Technical Problem

[0005]

A terminal device may use a macro cell CC and a small cell CC for carrier aggregation. In this case, the terminal device uses the CC of the macro cell as a primary component carrier (PCC), and uses the CC of the small cell as a secondary component carrier (SCC), for example. Additionally, an uplink control signal (such as an ACK/NACK, for example) for the SCC (that is, the CC of the small cell) may be transmitted by the PCC (that is, the CC of the macro cell). Furthermore, for example, the uplink control signal may be transmitted from a base station of the macro cell to a base station of the small cell via backhauling.

[0006]

However, in cases like the above, there is a possibility that the wireless communication of the terminal device may be greatly affected by the backhaul. For example, the uplink control signal (such as an ACK/NACK, for example) may take a large amount of time to reach the base station of the small cell because of a delay on the backhaul. As a result, operation by the base station of the small cell based on the uplink control signal may be delayed, and communication quality for the terminal device may be lowered.

[0007]

Accordingly, it is desirable to provide a mechanism enabling a reduction in the effect of backhauling on wireless communications in the case of carrier aggregation.

Solution to Problem

[0008]

According to a first aspect of the present disclosure, there is provided a communication control device including: an acquisition unit configured to acquire information about a terminal device that uses one component carrier of a macro cell as a primary component carrier; and a control unit configured to set one or more component carriers of a small cell partially or fully overlapping with the macro cell as an additional component carrier to be used additionally by the terminal device. The control unit sets one component carrier among the one or more component carriers as a special component carrier on which the terminal device is able to transmit uplink control information on an uplink

control channel in response to backhaul quality of a backhaul between a base station of the macro cell and a base station of the small cell.

[0009]

According to a second aspect of the present disclosure, there is provided a communication control method including: acquiring information about a terminal device that uses one component carrier of a macro cell as a primary component carrier; and setting, by a processor, one or more component carriers of a small cell partially or fully overlapping with the macro cell as an additional component carrier to be used additionally by the terminal device, wherein the setting of the one or more component carriers as the additional component carrier includes setting one component carrier among the one or more component carriers as a special component carrier on which the terminal device is able to transmit uplink control information on an uplink control channel in response to backhaul quality of a backhaul between a base station of the macro cell and a base station of the small cell.

[0010]

According to a third aspect of the present disclosure, there is provided a terminal device including: an acquisition unit configured to acquire, when the terminal device uses one component carrier of a macro cell as a primary component carrier, one or more component carriers of a small cell partially or fully overlapping with the macro cell are set as an additional component carrier to be used additionally by the terminal device, and one component carrier among the one or more component carriers is set as a special component carrier on which the terminal device is able to transmit uplink control information on an uplink control channel, information about the one component carrier; and a control unit configured to control wireless communication on the one component carrier so that the uplink control information is transmitted on the uplink control channel of the one component carrier in response to backhaul quality of a backhaul between a base station of the macro cell and a base station of the small cell.

Advantageous Effects of Invention

[0011]

According to embodiments of the present disclosure as described above, it is possible to reduce the effect of backhauling on wireless communications in the case of carrier

CLAIMS

1. A communication control device comprising:

an acquisition unit configured to acquire information about a terminal device that uses one component carrier of a macro cell as a primary component carrier; and

a control unit configured to set one or more component carriers of a small cell partially or fully overlapping with the macro cell as an additional component carrier to be used additionally by the terminal device, wherein

the control unit sets one component carrier among the one or more component carriers as a special component carrier on which the terminal device is able to transmit uplink control information on an uplink control channel in response to backhaul quality of a backhaul between a base station of the macro cell and a base station of the small cell.

2. The communication control device according to claim 1, wherein

the uplink control information includes an acknowledgement (ACK) and a negative acknowledgement (NACK) regarding reception of a downlink signal.

3. The communication control device according to claim 1, wherein

the uplink control information includes an uplink scheduling request.

4. The communication control device according to claim 1, wherein

the uplink control information includes periodically reported channel state information.

