") circuits or gate arrays, off-the-shelf semiconductors such as logic chips, transistors, or other discrete components. A module may also be implemented in programmable hardware devices such as field programmable gate arrays, programmable array logic, programmable logic devices or the like.

[0022] Modules may also be implemented in code and/or software for execution by various types of processors. An identified module of code may, for instance, include one or more physical or logical blocks of executable code which may, for instance, be organized as an object, procedure, or function. Nevertheless, the executables of an identified module need not be physically located together, but may include disparate instructions stored in different locations which, when joined logically together, include the module and achieve the stated purpose for the module.

[0023] Indeed, a module of code may be a single instruction, or many instructions, and may even be distributed over several different code segments, among different programs, and across several memory devices. Similarly, operational data may be identified and illustrated herein within modules, and may be embodied in any suitable form and organized within any suitable type of data structure. The operational data may be collected as a single data set, or may be distributed over different locations including over different computer readable storage devices. Where a module or portions of a module are implemented in software, the software portions are stored on one or more computer readable storage devices.

[0024] Any combination of one or more computer readable medium may be utilized. The computer readable medium may be a computer readable storage medium. The computer readable storage medium may be a storage device storing the code. The storage device may be, for example, but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, holographic, micromechanical, or semiconductor system, apparatus, or device, or any suitable combination of the foregoing.

[0025] More specific examples (a non-exhaustive list) of the storage device would include the following: an electrical connection having one or more wires, a portable computer diskette, a hard disk, a random access memory ("RAM"), a read-only memory ("ROM"), an erasable programmable read-only memory ("EPROM" or Flash memory), a portable compact disc read-only memory ("CD-ROM"), an optical storage device, a magnetic storage device, or any suitable combination of the foregoing. In the context of this document, a computer readable storage medium may be any tangible medium that can contain, or store a program for use by or in connection with an instruction execution system, apparatus, or device.

[0026] Code for carrying out operations for embodiments may be any number of lines and may be written in any combination of one or more programming languages including an object oriented programming language such as Python, Ruby, Java, Smalltalk, C++, or the like, and conventional procedural programming languages, such as the "C" programming language, or the like, and/or machine languages such as assembly languages. The code may execute entirely on the user's computer, partly on the user's computer, as a stand-alone software package, partly on the user's computer and partly on a remote computer or entirely on the remote computer or server. In the latter scenario, the remote computer may be connected to the user's computer through any type of network, including a local area network ("LAN") or a wide area network ("WAN"), or the connection may be made to an external computer (for example, through the Internet using an Internet Service Provider).

[0027] Reference throughout this specification to "one embodiment," "an embodiment," or similar language means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment. Thus, appearances of the phrases "in one embodiment," "in an embodiment," and similar language throughout this specification may, but do not necessarily, all refer to the same embodiment, but mean "one or more but not all embodiments" unless expressly specified otherwise. The terms "including," "comprising," "having," and variations thereof mean "including but not limited to," unless expressly specified otherwise. An enumerated listing of items does not imply that any or all of the items are mutually exclusive, unless expressly specified otherwise. The terms "a," "an," and "the" also refer to "one or more" unless expressly specified otherwise.

[0028] Furthermore, the described features, structures, or characteristics of the embodiments may be combined in any suitable manner. In the following description, numerous specific details are provided, such as examples of programming, software modules, user selections, network transactions, database queries, database structures, hardware modules, hardware circuits, hardware chips, etc., to provide a thorough understanding of embodiments. One skilled in the relevant art will recognize, however, that embodiments may be practiced without one or more of the specific details, or with other methods, components, materials, and so forth. In other instances, well-known structures, materials, or operations are not shown or described in detail to avoid obscuring aspects of an embodiment.

[0029] Aspects of the embodiments are described below with reference to schematic flowchart diagrams and/or schematic block diagrams of methods, apparatuses, systems, and program products according to embodiments. It will be understood that each block of the schematic flowchart diagrams and/or schematic block diagrams, and combinations of blocks in the schematic flowchart diagrams and/or schematic block diagrams, can be implemented by code. The code may be provided to a processor of a general purpose computer, special purpose computer, or other programmable data processing apparatus to produce a machine, such that the instructions, which execute via the processor of the computer or other programmable data processing apparatus, create means for implementing the functions/acts specified in the schematic flowchart diagrams and/or schematic block diagrams block or blocks.

[0030] The code may also be stored in a storage device that can direct a computer, other programmable data processing apparatus, or other devices to function in a particular manner, such that the instructions stored in the storage device produce an article of manufacture including instructions which implement the function/act specified in the schematic flowchart diagrams and/or schematic block diagrams block or blocks.

[0031] The code may also be loaded onto a computer, other programmable data processing apparatus, or other devices to cause a series of operational steps to be performed on the computer, other programmable apparatus or other devices to produce a computer implemented process such that the code which execute on the computer or other programmable apparatus provide processes for implementing the functions/acts specified in the flowchart and/or block diagram block or blocks.

[0032] The schematic flowchart diagrams and/or schematic block diagrams in the Figures illustrate the architecture, functionality, and operation of possible implementations of apparatuses, systems, methods and program products according to various embodiments. In this regard, each block in the schematic flowchart diagrams and/or schematic block diagrams may represent a module, segment, or portion of code, which includes one or more executable instructions of the code for implementing the specified logical function(s).

[0033] It should also be noted that, in some alternative implementations, the functions noted in the block may occur out of the order noted in the Figures. For example, two blocks shown in succession may, in fact, be executed substantially concurrently, or the blocks may sometimes be executed in the reverse order, depending upon the functionality involved. Other steps and methods may be conceived that are equivalent in function, logic, or effect to one or more blocks, or portions thereof, of the illustrated Figures.

