In the Inter-eNB CA, for example, a cell of the macro base station (Macro eNB (MeNB)) and a cell of a low-power base station (Low-Power Node (LPN)) are used simultaneously as a PCell and a SCell, respectively. In this case, bearers are separately configured in the PCell and the SCell. The UE communicates with the MeNB through a bearer in the PCell and communicates with the LPN through the bearer in the SCell.

[0012]

The inventors of this application has conducted various studies on the continuity of communication services when a radio terminal (UE) that is executing Inter-eNB CA moves between cells and has found several problems. For example, a case in which a UE that is executing Inter-eNB CA using a cell of a MeNB as a PCell and using a cell of a first LPN as a SCell changes the SCell to a cell of another second LPN will be considered. When a SCell change procedure (Fig. 17) in normal CA (i.e., Intra-eNB CA) is applied to this change of the SCell, the UE has to release all information regarding the cell of the first LPN and to newly configure information regarding the cell of the second LPN. Thus, a problem occurs in that communication services in the cell of the first LPN cannot be continued in the cell of the second LPN after the SCell is changed.

[0013]

Accordingly, embodiments of the present invention provide a radio communication system, a radio station, a radio terminal, a communication control method, and a program which contribute to enabling a communication service in a secondary cell to be continued after the secondary cell is changed when a radio terminal which is simultaneously using a plurality of cells served by different radio stations changes the secondary cell from a cell of one radio station to a cell of another radio station.

Solution to Problem

[0014]

~~According to a first aspect of the present invention, there is provided a radio communication system comprising: a radio network~~

~~including a first radio station that serves a first cell, a second radio station that serves a second cell, and a third radio station that serves a third cell; and a radio terminal that has a capability of, while using a cell of one radio station as a primary cell, using a cell of another radio station as a secondary cell, wherein the radio network and the radio terminal are configured to, when the radio terminal is using the first cell as the primary cell and the second cell as the secondary cell, change the secondary cell from the second cell to the third cell while keeping communication status information regarding the radio terminal on the second cell.~~

According to a first aspect of the present invention, there is provided a radio communication system comprising: a radio network including a first radio station operating a first cell, a second radio station operating a second cell, and a third radio station operating a third cell; and a radio terminal that has a capability of Dual Connectivity which is configured with the first cell operated by the first radio station as a Primary Cell (PCell) and either the second cell operated by the second radio station or the third cell operated by the third radio station as a Secondary Cell (SCell) wherein the first radio station is configured to receive a first SN Status Transfer message from the second radio station and transmit a second SN Status Transfer message to the third radio station, within a procedure changing a radio station operating the SCell of the radio terminal from the second radio station to the third radio station.

[0015]

~~According to a second aspect of the present invention, there is provided a first radio station that serves a first cell, comprising: radio communication means for serving the first cell; and communication control means for, when changing a secondary cell to a third cell served by a third radio station while a radio terminal is using the first cell as a primary cell and using a second cell served by a second radio station as the secondary cell, performing at least one of: (a) sending a request to abort data communication with the radio terminal in the~~

~~second cell; and (b) receiving or sending communication status information regarding the radio terminal on the second cell.~~

According to a second aspect of the present invention, there is provided a first radio station operating a first cell, the first radio station comprising: a transceiver configured to communicate with a radio terminal performing Dual Connectivity which is configured with the first cell as a Primary Cell (PCell) and either a second cell operated by a second radio station or a third cell operated by a third radio station as a Secondary Cell (SCell); and an interface configured to receive a first SN (Sequence Number) Status Transfer message from the second radio station and transmit a second SN Status Transfer message to the third radio station, within a procedure changing a radio station operating the SCell of the radio terminal from the second radio station to the third radio station.

[0016]

~~According to a third aspect of the present invention, there is provided a second radio station that serves a second cell, comprising: radio communication means for serving the second cell; and communication control means for, when changing a secondary cell to a third cell served by a third radio station while a radio terminal is using a first cell served by a first radio station as a primary cell and using the second cell as the secondary cell, receiving at least one of: (a) a request to abort data communication with the radio terminal in the second cell; and (b) a request to send communication status information regarding the radio terminal on the second cell, and for performing at least one of aborting the data communication and sending the communication status information.~~

According to a third aspect of the present invention, there is provided a second radio station operating a second cell, the second radio station comprising: a transceiver configured to communicate with a radio terminal performing Dual Connectivity which is configured with a first cell operated by a first radio station as a Primary Cell (PCell) and the second cell operated by the second radio station as a Secondary Cell (SCell); and an interface configured to transmit a first

SN (Sequence Number) Status Transfer message to the first radio station, within a procedure changing a radio station operating the SCell of the radio terminal from the second radio station to a third radio station operating a third cell.

