

[0001] RADIO NETWORK CONTROLLER EXCHANGE OF
EQUIPMENT INFORMATION

[0002] FIELD OF INVENTION

[0003] This invention relates to wireless communication systems. In particular, the invention relates to the transfer of information between radio network controllers in such systems.

[0004] BACKGROUND

[0005] Figure 1 is an illustration of a wireless communication system where all the users are handled by a radio network controller (RNC) 20. Each user, wireless transmit/receive unit (WTRU) 24, wirelessly communicates with a Node-B 22₁. A group of Node-Bs 22₁-22₂ are controlled by the radio network controller (RNC) 20.

[0006] As the WTRU 24 moves, the WTRU 24₁, 24₂ is handed off between base stations/Node-Bs 32,34. Figure 2 is an illustration of a WTRU 24₁, 24₂ moving from an area handled by a first RNC 28 to an area handled by a second RNC 26. The WTRU 24₂ is considered to have "drifted" into the new RNC's region and that RNC (the second RNC) is considered the drift RNC (D-RNC) 26. The D-RNC 26 has Node-Bs 32, which it controls. The first RNC is referred to as the servicing RNC (S-RNC) 28. Typically, the RNCs (S-RNC 28 and D-RNC 26) can communicate some information to each other over a RNC interface (Iur). After the WTRU 24₂ "drifts" to the D-RNC 26, the D-RNC 26 performs functions, such as dynamic channel allocation (DCA), admission control, scheduling and RRM functions for the "drifting" WTRU 24₂. The S-RNC 28 still performs other functions for the "drifting" WTRU 24₂, such as handoff decisions and collecting of WTRU downlink measurements. When the WTRU 24 has not "drifted", such as in Figure 1, the RNC 20 handling the WTRU 24 performs the functions of both the S-RNC 28 and D-RNC 26.

[0007] Under the R99, R4 and R5 Iur specifications as proposed for the third generation partnership project (3GPP), when the WTRU 24₁, 24₂ is handed

over from the S-RNC 28 to the D-RNC 26, cell loading and many Node-B measurements are sent from the S-RNC 28 to the D-RNC 26. However, there is no mechanism to transfer certain information from the S-RNC 28 to the D-RNC 26, such as the WTRU measurements.

[0008] Accordingly, it is desirable to have better peer-to-peer communications between RNCs.

[0009]

SUMMARY

[0010] In embodiments of the present invention, a drifting wireless transmit/receive unit (WTRU) has an associated drift radio network controller (D-RNC) and an associated servicing radio network controller (S-RNC). The D-RNC sends a request message to the S-RNC requesting measurements of the drifting WTRU. The S-RNC receives the request message and sends an information message with the requested measurements to the D-RNC. The D-RNC receives the the information message.

[0010a] According to a first aspect of the present invention, there is provided a wideband code division multiple access (W-CDMA) drift radio network controller (DRNC) comprising: a logic device configured to control a measurement request device such that the measurement request device requests common measurements using a global procedures module of a radio network sublayer application part (RNSAP) procedures over a radio network controller interface (IUR) for another radio network controller (RNC), the common measurements including received total wideband power, load and global positioning system (GPS) timing information; and the logic device configured to control the measurement request device such that the measurement request device requests user measurements from a serving radio network controller (SRNC) using RNSAP procedures over the IUR, the user measurements including received signal code power (RSCP) and interference signal code power (ISCP).

[0010b] According to a second aspect of the present invention, there is

provided a wideband code division multiple access (W-CDMA) serving radio network controller (SRNC) comprising: a measurement response device configured such that the measurement response device in response to receiving requests for common measurements using a global procedures module of a radio network sublayer application part (RNSAP) procedures from a radio network controller interface (IUR), sending a response message using the global procedures module of the RNSAP procedures over the IUR, the common measurements including received total wideband power, load and global positioning system (GPS) timing information; and the measurement response device configured such that in response to receiving requests for user measurements from a drift radio network controller (DRNC) using RNSAP procedures via the IUR, the measurement response device sends the user measurements to the DRNC using RNSAP procedures over the IUR, the user measurements including received signal code power (RSCP) and interference signal code power (ISCP).

