

has been demanded. Thus, the present disclosure proposes a novel and improved communication control device, radio communication device, communication control method, and radio communication method which can realize communication in which orthogonal resources and non-orthogonal resources are selectively used.

Solution to Problem

[0007a] According to a first aspect of the present invention, there is provided a control device, comprising: circuitry configured to communicate with a radio communication device of a radio communication system equipped to use a plurality of alternative access schemes, the plurality of alternative access schemes including at least one of a first multiple access scheme that uses orthogonal resources and a second multiple access scheme that uses non-orthogonal resources; and allocate resources according to a selected access scheme of the plurality of alternative access schemes, wherein a first information and a second information are provided to the radio communication device in different control channels and in stages, the first information regarding the orthogonal resources and the second information regarding the non-orthogonal resources.

[0007b] According to a second aspect of the present invention, there is provided a radio communication device, comprising: circuitry configured to communicate with a control device of a radio communication system equipped to allocate resources of a plurality of alternative access schemes, the plurality of alternative access schemes including at least one of a first multiple access scheme that uses orthogonal resources and a second multiple access scheme that uses non-orthogonal resources; and receive a first information and a second information in different control channels and in stages, the first information regarding the orthogonal resources and the second information regarding the non-orthogonal resources; and perform radio communications using a selected access scheme of the plurality of alternative access schemes.

[0007c] According to a third aspect of the present invention, there is provided a communication control method, comprising: communicating, by circuitry of a control device with a radio communication device equipped to use a plurality of alternate access schemes, the plurality of alternate access schemes including at least one of a first multiple access scheme that uses orthogonal resources and a second multiple access scheme that uses non-orthogonal resources; and allocating resources, by the circuitry, according to a selected access scheme of the plurality of alternative access schemes, wherein a first information and a

second information are provided to the radio communication device in different control channels and in stages, the first information regarding the orthogonal resources and the second information regarding the non-orthogonal resources.

[0008] Disclosed herein is a communication control device including: a communication unit configured to perform communication with a radio communication device of a radio communication system in which communication is possible using a plurality of access schemes including at least one of the access schemes of a multiple access scheme that uses orthogonal resources and a multiple access scheme that uses non-orthogonal resources; and a control unit configured to perform allocation of resources relating to the access schemes to be used by the radio communication device.

[0009] Disclosed herein is a radio communication device including: a radio communication unit configured to perform radio communication using one or more access schemes of at least either a multiple access scheme that uses orthogonal resources or a multiple access scheme that uses non-orthogonal resources; and a control unit configured to control the radio communication unit to perform radio communication using allocated resources for the access schemes to be used by the radio communication unit.

[0010] Disclosed herein is a communication control method including: performing communication with a radio communication device of a radio communication system in which communication is possible using a plurality of access schemes including at least one of the access schemes of a multiple access scheme that uses orthogonal resources and a multiple access scheme that uses non-orthogonal resources; and performing allocation of resources relating to the access schemes to be used by the radio communication device with a processor.

[0011] Disclosed herein is a radio communication method including: performing radio communication using one or more access schemes of at least either a multiple access scheme that uses orthogonal resources or a multiple access scheme that uses non-orthogonal resources; and controlling, with a processor, the radio communication to be performed using allocated resources for the access schemes to be used during the radio communication.

Advantageous Effects of Invention

[0012] According to embodiments of the present invention, communication in which orthogonal resources and non-orthogonal resources are selectively used can be realized. Note that the effects described above are not necessarily limited, and along

Claims

1. A control device, comprising:

circuitry configured to

communicate with a radio communication device of a radio communication system equipped to use a plurality of alternative access schemes, the plurality of alternative access schemes including at least one of a first multiple access scheme that uses orthogonal resources and a second multiple access scheme that uses non-orthogonal resources; and

allocate resources according to a selected access scheme of the plurality of alternative access schemes,

wherein a first information and a second information are provided to the radio communication device in different control channels and in stages, the first information regarding the orthogonal resources and the second information regarding the non-orthogonal resources.

2. The control device according to claim 1, wherein

the first information indicates frequency resources or time resources of the first multiple access scheme, and

the second information indicates a power level or an interleave of the second multiple access scheme.

