

METHOD FOR RECONFIGURING DATA RADIO BEARER AND USER EQUIPMENT

TECHNICAL FIELD

The present invention relates to mobile communication, in particular to a method for reconfiguring data radio bearer and user equipment.

BACKGROUND

Interoperability and integration of the Long Term Evolution (LTE) system of 3GPP and the Wireless Local Area Network (WLAN) at the core network level have been defined in the 3GPP standardization documents. 3GPP LTE Release 12 has studied the interoperability and integration of LTE and WLAN at the RAN level (see 3GPP TR37.834).

At the 3GPP TSG RAN # 67 meeting, a research proposal was approved to enhance the integration and interoperability of LTE-WLAN at the RAN level in 3GPP LTE Release 13 (see 3GPP Proposal RP-150510). Research on enhancing integration and interoperability of LTE-WLAN at the RAN level includes: enhancing integration of LTE-WLAN at the RAN level and enhancing the interoperability of LTE-WLAN at the RAN level. The integration of LTE-WLAN at the RAN level means that user equipment in the RRC connection state is configured to utilize the radio resources, provided by both LTE and WLAN, at the same time, all the while not affecting the existing standards on the MAC layer of WLAN. Enhancing integration of LTE-WLAN at the RAN level is based on dual-connection options, i.e., 2C and 3C, as defined by 3GPP LTE Release 12.

The options 2C and 3C illustrated in FIGS. 1 and 2 contain two logical nodes: main base station (MeNB) and WLN logical node. The MeNB refers to a base station that supports the integration and interoperability of LTE-WLN and is responsible for maintaining the RRM (Radio Resource Management) measurement configuration of user equipment and requesting the WLN to provide additional resources for the user equipment based on the received measurement report or traffic status or bearer type, etc. The WLN provides a data transmission service for the user equipment or rejects the request due to insufficient resources after receiving the request from the MeNB. The WLN refers to a logical node having functions of receiving user data from the MeNB and forwarding the data to the user equipment by using the radio resources provided by the WLAN.

The option 2C illustrated in FIG. 1 has the following characteristics: (1) the MeNB communicates with a service gateway through an S1-U interface; (2) a data radio bearer (DRB) is not split in the

MeNB; (3) a Packet Data Convergence Protocol (PDCP) entity at the MeNB encapsulates the PDCP SDU from the service gateway into a format required by a receiving entity (known as an adaptation entity or WLN entity) of the WLN and sends it to the adaptation entity. The adaptation entity encapsulates the data received from the PDCP entity of the MeNB as required and then transmits it to the user equipment (UE) via the WLAN radio resources. Herein, the UE may be a user terminal, a user node, a mobile terminal, or a tablet computer. In the following description, the data radio bearer with characteristics of the option 2C is referred to as a WLN non-split data radio bearer (WLN non-split DRB).

The option 3C illustrated in FIG. 2 has the following characteristics: (1) the MeNB communicates with a service gateway through an S1-U interface; (2) a data radio bearer is split in the MeNB; (3) for a split data radio bearer, there is a corresponding radio link control (RLC) entity in the MeNB. The PDCP entity located at the MeNB encapsulates the PDCP SDU from the service gateway into a PDCP PDU and sends a portion of the encapsulated PDCP PDU to the UE through the RLC entity, the MAC entity, and the physical layer of the MeNB. The remaining PDCP PDU is further encapsulated as required and sent to the adaptation entity of the WLN and to the UE via radio resources provided by the WLAN. In the following description of the present invention, a data radio bearer having the characteristics of the option 3C is referred to as WLN split data radio bearer (WLN split DRB).

The master cell group (MCG) cited in the present invention refers to a group of serving cells of UE, and the group of serving cells contains a primary cell (PCell) and 0 or more secondary cells (SCell). Based on the architecture of options 2C and 3C, in a system of LTE-WLAN integration and interoperation, in a case where user data transmitted by a DRB is transmitted only by using the MCG (i.e., the user data transmitted by a DRB is transmitted to UE via the PDCP entity, the RLC Entity, MAC entity, and physical layer (PHY) of the MCG), then the DRB is called the master cell group DRB (MCG DRB). In a case where the user data transmitted by a DRB is transmitted simultaneously using the radio resources of the MCG and the radio resources of the WLAN (i.e., a part of the user data transmitted by a DRB is transmitted to UE via the PDCP entity, the RLC entity, the MAC entity, and the physical layer PHY of the MCG, and the other part of the user data is transmitted to the UE via the PDCP entity of the MCG and the WLAN), then the DRB is called WLN split DRB (WLN split DRB). In a case where the user data transmitted by a DRB is encapsulated by the PDCP entity of the a MCG and transmitted by using the radio resources provided by the WLAN, this DRB is called a WLN non-split data DRB (WLN non-split DRB). In

other words, the user data of the WLN non-split DRB is not transmitted by the radio resources provided by the LTE, but rather is encapsulated by using the PDCP entity of the MCG, sent to the WLN, and then transmitted to the user equipment through the WLAN radio resources. In the present invention, the WLN split DRB and the WLN non-split DRB are collectively referred to as WLN DRB. That is, the WLN DRB mentioned in the present invention may indicate either a WLN split DRB or a WLN non-split DRB.

In a LTE-WLAN integrated system, it is necessary to dynamically perform DRB reconfiguration between the MeNB and the WLN, based on the available radio resources of the MeNB and the WLN. For example, when the MeNB cannot provide sufficient radio resources for the UE, the WLN may be requested to provide radio resources for the UE, i.e., the MCG DRB is reconfigured as a WLN split DRB or WLN non-split DRB. When the MeNB and the WLN are simultaneously serving the UE (i.e., based on the architecture of the option 3C), in a case where the MeNB has more radio resources available to the UE for a period of time, but the WLN does not have sufficient radio resources available to the UE, the MeNB may reconfigure the DRB to the MeNB. In other words, reconfiguring the WLN split DRB as an MCG DRB, and in a case where the MeNB has no radio resources available to the UE for a period of time, but the WLN can provide more radio resources for the UE, the MeNB may reconfigure the DRB to the WLN, that is, the WLN split DRB is reconfigured as a WLN non-split DRB. When the WLN provides radio resources for UE alone to carry out data transmission after the data is encapsulated by the PDCP entity of the MeNB (i.e., an architecture based on the option 2C), in a case where the MeNB has more radio resources available to the UE for a period of time or the WLN does not have sufficient radio resources available to the UE, the MeNB may reconfigure the DRB to the MeNB. In other words, reconfiguring the WLN split DRB as an MCG DRB, and in a case where the MeNB can provide a portion of radio resources for the UE for a period of time, in this case, the WLN non-split DRB is reconfigured as a WLN split DRB.

