The eNB has a downlink signaling configurations determining the time instants where the UE shall receive the scheduling and paging information. For power saving purposes, an eNB may configure time periods when the UE shall monitor downlink control signals. During other times the UE is allowed to go to power saving mode during which eNB cannot assume that the UE would listen for downlink signals. This relates to a discontinuous reception (DRX) period, which causes the UE to shut off its radio for periods of time to save power.

As coverage of data networks has increased, such as including WiFi networks, the demand for diverse smartphone applications also have increased. The significant amount of mobile applications present challenges to connectivity and power savings operations of the devices in view of the ubiquitous nature of these applications. One such challenge relates to these mobile applications running in the background on a UE which tend to require an always on connection with the network.

SUMMARY:

In an exemplary aspect of the invention, there is a method comprising: starting, by a device of a communications network, a timer in response to a radio resource control message, where a power preference indication message is not sent by the device for at least a duration of the timer and starting the timer comprises restarting a T340 timer.

In another exemplary aspect of the invention, there is an apparatus comprising: at least one processor; and at least one memory including computer program code, where the at least one memory and the computer program code are configured, with the at least one processor, to cause the apparatus to at least: start a timer in response to a radio resource control message, where a power preference indication message is not sent by the device for at least a duration of the timer and a T340 timer is restarted.

In yet another exemplary aspect of the invention, there is an apparatus comprising: means for starting a timer in response to a radio resource control message, where a power preference indication message is not sent by the device for at least a duration of the timer and a T340 timer is restarted.

In accordance with the exemplary aspect of the invention as in the paragraph above, the means for starting comprises a timer, and a computer readable medium including computer program code, the computer program code executed by at least one

processor.

In yet another exemplary aspect of the invention, there is a non-transitory computer-readable storage medium encoded with a computer program code, the computer program code executable by a processor to perform actions comprising: starting, by a device of a communications network, a timer in response to a radio resource control message, where a power preference indication message is not sent by the device for at least a duration of the timer and starting the timer comprises restarting a T340 timer.

BRIEF DESCRIPTION OF THE DRAWINGS:

The foregoing and other aspects of embodiments of this invention are made more evident in the following Detailed Description, when read in conjunction with the attached Drawing Figures, wherein:

Figure 1A is a conventional signaling diagram illustrating a successful RRC connection establishment;

Figure 1B is a conventional signaling diagram illustrating network reject of an RRC connection establishment procedure;

Figure 2A illustrates a communication of UE assistance information signaling between an E-UTRAN network and a UE;

Figure 2B illustrates RRC connection reconfiguration signaling relevant to the method in accordance with the exemplary embodiments of the invention;

Figure 3A illustrates a PPI operation with a long RRC connection;

Figure 3B illustrates connectivity mode operations using a timer, in accordance with the exemplary embodiments of the invention;

Figure 4 illustrates a simplified block diagram of various electronic devices that are suitable for use in practicing the exemplary embodiments presented herein; and

Figure 5 illustrates a simplified block diagram of a method in accordance with the exemplary embodiments of the invention.

DETAILED DESCRIPTION:

In accordance with the exemplary embodiments of the invention there is at least a method to provide enhanced diverse data applications (eDDA) and power savings for UE RRC connected modes with sparse and/or intermittent data transmissions by the data applications. The exemplary embodiments of the invention provide at least a method for a DRX, mobility, signaling load, and/or network connection release timer.

In order to optimize UE power savings, embodiments of the invention provide techniques to keep the UE and network synchronized in whichever power mode the UE is in to at least allowing successful background application data traffic. These techniques, as will be

CLAIMS

What is claimed is:

1. A method comprising:

starting, by a device of a communications network, a timer in response to a radio resource control message, where a power preference indication message is not sent by the device for at least a duration of the timer and starting the timer comprises restarting a T340 timer.

2. The method according to claim 1, where the radio resource control message relates to one of a radio resource connection setup procedure and a radio resource connection re-configuration procedure associated with the device.

3. The method according to claim 2, where the timer is started based on an indication that the one of the radio resource connection setup procedure and the radio resource connection re-configuration is completed.

4. The method according to claim 3, where the indication comprises one of a radio resource connection setup completion message and a radio resource connection re-configuration completion message.

5. The method according to claim 2, where the one of the radio resource connection setup procedure and the radio resource connection re-configuration procedure relates to a handover operation.

6. The method according to claim 1, where a duration of the timer is set based on information received from the communication network.