[0017]

~~According to a fourth aspect of the present invention, there is provided a third radio station that serves a third cell, comprising: radio communication means for serving the third cell; and communication control means for, when changing a secondary cell to the third cell while a radio terminal is using a first cell served by a first radio station as a primary cell and a second cell served by a second radio station as the secondary cell, receiving, from the first radio station or the second radio station, communication status information regarding the radio terminal on the second cell.~~

According to a fourth aspect of the present invention, there is provided a third radio station operating a third cell, the third radio station comprising: a transceiver configured to communicate with a radio terminal performing Dual Connectivity which is configured with a first cell operated by a first radio station as a Primary Cell (PCell) and the third cell operated by the third radio station as a Secondary Cell (SCell); and an interface configured to receive a second SN (Sequence Number) Status Transfer message from the first radio station, within a procedure changing a radio station operating the SCell of the radio terminal to the third radio station from a second radio station operating a second cell.

[0018]

~~According to a fifth aspect of the present invention, there is provided a radio terminal comprising: radio communication means for communicating with first to third radio stations; and communication control means for performing control of, while using a first cell served by the first radio station as a primary cell, using a second cell served by the second radio station as a secondary cell, wherein the communication control means is further configured to, when the first cell is being used as the primary cell and the second cell is being used~~

~~as the secondary cell, change the secondary cell from the second cell to a third cell served by the third radio station while keeping communication status information on the second cell.~~

According to a fifth aspect of the present invention, there is provided a radio terminal comprising: a transceiver configured to perform Dual Connectivity which is configured with a first cell operated by a first radio station as a Primary Cell (PCell) and either a second cell operated by a second radio station or a third cell operated by a third radio station as a Secondary Cell (SCell); and a controller configured to keep one or more information elements corresponding to one or more information elements commonly included in a first SN Status Transfer message and a second SN Status Transfer message while a procedure changing a radio station operating the SCell of the radio terminal from the second radio station to the third radio station, wherein the first SN Status Transfer message and the second SN Status Transfer message are transmitted from the second radio station to the first radio station and from the first radio station to the third radio station, respectively, within the procedure changing the radio station operating the SCell of the radio terminal from the second radio station to the third radio station.

[0019]

~~According to a sixth aspect of the present invention, there is provided a communication control method in a first radio station that serves a first cell, the method comprising: when changing a secondary cell to a third cell served by a third radio station while a radio terminal is using the first cell as a primary cell and using a second cell served by a second radio station as the secondary cell, performing at least one of: (a) sending a request to abort data communication with the radio terminal in the second cell; and (b) receiving or sending communication status information regarding the radio terminal on the second cell.~~

According to a sixth aspect of the present invention, there is provided a communication control method in a first radio station

operating a first cell, the method comprising: communicating with a radio terminal performing Dual Connectivity which is configured with the first cell as a Primary Cell (PCell) and either a second cell operated by a second radio station or a third cell operated by a third radio station as a Secondary Cell (SCell); and receiving a first SN (Sequence Number) Status Transfer message from the second radio station and transmitting a second SN Status Transfer message to the third radio station, within a procedure changing a radio station operating the SCell of the radio terminal from the second radio station to the third radio station.

[0020]

~~According to a seventh aspect of the present invention, there is provided a communication control method in a second radio station that serves a second cell, the method comprising: when changing a secondary cell to a third cell served by a third radio station while a radio terminal is using a first cell served by a first radio station as a primary cell and using the second cell as the secondary cell, receiving at least one of (a) a request to abort data communication with the radio terminal in the second cell and (b) a request to send communication status information regarding the radio terminal on the second cell; and performing at least one of aborting the data communication and sending the communication status information.~~

According to a seventh aspect of the present invention, there is provided a communication control method in a second radio station operating a second cell, the method comprising: communicating with a radio terminal performing Dual Connectivity which is configured with a first cell operated by a first radio station as a Primary Cell (PCell) and the second cell operated by the second radio station as a Secondary Cell (SCell); and transmitting a first SN (Sequence Number) Status Transfer message to the first radio station, within a procedure changing a radio station operating the SCell of the radio terminal from the second radio station to a third radio station operating a third cell.

[0021]

~~According to an eight aspect of the present invention, there is provided a communication control method in a third radio station that serves a third cell, the method comprising: when changing a secondary cell to the third cell while a radio terminal is using a first cell served by a first radio station as a primary cell and a second cell served by a second radio station as the secondary cell, receiving, from the first radio station or the second radio station, communication status information regarding the radio terminal on the second cell.~~

According to an eighth aspect of the present invention, there is provided a communication control method in a third radio station operating a third cell, the method comprising: communicating with a radio terminal performing Dual Connectivity which is configured with a first cell operated by a first radio station as a Primary Cell (PCell) and the third cell operated by the third radio station as a Secondary Cell (SCell); and receiving a second SN (Sequence Number) Status Transfer message from the first radio station, within a procedure changing a radio station operating the SCell of the radio terminal to the third radio station from a second radio station operating a second cell.