[0034] Although various arrow types and line types may be employed in the flowchart and/or block diagrams, they are understood not to limit the scope of the corresponding embodiments. Indeed, some arrows or other connectors may be used to indicate only the logical flow of the depicted embodiment. For instance, an arrow may indicate a waiting or monitoring period of unspecified duration between enumerated steps of the depicted embodiment. It will also be noted that each block of the block diagrams and/or flowchart diagrams, and combinations of blocks in the block diagrams and/or flowchart diagrams, can be implemented by special purpose hardware-based systems that perform the specified functions or acts, or combinations of special purpose hardware and code.

[0035] The description of elements in each figure may refer to elements of proceeding figures. Like numbers refer to like elements in all figures, including alternate embodiments of like elements.

[0036] FIG. **1** depicts an embodiment of a wireless communication system **100** for discontinuous reception configuration parameters for communication. In one embodiment, the wireless communication system **100** includes remote units **102** and network units **104**. Even though a specific number of remote units **102** and network units **104** are depicted in FIG. **1**, one of skill in the art will recognize that any number of remote units **102** and network units **104** may be included in the wireless communication system **100**.

[0037] In one embodiment, the remote units **102** may include computing devices, such as desktop computers, laptop computers, personal digital assistants ("PDAs"), tablet computers, smart phones, smart televisions (e.g., televisions connected to the Internet), set-top boxes, game consoles, security systems (including security cameras), vehicle on-board computers, network devices (e.g., routers, switches, modems), aerial vehicles, drones, or the like. In some embodiments, the remote units **102** include wearable devices, such as smart watches, fitness bands, optical head-mounted displays, or the like. Moreover, the remote units **102** may be referred to as subscriber units, mobiles, mobile stations, users, terminals, mobile terminals, fixed terminals, subscriber stations, UE, user terminals, a device, or by other terminology used in the art. The remote units **102** may communicate directly with one or more of the network units **104** via UL communication signals. In certain embodiments, the remote units **102** may communicate directly with other remote units **102** via sidelink communication.

[0038] The network units **104** may be distributed over a geographic region. In certain embodiments, a network unit **104** may also be referred to and/or may include one or more of an access point, an access terminal, a base, a base station, a location server, a core network ("CN"), a radio network entity, a Node-B, an evolved node-B ("eNB"), a 5G node-B ("gNB"), a Home Node-B, a relay node, a device, a core network, an aerial server, a radio access node, an access point ("AP"), new radio ("NR"), a network entity, an access and mobility management function ("AMF"), a unified data management ("UDM"), a unified data repository ("UDR"), a UDM/UDR, a policy control function ("PCF"), a radio access network ("RAN"), a network slice selection function ("NSSF"), an operations, administration, and management ("OAM"), a session management function ("SMF"), a user plane function ("UPF"), an application function, an authen-

tication server function ("AUSF"), security anchor functionality ("SEAF"), trusted non-3GPP gateway function ("TNGF"), or by any other terminology used in the art. The network units **104** are generally part of a radio access network that includes one or more controllers communicably coupled to one or more corresponding network units **104**. The radio access network is generally communicably coupled to one or more core networks, which may be coupled to other networks, like the Internet and public switched telephone networks, among other networks. These and other elements of radio access and core networks are not illustrated but are well known generally by those having ordinary skill in the art.

[0039] In one implementation, the wireless communication system **100** is compliant with NR protocols standardized in third generation partnership project ("3GPP"), wherein the network unit **104** transmits using an OFDM modulation scheme on the downlink ("DL") and the remote units **102** transmit on the uplink ("UL") using a single-carrier frequency division multiple access ("SC-FDMA") scheme or an orthogonal frequency division multiplexing ("OFDM") scheme. More generally, however, the wireless communication system **100** may implement some other open or proprietary communication protocol, for example, WiMAX, institute of electrical and electronics engineers ("IEEE") 802.11 variants, global system for mobile communications ("GSM"), general packet radio service ("GPRS"), universal mobile telecommunications system ("UMTS"), long term evolution ("LTE") variants, code division multiple access 2000 ("CDMA2000"), Bluetooth®, ZigBee, Sigfoxx, among other protocols. The present disclosure is not intended to be limited to the implementation of any particular wireless communication system architecture or protocol.

[0040] The network units **104** may serve a number of remote units **102** within a serving area, for example, a cell or a cell sector via a wireless communication link. The network units **104** transmit DL communication signals to serve the remote units **102** in the time, frequency, and/or spatial domain.

[0041] In various embodiments, a remote unit **102** may receive, at a first user equipment and over a first radio interface, discontinuous reception configuration parameters for communication over a second radio interface. In some embodiments, the remote unit **102** may receive quality of service requirements for transmission over the second radio interface. In certain embodiments, the remote unit **102** may determine discontinuous reception communication parameters based on the discontinuous reception configuration parameters and based on the quality of service requirements. In various embodiments, the remote unit **102** may transmit and receive communications over the second radio interface based on the discontinuous reception communication parameters. Accordingly, the remote unit **102** may be used for discontinuous reception configuration parameters for communication.

[0042] In certain embodiments, a network unit **104** may receive, at a policy control function and over a first radio interface, a policy association request for a corresponding user equipment. In some embodiments, the network unit **104** may obtain a subscription profile for the user equipment. The subscription profile includes a default discontinuous reception configuration for a second radio interface. In certain embodiments, the network unit **104** may determine configuration information for communications over the second radio interface for the first user equipment. In various embodiments, the network unit **104** may transmit the configuration information to the user equipment via non-access stratum control plane signaling over the first radio interface. Accordingly, the network unit **104** may be used for discontinuous reception configuration parameters for communication.

[0043] FIG. **2** depicts one embodiment of an apparatus **200** that may be used for discontinuous reception configuration parameters for communication. The apparatus **200** includes one embodiment of the remote unit **102**. Furthermore, the remote unit **102** may include a processor **202**, a memory **204**, an input device **206**, a display **208**, a transmitter **210**, and a receiver **212**. In some embodiments, the input device **206** and the display **208** are combined into a single device, such as a touchscreen. In certain embodiments, the remote unit **102** may not include any input device **206** and/or display **208**. In various embodiments, the remote unit **102** may include one or more of the processor **202**, the memory **204**, the transmitter **210**, and the receiver **212**, and may not include the input device **206** and/or the display **208**.

