COORDINATED SCHEDULING WITH ADAPTIVE MUTING

CROSS REFERENCE TO RELATED APPLICATION:

[0001] This application is a continuation-in-part of application Ser. No. 14/018,078, filed Sep. 4, 2013.

BACKGROUND

[0002] 1. Field

[0003] Embodiments of the invention generally relate to mobile communications networks, such as, but not limited to, the Universal Mobile Telecommunications System (UMTS) Terrestrial Radio Access Network (UTRAN), Long Term Evolution (LTE) Evolved UTRAN (E-UTRAN), and/or LTE-A.

[0004] 2. Description of the Related Art

[0005] Universal Mobile Telecommunications System (UMTS) Terrestrial Radio Access Network (UTRAN) refers to a communications network including base stations, or Node Bs, and for example radio network controllers (RNC). UTRAN allows for connectivity between the user equipment (UE) and the core network (UEs are also commonly known as user devices or just users). The RNC provides control functionalities for one or more Node Bs. The RNC and its corresponding Node Bs are called the Radio Network Subsystem (RNS). In case of E-UTRAN (enhanced UTRAN), no RNC exists and most of the RNC functionalities are contained in the enhanced Node B (eNodeB or eNB).

[0006] Long Term Evolution (LTE) or E-UTRAN refers to improvements of the UMTS through improved efficiency and services, lower costs, and use of new spectrum opportunities. In particular, LTE is a 3GPP standard that provides for uplink peak rates of at least 50 megabits per second (Mbps) and downlink peak rates of at least 100 Mbps. LTE supports scalable carrier bandwidths from 20 MHz down to 1.4 MHz and supports both Frequency Division Duplexing (FDD) and Time Division Duplexing (TDD).

[0007] As mentioned above, LTE may also improve spectral efficiency in networks, allowing carriers to provide more data and voice services over a given bandwidth. Therefore, LTE is designed to fulfill the needs for high-speed data and media transport in addition to high-capacity voice support. Advantages of LTE include, for example, high throughput, low latency, FDD and TDD support in the same platform, an improved end-user experience, and a simple architecture resulting in low operating costs.

[0008] Further releases of 3GPP LTE (e.g., LTE Rel-10, LTE Rel-11, LTE Rel-12) are targeted towards future international mobile telecommunications advanced (IMT-A) systems, referred to herein for convenience simply as LTE-Advanced (LTE-A).

[0009] LTE-A is directed toward extending and optimizing the 3GPP LTE radio access technologies. A goal of LTE-A is to provide significantly enhanced services by means of higher data rates and lower latency with reduced cost. LTE-A will be a more optimized radio system fulfilling the international telecommunication union-radio (ITU-R) requirements for IMT-Advanced while keeping the backward compatibility.

SUMMARY

[0010] One embodiment is directed to a network element comprising at least one processor, and at least one memory comprising computer program code. The at least one memory and the computer program code configured, with the at least one processor, to cause the network element at least to transmit at least one of: calculated impact information for a cell of the network element when taking an action related to a cell of the network element and/or when taking an action related to a cell of a second network element, and a request for taking the action related to the cell of the second network element.

[0011] Another embodiment is directed to a network element comprising at least one processor, and at least one memory comprising computer program code. The at least one memory and the computer program code configured, with the at least one processor, to cause the network element at least to receive at least one of: impact information for a cell of a second network element when taking an action related to the cell of the second network element, and/or when taking an action related to a cell of the network element, a request from the second network element for taking an action related to a cell of the network element, and a command from a central network element for taking an action related to a cell of the network element. The network element may be further caused to take the action related to the cell of the network element based at least on one of the received impact information, the command, or the request.

[0012] Another embodiment is directed to a centralized network element comprising at least one processor, and at least one memory comprising computer program code. The at least one memory and the computer program code configured, with the at least one processor, to cause the centralized network element at least to receive from a first network element at least one of: impact information for a cell of the first network element when taking an action related to a cell of the first network element, or when taking an action related to a cell of a second network element, and a request for taking an action related to the cell of the second network element. The centralized network element may be further caused to transmit a command for taking the action related to the cell of the second network element based on the received impact information and/or request.

[0013] Another embodiment is directed to a network element comprising transmitting means for transmitting at least one of calculated impact information for a cell of the network element when taking an action related to a cell of the network element and/or when taking an action related to a cell of a second network element, and requesting means for requesting to take the action related to the cell of the second network element.

[0014] Another embodiment is directed to a network element comprising receiving means for receiving at least one of impact information for a cell of a second network element when taking an action related to the cell of the second network element, and/or when taking an action related to a cell of the network element, a request for the second network element for taking an action related to a cell of the network element, and a command from a central network element for taking an action related to a cell of the network element. The network element can also include action means for taking the action related to the cell of the network element based on at least one of the received impact information, the command, or the request.

[0015] In another embodiment, a centralized network element can include receiving means for receiving, from a first network element, at least one of impact information for a cell of the first network element when taking an action related to