3. The control device according to claim 1, wherein

a first channel carrying the first information is communicated temporarily ahead of a second channel carrying the second information.

4. The control device according to claim 1, wherein

a first channel carrying the first information is communicated temporarily after a second channel carrying the second information.

5. The control device according to claim 1, wherein

a first channel carrying the first information is non-orthogonal to a second channel carrying the second information.

6. The control device according to claim 1, wherein
a first channel carrying the first information is orthogonal to other channels carrying other information, and
a second channel carrying the second information is non-orthogonal to the other channels carrying other information.
7. The control device according to claim 1, wherein the circuitry is configured to specify which of the plurality of alternative access schemes the radio communication device is to select.
8. The control device according to claim 1, wherein the circuitry is further configured to include the first and the second information in one or more control channels regarding the orthogonal resources and the non-orthogonal resources to be allocated to the radio communication device.
9. The control device according to claim 8, wherein the one or more control channels include at least two different control channels with at least different times and/or different frequencies, and having different predetermined respective relationships with data channels.
10. The control device according to claim 9, wherein levels or unit densities of electric power allocated to transmission of the at least two different control channels and respective data channels have a predetermined magnitude relation.
11. The control device according to claim 10, wherein a level or unit density of electric power allocated to transmission a control channel of the two different control channels which includes the first information regarding the orthogonal resources is equal to or higher than a level or unit density of electric power allocated to transmission of a corresponding data channel.
12. The control device according to claim 10, wherein the level or the unit density of electric power allocated to transmission of a control channel of the two different control channels which includes the first information regarding the orthogonal resources is equal to or higher than a level or a unit density of electric power allocated to transmission of a control

channel of the two different control channels which includes information regarding the non-orthogonal resources.

13. The control device according to claim 1, wherein the circuitry is configured to receive capability information from the radio communication device.

14. The control device according to claim 13, wherein the circuitry is configured to receive the capability information via a random access protocol scheme or a RRC connection scheme.

15. The control device according to claim 13, wherein the circuitry is configured to transfer the capability information of the radio communication device to another device.

16. The control device according to claim 13, wherein the circuitry is configured to use the capability information of the radio communication device in a handover procedure of the radio communication device or admission control procedure.

17. The control device according to claim 16, wherein the circuitry is further configured to use the capability information of a base station serving as a handover destination candidate with respect to the radio communication device.

18. The control device according to claim 13, wherein the capability information includes a bit flag indicating whether or not a device is compatible with each of the orthogonal resources and the non-orthogonal resources.

19. The control device according to claim 1, wherein the circuitry is configured to transmit a message indicating a change in allocation to the radio communication device.

20. The control device according to claim 19, wherein the circuitry is configured to receive a message indicating a result of change possibility determination with respect to the radio communication device according to the message indicating a change in allocation.

21. The control device according to claim 20, wherein the circuitry is configured to determine a handover possibility according to the result of the change possibility determination.

22. The control device according to claim 1, wherein the circuitry is configured to transmit information indicating an allocation result by the circuitry to the radio communication device.

23. The control device according to claim 1, wherein the circuitry is configured to allocate different or shared resources to one or more radio communication devices.

24. A radio communication device, comprising:
circuitry configured to

communicate with a control device of a radio communication system equipped to allocate resources of a plurality of alternative access schemes, the plurality of alternative access schemes including at least one of a first multiple access scheme that uses orthogonal resources and a second multiple access scheme that uses non-orthogonal resources; and

receive a first information and a second information in different control channels and in stages, the first information regarding the orthogonal resources and the second information regarding the non-orthogonal resources; and

perform radio communications using a selected access scheme of the plurality of alternative access schemes.

25. A communication control method, comprising:

communicating, by circuitry of a control device with a radio communication device equipped to use a plurality of alternate access schemes, the plurality of alternate access schemes including at least one of a first multiple access scheme that uses orthogonal resources and a second multiple access scheme that uses non-orthogonal resources; and

allocating resources, by the circuitry, according to a selected access scheme of the plurality of alternative access schemes,

wherein a first information and a second information are provided to the radio communication device in different control channels and in stages, the first information regarding the orthogonal resources and the second information regarding the non-orthogonal resources.