[0044] The processor **202**, in one embodiment, may include any known controller capable of executing computer-readable instructions and/or capable of performing logical operations. For example, the processor **202** may be a microcontroller, a microprocessor, a central processing unit ("CPU"), a graphics processing unit ("GPU"), an auxiliary processing unit, a field programmable gate array ("FPGA"), or similar programmable controller. In some embodiments, the processor **202** executes instructions stored in the memory **204** to perform the methods and routines described herein. The processor **202** is communicatively coupled to the memory **204**, the input device **206**, the display **208**, the transmitter **210**, and the receiver **212**.

[0045] The memory **204**, in one embodiment, is a computer readable storage medium. In some embodiments, the memory **204** includes volatile computer storage media. For example, the memory **204** may include a RAM, including dynamic RAM ("DRAM"), synchronous dynamic RAM ("SDRAM"), and/or static RAM ("SRAM"). In some embodiments, the memory **204** includes non-volatile computer storage media. For example, the memory **204** may include a hard disk drive, a flash memory, or any other suitable non-volatile computer storage device. In some embodiments, the memory **204** includes both volatile and non-volatile computer storage media. In some embodiments, the memory **204** also stores program code and related data, such as an operating system or other controller algorithms operating on the remote unit **102**.

[0046] The input device **206**, in one embodiment, may include any known computer input device including a touch panel, a button, a keyboard, a stylus, a microphone, or the like. In some embodiments, the input device **206** may be integrated with the display **208**, for example, as a touchscreen or similar touch-sensitive display. In some embodiments, the input device **206** includes a touchscreen such that text may be input using a virtual keyboard displayed on the touchscreen and/or by handwriting on the touchscreen. In some embodiments, the input device **206** includes two or more different devices, such as a keyboard and a touch panel.

[0047] The display **208**, in one embodiment, may include any known electronically controllable display or display

device. The display **208** may be designed to output visual, audible, and/or haptic signals. In some embodiments, the display **208** includes an electronic display capable of outputting visual data to a user. For example, the display **208** may include, but is not limited to, a liquid crystal display ("LCD"), a light emitting diode ("LED") display, an organic light emitting diode ("OLED") display, a projector, or similar display device capable of outputting images, text, or the like to a user. As another, non-limiting, example, the display **208** may include a wearable display such as a smart watch, smart glasses, a heads-up display, or the like. Further, the display **208** may be a component of a smart phone, a personal digital assistant, a television, a table computer, a notebook (laptop) computer, a personal computer, a vehicle dashboard, or the like.

[0048] In certain embodiments, the display **208** includes one or more speakers for producing sound. For example, the display **208** may produce an audible alert or notification (e.g., a beep or chime). In some embodiments, the display **208** includes one or more haptic devices for producing vibrations, motion, or other haptic feedback. In some embodiments, all or portions of the display **208** may be integrated with the input device **206**. For example, the input device **206** and display **208** may form a touchscreen or similar touch-sensitive display. In other embodiments, the display **208** may be located near the input device **206**.

[0049] In certain embodiments, the receiver **210**: receives, over a first radio interface, discontinuous reception configuration parameters for communication over a second radio interface; and receives quality of service requirements for transmission over the second radio interface. In various embodiments, the processor **202** determines discontinuous reception communication parameters based on the discontinuous reception configuration parameters and based on the quality of service requirements. In certain embodiments, the transmitter **212** transmits communications and the receiver **210** receives communications over the second radio interface based on the discontinuous reception communication parameters.

[0050] Although only one transmitter **210** and one receiver **212** are illustrated, the remote unit **102** may have any suitable number of transmitters **210** and receivers **212**. The transmitter **210** and the receiver **212** may be any suitable type of transmitters and receivers. In one embodiment, the transmitter **210** and the receiver **212** may be part of a transceiver.

[0051] FIG. **3** depicts one embodiment of an apparatus **300** that may be used for discontinuous reception configuration parameters for communication. The apparatus **300** includes one embodiment of the network unit **104**. Furthermore, the network unit **104** may include a processor **302**, a memory **304**, an input device **306**, a display **308**, a transmitter **310**, and a receiver **312**. As may be appreciated, the processor **302**, the memory **304**, the input device **306**, the display **308**, the transmitter **310**, and the receiver **312** may be substantially similar to the processor **202**, the memory **204**, the input device **206**, the display **208**, the transmitter **210**, and the receiver **212** of the remote unit **102**, respectively.

[0052] In certain embodiments, the receiver **312** receives, over a first radio interface, a policy association request for a corresponding user equipment. In various embodiments, the processor **302**: obtains a subscription profile for the user equipment, wherein the subscription profile includes a default discontinuous reception configuration for a second radio interface; and determines configuration information for communications over the second radio interface for the first user equipment. In certain embodiments, the transmitter **310** transmits the configuration information to the user equipment via non-access stratum control plane signaling over the first radio interface.

[0053] In certain embodiments, sidelink communication over a user equipment ("UE") to UE interface ("PC5") interface for pedestrians may support sidelink communication with power efficiency.

[0054] In some embodiments, a vehicle to everything ("V2X") UE transmits a message for sidelink communication over PC5 at a constant rate. For example, a cooperative awareness message ("CAM") may be sent over PC5 every 100 ms. This constant operation may reduce the power efficiency of the UE. However, V2X UEs (e.g., cars or roadside units ("RSUs")) have large battery capacity that enables this constant operation. On the other hand, pedestrian UEs (e.g., smartphones, smart watches) have limited battery capacity or radio resources available.

[0055] In various embodiments, a V2X pedestrian UE applies discontinuous reception ("DRX") over PC5 in a manner to increase power efficiency. In certain embodiments, DRX synchronization is carried out between V2X UEs running the same application and/or service to increase power efficiency.