SUMMARY

It is an object of the present invention to solve the problem of radio bearer reconfiguration between a MeNB and a WLN.

According to one aspect of the present invention, there is provided a method executed by user equipment, including: receiving a radio resource control (RRC) connection reconfiguration message;

determining whether the received RRCConnectionReconfiguration message contains indication information, the indication information indicating user equipment (UE) to reconfigure a first type of data radio bearer (DRB) into a second type of DRB that is different from the first type of DRB; and in a case where the received RRCConnectionReconfiguration message includes the indication information, reconfiguring the UE according to the RRCConnectionReconfiguration message, wherein the first type of DRB comprises a main cell group (MCG) DRB or a wireless local area network (WLAN) split DRB, and the second type of DRB includes an MCG DRB, a WLN split DRB or a WLN non-split DRB.

In one embodiment, the first type of DRB is an MCG DRB, the second type of DRB is a WLN split DRB, and reconfiguring the UE according to the RRCConnectionReconfiguration message includes: reconfiguring an adaption entity according to configuration information contained in the RRCConnectionReconfiguration message and related to the adaption entity; reconfiguring a PDCP (Packet Data Convergence Protocol) entity in a case where the RRCConnectionReconfiguration message contains configuration information related to the PDCP entity; reconfiguring an MCG RLC (Radio Link Control) entity and an MCG DTCH (dedicated channel) logical channel in a case where the RRCConnectionReconfiguration message contains configuration information related to the RLC entity and the MCG DTCH logical channel.

In one embodiment, the first type of DRB is an MCG DRB, the second type of DRB is a WLN split DRB, and reconfiguring the UE according to the RRCConnectionReconfiguration message includes: establishing an adaption entity according to configuration information contained in the RRCConnectionReconfiguration message and related to the adaption entity; reconfiguring a PDCP entity in a case where the RRCConnectionReconfiguration message contains configuration information related to the PDCP entity; reconfiguring an MCG RLC entity and an MCG DTCH logical channel in a case where the RRCConnectionReconfiguration message contains configuration information related to the RLC entity and the MCG DTCH logical channel.

In one embodiment, the first type of DRB is WLN split DRB, the second type of DRB is an MCG DRB, and reconfiguring the UE according to the RRCConnectionReconfiguration message includes: reconfiguring a PDCP entity in a case where the RRCConnectionReconfiguration

message contains configuration information related to the PDCP entity; reconfiguring an MCG RLC entity and an MCG DTCH logical channel in a case where the RRCConnectionReconfiguration message contains configuration information related to the RLC entity and the MCG DTCH logical channel; and reconfiguring an adaption entity according to configuration information contained in the RRCConnectionReconfiguration message and related to the adaption entity.

In one embodiment, the first type of DRB is WLN split DRB, the second type of DRB is an MCG DRB, and reconfiguring the UE according to the RRCConnectionReconfiguration message includes: reconfiguring a PDCP entity in a case where the RRCConnectionReconfiguration message contains configuration information related to the PDCP entity; reconfiguring an MCG RLC entity and an MCG DTCH logical channel in a case where the RRCConnectionReconfiguration message contains configuration information related to the RLC entity and the MCG DTCH logical channel; and releasing an adaption entity.

In one embodiment, the first type of DRB is WLN split DRB, the second type of DRB is a WLN non-split DRB, and reconfiguring the UE according to the RRCConnectionReconfiguration message includes: releasing an MCG RLC entity and an MCG DTCH logical channel; and reconfiguring a PDCP entity in a case where the RRCConnectionReconfiguration message contains configuration information related to the PDCP entity; and reconfiguring an adaption entity according to configuration information contained in the RRCConnectionReconfiguration message and related to the adaption entity.

In one embodiment, the method further comprises: re-establishing the PDCP entity.

In one embodiment, whether to re-establish the PDCP is ascertained by transmitting an RRC signaling to the UE.

In one embodiment, the indication information contains a drb-TypeChangWLN carried in drb-ToAddModList information element and a drb-TypeWLN information element carried in a drb-ToAddModListWLN. The drb-ToAddModList information element is a group of DRBs in need of addition or modification; the drb-TypeChangWLN information element is used for indicating whether to reconfigure a WLN split DRB or a WLN non-split DRB as an MCG DRB. The drb-ToAddModListWLN information element is a group of WLN DRBs in need of addition or modification. The drb-TypeWLN information element represents the Type of a corresponding DRB.

Preferably, according to the value of the drb-TypeWLN information element and whether the DRB corresponding to the drb-TypeWLN information element is contained in the drb-ToAddModList information element and the drb-ToAddModListWLN information element, it is possible to determine whether to reconfigure an MCG DRB as a WLN split DRB or reconfigure a WLN split DRB as an MCG DRB or reconfigure a WLN split DRB as a WLN non-split DRB.

According to one aspect of the present invention, there is provided UE, including: a receiving unit, configured to receive a radio resource control (RRC) connection reconfiguration message; a determining unit, configured to determine whether the received RRCConnectionReconfiguration message contains indication information, the indication information indicating user equipment (UE) to reconfigure a first type of data radio bearer (DRB) into a second type of DRB that is different from the first type of DRB; and a reconfiguring unit, configured to reconfigure the UE according to the RRCConnectionReconfiguration message if the received RRCConnectionReconfiguration message contains the indication information, wherein the first type of DRB comprises a main cell group (MCG) DRB or a wireless local area network (WLAN) split DRB, and the second type of DRB includes an MCG DRB, a WLN split DRB or a WLN non-split DRB.

In one embodiment, the first type of DRB is an MCG DRB, the second type of DRB is a WLN split DRB, and the reconfiguring unit is configured to reconfigure an adaption entity according to configuration information contained in the RRCConnectionReconfiguration message and related to the adaption entity, reconfigure a PDCP entity if the RRCConnectionReconfiguration message contains configuration information related to the PDCP entity, and reconfigure an MCG RLC entity and an MCG DTCH logical channel if the RRCConnectionReconfiguration message contains configuration information related to the RLC entity and the MCG DTCH logical channel.

In one embodiment, the first type of DRB is an MCG DRB, the second type of DRB is a WLN split DRB, and the reconfiguring unit is configured to establish an adaption entity according to configuration information contained in the RRCConnectionReconfiguration message and related to the adaption entity, reconfigure a PDCP entity if the RRCConnectionReconfiguration message contains configuration information related to the PDCP entity, and reconfigure an MCG RLC entity and an MCG DTCH logical channel if the RRCConnectionReconfiguration message contains configuration information related to the RLC entity and the MCG DTCH logical channel.

