data to the first RLC (or a first RLC entity) 33a' and the second RLC (or a second RLC entity) 33b'. For example, according to the NR PDCP standard (3GPP TS 38.323 V15.2.0, 2018-06) published recently, a means for minimizing PDCP reordering delay caused by a data splitting operation performed by the UE 30" is defined as a capability of the UE 30".

[37] In some embodiments, the PDCP 34' may be provided with a plurality of indicators from lower layers and may distribute data to the first RLC 33a' and the second RLC 33b', based on the plurality of indicators. For example, as illustrated in FIG. 3, the PDCP 34' may be provided with first indicators IND1 from the first PHY layer 31a', the first MAC 32a' and the first RLC 33a' and may be provided with second indicators IND2 from the second PHY layer 31b' the second MAC 32b' and the second RLC 33b'. The PDCP 34' may detect states of the first channel CH1 and the second channel CH2 based on the first indicators IND1 and the second indicators IND2, and may distribute data to the first RLC 33a', and the second RLC 33b' based on the states of the first channel CH1 and the second channel CH2. An exemplary operation of the PDCP 34' will be described below with reference to FIG. 4.

[38] FIG. 4 is a flowchart illustrating a method for multi-connectivity according to an exemplary embodiment. For example, the method of FIG. 4 may be performed by the PDCP 34' of FIG. 3, and as described below with reference to FIG. 5, may be triggered by various factors. Hereinafter, FIG. 4 will be described with reference to FIGS. 1 and 3.

[39] Referring to FIG. 4, in operation S200, an operation of estimating round trip times may be performed. A round trip time (RTT) may be defined as a time taken for a transmitting side to transmit data to a receiving side and receive a response (for example, an acknowledgement response (ACK)) to the transmitted data from the receiving side. A document "Stability of end-to-end algorithms for joint routing and rate control" (F. Kelly

the variable i is less than M, the variable i may increase by one in operation S646a, and operation S642a may be performed again. On the other hand, when the variable i matches M, namely, when data sizes corresponding to the M channels are all determined, operation S640a may end.

[77] Referring to FIG. 9B, operation S640b may include operations S641b to S646b. Operations similar to the operations performed in some operations among operations S641a and S643a to S646a of operation S640a of FIG. 9A may be performed in some operations among operations S641b and S643b to S646b of FIG. 9B.

[78] In operation S642b, an operation of comparing a predefined threshold value THR3 with a rate NACK% of a negative acknowledgement response (NACK) occurring in the i^{th} channel may be performed. As illustrated in FIG. 9B, when the rate NACK% of NACK occurring in the i^{th} channel is higher than the threshold value THR3, operation S644b may be performed, and when the rate NACK% of NACK occurring in the i^{th} channel is equal to or lower than the threshold value THR3, operation S643b may be performed. As a result, when an NACK rate NACK% of a channel is high, the PDCP 34' may block transmission of data through a corresponding channel.

[79] FIG. 10 is a block diagram illustrating UE 100 according to an exemplary embodiment. As described above with reference to FIG. 1, the UE 100 of FIG. 10 may support multi-connectivity and may perform wireless communication with two or more base stations. As illustrated in FIG. 10, the UE 100 may include an antenna 110, a transceiver 120, a data processor 130, a memory 140, and a main processor 150. The elements of the UE 100 are independently illustrated in FIG. 10, but in some embodiments, two or more elements may be implemented as one entity (for example, a semiconductor chip).

What is Claimed is:

1. A method for multi-connectivity between a plurality of base stations and user equipment through a plurality of channels, the method comprising:

estimating a first round trip time (RTT) at the user equipment, wherein the first RTT is expected time to be taken for transmitting data and receiving an acknowledgement (ACK) through a first channel;

estimating a second RTT at the user equipment, wherein the second RTT is expected time to be taken for transmitting data and receiving an ACK through a second channel; and

determining, at the user equipment, a size of uplink data which is to be transmitted through the first channel, based on the first RTT and the second RTT.

2. The method of claim 1, wherein the estimating the first RTT comprises:

obtaining retransmission parameters corresponding to the first channel; and

obtaining the first RTT, based on the retransmission parameters.

3. The method of claim 2, wherein

the retransmission parameters comprise a retransmission period c_1 and a maximum retransmission number N_1, and

the obtaining the first RTT comprises obtaining an RTT_{S1}, which is expressed in an equation below:

$$RTT_{S1} = (1 - BLER_1) * \sum_{n=0}^{N_1-1} BLER_1{}^n (p_1 + n * c_1),$$

wherein the $BLER_1$ and the p_1 are a block error rate and a signal moving time in the first channel, respectively.

4. The method of claim 3, wherein

the retransmission parameters further comprise a maximum retransmission number R_1 of a radio link control (RLC) entity, and

the obtaining the first RTT comprises obtaining, as the first RTT, an RTT_{T1}, which is expressed in an equation below:

$$RTT_{T1} = RTT_{S1} * \sum_{r=0}^{R_1} \left(BLER_1{}^{N_1}\right)^r.$$

5. The method of claim 3 or claim 4, wherein the obtaining the first RTT comprises determining the RTT_{S1} as the first RTT in response to the $BLER_1$ being less than a first threshold value.