[0022]

~~According to a ninth aspect of the present invention, there is provided a communication control method in a radio terminal, the method comprising: while using a first cell served by a first radio station as a primary cell, using a second cell served by a second radio station as a secondary cell; and when the first cell is being used as the primary cell and the second cell is being used as the secondary cell, changing the secondary cell from the second cell to a third cell served by a third radio station while keeping communication status information on the second cell.~~

According to a ninth aspect of the present invention, there is provided a communication control method in a radio terminal, the method comprising: performing Dual Connectivity which is configured with a first cell operated by a first radio station as a Primary Cell

(PCell) and either a second cell operated by a second radio station or a third cell operated by a third radio station as a Secondary Cell (SCell); and keeping one or more information elements corresponding to one or more information elements commonly included in a first SN Status Transfer message and a second SN Status Transfer message while a procedure changing a radio station operating the SCell of the radio terminal from the second radio station to the third radio station, wherein the first SN Status Transfer message and the second SN Status Transfer message are transmitted from the second radio station to the first radio station and from the first radio station to the third radio station, respectively, within the procedure changing the radio station operating the SCell of the radio terminal from the second radio station to the third radio station.

[0023]

~~According to a tenth aspect of the present invention, there is provided a non-transitory computer-readable medium storing therein a program for causing a computer to perform a communication control method in a first radio station that serves a first cell, wherein the communication control method comprises: when changing a secondary cell to a third cell served by a third radio station while a radio terminal is using the first cell as a primary cell and using a second cell served by a second radio station as the secondary cell, performing at least one of: (a) sending a request to abort data communication with the radio terminal in the second cell and (b) receiving or sending communication status information regarding the radio terminal on the second cell.~~

According to a tenth aspect of the present invention, there is provided a non-transitory computer-readable medium storing therein a program for causing a computer to perform a communication control method in a first radio station operating a first cell, wherein the first radio station is configured to communicate with a radio terminal performing Dual Connectivity which is configured with the first cell as a Primary Cell (PCell) and either a second cell operated by a second

radio station or a third cell operated by a third radio station as a Secondary Cell (SCell), and the communication control method comprises receiving a first SN (Sequence Number) Status Transfer message from the second radio station and transmitting a second SN Status Transfer message to the third radio station, within a procedure changing a radio station operating the SCell of the radio terminal from the second radio station to the third radio station.

[0024]

~~According to an eleventh aspect of the present invention, there is provided a non-transitory computer-readable medium storing therein a program for causing a computer to perform a communication control method in a second radio station that serves a second cell, wherein the communication control method comprises: when changing a secondary cell to a third cell served by a third radio station while a radio terminal is using a first cell served by a first radio station as a primary cell and using the second cell as the secondary cell, receiving at least one of (a) a request to abort data communication with a radio terminal in the second cell and (b) a request to send communication status information regarding the radio terminal on the second cell; and performing at least one of aborting the data communication and sending the communication status information.~~

According to a eleventh aspect of the present invention, there is provided a non-transitory computer-readable medium storing therein a program for causing a computer to perform a communication control method in a second radio station operating a second cell, wherein the second radio station is configured to communicate with a radio terminal performing Dual Connectivity which is configured with a first cell operated by a first radio station as a Primary Cell (PCell) and the second cell operated by the second radio station as a Secondary Cell (SCell), and the communication control method comprises transmitting a first SN (Sequence Number) Status Transfer message to the first radio station, within a procedure changing a radio station operating the SCell of the radio terminal from the second radio station to a third radio station operating a third cell.

[0025]

~~According to a twelfth aspect of the present invention, there is provided a non-transitory computer-readable medium storing therein a program for causing a computer to perform a communication control method in a third radio station that serves a third cell, wherein the communication control method comprises, when changing a secondary cell to the third cell while a radio terminal is using a first cell served by a first radio station as a primary cell and a second cell served by a second radio station as the secondary cell, receiving, from the first radio station or the second radio station, communication status information regarding the radio terminal on the second cell.~~

According to a twelfth aspect of the present invention, there is provided a non-transitory computer-readable medium storing therein a program for causing a computer to perform a communication control method in a third radio station operating a third cell, wherein the third radio station is configured to communicate with a radio terminal performing Dual Connectivity which is configured with a first cell operated by a first radio station as a Primary Cell (PCell) and the third cell operated by the third radio station as a Secondary Cell (SCell), and the communication control method comprises receiving a second SN (Sequence Number) Status Transfer message from the first radio station, within a procedure changing a radio station operating the SCell of the radio terminal to the third radio station from a second radio station operating a second cell.