In one embodiment, the first type of DRB is a WLN split DRB, the second type of DRB is an MCG DRB, and the reconfiguring unit is configured to reconfigure a PDCP entity in a case where the RRCConnectionReconfiguration message contains configuration information related to the PDCP entity, reconfigure an MCG RLC entity and an MCG DTCH logical channel in a case where the RRCConnectionReconfiguration message contains configuration information related to the RLC entity and the MCG DTCH logical channel, and reconfigure an adaption entity according to configuration information contained in the RRCConnectionReconfiguration message and related to the adaption entity.

In one embodiment, the first type of DRB is a WLN split DRB, the second type of DRB is an MCG DRB, and the reconfiguring unit is configured to reconfigure a PDCP entity in a case where the RRCConnectionReconfiguration message contains configuration information related to the PDCP entity, reconfigure an MCG RLC entity and an MCG DTCH logical channel in a case where the RRCConnectionReconfiguration message contains configuration information related to the RLC entity and the MCG DTCH logical channel, and release an adaption entity.

In one embodiment, the first type of DRB is WLN split DRB, the second type of DRB is a WLN non-split DRB, and the reconfiguring unit is configured to release an MCG RLC entity and an MCG DTCH logical channel, and reconfigure a PDCP entity in a case where the RRCConnectionReconfiguration message contains configuration information related to the PDCP entity, or reconfigure an adaption entity according to configuration information contained in the RRCConnectionReconfiguration message and related to the adaption entity.

In one embodiment, the UE further includes: a re-establishing unit, configured to re-establish the PDCP entity.

In one embodiment, whether to re-establish the PDCP is ascertained by transmitting an RRC signaling to the UE.

In one embodiment, the indication information contains a drb-TypeChangWLN information element carried in drb-ToAddModList information element and a drb-TypeWLN information element carried in a drb-ToAddModListWLN information element. The drb-ToAddModList information element is a group of DRBs in need of addition or modification; the drb-TypeChangWLN information element is used for indicating whether to reconfigure a WLN split DRB or a WLN non-split DRB as an MCG DRB. The drb-ToAddModListWLN information element is a group of WLN DRBs in need of

addition or modification. The drb-TypeWLN information element represents the Type of a corresponding DRB. Preferably, according to the value of the drb-TypeWLN information element and whether the DRB corresponding to the drb-TypeWLN information element is contained in the drb-ToAddModList information element and the drb-ToAddModListWLN information element, it is possible to determine whether to reconfigure an MCG DRB as a WLN split DRB or reconfigure a WLN split DRB as an MCG DRB or reconfigure a WLN split DRB as a WLN non-split DRB.

DESCRIPTION OF THE DRAWINGS

The features described above and other features of the present invention will become more apparent from the following detailed description in conjunction with the accompanying drawings, wherein:

FIG. 1 is a schematic diagram of the option 2C of the LET-WLN integration and interoperability deployment;

FIG. 2 is a schematic diagram of the option 3C of the LET-WLN integration and interoperability deployment;

FIG. 3 is a flow chart of a method for reconfiguring an MCG DRB as a WLN split DRB, provided by an embodiment of the present invention;

FIG. 4 is a flow chart of a method for reconfiguring an MCG DRB as a WLN non-split DRB, provided by an embodiment of the present invention;

FIG. 5 is a flow chart of a method for reconfiguring a WLN split DRB as an MCG DRB, provided by an embodiment of the present invention;

FIG. 6 is a flow chart of a method for reconfiguring a WLN split DRB as a WLN non-split DRB, provided by an embodiment of the present invention;

FIG. 7 is a flow chart of a method for reconfiguring a WLN non-split DRB as an MCG DRB, provided by an embodiment of the present invention;

FIG. 8 is a flow chart of a method for reconfiguring a WLN non-split DRB as a WLN split DRB, provided by an embodiment of the present invention;

FIG. 9 is a flow chart of a method in which the RRCConnectionReconfiguration message carries indication information for indicating the UE to reconfigure a type of DRB into another type of DRB, provided by an embodiment of the present invention;

FIG. 10 is a flow chart of a method in which the RRCConnectionReconfiguration message carries indication information for indicating the UE to reconfigure a type of DRB into another type of DRB, provided by an embodiment of the present invention; and

FIG. 11 is a block diagram of user equipment according to an embodiment of the present invention.

DESCRIPTION OF THE EMBODIMENTS

The principle and implementation of the present invention will become apparent from the following description on specific embodiments of the present invention in conjunction with the accompanying drawings. Noted that the present invention shall not be limited to the specific embodiments described below. In addition, for simplicity, a detailed description on the known art not directly related to the present invention is omitted to prevent confusion in the understanding of the present invention.

In the following description, an LTE Rel-13 mobile communication system and its later evolved releases are used as exemplary application environments to set forth embodiments of the present invention in detail. Note, however, that the present invention is not limited to the following embodiments and may be applicable to more other wireless communication systems, such as a future 5G cellular communication system. In addition, although the implementation examples of the technical solution of the present invention is described with respect to the case where the MeNB cooperates with one WLN to provide a communication service for the UE, a person skilled in the art would be conceivable of that the technical solution of the present invention likewise is applicable to the cases where the MeNB cooperates with more than one WLN to provide a communication service for the UE.

In the LTE system, the UE carries out the processes of adding (establishing) and reconfiguring a DRB according to a received RRCConnectionReconfiguration message. The RRCConnectionReconfiguration message is mainly used for establishing/modifying/releasing radio bearers (RBs) and executing switching, establishing/modifying/releasing measurement and the like. The RBs comprise signaling radio bearers (SRBs) and data radio bearers (DRBs). The data radio bearers (DRBs) comprise MCG DRBs, split DRBs (bearers for dual connection option 3C described in 3GPP Release 12), SCG DRBs (bearers for dual connection option 1A described in 3GPP Release 12), and bears for the transmission of user data, such as WLN split DRBs and WLN non-split DRBs.

In the following, the meanings of parameters contained in the RRCConnectionReconfiguration message cited herein are each described. Furthermore, if a parameter mentioned herein is the same as that in 3GPP TS36.331 in denomination, the meaning and inclusion relation between cells, represented by it, are the same as those in 3GPP TS36.331.

drb-ToAddModListWLNinformation element: a group of WLN DRBs in need of addition or modification;

drb-ToAddModListinformation element: a group of DRBs in need of addition or modification;

Adaptation-Configinformation element: containing configurable parameters corresponding to an adaption entity used for configuring WLN DRB;

pdcp-Configinformation element: containing configurable PDCP parameters of DRBs;

drb-Identityinformation element: DRB ID;

rlc-Configinformation element: containing configuration information of an RLC entity corresponding to SRBs and DRBs;

logicalChannelIdentityinformation element: logical channel ID; and:

logicalChannelConfig information element: containing parameters for configuring a logical channel.