[0010c] According to a third aspect of the present invention, there is provided a wideband code division multiple access (W-CDMA) radio network controller (RNC) configured to operate as a serving radio network controller (SRNC) and a drift radio network controller (DRNC), the RNC comprising: a logic device configured to control a measurement request device such that the measurement request device requests common measurements using a global procedures module of a radio network sublayer application part (RNSAP) procedures over a radio network controller interface (IUR) for another radio network controller (RNC), the common measurements including received total wideband power, load and global positioning system (GPS) timing information; a measurement response device configured such that the measurement response device in response to receiving requests for the common measurements using the global procedures module of RNSAP procedures from the IUR, sends a response message using the global procedures module of the RNSAP procedures over the

IUR; the logic device configured when the RNC operates as the DRNC to control the measurement request device such that the measurement request device requests user measurements from another SRNC using RNSAP procedures over the IUR, the user measurements including received signal code power (RSCP) and interference signal code power (ISCP); and the measurement response device configured such that when the RNC operates as the SRNC and in response to receiving requests for user measurements from another DRNC using RNSAP procedures via the IUR, the measurement response device sends the user measurements to the DRNC using RNSAP procedures over the IUR.

[0010d] According to a fourth aspect of the present invention, there is provided a method for use in a wideband code division multiple access communication system having a serving radio network controller (SRNC) and a drift radio network controller (DRNC), the method comprising: requesting by one of the DRNC and the SRNC common measurements using a global procedures module of a radio network sublayer application part (RNSAP) procedures over a radio network controller interface (IUR) for an other of the DRNC and the SRNC, the common measurements including received total wideband power, load and global positioning system (GPS) timing information; in response to receiving requests for the common measurements using the global procedures module of the RNSAP procedures from the IUR by the other of the DRNC and the SRNC, sending a response message using the global procedures module of the RNSAP procedures over the IUR; the DRNC requesting user measurements from the SRNC using the RNSAP procedures over the IUR, the user measurements including received signal code power (RSCP) and interference signal code power (ISCP); and the SRNC in response to receiving the request for user measurements, sending the user measurements to the DRNC using RNSAP procedures over the IUR.

[0011] BRIEF DESCRIPTION OF THE DRAWING(S)

[0012] Figure 1 is an illustration of a RNC handling a WTRU.

[0013] Figure 2 is an illustration of a WTRU drifting between RNCs.

[0014] Figure 3 is a block diagram of a preferred embodiment for peer-to-peer information exchange.

[0015] Figure 4 is a flow chart of a preferred embodiment for peer-to-peer information exchange.

[0016] DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

[0017] Although the preferred embodiments are described in conjunction with a third generation partnership program (3GPP) wideband code division multiple access (W-CDMA) system, the embodiments are applicable to other wireless communication systems.

[0018] Hereafter, a wireless transmit/receive unit (WTRU) includes but is not limited to a user equipment, mobile station, fixed or mobile subscriber unit,

pager, or any other type of device capable of operating in a wireless environment.

[0019] Figure 3 is a simplified block diagram of a S-RNC 40, a D-RNC 38 and an IUR 36 for a "drifting" WTRU 24₂ using peer-to-peer information exchange. Figure 4 is a flow chart of peer-to-peer information exchange. The S-RNC 40 typically performs functions such as handoff decisions and collecting of WTRU downlink measurements for the "drifting" WTRU 24₂. The D-RNC 38 typically performs functions such as DCA, admission control, scheduling and RRM functions for the "drifting" WTRU 24₂.

[0020] The D-RNC 38 has a RRM 42. The RRM 42 controls the resources for the WTRUs of cells associated with the D-RNC 38. The D-RNC 38 collects uplink measurements for the cell of the "drifting" WTRU 24₂ as well as other cells using an uplink measurement collection device 44. These measurements are available to the RRM 42 for use in resource allocation and management. The RRM 42 also has information for WTRUs that it is performing S-RNC functions.

[0021] The D-RNC 38 has logic associated with the RRM 42. When the RRM 42 requires downlink measurements of the "drifting" WTRU 24₂ or a group of WTRUs, the logic 46 initiates a WTRU measurement request device 48 to send a message through the Iur 36 for such information, step 60.