[0026]

~~According to a thirteenth aspect of the present invention, there is provided a non-transitory computer-readable medium storing therein a program for causing a computer to perform a communication control method in a radio terminal, wherein the communication control method comprises: while using a first cell served by a first radio station as a primary cell, using a second cell served by a second radio station as a secondary cell; and when the first cell is being used as the primary cell and the second cell is being used as the secondary cell, changing the secondary cell from the second cell to a third cell served by a third~~

~~radio station while keeping communication status information on the second cell.~~

According to a thirteenth aspect of the present invention, there is provided a non-transitory computer-readable medium storing therein a program for causing a computer to perform a communication control method in a radio terminal, wherein the radio terminal is configured to perform Dual Connectivity which is configured with a first cell operated by a first radio station as a Primary Cell (PCell) and either a second cell operated by a second radio station or a third cell operated by a third radio station as a Secondary Cell (SCell), and the communication control method comprises keeping one or more information elements corresponding to one or more information elements commonly included in a first SN Status Transfer message and a second SN Status Transfer message while a procedure changing a radio station operating the SCell of the radio terminal from the second radio station to the third radio station, wherein the first SN Status Transfer message and the second SN Status Transfer message are transmitted from the second radio station to the first radio station and from the first radio station to the third radio station, respectively, within the procedure changing the radio station operating the SCell of the radio terminal from the second radio station to the third radio station.

Advantageous Effects of Invention

[0027]

According to the above aspects, it is possible to provide a radio communication system, a radio station, a radio terminal, a communication control method, and a program capable of enabling a communication service in a secondary cell to be continued after the secondary cell is changed when a radio terminal which is simultaneously using a plurality of cells served by different radio stations changes the secondary cell from a cell of one radio station to a cell of another radio station.

Brief Description of Drawings

[0028]

Fig. 1 is a diagram illustrating a configuration example of a radio communication system according to a first embodiment.

Fig. 2 is a diagram illustrating a configuration example of a first radio station according to the first embodiment.

Fig. 3 is a diagram illustrating a configuration example of a second radio station according to the first embodiment.

Fig. 4 is a diagram illustrating a configuration example of a third radio station according to the first embodiment.

Fig. 5 is a diagram illustrating a configuration example of a radio terminal according to the first embodiment.

Fig. 6 is a flowchart illustrating an operation example of a radio terminal according to the first embodiment (Procedure Example 1).

Fig. 7 is a flowchart illustrating an operation example of a radio network according to the first embodiment (Procedure Example 1).

Fig. 8 is a sequence diagram illustrating an example of a communication control method in the radio communication system

Claims

1. A radio communication system comprising:

a radio network including a first radio station ~~that serves~~ operating a first cell, a second radio station ~~that serves~~ operating a second cell, and a third radio station ~~that serves~~ operating a third cell; and

a radio terminal that has a capability of Dual Connectivity which is configured with the first cell operated by the first radio station as a Primary Cell (PCell) and either the second cell operated by the second radio station or the third cell operated by the third radio station as a Secondary Cell (SCell), ~~while using a cell of one radio station as a primary cell, using a cell of another radio station as a secondary cell,~~

wherein the first radio station is ~~radio network and the radio terminal are~~ configured to receive a first SN Status Transfer message from the second radio station and transmit a second SN Status Transfer message to the third radio station, within a procedure changing a radio station operating the SCell of the radio terminal from the second radio station to the third radio station, ~~when the radio terminal is using the first cell as the primary cell and the second cell as the secondary cell, change the secondary cell from the second cell to the third cell while keeping communication status information regarding the radio terminal on the second cell~~.

2. The radio communication system according to Claim 1, wherein the radio network is configured to ~~keep the communication status information while a procedure for changing the secondary cell is being performed and configured to~~ allow data communication which has been provided to the radio terminal in the second cell to be continuously provided after the radio station operating the SCell ~~secondary cell~~ is changed to the third radio station ~~cell~~.

3. The radio communication system according to Claim 1 or 2, wherein the radio terminal is configured to keep ~~the communication status~~ one or more information elements corresponding to one or more information elements commonly included in the first SN Status Transfer message and the second SN Status Transfer message while ~~a~~ the procedure for changing the SCell ~~secondary cell~~ is being performed and configured to allow data communication which has been performed in

the second cell before the SCell ~~secondary cell~~ is changed to be continued in the third cell after the SCell ~~secondary cell~~ is changed.

4. The radio communication system according to any one of Claims 1 to 3, wherein the second SN Status Transfer message is same as or based on the first SN Status Transfer message ~~the communication status information includes at least one of a user data transmission status, a user data reception status, service information, bearer information, and radio resource configuration information~~.