[0056] It should be noted that, as used here, the term eNB and/or gNB are used for a base station but may be replaceable by any other radio access node (e.g., base station ("BS"), eNB, gNB, access point ("AP"), new radio ("NR"), and so forth). Further, certain embodiments described herein may be described in the context of NR V2X. However, embodiments herein may be applicable to any mobile communication systems supporting sidelink Communication over a PC5 interface. Moreover, any of the embodiments described herein may be combined together.

[0057] In certain embodiments, a UE may be configured with DRX to use for sidelink communication over PC5. In a first embodiment, a UE receives a DRX configuration for sidelink communication over PC5 via non-access stratum ("NAS") signaling from an application management function ("AMF") or policy control function ("PCF"). In a second embodiment, applications may provide synchronization parameters that assist a UE (e.g., V2X layer) to identify required DRX parameters. In a third embodiment, a UE receives a DRX configuration from a UE acting as a DRX synchronization function (e.g., an RSU UE).

[0058] In some embodiments, once a UE receives a DRX to use over PC5, the UE applies the DRX for transmitting and/or receiving V2X messages as shown in FIG. **4**. In such embodiments, the UE configures an "Active Time" and an "Inactive Time" for sidelink communication over PC5 based on the received DRX configuration. Further, when the UE is in the "Inactive Time," the UE enters into a "sleep" state and does not transmit or listen for sidelink communication messages over PC5. Moreover, when the UE is in the "Active Time," the UE may transmit data provided by a V2X application layer or listen for sidelink communication messages over PC5. If the V2X application provides the data during a UE inactive state, the UE buffers the data and transmits it during the Active Time period.

[0059] In various embodiments, a UE may apply the same DRX configuration for communication over a UE to network interface ("Uu") and a PC5 interface.

[0060] FIG. **4** is a timing diagram **400** illustrating one embodiment of a system for transmitting a message over a PC5 interface based on a DRX configuration. The timing diagram **400** illustrates timing of communications of an application layer **402** compared to a UE state **404** based on DRX. While the UE state **404** is in an inactive period **406**, the application layer **402** transmits data **408** and includes a first time period from **410** to **412**. Moreover, a second time period **414** (e.g., 1 sec) may be between each data **408** transmission. The UE state **404** may have an active time **416** as illustrated.

[0061] In some embodiments, there may be NAS-based DRX configuration. In the first embodiment, a UE receives a DRX configuration to use for sidelink communication over PC5 from an AMF or PCF via NAS signaling.

[0062] In various embodiments, an AMF determines that a DRX configuration for sidelink communication over PC5 is required to be provided to a UE based on a UE subscription. More specifically, the AMF determines, by receiving from a unified data repository ("UDR"), the UE subscription that includes information indicating whether the UE is authorized to perform sidelink communication over PC5 as a pedestrian UE. The DRX configuration that is provided to the UE may be based on a pre-configuration at the AMF. The pre-configuration may be carried out by a network operator based on a knowledge of quality of service ("QoS") requirements of applications providing pedestrian services. Once the UE receives the DRX configuration, the UE applies the DRX.

[0063] In certain embodiments, some V2X applications may require sidelink communications over PC5 for a V2X service (e.g., identified by a provider service identifier ("PSID") or intelligent transports systems application identifier ("ITS-AID") with specific QoS requirements. For example, low latency and high guaranteed bit rate ("GBR") requirements. In such embodiments, a DRX configuration provided by an AMF may not be adequate to sustain the low latency and/or high GBR. Moreover, in such embodiments, a UE may add an offset in a configured DRX to extend the "Active Time" for transmitting the data according to the low latency and/or high GBR requirements of the application. This is shown in FIG. **5**.

[0064] Specifically, FIG. **5** is a schematic block diagram **500** illustrating one embodiment of a system for extending DRX to support a required QoS. In the schematic block diagram **500**, a UE state **502** (e.g., based on DRX to support low latency QoS) includes a repetition of an active time **504** followed by an offset **506**, followed by an inactive period **508**.

[0065] FIG. **6** is a network communications **600** diagram illustrating one embodiment of a DRX configuration via NAS (e.g., AMF based). The network communications **600** are made between a UE **602** (e.g., pedestrian UE), an AMF **604**, and a unified data management ("UDM") and/or UDR ("UDM/UDR") **606**. Each of the illustrated network communications **600** may include one or more messages.

[0066] In a first communication **608** transmitted from the UE **602** to the AMF **604**, the UE **602** transmits a message to register to a 3GPP network using standard authentication procedures by sending a registration request to the AMF **604**. The UE **602** includes an indication in the registration request that the UE **602** is V2X capable.

[0067] The AMF **604** performs **610** an authentication server function ("AUSF") selection, authentication, and security.

[0068] In a second communication **612** transmitted from the UDM/UDR **606** to the AMF **604**, during the registration procedure the AMF **604** receives a subscription profile from the UDR/UDM **606**. The UDM/UDR **606** contains **614** the subscription profile that may include information indicating that the UE **602** is authorized for V2X communication over PC5 as a pedestrian UE.

[0069] The AMF **604** determines **616** from the subscription provide that the UE **602** is authorized for V2X communication over PC5 as a pedestrian UE.

[0070] Moreover, the AMF **604** determines **618** the DRX configuration required over PC5. Further, the AMF **604** ensures that all UEs registered on the same traffic area receive the same DRX configuration.

[0071] In a third communication **620** transmitted from the AMF **604** to the UE **602**, the AMF **604** provides the DRX configuration over PC5 in a registration accept message sent to the UE **602**.

[0072] Based on the received DRX configuration, the UE **602** determines **622** an Active Time and an Inactive Time. The UE **602** transmits and/or listens for sidelink communications over PC5 only during the Active Time. Moreover, an access stratum ("AS") layer of the UE **602** configures the Active Time and the Inactive Time for PC5. The AS layer in the UE **602** does not transmit or monitor for V2X messages during the Inactive Time. This may apply to broadcast, groupcast, and unicast transmissions.