FIG. 3 illustrates a flow chart of a method for reconfiguring an MCG DRB as a WLN split DRB. The method illustrated in FIG. 3 includes the following steps:

Step 301: UE receives the RRCConnectionReconfiguration message and determines whether the message carries an indication information used for indicating UE to reconfigure an MCG DRB as a WLN split DRB; in a case where the message carries the indication information, step 302a or step 302b is executed according to the correspondence between the WLN DRB and an adaptation entity; otherwise, the process is ended.

In a case where there is a many-to-one mapping relationship between the WLN DRB and the adaptation entity, the process goes to step 302a; in a case where there is a one-to-one mapping relationship between the WLN DRB and the adaptation entity, the process goes to step 302b.

Step 302a: The UE reconfigures the adaptation entity according to the Adaptation-Config information element carried in drb-ToAddModListWLN.

Alternatively, an adaptation entity is to be established in a case where there is no adaptation entity in the WLN, i.e., the WLN split DRB reconfigured by the MCG DRB is the first WLN DRB of the adaptation entity.

Step 302b: The user establishes an adaptation entity based on the Adaptation-Config information element carried in drb-ToAddModListWLN.

Step 303: In a case where the pdcp-Config information element is carried in the drb-ToAddModList, the PDCP entity is reconfigured according to the pdcp-Config information element.

Step 304: In a case where the drb-ToAddModList carries the rlc-Config information element, the logicalChannelIdentity information element, and the logicalChannelConfig information element, the MCG RLC entity and the MCG DTCH logical channel are reconfigured according to the rlc-Config information element, the logicalChannelIdentity information element, and the logicalChannelConfig information element.

Note that the execution sequence of step 302a (or 302b), step 303, and step 304 may be arbitrarily changed.

Alternatively, when the UE reconfigures the MCG DRB as the WLN split DRB, the UE re-establishes the PDCP entity and the RLC entity and transmits a PDCP status report. Alternatively, the UE may be configured according to an RRC signaling whether to re-establish the PDCP entity and the RLC entity and transmit the PDCP status report when the MCG DRB is reconfigured as WLN split DRB.

FIG. 4 illustrates a flow chart of a method for reconfiguring an MCG DRB as a WLN non-split DRB. The method illustrated in FIG. 4 includes the following steps:

Step 401: UE receives the RRCConnectionReconfiguration message and determines whether the message carries an indication information used for indicating UE to reconfigure an MCG DRB as a WLN non-split DRB; in a case where the message carries the indication information, step 402a or step 402b is executed according to the correspondence between the WLN DRB and an adaptation entity; otherwise, the process is ended.

In a case where there is a many-to-one mapping relationship between the WLN DRB and the adaptation entity, the process goes to step 402a; in a case where there is a one-to-one mapping relationship between the WLN DRB and the adaptation entity, the process goes to step 402b.

Step 402a: The UE reconfigures the adaptation entity according to the Adaptation-Config information element carried in drb-ToAddModListWLN.

Alternatively, an adaptation entity is to be established if there is no adaptation entity in the WLN, i.e., the WLN non-split DRB reconfigured by the MCG DRB is the first WLN DRB of the adaptation entity.

Step 402b: The UE establishes an adaptation entity based on the Adaptation-Config information element carried in drb-ToAddModListWLN.

Step 403: In a case where the pdcp-Config information element is carried in the drb-ToAddModList, the PDCP entity is reconfigured according to the pdcp-Config information element.

Step 404: The MCG RLC entity and the MCG DTCH logical channel are released.

Note that the execution sequence of step 402a (or 402b), step 403, and step 404 may be arbitrarily changed.

Alternatively, the UE re-establishes the PDCP entity and transmits a PDCP status report when the MCG DRB is reconfigured as the WLN non-split DRB. Alternatively, the UE may be configured according to an RRC signaling whether to re-establish the PDCP entity and transmit the PDCP status report when the MCG DRB is reconfigured as the WLN split DRB.

FIG. 5 illustrates a flow chart of a method for reconfiguring a WLN split DRB as an MCG DRB. The method illustrated in FIG. 5 includes the following steps:

Step 501: UE receives the RRCConnectionReconfiguration message and determines whether the message carries an indication information used for indicating UE to reconfigure a WLN split DRB as an MCG DRB; in a case where the message carries the indication information, step 502a or step 502b is executed according to the correspondence between the WLN DRB and an adaptation entity; otherwise, the process is ended.

In a case where there is a many-to-one mapping relationship between the WLN DRB and the adaptation entity, the process goes to step 502a; in a case where there is a one-to-one mapping relationship between the WLN DRB and the adaptation entity, the process goes to step 502b.

Step 502a: In a case where the Adaptation-Config information element is carried in the drb-ToAddModListWLN, the adaption entity is reconfigured according to the Adaptation-Config information element.

Alternatively, if there is no other WLN DRB in the adaptation entity after the WLN split DRB is reconfigured as the MCG DRB, the adaptation entity is released.

Step 502b: The adaptation entity is released, that is, the relevant information of the WLN split DRB which is reconfigured as the MCG DRB in the WLN is released.

Step 503: in a case where the pdcp-Config information element is carried in the drb-ToAddModList, the PDCP entity is reconfigured according to the pdcp-Config information element.

Step 504: In a case where the drb-ToAddModList carries the rlc-Config information element, the logicalChannelIdentity information element, and the logicalChannelConfig information element, the MCG RLC entity and the MCG DTCH logical channel are reconfigured according to the rlc-Config information element, the logicalChannelIdentity information element, and the logicalChannelConfig information element

Note that the execution sequence of step 502a (or 502b), step 503, and step 504 may be arbitrarily changed.

Alternatively, the UE re-establishes the PDCP entity and transmits a PDCP status report when the WLN split DRB is reconfigured as the MCG DRB. Alternatively, the UE may be configured according to an RRC signaling whether to re-establish the PDCP entity and transmit the PDCP status report when the MCG DRB is reconfigured as the WLN split DRB.

FIG. 6 illustrates a flow chart of a method for reconfiguring a WLN split DRB as a WLN non-split DRB. The method shown in FIG. 6 includes the following steps:

Step 601: UE receives an RRCConnectionReconfiguration message and determines whether the message carries an indication information used for indicating the UE to reconfigure a WLN split DRB as a WLN non-split DRB; in a case where the message carries the indication information, the process goes to step 602; otherwise, the process is ended.

Step 602a: In a case where the Adaptation-Config information element is carried in the drb-ToAddModListWLN, the adaption entity is reconfigured according to the Adaptation-Config information element.

Step 603: In a case where the pdcp-Config information element is carried in the drb-ToAddModList, the PDCP entity is reconfigured according to the pdcp-Config information element.