5. The radio communication system according to Claim ~~1–4~~ 1, wherein the first SN Status Transfer message and the second SN Status Transfer message each include ~~the user data transmission status and the user data reception status include~~ at least one of a PDCP SN, an E-RAB ID, a Receive Status of UL PDCP SDUs, an UL COUNT Value (PDCP SN + HFN), and a DL COUNT Value (PDCP SN + HFN)~~, and a RLC STATUS~~.

~~6. The radio communication system according to any one of Claims 1 to 5, wherein~~

~~one of the first radio station and the third radio station is configured to request the second radio station to report the communication status information, and~~

~~the second radio station is configured to report the communication status information to the first radio station or the third radio station.~~

~~7~~6. The radio communication system according to any one of Claims 1 to ~~6~~5, wherein

the first radio station is configured to request the second radio station to abort communication with the radio terminal in the second cell, and

the second radio station is configured to abort the communication with the radio terminal in the second cell.

~~8~~7. The radio communication system according to any one of Claims 1 to ~~7~~6, wherein

the radio network further includes an upper-level network device, and

at least one of the first radio station and the second radio station is configured to request the upper-level network device to switch a bearer, configured in the second radio station for the radio terminal, to the first radio station, and

the upper-level network device is configured to switch the bearer for the radio terminal to the first radio station.

~~9~~8. The radio communication system according to any one of Claims 1 to ~~8~~7, wherein

the radio network further includes an upper-level network device,

at least one of the first radio station, the second radio station, and the third radio station is configured to request the upper-level network device to switch a bearer, configured in the second radio station for the radio terminal, to the third radio station, and

the upper-level network device is configured to switch the bearer for the radio terminal to the third radio station.

~~10~~9. The radio communication system according to any one of Claims 1 to ~~9~~8, wherein the radio terminal is configured to release a secondary bearer in the second cell while keeping configuration information of the secondary bearer and configured to re-establish the secondary bearer in the third cell.

~~11~~10. The radio communication system according to Claim 3 ~~any one of Claims 1 to 9~~, wherein the radio terminal is configured to release a bearer in the second cell while keeping the one or more information elements corresponding to one or more information elements commonly included in the first SN Status Transfer message and the second SN Status Transfer message ~~the communication status information~~ and configured to configure a new bearer in the third cell.

~~12~~11. The radio communication system according to any one of Claims 1 to ~~11~~10, wherein the first radio station is configured to instruct the radio terminal to change the SCell ~~secondary cell~~ while keeping, in the radio terminal, the one or more information elements corresponding to one or more information elements commonly included in the first SN Status Transfer message and the second SN Status Transfer message ~~communication status information in the radio terminal~~.

~~13~~12. A first radio station operating ~~that serves~~ a first cell, the first radio station comprising:

a transceiver configured to communicate with a radio terminal performing Dual Connectivity which is configured with the first cell as a Primary Cell (PCell) and either a second cell operated by a second radio station or a third cell operated by a third radio station as a Secondary Cell (SCell)~~radio communication means for serving the first cell~~; and

an interface configured to receive a first SN (Sequence Number) Status Transfer message from the second radio station and transmit a second SN Status Transfer message to the third radio station, within a procedure changing a radio station operating the SCell of the radio terminal from the second radio station to the third radio station~~communication control means for, when changing a secondary cell to a third cell served by a third radio station while a radio terminal is using the first cell as a primary cell and using a second cell served by a second radio station as the secondary cell, performing at least one of: (a) sending a request to abort data communication with the radio terminal in the second cell; and (b) receiving or sending communication status information regarding the radio terminal on the second cell~~.

~~14~~13. The first radio station according to Claim ~~13~~12, wherein the second SN Status Transfer message is same as or based on the first SN Status Transfer message~~the communication status information is used by the third radio station in order to provide, in the third cell, the data communication which has been provided to the radio terminal in the second cell as the secondary cell~~.

~~15. The first radio station according to Claim 13 or 14, wherein the communication control means requests the second radio station to report the communication status information.~~

~~16. The first radio station according to any one of Claims 13 to 15, wherein the communication control means receives the communication status information regarding the radio terminal on the second cell from the second radio station and sends the communication status information to the third radio station.~~

~~17~~14. The first radio station according to Claim 12 or 13~~any one of Claims 13 to 16~~, wherein the interface is further configured to send~~communication control means sends~~, to the second radio station, the request to abort the data communication.

~~18~~15. The first radio station according to any one of Claims ~~13~~12 to ~~17~~14, wherein the interface is further configured to request ~~communication control means further requests~~ the radio terminal to change the SCell ~~secondary cell~~ while keeping one or more information elements corresponding to one or more information elements commonly included in the first SN Status Transfer message and the second SN Status Transfer message~~the communication status information in the radio terminal~~.