[0073] The AS layer of the UE **602** may notify **624** higher layers about at which time interval a V2X message may be transmitted. Moreover, an application in the UE **602** requests **626** to send a message over sidelink communication over PC5 with specific QoS requirements. Further, the UE **602** determines **628** that the configured DRX cannot support the QoS requirements and determines an additional offset in the configured DRX to support the required QoS. The UE **602** applies **630** the DRX for all sidelink communications over PC5 for any V2X service. Once the UE **602** determines the DRX required, the UE **602** may exchange the DRX with other UEs that are using the same V2X application and V2X service via unicast signaling.

[0074] In some embodiments, a UE may determine that a different DRX configuration is required when two UEs exchange QoS requirements during sidelink communications over PC5 over a unicast link. This is illustrated in FIG. **7**.

[0075] Specifically, FIG. **7** is a network communications **700** diagram illustrating another embodiment of a DRX configuration between UEs for unicast sidelink communication over PC5. The network communications **700** are made between a first UE **702** (e.g., pedestrian UE) and a second UE **704** (e.g., pedestrian UE). Each of the illustrated network communications **700** may include one or more messages.

[0076] In certain configurations, in a first communication **706** transmitted between the first UE **702** and the second UE **704**, based on a received DRX configuration the first UE **702** and the second UE **704** determine an Active Time and an

Inactive Time. The first UE **702** and the second UE **704** transmit and/or listen for sidelink communications over PC5 only during the Active Time.

[0077] In a second communication **708** transmitted between the first UE **702** and the second UE **704**, the AS layer of each UE may notify higher layers of the Active Time and the Inactive Time used.

[0078] In a third communication **710** transmitted between the first UE **702** and the second UE **704**, if the first UE **702** needs to establish a unicast session over PC5 with the second UE **704**, the first UE **702** establishes the unicast connection during the Active Time period. During security association, both the first UE **702** and the second UE **704** determine the QoS requirements and associated DRX configuration.

[0079] Both the first UE **702** and the second UE **704** use **712** the negotiated DRX. If the unicast session ends, the first UE **702** and the second UE **704** fallback to a default DRX.

[0080] In various embodiments, a DRX configuration is provided via NAS from a PCF. The PCF provides a default DRX over PC5 for V2X services that are used by pedestrian UEs within a provisioned V2X configuration information. The V2X configuration information may include: 1) a mapping of a V2X service for pedestrian UEs (e.g., identified by a PSID or ITS-AID) to a default DRX configuration; 2) a mapping of DRX configuration per QoS requirement (e.g., QoS class, packet delay budget ("PDB"), etc.)—in one embodiment there may be a default DRX configuration and an additional offset per QoS requirement; and/or 3) a mapping of DRX configuration per cast type (e.g., broadcast, unicast, groupcast).

[0081] In certain embodiments, if an application requests to send sidelink communication over PC5, a UE uses a DRX configuration within a V2X configuration to determine the DRX. If the application has specific QoS requirements, the UE determines an additional offset based on the received DRX configuration. A procedure to provide a UE with a DRX configuration from a PCF is shown in FIG. **8**.

[0082] Specifically, FIG. **8** is a network communications **800** diagram illustrating one embodiment of a DRX configuration via NAS (e.g., PCF based). The network communications **800** are made between a first UE **802** (e.g., pedestrian UE), a second UE **804** (e.g., pedestrian UE), a RAN **806**, an AMF **808**, a UDM/UDR **810**, and a PCF **812**. Each of the illustrated network communications **800** may include one or more messages.

[0083] In a first communication **814** transmitted from the second UE **804** to the AMF **808** and/or in a second communication **816** transmitted from the first UE **802** to the AMF **808**, the first UE **802** and the second UE **804** register to the 3GPP network using standard authentication procedures by sending a registration request. The first UE **802** and the second UE **804** include an indication in the registration request that the first UE **802** and the second UE **804** are V2X capable.

[0084] The AMF **808** performs **818** an AUSF selection, authentication, and security.

[0085] In a third communication **820** transmitted between the AMF **808** and the UDM/UDR **810**, during the registration procedure the AMF **808** receives a subscription profile from the UDR/UDM **810**. The UDM/UDR **810** contains **822** the subscription profile that may include information indicating that the UEs are authorized for V2X communication over PC5 as pedestrian UEs.

[0086] The AMF **808** determines **824** from the subscription provide that the UEs are authorized for V2X communication over PC5 as pedestrian UEs and selects the PCF **812**.

[0087] In a fourth communication **826** transmitted between the AMF **808** and the PCF **812**, the AMF **808** establishes a UE policy association with the PCF **812** including a V2X capability indication.

[0088] In a fifth communication **828** transmitted from the AMF **808** to the second UE **804** and/or in a sixth communication **830** transmitted from the AMF **808** to the first UE **802**, the AMF **808** completes registration with the UEs with a registration accept message.

[0089] The PCF **812** determines **832** the V2X configuration based on subscription information provided by the UDM/UDR **810**. The PCF **812** includes in the V2X configuration a DRX configuration for sidelink communication over PC5.

[0090] In a seventh communication **834** transmitted from the PCF **812** to the first UE **802** and/or in an eighth communication **836** transmitted from the PCF **812** to the second UE **804**, the PCF **812** provides the V2X configuration to the UEs using a UE policy delivery via a transparent UE configuration update.

[0091] Based on the received DRX configuration and the V2X application's requirements (e.g., QoS requirements, application periodicity), the first UE **802** and the second UE **806** determine **838** an Active Time and an Inactive Time. The first UE **802** and the second UE **806** transmit and/or listen for V2X messages over PC5 for specific V2X services used by pedestrians (e.g., according to the DRX configuration over PC5) only during the Active Time.