Step 604: The MCG RLC entity and the MCG DTCH logical channel are released.

Note that the execution sequence of step 602, step 603, and step 604 may be arbitrarily changed.

Alternatively, the UE re-establishes the PDCP entity and transmits a PDCP status report when the WLN split DRB is reconfigured as the WLN non-split DRB. Alternatively, the UE may be configured according to an RRC signaling whether to re-establish the PDCP entity and transmit the PDCP status report when the MCG DRB is reconfigured as the WLN split DRB.

FIG. 7 illustrates a flow chart of a method for reconfiguring a WLN non-split DRB as an MCG DRB. The method shown in FIG. 7 includes the following steps:

Step 701: UE receives the RRCConnectionReconfiguration message and determines whether the message carries an indication information used for indicating UE to reconfigure a WLN non-split DRB as an MCG DRB; in a case where the message carries the indication information, step 702a or step 702b is executed according to the correspondence between the WLN DRB and an adaptation entity; otherwise, the process is ended.

In a case where there is a many-to-one mapping relationship between the WLN DRB and the adaptation entity, the process goes to step 702a; in a case where there is a one-to-one mapping relationship between the WLN DRB and the adaptation entity, the process goes to step 702b.

Step 702a: In a case where the Adaptation-Config information element is carried in the drb-ToAddModListWLN, the adaption entity is reconfigured according to the Adaptation-Config information element.

Alternatively, in a case where there is no other WLN DRB in the adaptation entity after the WLN non-split DRB is reconfigured as the MCG DRB, the adaptation entity is released.

Step 702b: The adaptation entity is released, that is, the relevant information of the WLN non-split DRB which is reconfigured as the MCG DRB in the WLN is released.

Step 703: In a case where the pdcp-Config information element is carried in the drb-ToAddModList, the PDCP entity is reconfigured according to the pdcp-Config information element.

Step 704: The MCG RLC entity and the MCG DTCH logical channel are established according to the rlc-Config information element, the logicalChannelIdentity information element, and the logicalChannelConfig information element, carried in the drb-ToAddModList.

Note that the execution sequence of step 702a (or 702b), step 703, and step 704 may be arbitrarily changed.

Alternatively, the UE re-establishes the PDCP entity and transmits a PDCP status report when the WLN non-split DRB is reconfigured as the MCG DRB. Alternatively, the UE may be configured according to an RRC signaling whether to re-establish the PDCP entity and transmit the PDCP status report when the MCG DRB is reconfigured as the WLN split DRB.

FIG. 8 shows a flow chart of a method for reconfiguring a WLN non-split DRB as a WLN split DRB. The method illustrated in FIG. 8 includes the following steps:

Step 801: UE receives an RRCConnectionReconfiguration message and determines whether the message carries an indication information used for indicating the UE to reconfigure a WLN non-split DRB as a WLN split DRB; in a case where the message carries the indication information, the process goes to step 802; otherwise, the process is ended.

Step 802: In a case where the Adaptation-Config information element is carried in the drb-ToAddModListWLN, the adaption entity is reconfigured according to the Adaptation-Config information element.

Step 803: In a case where the pdcp-Config information element is carried in the drb-ToAddModList, the PDCP entity is reconfigured according to the pdcp-Config information element.

Step 804: The MCG RLC entity and the MCG DTCH logical channel are established according to the rlc-Config information element, the logicalChannelIdentity information element, and the logicalChannelConfig information element, carried in the drb-ToAddModList.

Note that the execution sequence of step 802a (or 802b), step 803, and step 804 may be arbitrarily changed.

Alternatively, the UE re-establishes the PDCP entity and transmits a PDCP status report when the WLN non-split DRB is reconfigured as the WLN split DRB. Alternatively, the UE may be configured according to an RRC signaling whether to re-establish the PDCP entity and transmit the PDCP status report when the MCG DRB is reconfigured as the WLN split DRB.

FIG. 9 and FIG. 10 respectively show flow charts of two methods in which the RRCConnectionReconfiguration message carries an indication information for indicating the UE to reconfigure a type of DRB into another type of DRB. The DRBs at least include WLN split DRB, WLN non-split DRB, and MCG DRB. In the method illustrated in FIGS. 9 and 10, the UE determines whether to reconfigure a certain type of DRB as another type of DRB, according to the drb-TypeChangeWLN information element carried in the drb-ToAddModList information element and the drb-TypeWLN information element carried in the drb-ToAddModListWLN information element. The drb-TypeChangeWLN information element is used to indicate whether to reconfigure a WLN DRB (comprising WLN split DRB, WLN non-split DRB) as an MCG DRB. The drb-TypeWLN information element represents the type of the corresponding DRB; according to the value of the drb-TypeWLN information element and whether the DRB corresponding to the drb-TypeWLN information element is contained in the drb-ToAddModList information element and the drb-ToAddModListWLN information element, the UE determines whether to reconfigure an MCG DRB as a WLN DRB, or reconfigure a WLN non-split DRB as a WLN split DRB, or reconfigure a WLN split DRB as a WLN non-split DRB. In the embodiment of the present invention, the value of the drb-TypeChangeWLN information element is expressed as: toMCG (indicating that WLN DRB is reconfigured as MCG DRB); the value of the drb-TypeWLN information element is expressed as: WLNsplit (indicating that the corresponding DRB is WLN split DRB) or WLNnon-split (indicating that the corresponding DRB is WLN non-split DRB). Note that the valuing of the drb-TypeChangeWLN information element and the drb-TypeWLN information element include, but are not limited to, the above-described valuing mode.

The method illustrated in FIG. 9 includes the following steps (executed by UE):

Step 9001: UE receives an RRCConnectionReconfiguration message;

Step 9002: with respect to a DRB that has been configured in the UE (the DRB is identified as drb-Identity), the UE determines whether the RRCConnectionReconfiguration message contains a drb-ToAddModList information element, and whether the drb-Identity is contained in the drb-ToAddModList information element; If so, the process goes to step 9003; otherwise, the process goes to step 9016;

Step 9003: the UE determines whether the RRCConnectionReconfiguration message contains a drb-ToAddModListWLN information element, and whether the drb-identity is contained in the drb-ToAddModListWLN information element; If so, the process goes to step 9004; otherwise, the process goes to step 9010;

Step 9004: the UE Determines whether the DRB that has been configured in the UE and is identified as drb-Identity is MCG DRB; If so, the process goes to step 9005; otherwise, the process goes to step 9007;

Step 9005: the UE determines whether the drb-ToAddModListWLN information element contains the drb-TypeWLN information element associated with the drb-Identity and whether the value of the drb-TypeWLN is WLNsplit; If so, the process goes to step 9006;

Step 9006: the UE reconfigures the MCG DRB as a WLN split DRB;