~~19~~16. A second radio station operating ~~that serves~~ a second cell, the second radio station comprising:

a transceiver configured to communicate with a radio terminal performing Dual Connectivity which is configured with a first cell operated by a first radio station as a Primary Cell (PCell) and the second cell operated by the second radio station as a Secondary Cell (SCell) ~~radio communication means for serving the second cell~~; and

an interface configured to transmit a first SN (Sequence Number) Status Transfer message to the first radio station, within a procedure changing a radio station operating the SCell of the radio terminal from the second radio station to a third radio station operating a third cell ~~communication control means for, when changing a secondary cell to a third cell served by a third radio station while a radio terminal is using a first cell served by a first radio station as a primary cell and using the second cell as the secondary cell, receiving at least one of: (a) a request to abort data communication with the radio terminal in the second cell; and (b) a request to send communication status information regarding the radio terminal on the second cell, and for performing at least one of aborting the data communication and sending the communication status information~~.

~~20~~17. The second radio station according to Claim ~~19~~16, wherein the first SN Status Transfer message is used by the first radio station to transmit a second SN Status Transfer message to the third base station~~the communication control means~~

~~sends the communication status information to the first radio station or the third radio station~~.

~~21~~18. The second radio station according to Claim 16 or 17 ~~19 or 20~~, wherein the second SN Status Transfer message ~~communication status information~~ is used by the third radio station in order to allow ~~the~~ data communication which has been provided to the radio terminal in the second cell as the SCell ~~secondary cell~~ to be continuously provided in the third cell after the radio station operating the SCell is changed to the third radio station.

~~22~~19. A third radio station operating ~~that serves~~ a third cell, the third radio station comprising:

a transceiver configured to communicate with a radio terminal performing Dual Connectivity which is configured with a first cell operated by a first radio station as a Primary Cell (PCell) and the third cell operated by the third radio station as a Secondary Cell (SCell) ~~radio communication means for serving the third cell~~; and

an interface configured to receive a second SN (Sequence Number) Status Transfer message from the first radio station, within a procedure changing a radio station operating the SCell of the radio terminal to the third radio station from a second radio station operating a second cell ~~communication control means for, when changing a secondary cell to the third cell while a radio terminal is using a first cell served by a first radio station as a primary cell and a second cell served by a second radio station as the secondary cell, receiving, from the first radio station or the second radio station, communication status information regarding the radio terminal on the second cell~~.

~~23~~20. The third radio station according to Claim ~~22~~19, wherein the second SN Status Transfer message is same as or based on a first SN Status Transfer message transmitted from the second radio station to the first radio station within the procedure changing the radio station operating the SCell of the radio terminal to the third radio station from the second radio station ~~the communication control means requests the second radio station to send the communication status information~~.

~~24~~21. The third radio station according to Claim 18 or 19~~-22 or 23~~, wherein the interface is further configured to perform ~~communication control means performs~~ control to allow data communication which has been provided to the radio terminal in the second cell as the SCell ~~secondary cell~~ to be continuously provided in the third cell after the radio station operating the SCell ~~secondary cell~~ is changed to the third radio station ~~cell~~.

~~25~~22. A radio terminal comprising:

a transceiver configured to perform Dual Connectivity which is configured with a first cell operated by a first radio station as a Primary Cell (PCell) and either a second cell operated by a second radio station or a third cell operated by a third radio station as a Secondary Cell (SCell) ~~radio communication means for communicating with first to third radio stations~~; and

a controller configured to keep one or more information elements corresponding to one or more information elements commonly included in a first SN Status Transfer message and a second SN Status Transfer message while a procedure changing a radio station operating the SCell of the radio terminal from the second radio station to the third radio station, wherein the first SN Status Transfer message and the second SN Status Transfer message are transmitted from the second radio station to the first radio station and from the first radio station to the third radio station, respectively, within the procedure changing the radio station operating the SCell of the radio terminal from the second radio station to the third radio station ~~communication control means for performing control of, while using a first cell served by the first radio station as a primary cell, using a second cell served by the second radio station as a secondary cell, wherein~~

~~the communication control means is further configured to, when the first cell is being used as the primary cell and the second cell is being used as the secondary cell, change the secondary cell from the second cell to a third cell served by the third radio station while keeping communication status information on the second cell~~.

~~26~~23. The radio terminal according to Claim ~~25~~22, wherein the controller is configured to use the one or more information elements corresponding to one or more information elements commonly included in the first SN Status Transfer message and the second SN Status Transfer message to allow ~~communication control~~

~~means allows~~ data communication which has been provided in the second cell as the SCell ~~secondary cell~~ to be resumed in the third cell after the radio station operating SCell ~~secondary cell~~ is changed to the third radio station ~~cell~~.

~~27~~24. The radio terminal according to Claim ~~25 or 26~~ 22 or 23, wherein the controller is configured to release communication control means releases a secondary bearer in the second cell while keeping configuration information of the secondary bearer ~~in addition to the communication status information~~ and re-establishes the secondary bearer in the third cell.