[0092] In the second embodiment, there may be application layer DRX configuration. Moreover, in the second embodiment, an application's message periodicity and QoS requirements are provided from upper layers to a V2X layer of a UE. The V2X layer determines the best DRX configuration based on each application's requirements and the DRX configuration received as described in the first embodiment.

[0093] In the third embodiment, there may be dynamic DRX synchronization via a relay UE. Moreover, in the third embodiment, DRX over PC5 is synchronized via sidelink communications over PC5 with a UE that supports DRX configuration synchronization of one or more V2X services (e.g., this UE as a 'DRX sync' UE and/or a relay UE). The DRX sync UE may be an RSU supporting sidelink communications over PC5 and/or Uu. The DRX sync UE advertises via broadcast signaling the V2X services that it supports (e.g., supports for V2X communication for pedestrian service identified by the PSID or ITS-AID). A UE may also additionally broadcast that DRX synchronization is supported for one or more V2X services.

[0094] In certain embodiments, UEs that are interested in services advertised by a DRX sync UE establish a unicast connection using DRX synchronization information based on a UEs active V2X services.

[0095] In some embodiments, a relay UE or DRX sync UE periodically broadcasts a DRX configuration to be used per service type for the pedestrian UE and the pedestrian UE may broadcast messages to other pedestrian UEs using the DRX configuration.

[0096] In various embodiments, a DRX sync UE maintains the same DRX configuration for all UEs that are

interested in services the DRX sync UE advertises and updates the DRX configuration to all UEs based on QoS requirements of each UE that has established a unicast connection with the DRX sync UE.

[0097] FIG. **9** is a network communications **900** diagram illustrating one embodiment of a DRX configuration via a relay UE (e.g., RSU). The network communications **900** are made between a first UE **902** (e.g., pedestrian UE), a second UE **904** (e.g., pedestrian UE), and a relay UE **906** (e.g., DRX sync UE). Each of the illustrated network communications **900** may include one or more messages.

[0098] In a first communication **908** transmitted from the relay UE **906** to the second UE **904** and/or in a second communication **910** transmitted from the relay UE **906** to the first UE **902**, the relay UE **906**, acting as a DRX sync UE, advertises support for DRX synchronization for one or more V2X services via broadcast signaling to the first UE **902** and the second UE **904**.

[0099] The first UE **902** determines **912**, based on a 'Destination Layer-2 ID' of the first communication **908**, to establish a unicast connection with the PC5 based RSU.

[0100] In a second communication **914** transmitted from the first UE **902** to the relay UE **906**, the first UE **902** sends a direct communication request to the relay UE **906** including source user information, and/or V2X services requested (e.g., within V2X service information).

[0101] In a potential third communication **916** transmitted between the first UE **902** and the relay UE **906**, a security association is established between the first UE **902** and the relay UE **906** (e.g., RSU based PC5). During the security association, the first UE **902** provides its QoS requirements. In various embodiments, the first UE **902** may provide its current DRX configuration. The relay UE **906** may determine a DRX configuration required and update the first UE **902**.

[0102] In a fourth communication **918** transmitted from the relay UE **906** to the first UE **902**, once the security association is complete the relay UE **906** sends a direct communication accept message.

[0103] In some embodiments, the second UE **904** establishes **920** a unicast connection with the relay UE **906** via steps **912** through **918**.

[0104] If the relay UE **906** determines **922** that DRX configuration has changed, the relay UE updates all UEs with the new DRX configuration for the services.

[0105] In an optional fifth communication **924** transmitted from the relay UE **906** to the first UE **902**, the relay UE **906** initiates transmission of a link modification request to all UEs that have a unicast connection and provides an updated DRX configuration (e.g., V2X service information, DRX information).

[0106] In an optional sixth communication **926** transmitted from the first UE **902** to the relay UE **906**, the first UE **902** sends a link modification acknowledgement.

[0107] The UEs apply **928**, **930** the configured DRX for all V2X communication corresponding to the V2X services advertised by the relay UE **906**.

[0108] FIG. **10** is a flow chart diagram illustrating one embodiment of a method **1000** for discontinuous reception configuration parameters for communication. In some embodiments, the method **1000** is performed by an apparatus, such as the remote unit **102**. In certain embodiments, the method **1000** may be performed by a processor executing program code, for example, a microcontroller, a microprocessor, a CPU, a GPU, an auxiliary processing unit, a FPGA, or the like.

[0109] In various embodiments, the method **1000** includes receiving **1002**, at a first user equipment and over a first radio interface, discontinuous reception configuration parameters for communication over a second radio interface. In some embodiments, the method **1000** includes receiving **1004** quality of service requirements for transmission over the second radio interface. In certain embodiments, the method **1000** includes determining **1006** discontinuous reception communication parameters based on the discontinuous reception configuration parameters and based on the quality of service requirements. In various embodiments, the method **1000** includes transmitting **1008** and receiving communications over the second radio interface based on the discontinuous reception communication parameters.

[0110] In some embodiments, receiving the discontinuous reception configuration parameters comprises receiving the discontinuous reception configuration parameters from a policy control function. In certain embodiments, determining the discontinuous reception communication parameters based on the discontinuous reception configuration parameters and based on the quality of service requirements comprises determining an offset to the discontinuous reception configuration parameters to meet the quality of service requirements. In various embodiments, determining an offset is based on a mapping of an offset parameter to the quality of service requirements included within the discontinuous reception configuration parameters. In one embodiment, receiving the quality of service requirements for transmission over the second radio interface comprises receiving the quality of service requirements from a second user equipment.

[0111] In some embodiments, determining the discontinuous reception communication parameters based on the discontinuous reception parameters comprises determining an active time and an inactive time. In certain embodiments, the inactive time comprises a time in which the first user equipment is in a sleep state and does not transmit sidelink communication messages over the second radio interface and does not listen for sidelink communication messages over the second radio interface. In various embodiments, receiving the discontinuous reception configuration parameters comprises receiving a default discontinuous reception configuration.