Step 9007: the UE determines whether the DRB that has been configured in the UE and is identified as drb-Identity is a WLN non-split DRB; If so, the process goes to step 9008;

Step 9008: the UE determines whether the drb-ToAddModListWLN information element contains the drb-TypeWLN information element associated with the drb-Identity, and whether the value of the drb-TypeWLN is WLNsplit; If so, the process goes to step 9009;

Step 9009: the UE reconfigures the WLN non-split DRB as a WLN split DRB;

Step 9010: the UE determines whether the DRB that has been configured in the UE and is identified as drb-Identity is a WLN split DRB; If so, the process goes to step 9011; otherwise, the process goes to step 9013;

Step 9011: the UE determines whether the drb-ToAddModList information element contains a drb-TypeChangeWLN information element associated with the drb-identity, and whether the value of the drb-TypeChangeWLN is toMCG; If so, the process goes to step 9012;

Step 9012: the UE reconfigures the WLN split DRB as an MCG DRB;

Step 9013: the UE determines whether the DRB that has been configured in the UE and is identified as drb-Identity is a WLN non-split DRB; If so, the process goes to step 9014;

Step 9014: the UE determines whether the drb-ToAddModList information element contains a drb-TypeChangeWLN information element associated with the drb-Identity, and whether the value of the drb-TypeChangeWLN is toMCG? If so, the process goes to step 9015;

Step 9015: the UE reconfigures the WLN non-split DRB as an MCG DRB;

Step 9016: the UE determines whether the RRCConnectionReconfiguration message contains a drb-ToAddModListWLN information element, and whether the drb-identity is contained in the drb-ToAddModListWLN information element; If so, the process goes to step 9017; step 9017: the UE determines whether the DRB that has been configured in the UE and is identified as drb-Identity is an MCG DRB. If so, the process goes to step 9018; otherwise, the process goes to step 9020;

Step 9018: the UE determines whether the drb-ToAddModListWLN information element contains a drb-TypeWLN information element corresponding to the drb-Identity, and whether the value of the drb-TypeWLN is WLNnon-split; If so, the process goes to step 9019;

Step 9019: the UE reconfigures the MCG DRB as a WLN non-split DRB;

Step 9020: the UE determines whether the DRB that has been configured in the UE and is identified as drb-Identity is a WLN split DRB; If so, the process goes to step 9021; step 9021: the UE determines whether a drb-TypeWLN information element corresponding to the drb-Identity is contained in the drb-ToAddModListWLN information element, and whether the value of the drb-TypeWLN is WLNnon-split; If so, the process goes to step 9022; and

Step 9022: the UE reconfigures the WLN split DRB as a WLN non-split DRB.

The method illustrated in FIG. 10 includes the following steps (executed by UE):

Step 1001: UE receives an RRCConnectionReconfiguration message;

Step 1002: the UE determines whether a DRB that has been configured in the UE and is identified as drb-Identity is a WLN split DRB; If so, the process goes to step 1003; otherwise, the process goes to step 1008;

Step 1003: the UE determines whether the RRCConnectionReconfiguration message contains a drb-ToAddModList information element, whether the drb-ToAddModList information element contains the drb-identity, whether the drb-ToAddModList information element further contains a drb-TypeChangeWLN information element corresponding to the drb-identity, and whether the value of the drb-TypeChangeWLN is toMCG; If so, the process goes to step 1004; otherwise, the process goes to step 1005;

Step 1004: the UE reconfigures the WLN split DRB as an MCG DRB;

Step 1005: the UE determines whether the RRCConnectionReconfiguration message contains a drb-ToAddModListWLN information element, whether the drb-ToAddModListWLN information element contains the drb-identity, whether the drb-ToAddModListWLN information element further contains a drb-TypeWLN information element corresponding to the drb-identity, and whether the value of the drb-TypeWLN is WLNnon-split; If so, the process goes to step 1006; otherwise, the process goes to step 1007;

Step 1006: the UE reconfigures the WLN split DRB as a WLN non-split DRB.

Step 1007: the UE reconfigures the MCG DRB as a WLN non-split DRB;

Step 1008: the UE determines whether the DRB that has been configured in the UE and is identified as drb-Identity is a WLN non-split DRB; If so, the process goes to step 1009; otherwise, the process goes to step 1014;

Step 1009: the UE determines whether the RRCConnectionReconfiguration message contains a drb-ToAddModList information element, whether the drb-ToAddModList information element contains the drb-identity, whether the drb-ToAddModList information element further contains a drb-TypeChangeWLN information element corresponding to the drb-identity, and whether the value of the drb-TypeChangeWLN is toMCG; If so, the process goes to step 1010; otherwise, the process goes to step 1011;

Step 1010: the UE reconfigures the WLN non-split DRB as an MCG DRB;

Step 1011: the UE determines whether the RRCConnectionReconfiguration message contains a drb-ToAddModListWLN information element, whether the drb-ToAddModListWLN information element contains the drb-identity, whether the drb-ToAddModListWLN information element further contains a drb-TypeWLN information element corresponding to the

drb-identity, and whether the value of the drb-TypeWLN is WLNsplit; If so, the process goes to step 1012; otherwise, the process goes to step 1013;

Step 1012: the UE reconfigures the WLN non-split DRB as a WLN split DRB.

Step 1013: the UE reconfigures the WLN split DRB as a WLN non-split DRB;

Step 1014: the UE determines whether the DRB that has been configured in the UE and is identified as drb-Identity is MCG DRB. If so, the process goes to step 1015; and

Step 1015: the UE determines whether the RRCConnectionReconfiguration message contains a drb-ToAddModListWLN information element, whether the drb-ToAddModListWLN information element contains the drb-identity, whether the drb-ToAddModListWLN information element further contains a drb-TypeWLN information element corresponding to the drb-identity, and whether the value of the drb-TypeWLN is WLNnon-split; If so, the process goes to step 1016; otherwise, the process goes to step 1017;

Step 1016: the UE reconfigures the MCG DRB as a WLN non-split DRB;

Step 1017: the UE determines whether the RRCConnectionReconfiguration message contains a drb-ToAddModListWLN information element, whether the drb-ToAddModListWLN information element contains the drb-identity, whether the drb-ToAddModListWLN information element further contains a drb-TypeWLN information element corresponding to the drb-identity, and whether the value of the drb-TypeWLN is WLNsplit; If so, the process goes to step 9018; and

Step 1018: the UE reconfigures the MCG DRB as a WLN split DRB;

Note that the process of reconfiguring the WLN split DRB as an MCG DRB in step 9012 and step 1004 may be carried out according to the procedure illustrated in FIG. 5. The process of reconfiguring the WLN split DRB as a WLN non-split DRB in step 9022 and step 1006 may be carried out according to the procedure illustrated in FIG. 6. The process of reconfiguring the WLN non-split DRB as an MCG DRB in step 9015 and step 1010 may be carried out according to the procedure illustrated in FIG. 7. The process of reconfiguring the WLN non-split DRB as a WLN split DRB in step 9009 and step 1012 may be carried out according to the procedure illustrated in FIG. 8. The process of reconfiguring the MCG DRB as a WLN split DRB in step 9006 and step 1018 may be carried out according to the procedure illustrated in FIG. 3. The process of

reconfiguring the MCG DRB as a WLN non-split DRB in step 9019 and step 1016 may be carried out according to the procedure illustrated in FIG. 4.