~~28~~25. The radio terminal according to Claim ~~25 or 26~~ 22 or 23, wherein the controller is configured to release ~~communication control means releases~~ a bearer in the second cell while keeping the one or more information elements corresponding to one or more information elements commonly included in the first SN Status Transfer message and the second SN Status Transfer message ~~communication status information~~ and configures a new bearer in the third cell.

~~29~~26. The radio terminal according to any one of Claims ~~25~~22 to ~~28~~25, wherein the second SN Status Transfer message is same as or based on the first SN Status Transfer message ~~the communication status information includes at least one of a user data transmission status, a user data reception status, service information, bearer information, and radio resource configuration information~~.

~~30~~27. The radio terminal according to any one of Claims ~~25~~22 to ~~29~~26, wherein the controller is configured to receive ~~communication control means receives~~ from the first radio station an instruction to change the SCell ~~secondary cell~~ while keeping the one or more information elements corresponding to one or more information elements commonly included in the first SN Status Transfer message and the second SN Status Transfer message ~~communication status information on the second cell~~.

~~31~~28. The radio terminal according to any one of Claims ~~25~~22 to ~~30~~27, wherein the radio terminal performs data communication in the first cell while keeping the one or more information elements corresponding to one or more

information elements commonly included in the first SN Status Transfer message and the second SN Status Transfer message ~~communication status information on the second cell~~ while ~~a~~ the procedure for changing the SCell ~~secondary cell~~ is being performed.

~~32~~29. A communication control method in a first radio station operating ~~that serves~~ a first cell, the method comprising:

communicating with a radio terminal performing Dual Connectivity which is configured with the first cell as a Primary Cell (PCell) and either a second cell operated by a second radio station or a third cell operated by a third radio station as a Secondary Cell (SCell); and

receiving a first SN (Sequence Number) Status Transfer message from the second radio station and transmitting a second SN Status Transfer message to the third radio station, within a procedure changing a radio station operating the SCell of the radio terminal from the second radio station to the third radio station ~~when changing a secondary cell to a third cell served by a third radio station while a radio terminal is using the first cell as a primary cell and using a second cell served by a second radio station as the secondary cell, performing at least one of: (a) sending a request to abort data communication with the radio terminal in the second cell; and (b) receiving or sending communication status information regarding the radio terminal on the second cell~~.

~~33~~30. A communication control method in a second radio station operating ~~that serves~~ a second cell, the method comprising:

communicating with a radio terminal performing Dual Connectivity which is configured with a first cell operated by a first radio station as a Primary Cell (PCell) and the second cell operated by the second radio station as a Secondary Cell (SCell); and

transmitting a first SN (Sequence Number) Status Transfer message to the first radio station, within a procedure changing a radio station operating the SCell of the radio terminal from the second radio station to a third radio station operating a third cell ~~when changing a secondary cell to a third cell served by a third radio station while a radio terminal is using a first cell served by a first radio station as a primary cell and using the second cell as the secondary cell, receiving at least one of~~

~~(a) a request to abort data communication with the radio terminal in the second cell and (b) a request to send communication status information regarding the radio terminal on the second cell; and~~

~~performing at least one of aborting the data communication and sending the communication status information~~.

~~34~~31. A communication control method in a third radio station operating ~~that serves~~ a third cell, the method comprising:

communicating with a radio terminal performing Dual Connectivity which is configured with a first cell operated by a first radio station as a Primary Cell (PCell) and the third cell operated by the third radio station as a Secondary Cell (SCell); and

receiving a second SN (Sequence Number) Status Transfer message from the first radio station, within a procedure changing a radio station operating the SCell of the radio terminal to the third radio station from a second radio station operating a second cell ~~when changing a secondary cell to the third cell while a radio terminal is using a first cell served by a first radio station as a primary cell and a second cell served by a second radio station as the secondary cell, receiving, from the first radio station or the second radio station, communication status information regarding the radio terminal on the second cell~~.

~~35~~32. The communication control method according to Claim ~~34~~31, further comprising allowing data communication which has been provided to the radio terminal in the second cell as the SCell ~~secondary cell~~ to be continuously provided in the third cell after the radio station operating the SCell ~~secondary cell~~ is changed to the third radio station ~~cell~~.

~~36~~33. A communication control method in a radio terminal, the method comprising:

performing Dual Connectivity which is configured with a first cell operated by a first radio station as a Primary Cell (PCell) and either a second cell operated by a second radio station or a third cell operated by a third radio station as a Secondary Cell (SCell) ~~while using a first cell served by a first radio station as a primary cell, using a second cell served by a second radio station as a secondary cell~~; and

keeping one or more information elements corresponding to one or more information elements commonly included in a first SN Status Transfer message and a second SN Status Transfer message while a procedure changing a radio station operating the SCell of the radio terminal from the second radio station to the third radio station, wherein the first SN Status Transfer message and the second SN Status Transfer message are transmitted from the second radio station to the first radio station and from the first radio station to the third radio station, respectively, within the procedure changing the radio station operating the SCell of the radio terminal from the second radio station to the third radio station ~~when the first cell is being used as the primary cell and the second cell is being used as the secondary cell, changing the secondary cell from the second cell to a third cell served by a third radio station while keeping communication status information on the second cell~~.