[0112] In one embodiment, the user equipment uses default discontinuous reception configuration parameters to fallback to a default discontinuous reception communication. In some embodiments, the default discontinuous reception configuration comprises a mapping of configuration per vehicle to everything service type. In certain embodiments, the default discontinuous reception configuration comprises a mapping of discontinuous reception configuration parameters per quality of service requirement.

[0113] In various embodiments, the default discontinuous reception configuration comprises a mapping of discontinuous reception configuration parameters per groupcast, broadcast, or unicast transmission over the second radio interface. In one embodiment, transmitting and receiving communications over the second radio interface comprises transmitting and receiving communications with the second user equipment via a PC5 interface. In some embodiments,

transmissions over the first radio interface comprise communication with a mobile core network via a Uu interface.

[0114] FIG. **11** is a flow chart diagram illustrating one embodiment of a method **1100** for discontinuous reception configuration parameters for communication. In some embodiments, the method **1100** is performed by an apparatus, such as the network unit **104**. In certain embodiments, the method **1100** may be performed by a processor executing program code, for example, a microcontroller, a microprocessor, a CPU, a GPU, an auxiliary processing unit, a FPGA, or the like.

[0115] In various embodiments, the method **1100** includes receiving **1102**, at a policy control function and over a first radio interface, a policy association request for a corresponding user equipment. In some embodiments, the method **1100** includes obtaining **1104** a subscription profile for the user equipment. The subscription profile includes a default discontinuous reception configuration for a second radio interface. In certain embodiments, the method **1100** includes determining **1106** configuration information for communications over the second radio interface for the first user equipment. In various embodiments, the method **1100** includes transmitting **1108** the configuration information to the user equipment via non-access stratum control plane signaling over the first radio interface.

[0116] In one embodiment, a method comprises: receiving, at a first user equipment and over a first radio interface, discontinuous reception configuration parameters for communication over a second radio interface; receiving quality of service requirements for transmission over the second radio interface; determining discontinuous reception communication parameters based on the discontinuous reception configuration parameters and based on the quality of service requirements; and transmitting and receiving communications over the second radio interface based on the discontinuous reception communication parameters.

[0117] In some embodiments, receiving the discontinuous reception configuration parameters comprises receiving the discontinuous reception configuration parameters from a policy control function.

[0118] In certain embodiments, determining the discontinuous reception communication parameters based on the discontinuous reception configuration parameters and based on the quality of service requirements comprises determining an offset to the discontinuous reception configuration parameters to meet the quality of service requirements.

[0119] In various embodiments, determining an offset is based on a mapping of an offset parameter to the quality of service requirements included within the discontinuous reception configuration parameters.

[0120] In one embodiment, receiving the quality of service requirements for transmission over the second radio interface comprises receiving the quality of service requirements from a second user equipment.

[0121] In some embodiments, determining the discontinuous reception communication parameters based on the discontinuous reception parameters comprises determining an active time and an inactive time.

[0122] In certain embodiments, the inactive time comprises a time in which the first user equipment is in a sleep state and does not transmit sidelink communication messages over the second radio interface and does not listen for sidelink communication messages over the second radio interface.

[0123] In various embodiments, receiving the discontinuous reception configuration parameters comprises receiving a default discontinuous reception configuration.

[0124] In one embodiment, the user equipment uses default discontinuous reception configuration parameters to fallback to a default discontinuous reception communication.

[0125] In some embodiments, the default discontinuous reception configuration comprises a mapping of configuration per vehicle to everything service type.

[0126] In certain embodiments, the default discontinuous reception configuration comprises a mapping of discontinuous reception configuration parameters per quality of service requirement.

[0127] In various embodiments, the default discontinuous reception configuration comprises a mapping of discontinuous reception configuration parameters per groupcast, broadcast, or unicast transmission over the second radio interface.

[0128] In one embodiment, transmitting and receiving communications over the second radio interface comprises transmitting and receiving communications with the second user equipment via a PC5 interface.

[0129] In some embodiments, transmissions over the first radio interface comprise communication with a mobile core network via a Uu interface.

[0130] In one embodiment, an apparatus comprising a first use equipment. The apparatus further comprises: a receiver that: receives, over a first radio interface, discontinuous reception configuration parameters for communication over a second radio interface; and receives quality of service requirements for transmission over the second radio interface; a processor that determines discontinuous reception communication parameters based on the discontinuous reception configuration parameters and based on the quality of service requirements; and a transmitter; wherein the transmitter transmits communications and the receiver receives communications over the second radio interface based on the discontinuous reception communication parameters.

[0131] In some embodiments, the receiver receiving the discontinuous reception configuration parameters comprises the receiver receiving the discontinuous reception configuration parameters from a policy control function.

[0132] In certain embodiments, the processor determining the discontinuous reception communication parameters based on the discontinuous reception configuration parameters and based on the quality of service requirements comprises the processor determining an offset to the discontinuous reception configuration parameters to meet the quality of service requirements.

[0133] In various embodiments, the processor determines an offset is based on a mapping of an offset parameter to the quality of service requirements included within the discontinuous reception configuration parameters.

[0134] In one embodiment, the receiver receiving the quality of service requirements for transmission over the second radio interface comprises the receiver receiving the quality of service requirements from a second user equipment.

[0135] In some embodiments, the processor determining the discontinuous reception communication parameters

based on the discontinuous reception parameters comprises the processor determining an active time and an inactive time.

[0136] In certain embodiments, the inactive time comprises a time in which the first user equipment is in a sleep state and does not transmit sidelink communication messages over the second radio interface and does not listen for sidelink communication messages over the second radio interface.

[0137] In various embodiments, the receiver receiving the discontinuous reception configuration parameters comprises the receiver receiving a default discontinuous reception configuration.

[0138] In one embodiment, the user equipment uses default discontinuous reception configuration parameters to fallback to a default discontinuous reception communication.