According to an embodiment of the present invention, the user equipment establishing the WLN split DRB includes the following process: in a case where there is a many-to-one mapping relationship between a WLN DRB and an adaptation entity, the adaptation entity is reconfigured according to the Adaptation-Config information element carried in the drb-ToAddModListWLN. Alternatively, an adaptation entity is established in a case where there is no adaptation entity in the WLN, i.e. the WLN split DRB that needs to be established is the first WLN DRB of the adaptation entity. In a case where there is a one-to-one mapping relationship between a WLN DRB and an adaptation entity, the adaptation entity is established according to the Adaptation-Config information element carried in drb-ToAddModListWLN. A PDCP entity is established according to the pdcp-Config information element carried in the drb-ToAddModList, and the PDCP entity is configured by using MCG security configuration information. An MCG RLC entity and an MCG DTCH logical channel are established according to the rlc-Config information element, the logicalChannelIdentity information element, and the logicalChannelConfig information element, carried in the drb-ToAddModList.

According to an embodiment of the present invention, the user equipment establishing the WLN non-split DRB includes the following process: in a case where there is a many-to-one mapping relationship between a WLN DRB and an adaptation entity, the adaptation entity is reconfigured according to the Adaptation-Config information element carried in the drb-ToAddModListWLN. Alternatively, an adaptation entity is established in a case where there is no adaptation entity in the WLN, i.e. the WLN split DRB that needs to be established is the first WLN DRB of the adaptation entity. In a case where there is a one-to-one mapping relationship between a WLN DRB and an adaptation entity, the adaptation entity is established according to the Adaptation-Config information element carried in drb-ToAddModListWLN. A PDCP entity is established according to the pdcp-Config information element carried in the drb-ToAddModList, and the PDCP entity is configured by using MCG security configuration information. Alternatively, a PDCP entity is established according to the pdcp-Config information element carried in the drb-ToAddModListWLN, and the PDCP entity is configured by using MCG security configuration information.

According to an embodiment of the present invention, the user equipment reconfiguring the WLN split DRB includes the following process: in a case where the Adaption-Config information element is carried in the drb-ToAddModListWLN, the adaptation entity is reconfigured according to the Adaptation-Config information element. In a case where the pdcp-Config information element is carried in the drb-ToAddModList, the PDCP entity is reconfigured according to the pdcp-Config information element. Alternatively, if the pdcp-Config information element is carried in the drb-ToAddModListWLN, the PDCP entity is reconfigured according to the pdcp-Config information element. In a case where the drb-ToAddModList carries the rlc-Config information element, the logicalChannelIdentity information element, and the logicalChannelConfig information element, the MCG RLC entity and the MCG DTCH logical channel are reconfigured according to the rlc-Config information element, the logicalChannelIdentity information element, and the logicalChannelConfig information element. Alternatively, the UE re-establishes the PDCP entity and transmits a PDCP status report when the UE reconfigures a WLN split DRB. Alternatively, the UE may be configured according to an RRC signaling whether to re-establish the PDCP entity and transmit a PDCP status report when a WLN split DRB is reconfigured.

According to an embodiment of the present invention, the user equipment reconfiguring the WLN split DRB includes the following process: in a case where the Adaption-Config information element is carried in the drb-ToAddModListWLN, the adaptation entity is reconfigured according to the Adaptation-Config information element. In a case where the pdcp-Config information element is carried in the drb-ToAddModList, the PDCP entity is reconfigured according to the pdcp-Config information element. Alternatively, in a case where the pdcp-Config information element is carried in the drb-ToAddModListWLN, the PDCP entity is reconfigured according to the pdcp-Config information element.

Alternatively, the UE re-establishes the PDCP entity and transmits a PDCP status report when the UE reconfigures a WLN non-split DRB. Alternatively, the UE may be configured according to an RRC signaling whether to re-establish the PDCP entity and transmit a PDCP status report when a WLN non-split DRB is reconfigured.

FIG. 11 is a block diagram of user equipment according to an embodiment of the present invention. As illustrated in FIG. 11, the UE 1100 includes a receiving unit 1101, a determining unit 1102, and a reconfiguring unit 1103. Alternatively, the UE 1100 may further include a re-establishing unit 1104.

The receiving unit 1101 may be configured to receive an RRCConnectionReconfiguration message.

The determining unit 1102 is configured to determine whether the received RRCConnectionReconfiguration message contains indication information, the indication information indicating the UE to reconfigure the first type of DRB as the second type of DRB that is different from the first type.

The reconfiguring unit 1103 is configured to reconfigure the UE according to the RRCConnectionReconfiguration message if the received RRCConnectionReconfiguration message contains indication information.

The re-establishing unit 1104 can be configured to re-establish a PDCP entity.

According to an embodiment of the present invention, the first type of DRB may include an MCG DRB, a WLN split DRB or a WLN non-split DRB. The second type of DRB may include an MCG DRB, a WLN split DRB, or a WLN non-split DRB.

It will be appreciated by those skilled in the art that the UE 1100 illustrated in FIG. 11 may be configured to perform the various methods described above with respect to FIGS. 3 to 10. For the sake of brevity, the description is not repeated herein.

It is to be understood that the above-described embodiments of the present invention may be implemented by software or by hardware or by a combination of both software and hardware. For example, the various components within the user equipment in the above embodiments may be implemented by a variety of devices including, but not limited to, analog circuit devices, digital circuit devices, digital signal processing (DSP) circuits, programmable processors, application-specific integrated circuits (ASICs), field programmable gate arrays (FPGAs), programmable logic devices (CPLDs), and the like.

In this application, the term “base station” refers to a mobile communication data and control switching center having a large transmission power and a wide coverage area and including functions such as resource allocation scheduling, data reception and transmission, and the like. The term “user equipment” refers to a user mobile terminal, such as a terminal device that can

perform wireless communication with a base station or a micro base station, including a mobile phone, a notebook, or the like.