~~37~~34. The communication control method according to Claim ~~36~~33, further comprising allowing data communication which has been performed in the second cell as the SCell ~~secondary cell~~ to be resumed in the third cell after the radio station operating the SCell ~~secondary cell~~ is changed to the third radio station ~~cell~~.

~~38~~35. A non-transitory computer-readable medium storing therein a program for causing a computer to perform a communication control method in a first radio station operating ~~that serves~~ a first cell, wherein

the first radio station is configured to communicate with a radio terminal performing Dual Connectivity which is configured with the first cell as a Primary Cell (PCell) and either a second cell operated by a second radio station or a third cell operated by a third radio station as a Secondary Cell (SCell), and

the communication control method comprises~~:~~ receiving a first SN (Sequence Number) Status Transfer message from the second radio station and transmitting a second SN Status Transfer message to the third radio station, within a procedure changing a radio station operating the SCell of the radio terminal from the second radio station to the third radio station

~~when changing a secondary cell to a third cell served by a third radio station while a radio terminal is using the first cell as a primary cell and using a second cell served by a second radio station as the secondary cell, performing at least one of: (a) sending a request to abort data communication with the radio terminal in the second~~

~~cell and (b) receiving or sending communication status information regarding the radio terminal on the second cell~~.

~~39~~36. A non-transitory computer-readable medium storing therein a program for causing a computer to perform a communication control method in a second radio station operating ~~that serves~~ a second cell, wherein

the second radio station is configured to communicate with a radio terminal performing Dual Connectivity which is configured with a first cell operated by a first radio station as a Primary Cell (PCell) and the second cell operated by the second radio station as a Secondary Cell (SCell), and

the communication control method comprises~~:~~ transmitting a first SN (Sequence Number) Status Transfer message to the first radio station, within a procedure changing a radio station operating the SCell of the radio terminal from the second radio station to a third radio station operating a third cell

~~when changing a secondary cell to a third cell served by a third radio station while a radio terminal is using a first cell served by a first radio station as a primary cell and using the second cell as the secondary cell, receiving at least one of (a) a request to abort data communication with a radio terminal in the second cell and (b) a request to send communication status information regarding the radio terminal on the second cell; and~~

~~performing at least one of aborting the data communication and sending the communication status information~~.

~~40~~37. A non-transitory computer-readable medium storing therein a program for causing a computer to perform a communication control method in a third radio station operating ~~that serves~~ a third cell, wherein

the third radio station is configured to communicate with a radio terminal performing Dual Connectivity which is configured with a first cell operated by a first radio station as a Primary Cell (PCell) and the third cell operated by the third radio station as a Secondary Cell (SCell), and

the communication control method comprises~~,~~ receiving a second SN (Sequence Number) Status Transfer message from the first radio station, within a procedure changing a radio station operating the SCell of the radio terminal to the third radio station from a second radio station operating a second cell ~~when changing~~

~~a secondary cell to the third cell while a radio terminal is using a first cell served by a first radio station as a primary cell and a second cell served by a second radio station as the secondary cell, receiving, from the first radio station or the second radio station, communication status information regarding the radio terminal on the second cell~~.

~~41~~38. A non-transitory computer-readable medium storing therein a program for causing a computer to perform a communication control method in a radio terminal, wherein

the radio terminal is configured to perform Dual Connectivity which is configured with a first cell operated by a first radio station as a Primary Cell (PCell) and either a second cell operated by a second radio station or a third cell operated by a third radio station as a Secondary Cell (SCell), and

the communication control method comprises~~:~~ keeping one or more information elements corresponding to one or more information elements commonly included in a first SN Status Transfer message and a second SN Status Transfer message while a procedure changing a radio station operating the SCell of the radio terminal from the second radio station to the third radio station, wherein the first SN Status Transfer message and the second SN Status Transfer message are transmitted from the second radio station to the first radio station and from the first radio station to the third radio station, respectively, within the procedure changing the radio station operating the SCell of the radio terminal from the second radio station to the third radio station

~~while using a first cell served by a first radio station as a primary cell, using a second cell served by a second radio station as a secondary cell; and~~

~~when the first cell is being used as the primary cell and the second cell is being used as the secondary cell, changing the secondary cell from the second cell to a third cell served by a third radio station while keeping communication status information on the second cell~~.