[0139] In some embodiments, the default discontinuous reception configuration comprises a mapping of configuration per vehicle to everything service type.

[0140] In certain embodiments, the default discontinuous reception configuration comprises a mapping of discontinuous reception configuration parameters per quality of service requirement.

[0141] In various embodiments, the default discontinuous reception configuration comprises a mapping of discontinuous reception configuration parameters per groupcast, broadcast, or unicast transmission over the second radio interface.

[0142] In one embodiment, the transmitter transmits communications and the receiver receives communications over the second radio interface the transmitter transmits communications and the receiver receives communications with the second user equipment via a PC5 interface.

[0143] In some embodiments, transmissions over the first radio interface comprise communication with a mobile core network via a Uu interface.

[0144] In one embodiment, a method comprises: receiving, at a policy control function and over a first radio interface, a policy association request for a corresponding user equipment; obtaining a subscription profile for the user equipment, wherein the subscription profile comprises a default discontinuous reception configuration for a second radio interface; determining configuration information for communications over the second radio interface for the first user equipment; and transmitting the configuration information to the user equipment via non-access stratum control plane signaling over the first radio interface.

[0145] In one embodiment, an apparatus comprising a policy and control function. The apparatus further comprises: a receiver that receives, over a first radio interface, a policy association request for a corresponding user equipment; a processor that: obtains a subscription profile for the user equipment, wherein the subscription profile comprises a default discontinuous reception configuration for a second radio interface; and determines configuration information for communications over the second radio interface for the first user equipment; and a transmitter that transmits the configuration information to the user equipment via non-access stratum control plane signaling over the first radio interface.

[0146] Embodiments may be practiced in other specific forms. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

1. An apparatus comprising a first user equipment, the apparatus further comprising:

a receiver that:

receives, over a first radio interface, discontinuous reception configuration parameters for communication over a second radio interface; and

receives quality of service requirements for transmission over the second radio interface;

a processor that determines discontinuous reception communication parameters based on the discontinuous reception configuration parameters and based on the quality of service requirements; and

a transmitter;

wherein the transmitter transmits communications and the receiver receives communications over the second radio interface based on the discontinuous reception communication parameters.

2. The apparatus of claim **1**, wherein the receiver receiving the discontinuous reception configuration parameters comprises the receiver receiving the discontinuous reception configuration parameters from a policy control function.

3. The apparatus of claim **1**, wherein the processor determining the discontinuous reception communication parameters based on the discontinuous reception configuration parameters and based on the quality of service requirements comprises the processor determining an offset to the discontinuous reception configuration parameters to meet the quality of service requirements.

4. The apparatus of claim **3**, wherein the processor determines an offset is based on a mapping of an offset parameter to the quality of service requirements included within the discontinuous reception configuration parameters.

5. The apparatus of claim **1**, wherein the receiver receiving the quality of service requirements for transmission over the second radio interface comprises the receiver receiving the quality of service requirements from a second user equipment.

6. The apparatus of claim **1**, wherein the processor determining the discontinuous reception communication parameters based on the discontinuous reception parameters comprises the processor determining an active time and an inactive time.

7. The apparatus of claim **6**, wherein the inactive time comprises a time in which the first user equipment is in a sleep state and does not transmit sidelink communication messages over the second radio interface and does not listen for sidelink communication messages over the second radio interface.

8. The apparatus of claim **1**, wherein the receiver receiving the discontinuous reception configuration parameters comprises the receiver receiving a default discontinuous reception configuration.

9. The apparatus of claim **8**, wherein the user equipment uses default discontinuous reception configuration parameters to fallback to a default discontinuous reception communication.

10. The apparatus of claim **8**, wherein the default discontinuous reception configuration comprises a mapping of configuration per vehicle to everything service type.

11. The apparatus of claim **8**, wherein the default discontinuous reception configuration comprises a mapping of discontinuous reception configuration parameters per quality of service requirement.

12. The apparatus of claim **8**, wherein the default discontinuous reception configuration comprises a mapping of discontinuous reception configuration parameters per groupcast, broadcast, or unicast transmission over the second radio interface.

13. The apparatus of claim **1**, wherein the transmitter transmits communications and the receiver receives communications over the second radio interface the transmitter transmits communications and the receiver receives communications with the second user equipment via a PC5 interface.

14. The apparatus of claim **1**, wherein transmissions over the first radio interface comprise communication with a mobile core network via a Uu interface.

15. An apparatus comprising a policy and control function, the apparatus further comprising:

a receiver that receives, over a first radio interface, a policy association request for a corresponding user equipment;

a processor that:

obtains a subscription profile for the user equipment, wherein the subscription profile comprises a default discontinuous reception configuration for a second radio interface; and

determines configuration information for communications over the second radio interface for the first user equipment; and

a transmitter that transmits the configuration information to the user equipment via non-access stratum control plane signaling over the first radio interface.

16. A method at a first user equipment, the method comprising:

receiving, over a first radio interface, discontinuous reception configuration parameters for communication over a second radio interface;

receiving quality of service requirements for transmission over the second radio interface;

determining discontinuous reception communication parameters based on the discontinuous reception configuration parameters and based on the quality of service requirements; and

transmitting communications and receiving communications over the second radio interface based on the discontinuous reception communication parameters.

17. The method of claim **16**, wherein receiving the discontinuous reception configuration parameters comprises receiving the discontinuous reception configuration parameters from a policy control function.

18. The method of claim **16**, wherein determining the discontinuous reception communication parameters based on the discontinuous reception configuration parameters and based on the quality of service requirements comprises determining an offset to the discontinuous reception configuration parameters to meet the quality of service requirements.

19. The method of claim **18**, further comprising determining an offset based on a mapping of an offset parameter to the quality of service requirements included within the discontinuous reception configuration parameters.

20. The method of claim **16**, wherein receiving the quality of service requirements for transmission over the second radio interface comprises receiving the quality of service requirements from a second user equipment.

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