[0022] Examples of the information that may be requested by the D-RNC 38, include downlink common control physical channel (CCPCH) received signal code power (RSCP), interference signal code power (ISCP) measurements and/or traffic volume measurements. Preferably, the D-RNC information request messages can not request the WTRU 24₂ to make and send measurements, but the D-RNC 38 requests such measurement information currently available at the S-RNC 40.

[0023] The signaling messages on the Iur 36 allows any D-RNC 38 to initiate information exchange with S-RNCs on an individual WTRU, groups of WTRUs or WTRUs present in one or more cells for which it does not assume itself the role of an S-RNC. This procedure is preferably not a simple "forwarding" of WTRU-specific information, such as WTRU measurements. Preferably, the D-

RNC logic 46 generally makes the decision of the type of information to request, although the logic function 46 may be performed by the controlling RNC (C-RNC). A logic function 46 in the D-RNC 38 decides if and when it will request measurements to be forwarded from the S-RNC 40. For example, if the D-RNC 38 detects that more than a threshold number or percentage, such as 10%, of its WTRUs are in "drift" mode, it would typically start requesting measurements to be forwarded. In the preferred implementation, existing information elements and standardized WTRU measurements/reporting mechanisms defined by the 3GPP standard for Node-B interface (Iub)/Iur are utilized.

[0024] One preferred message allows the D-RNC 38 to request measurements for a particular "drift" WTRU 24₂ for a given time frame or for all the "drift" WTRUs in a given cell or group of cells associated with the S-RNC 40 for a given time frame. One scenario that requesting a group of WTRUs information is desirable is when many WTRUs having a particular S-RNC are in "drift" mode. For example, a first train station is supported by a first RNC and a second train station by a second RNC. All of the WTRUs boarding a train starting at the first station and departing at the second station may have the first RNC as the S-RNC 40 and the second RNC as the D-RNC 38. In this scenario, requesting WTRU information for the group of "drifting" WTRUs reduces the messaging overhead. However, a scenario where the procedure allows only a single WTRU per message may be used, with increased messaging overhead.

[0025] The message is received by the "drifting" WTRU's S-RNC 40, step 62. That S-RNC 40 has a WTRU measurement collection device 52. The WTRU measurement collection device 52 stores the particular WTRU's downlink measurements. A WTRU measurement response device 50 sends a measurement/information message to the D-RNC 38 through the Iur 36, step 64. The D-RNC RRM 42 uses these measurements in its resource allocations and management, step 66. One benefit of transferring such data through the IUR 36 is such data transfer is typically quite fast.

[0026] One preferred approach for requesting and transferring the WTRU measurements uses the radio network sublayer application part (RNSAP) procedures. RNSAP has four basic modules. One of these modules is the "Global Procedures" module. That module contains procedures that involve signaling for exchange of cell level information between RNCs. For example, received total wide band power, load and global positioning system (GPS) timing information is exchanged using the Common Measurement messages.

[0027] The list of information exchanged using RNSAP Global Procedures is expanded to allow for better RRM. In particular, this information aids primarily handover decisions. For example, information associated with cell biasing of handovers to neighboring RNCs would aid in such decisions. In the proposed 3GPP system, the information exchanged using the Global Procedures module is not related to a particular WTRU or group of WTRUs. As a result, it does not support the transfer of WTRU data transfer across the Iur 36. Preferably, information should be transferred across the Iur 36 using RNSAP procedures, if the analogous cell information is available in the S-RNC 40 for relevant RRM decisions by the D-RNC 38.

[0028] Such information exchange over the Iur 36 allows a D-RNC 38 to request WTRU measurement information from the S-RNC 40 and allows more cell information to be exchanged between peer RNCs using the RNSAP Global Procedures module. Typically, this exchange of information enhances the performance of RRM algorithms (DCA, Admission Control, Scheduling and others) in the D-RNC 38, due to the availability of WTRU measurements. Enhanced RRM, especially DCA, facilitates performance, efficiency and robustness in wireless systems, such as the time division duplex (TDD) mode of 3GPP.

