

What is claimed is:

1. A method of transmitting, by a user equipment (UE), data in a wireless communication system, the method comprising:

receiving a higher layer signal that enables or disables a code block group (CBG)-based transmission by the UE;

receiving downlink control information (DCI) comprising (i) a new data indicator (NDI) indicating whether a transmission of a transport block (TB) in an initial transmission, and (ii) scheduling information for transmission of at least one CBG in the TB;

based on (i) the higher layer signal enabling CBG-based transmissions, and (ii) the NDI indicating that the transmission of the TB is an initial transmission:

transmitting all CBGs in the TB; and

based on (i) the higher layer signal enabling the CBG-based transmissions, and (ii) the NDI indicating that the transmission of the TB is not an initial transmission:

transmitting only those CBGs in the TB that are specified by the scheduling information that was received in the DCI.

2. The method of claim 1, wherein the NDI is a 1-bit field in the DCI,

wherein transmitting all CBGs in the TB is based on (i) the NDI being equal to a first binary value and (ii) the higher layer signal enabling the CBG-based transmissions, and

wherein transmitting only those CBGs in the TB that are specified by the scheduling information is based on (i) the NDI being equal to a second binary value and (ii) the higher layer signal enabling CBG-based transmissions.

3. The method of claim 1, wherein the higher-layer signal enabling the CBG-based transmissions is a Radio Resource Control (RRC) layer signal.

4. The method of claim 1, further comprising:

receiving a second higher layer signal that indicates a number of CBGs in the TB.

5. The method of claim 1, wherein the DCI is a first DCI comprising (i) a first NDI indicating that a transmission of a first TB is an initial transmission in a hybrid automatic repeat request (HARQ) process, and (ii) first scheduling information for transmission of all CBGs in the first TB, and

wherein the method further comprises:

receiving a second DCI comprising (i) a second NDI indicating that a transmission of a second TB is not an initial transmission in the HARQ process, and (ii) second scheduling information for transmission of fewer than all CBGs in the second TB.

6. The method of claim 5, wherein each of the first DCI and the second DCI comprises one bit to indicate which of TB-based scheduling or CBG-based scheduling is to be used for scheduling.

7. The method of claim 5, wherein a first HARQ process identifier (ID) field in the first DCI has a same value as a second HARQ process ID field in the second DCI,

wherein a second NDI field in the second DCI has a same value as a first NDI field in the first DCI, and

wherein the second scheduling information in the second DCI relates to information for CBG-based scheduling.

8. The method of claim 5, wherein based on (i) a first HARQ process ID field in the first DCI having a same value as a second HARQ process ID field in the second DCI and (ii) a second NDI field in the second DCI having a different value from that of a first NDI field in the first DCI:

remaining fields in the second DCI are interpreted as information for TB-based scheduling.

9. The method of claim 5, wherein based on a higher-layer signal setting CBG-based data retransmission, each of the first DCI and the second DCI comprises a CBG indication field indicating a CBG.

10. The method of claim 9, further comprising: (i) based on a first HARQ process ID field in the first DCI having a same value as a second HARQ process ID field in the second DCI, (ii) a second NDI field in the second DCI having a different value from that of a first NDI field in the first DCI, and (iii) the CBG indication field in the second DCI indicating only some of CBGs in the TB:

transmitting a negative acknowledge (NACK) of all the CBGs in the TB.

11. A user equipment (UE) comprising:

a transceiver;

at least one processor; and

at least one computer memory operably connectable to the at least one processor and storing instructions that, when executed, cause the at least one processor perform operations comprising:

receiving a higher layer signal that enables or disables a code block group (CBG)-based transmission by the UE;

receiving downlink control information (DCI) comprising (i) a new data indicator (NDI) indicating whether a transmission of a transport block (TB) in an initial transmission, and (ii) scheduling information for transmission of at least one CBG in the TB;

based on (i) the higher layer signal enabling CBG-based transmissions, and (ii) the NDI indicating that the transmission of the TB is an initial transmission:

transmitting all CBGs in the TB; and

based on (i) the higher layer signal enabling the CBG-based transmissions, and (ii) the NDI indicating that the transmission of the TB is not an initial transmission:

transmitting only those CBGs in the TB that are specified by the scheduling information that was received in the DCI.

12. The UE of claim 11, wherein the NDI is a 1-bit field in the DCI,

wherein transmitting all CBGs in the TB is based on (i) the NDI being equal to a first binary value and (ii) the higher layer signal enabling the CBG-based transmissions, and

wherein transmitting only those CBGs in the TB that are specified by the scheduling information is based on (i) the NDI being equal to a second binary value and (ii) the higher layer signal enabling CBG-based transmissions.

13. The UE of claim 11, wherein the higher-layer signal enabling the CBG-based transmissions is a Radio Resource Control (RRC) layer signal.

14. The UE of claim 11, wherein the operations further comprise:
receiving a second higher layer signal that indicates a number of CBGs in the TB.

15. The UE of claim 11, wherein the DCI is a first DCI comprising (i) a first NDI indicating that a transmission of a first TB is an initial transmission in a hybrid automatic repeat request (HARQ) process, and (ii) first scheduling information for transmission of all CBGs in the first TB, and

wherein the operations further comprise:
receiving a second DCI comprising (i) a second NDI indicating that a transmission of a second TB is not an initial transmission in the HARQ process, and (ii) second scheduling information for transmission of fewer than all CBGs in the second TB.

16. The UE of claim 15, wherein each of the first DCI and the second DCI comprises one bit to indicate which of TB-based scheduling or CBG-based scheduling is to be used for scheduling.

17. The UE of claim 15, wherein a first HARQ process identifier (ID) field in the first DCI has a same value as a second HARQ process ID field in the second DCI,

wherein a second NDI field in the second DCI has a same value as a first NDI field in the first DCI, and

wherein the second scheduling information in the second DCI relates to information for CBG-based scheduling.

18. The UE of claim 15, wherein based on (i) a first HARQ process ID field in the first DCI having a same value as a second HARQ process ID field in the second DCI and (ii) a second NDI field in the second DCI having a different value from that of a first NDI field in the first DCI:

remaining fields in the second DCI are interpreted as information for TB-based scheduling.

19. The UE of claim 15, wherein based on a higher-layer signal setting CBG-based data retransmission, each of the first DCI and the second DCI comprises a CBG indication field indicating a CBG.

20. The UE of claim 19, wherein the operations further comprise: (i) based on a first HARQ process ID field in the first DCI having a same value as a second HARQ process ID field in the second DCI, (ii) a second NDI field in the second DCI having a different value from that of a first NDI field in the first DCI, and (iii) the CBG indication field in the second DCI indicating only some of CBGs in the TB:

transmitting a negative acknowledge (NACK) of all the CBGs in the TB.