In addition, embodiments of the invention disclosed herein may be implemented on a computer program product. More specifically, the computer program product is one of those having a computer-readable medium encoded with computer program logic, which, when executed on a computing device, provides the associated operations to achieve the above technical solution of the present invention. When executed on at least one processor of a computing system, the computer program logic causes the processor to perform the operations (methods) described in the embodiments of the present invention. Such an arrangement of the present invention is typically provided as software, codes, and/or other data structures that are arranged or encoded on a computer-readable medium, such as an optical medium (e.g., a CD-ROM), a floppy disk or a hard disk, or, for example, other media for a firmware or a microcode on one or more ROM or RAM or PROM chips, or the downloadable software images, shared database and so on in one or more modules. Software or firmware or such configuration may be installed on a computing device such that one or more processors in the computing device perform the technical solutions described in the embodiments of the present invention.

While the present invention has been described in connection with the preferred embodiments of the present invention, it will be understood by those skilled in the art that various modifications, substitutions, and alterations may be made therein without departing from the spirit and scope of the invention. Accordingly, the present invention should not be limited by the above-described embodiments, but rather by the appended claims and their equivalents.

Claims

1. A method performed by a user equipment (UE), comprising:

receiving an RRCConnectionReconfiguration message which contains an indication to reconfigure a first data radio bearer (DRB) to a second DRB and a drb-ToAddModList parameter that contains a list of DRBs needed to be added;

reconfiguring a PDCP entity in accordance with a pdcp-Config parameter, if the pdcp-Config parameter included in the drb-ToAddModList parameter, wherein the pdcp-Config parameter is used to set configurable PDCP parameters for configuring the first DRB to the second DRB; and

reconfiguring an RLC entity and/or a DTCH logical channel in accordance with an rlc-Config parameter and a logicalChannelConfig parameter, if the rlc-Config parameter and the logicalChannelConfig parameter are included in the drb-ToAddModList parameter, wherein the rlc-Config parameter is used to specify RLC configuration for configuring the first DRB to the second DRB, and the logicalChannelConfig parameter is used to configure logical channel parameters, wherein

the first DRB is a bearer whose radio protocols are located in a base station (eNB) and are not located in a WLAN to use eNB radio resources among the eNB radio resources and WLAN resources, and

the second DRB is a bearer whose radio protocols are located in both the eNB and the WLAN to use both the eNB radio resources and the WLAN resources.

2. The method according to Claim 1, further comprising:

reconfiguring one adaptation entity for a plurality of second DRBs which receives data from the PDCP entity.

3. A method performed by a base station (eNB), comprising:

transmitting an RRCConnectionReconfiguration message which contains an indication to reconfigure a first data radio bearer (DRB) to a second DRB and a drb-ToAddModList parameter that contains a list of DRBs needed to be added;

reconfiguring a PDCP entity in accordance with a pdcp-Config parameter, if the pdcp-Config parameter included in the drb-ToAddModList parameter, wherein the pdcp-Config parameter is used to set configurable PDCP parameters for configuring the first DRB to the second DRB; and

reconfiguring an RLC entity and/or a DTCH logical channel in accordance with an rlc-Config parameter and a logicalChannelConfig parameter, if the rlc-Config parameter and the logicalChannelConfig parameter are included in the drb-ToAddModList parameter, wherein the rlc-Config parameter is used to specify RLC configuration for configuring the first DRB to the second DRB, and the logicalChannelConfig parameter is used to configure logical channel parameters, wherein

the first DRB is a bearer whose radio protocols are located in the eNB and are not located in a WLAN to use eNB radio resources among the eNB radio resources and WLAN resources, and

the second DRB is a bearer whose radio protocols are located in both the eNB and the WLAN to use both the eNB radio resources and the WLAN resources.

4. The method according to Claim 3, further comprising:

reconfiguring one adaptation entity for a plurality of second DRBs which receives data from the PDCP entity.

5. A user equipment (UE) comprising:

receiving circuitry configured to receive an RRCConnectionReconfiguration message which contains an indication to reconfigure a first data radio bearer (DRB) to a second DRB and a drb-ToAddModList parameter that contains a list of DRBs needed to be added; and

reconfiguring circuitry configured to reconfigure a PDCP entity in accordance with a pdcp-Config parameter, if the pdcp-Config parameter included in the drb-ToAddModList parameter, wherein the pdcp-Config parameter is used to set configurable PDCP parameters for configuring the first DRB to the second DRB, wherein

the reconfiguring circuitry is further configured to reconfigure an RLC entity and/or a DTCH logical channel in accordance with an rlc-Config parameter and a logicalChannelConfig

parameter, if the rlc-Config parameter and the logicalChannelConfig parameter are included in the drb-ToAddModList parameter, wherein

the rlc-Config parameter is used to specify RLC configuration for configuring the first DRB to the second DRB, and the logicalChannelConfig parameter is used to configure logical channel parameters,

the first DRB is a bearer whose radio protocols are located in a base station (eNB) and are not located in a WLAN to use eNB radio resources among the eNB radio resources and WLAN resources, and

the second DRB is a bearer whose radio protocols are located in both the eNB and the WLAN to use both the eNB radio resources and the WLAN resources.

6. The UE according to Claim 5, wherein

the reconfiguring circuitry is further configured to reconfigure one adaptation entity for a plurality of second DRBs which receives data from the PDCP entity.

7. A base station (eNB) comprising:

transmitting circuitry configured to transmit an RRCConnectionReconfiguration message which contains an indication to reconfigure a first data radio bearer (DRB) to a second DRB and a drb-ToAddModList parameter that contains a list of DRBs needed to be added; and

reconfiguring circuitry configured to reconfigure a PDCP entity in accordance with a pdcp-Config parameter, if the pdcp-Config parameter included in the drb-ToAddModList parameter, wherein the pdcp-Config parameter is used to set configurable PDCP parameters for configuring the first DRB to the second DRB; wherein

the reconfiguring circuitry is further configured to reconfigure an RLC entity and/or a DTCH logical channel in accordance with an rlc-Config parameter and a logicalChannelConfig parameter, if the rlc-Config parameter and the logicalChannelConfig parameter are included in the drb-ToAddModList parameter, wherein

the rlc-Config parameter is used to specify RLC configuration for configuring the first DRB to the second DRB, and the logicalChannelConfig parameter is used to configure logical channel parameters,

the first DRB is a bearer whose radio protocols are located in the eNB and are not located in a WLAN to use eNB radio resources among the eNB radio resources and WLAN resources, and

the second DRB is a bearer whose radio protocols are located in both the eNB and the WLAN to use both the eNB radio resources and the WLAN resources.

8. The eNB according to Claim 7, wherein
the reconfiguring circuitry is further configured to reconfigure one adaptation entity for a plurality of second DRBs which receives data from the PDCP entity.