6. The method of any one of claims 3 to 5, wherein the determining the size of the uplink data comprises determining the size of the uplink data as zero in response to the $BLER_1$ being greater than a second threshold value.

7. The method of claim 2, wherein

the obtaining the retransmission parameters comprises obtaining updated retransmission parameters corresponding to the first channel, and

the obtaining the first RTT comprises obtaining the first RTT based on the updated retransmission parameters.

8. The method of any one of claims 1 to 7, further comprising:

obtaining a first channel bandwidth corresponding to the first channel; and

obtaining a second channel bandwidth corresponding to the second channel,

wherein the determining the size of the uplink data comprises obtaining the size of

the uplink data, based on the first RTT, the second RTT, the first channel bandwidth and the second channel bandwidth.

9. The method of claim 8, wherein the determining the size of the uplink data comprises changing the size of the uplink data, based on a variation Δw, which is expressed in an equation below:

$$\Delta w = \frac{max(\frac{BW_1}{RTT_1}, \frac{BW_2}{RTT_2})}{(BW_1+BW_2)^2},$$

wherein the RTT_1, the RTT_2, the BW_1, and the BW_2 are the first RTT, the second RTT, the first channel bandwidth, and the second channel bandwidth, respectively.

10. The method of claim 8, wherein the determining the size of the uplink data comprises changing the size of the uplink data, based on a variation Δw, which is expressed in an equation below:

$$\Delta w = \frac{max(\frac{BW_1}{RTT_1}, \frac{BW_2}{RTT_2})}{(BW_1+BW_2)^2} * N_{ACK1},$$

wherein the RTT_1, the RTT_2, the BW_1, the BW_2, and the N_{ACK1} are the first RTT, the second RTT, the first channel bandwidth, the second channel bandwidth, and a number of ACKs received through the first channel, respectively.

11. The method of any one of claims 1 to 10, wherein the method is performed in a packet data convergence protocol (PDCP) layer.

12. The method of any one of claims 1 to 11, wherein the determining the size of the uplink data comprises determining the size of the uplink data as zero in response to a rate of negative acknowledgement (NACK) through the first channel being greater than a

third threshold value.

13. The method of any one of claims 1 to 12, further comprising determining a size of uplink data which is to be transmitted through the second channel, based on the first RTT and the second RTT.

14. The method of any one of claims 1 to 13, wherein

the user equipment communicates with a first base station through the first channel and a second base station through the second channel, and

the first base station and the second base station communicate with the user equipment, based on the same radio access technology.

15. The method of any one of claims 1 to 13, wherein

the user equipment communicates with a first base station through the first channel and a second base station through the second channel, and

the first base station and the second base station communicate with the user equipment, based on different radio access technologies.

16. A method for multi-connectivity between a plurality of base stations and a user equipment through a plurality of channels, the method comprising:

estimating a first round trip time (RTT) at a first base station, wherein the first RTT is expected time to be taken for transmitting data and receiving an acknowledgement (ACK) through a first channel;

obtaining a second RTT at the first base station, wherein the second RTT is actual time to be taken for transmitting data and receiving an ACK through a second channel; and

determining, at the first base station, a size of downlink data which is to be transmitted from the first base station to the user equipment, based on the first RTT and the second RTT.

17. The method of claim 16, wherein the obtaining the second RTT comprises receiving the second RTT, estimated by a second base station, from the second base station.

18. The method of claim 16 or claim 17, wherein the obtaining the second RTT comprises:

receiving channel information about the second channel from a second base station; and

estimating the second RTT, based on the channel information.

19. A method for multi-connectivity between a plurality of base stations and user equipment through a plurality of channels, the method comprising:

estimating a first round trip time (RTT) at the user equipment, wherein the first RTT is expected time to be taken for transmitting data and receiving an acknowledgement (ACK) through a first channel;

estimating a second RTT at the user equipment, wherein the second RTT is expected time to be taken for transmitting data and receiving an ACK through a second channel;

obtaining channel bandwidths of the first channel and the second channel; and

determining, at the user equipment, sizes of uplink data to be transmitted through the first channel and the second channel, based on the first RTT, the second RTT and the channel bandwidths of the first channel and the second channel.

20. The method of claim 19, wherein the determining the size of the uplink data comprises changing the size of the uplink data, based on a variation Δw, which is expressed in an equation below:

$$\Delta w = \frac{max(\frac{BW_1}{RTT_1}, \frac{BW_2}{RTT_2})}{(BW_1+BW_2)^2},$$

wherein the RTT_1, the RTT_2, the BW_1, and the BW_2 are the first RTT, the second RTT, the channel bandwidth of the first channel, and the channel bandwidth of the second channel, respectively.