* * *

CLAIMS

1. A wideband code division multiple access (W-CDMA) drift radio network controller (DRNC) comprising:
 - a logic device configured to control a measurement request device such that the measurement request device requests common measurements using a global procedures module of a radio network sublayer application part (RNSAP) procedures over a radio network controller interface (IUR) for another radio network controller (RNC), the common measurements including received total wideband power, load and global positioning system (GPS) timing information; and
 - the logic device configured to control the measurement request device such that the measurement request device requests user measurements from a serving radio network controller (SRNC) using RNSAP procedures over the IUR, the user measurements including received signal code power (RSCP) and interference signal code power (ISCP).
2. The DRNC as claimed in claim 1 wherein the RSCP is the RSCP of a common control channel.
3. The DRNC as claimed in claims 1 or 2 wherein the measurement request device is configured to receive responses to the requests for common measurements and user measurements.
4. The DRNC as claimed in claims 1, 2 or 3 comprising a measurement collection device for storing the received responses.
5. A wideband code division multiple access (W-CDMA) serving radio network controller (SRNC) comprising:
 - a measurement response device configured such that the measurement response device in response to receiving requests for common measurements

using a global procedures module of a radio network sublayer application part (RNSAP) procedures from a radio network controller interface (IUR), sending a response message using the global procedures module of the RNSAP procedures over the IUR, the common measurements including received total wideband power, load and global positioning system (GPS) timing information; and

the measurement response device configured such that in response to receiving requests for user measurements from a drift radio network controller (DRNC) using RNSAP procedures via the IUR, the measurement response device sends the user measurements to the DRNC using RNSAP procedures over the IUR, the user measurements including received signal code power (RSCP) and interference signal code power (ISCP).

6. The SRNC as claimed in claim 5 wherein the RSCP is the RSCP of a common control channel.

7. The SRNC as claimed in claims 5 or 6 wherein the measurement response device is configured to retrieve the user measurements from a measurement collection device.

8. A wideband code division multiple access (W-CDMA) radio network controller (RNC) configured to operate as a serving radio network controller (SRNC) and a drift radio network controller (DRNC), the RNC comprising:

a logic device configured to control a measurement request device such that the measurement request device requests common measurements using a global procedures module of a radio network sublayer application part (RNSAP) procedures over a radio network controller interface (IUR) for another radio network controller (RNC), the common measurements including received total wideband power, load and global positioning system (GPS) timing information;

a measurement response device configured such that the measurement response device in response to receiving requests for the common measurements using the global procedures module of RNSAP procedures from the IUR, sends a

response message using the global procedures module of the RNSAP procedures over the IUR;

the logic device configured when the RNC operates as the DRNC to control the measurement request device such that the measurement request device requests user measurements from another SRNC using RNSAP procedures over the IUR, the user measurements including received signal code power (RSCP) and interference signal code power (ISCP); and

the measurement response device configured such that when the RNC operates as the SRNC and in response to receiving requests for user measurements from another DRNC using RNSAP procedures via the IUR, the measurement response device sends the user measurements to the DRNC using RNSAP procedures over the IUR.

9. The RNC as claimed in claim 8 wherein the RSCP is the RSCP of a common control channel.

10. The RNC as claimed in claims 8 or 9 wherein the measurement request device is configured to receive responses to the requests for common measurements.

11. The RNC as claimed in claims 8, 9 or 10 comprising a measurement collection device for storing the received responses.

12. A method for use in a wideband code division multiple access communication system having a serving radio network controller (SRNC) and a drift radio network controller (DRNC), the method comprising:

requesting by one of the DRNC and the SRNC common measurements using a global procedures module of a radio network sublayer application part (RNSAP) procedures over a radio network controller interface (IUR) for an other

of the DRNC and the SRNC, the common measurements including received total wideband power, load and global positioning system (GPS) timing information;

in response to receiving requests for the common measurements using the global procedures module of the RNSAP procedures from the IUR by the other of the DRNC and the SRNC, sending a response message using the global procedures module of the RNSAP procedures over the IUR;

the DRNC requesting user measurements from the SRNC using the RNSAP procedures over the IUR, the user measurements including received signal code power (RSCP) and interference signal code power (ISCP); and

the SRNC in response to receiving the request for user measurements, sending the user measurements to the DRNC using RNSAP procedures over the IUR.

13. The method as claimed in claim 12 wherein the RSCP is the RSCP of a common control channel.