5. The communication control device according to claim 1, wherein

the uplink control channel is a physical uplink control channel (PUCCH).

6. The communication control device according to claim 1, wherein

the special component carrier is a component carrier on which a connection establishment procedure is not conducted by the terminal device.

7. The communication control device according to claim 1, wherein

the special component carrier is a component carrier selected for each terminal device.

8. The communication control device according to claim 1, wherein

when newly setting a component carrier of the small cell as the additional component carrier, if the control unit sets the relevant component carrier as the special component carrier, the control unit notifies the terminal device of the addition of the component carrier as the special component carrier.

9. The communication control device according to claim 1, wherein

the control unit sets a component carrier not set as the special component carrier from among the one or more component carriers of the small cell as a secondary component carrier associated with the special component carrier,

the secondary component carrier is a component carrier on which the terminal device is unable to transmit the uplink control information on the uplink control channel, and

the uplink control information related to the secondary component carrier is information transmitted on the uplink control channel of the special component carrier.

10. The communication control device according to claim 9, wherein

when newly setting a component carrier of the small cell as the additional component carrier, if the control unit sets the relevant component carrier as the secondary component carrier, the control unit notifies the terminal device of the addition of the component carrier as the secondary component carrier.

11. The communication control device according to claim 9, wherein

the control unit changes the special component carrier by newly setting, as the special component carrier, one component carrier currently set as the secondary component carrier.

12. The communication control device according to claim 11, wherein

after the special component carrier is changed, another component carrier currently set as the secondary component carrier is associated with the one component carrier newly set as the special component carrier.

13. The communication control device according to claim 11, wherein

when changing the special component carrier, the control unit notifies the terminal device that the special component carrier is changed to the one component carrier newly set as

the special component carrier.

14. The communication control device according to claim 13, wherein

the control unit notifies the terminal device that the special component carrier is changed to the one component carrier newly set as the special component carrier in a message during a connection reconfiguration procedure.

15. The communication control device according to claim 11, wherein

if a radio link failure occurs on the special component carrier, the control unit newly sets, as the special component carrier, one component carrier currently set as the secondary component carrier, via a prescribed procedure.

16. The communication control device according to claim 15, wherein

the prescribed procedure is a connection reconfiguration procedure or a connection re-establishment procedure for changing the special component carrier.

17. The communication control device according to claim 15, wherein

if the prescribed procedure does not complete within a prescribed period, the control unit stops usage of the special component carrier and the secondary component carrier associated with the special component carrier by the terminal device.

18. The communication control device according to claim 1, wherein

if the backhaul between the base station of the macro cell and the base station of the small cell does not satisfy a prescribed quality standard, the control unit sets the one component carrier among the one or more component carriers as the special component carrier, whereas if the backhaul satisfies the prescribed quality standard, the control unit sets each of the one or more component carriers as a secondary component carrier associated with the primary component carrier.

19. A communication control method comprising:

acquiring information about a terminal device that uses one component carrier of a macro cell as a primary component carrier; and

setting, by a processor, one or more component carriers of a small cell partially or

fully overlapping with the macro cell as an additional component carrier to be used additionally by the terminal device, wherein

the setting of the one or more component carriers as the additional component carrier includes setting one component carrier among the one or more component carriers as a special component carrier on which the terminal device is able to transmit uplink control information on an uplink control channel in response to backhaul quality of a backhaul between a base station of the macro cell and a base station of the small cell.

20. A terminal device comprising:

an acquisition unit configured to acquire, when the terminal device uses one component carrier of a macro cell as a primary component carrier, one or more component carriers of a small cell partially or fully overlapping with the macro cell are set as an additional component carrier to be used additionally by the terminal device, and one component carrier among the one or more component carriers is set as a special component carrier on which the terminal device is able to transmit uplink control information on an uplink control channel, information about the one component carrier; and

a control unit configured to control wireless communication on the one component carrier so that the uplink control information is transmitted on the uplink control channel of the one component carrier in response to backhaul quality of a backhaul between a base station of the macro cell and a base station of the small cell.