7. The method according to claim 1, further comprising: based on an expiration of the timer, sending a power preference indication message towards the network.

8. The method according to claim 7, where the power preference indication message comprises a powerprefindication value.

9. The method according to claim 8, where the powerprefindication value indicates that the device is in one of a low power consumption mode or a normal power consumption mode.

~~10. The method according to claim 1, where starting the timer comprises restarting a T340 timer.~~

10~~11~~. The method according to claim 1~~0~~, where a duration of the timer is based on a duration of the T340 timer.

1112. The method according to claim 10, wherein the device comprises a mobile terminal.

1213. A non-transitory computer-readable storage medium encoded with a computer program code, the computer program code executable by a processor to perform actions comprising:

starting, by a device of a communications network, a timer in response to a radio resource control message, where a power preference indication message is not sent by the device for at least a duration of the timer and starting the timer comprises restarting a T340 timer.

1314. The non-transitory computer-readable storage medium according to claim 1213, where the radio resource control message relates to one of a radio resource connection setup procedure and a radio resource connection re-configuration procedure associated with the device.

1415. The non-transitory computer-readable storage medium according to claim 1314, where the timer is started based on an indication that the one of the radio resource connection setup procedure and the radio resource connection re-configuration is completed.

1516. The non-transitory computer-readable storage medium according to claim 1415, where the indication comprises one of a radio resource connection setup completion message and a radio resource connection re-configuration completion message.

1617. The non-transitory computer-readable storage medium according to claim 1314, where the one of the radio resource connection setup procedure and the radio resource connection re-configuration procedure relates to a handover operation.

1718. The non-transitory computer-readable storage medium according to claim 1213, where a duration of the timer is set based on information received from the communication network.

1819. The non-transitory computer-readable storage medium according to claim 1213, further comprising: based on an expiration of the timer, sending a power preference indication message towards the network.

1920. The non-transitory computer-readable storage medium according to claim 1819, where the power preference indication message comprises a powerprefindication value.

2021. The non-transitory computer-readable storage medium according to claim 1920, where the powerprefindication value indicates that the device is in one of a low power consumption mode or a normal power consumption mode.

2122. An apparatus comprising:

at least one processor; and

at least one memory including computer program code, where the at least one memory and the computer program code are configured, with the at least one processor, to cause the apparatus to at least:

start a timer in response to a radio resource control message, where a power preference indication message is not sent by the device for at least a duration of the timer and a T340 timer is restarted.

2223. The apparatus according to claim 2122, where the radio resource control message relates to one of a radio resource connection setup procedure and a radio resource connection re-configuration procedure associated with the device.

2324. The apparatus according to claim 2223, where the timer is started based on an indication that the one of the radio resource connection setup procedure and the radio resource connection re-configuration is completed.

2425. The apparatus according to claim 2324, where the indication comprises one of a radio resource connection setup completion message and a radio resource connection re-configuration completion message.

2526. The apparatus according to claim 2223, where the one of the radio resource connection setup procedure and the radio resource connection re-configuration procedure relates to a handover operation.

2627. The apparatus according to claim 2122, where a duration of the timer is set based on information received from the communication network.

2728. The apparatus according to claim 2122, where the at least one memory including the computer program code is configure with the at least one processor to cause the apparatus, based on an expiration of the timer, to send a power preference indication message towards the network.

2829. The apparatus according to claim 2728, where the power preference indication message comprises a powerprefindication value.

2930. The apparatus according to claim 2829, where the powerprefindication value indicates that the device is in one of a low power consumption mode or a normal power consumption mode.

~~31. The apparatus according to claim 22, where starting the timer comprises restarting a T340 timer.~~

3032. The apparatus according to claim 2131, where a duration of the timer is based on a duration of the T340 timer.

3133. The apparatus according to claim 2122 comprising a mobile terminal.

3234. An apparatus comprising:

means for starting a timer in response to a radio resource control message, where a power preference indication message is not sent by the device for at least a duration of the timer and a T340 is restarted.

3335. The apparatus according to claim 3234, where the radio resource control message relates to one of a radio resource connection setup procedure and a radio resource connection re-configuration procedure associated with the device.

3436. The apparatus according to claim 3335, where the timer is started based on an indication that the one of the radio resource connection setup procedure and the radio resource connection re-configuration is completed.

3537. The apparatus according to claim 3436, where the indication comprises one of a radio resource connection setup completion message and a radio resource connection re-configuration completion message received by the device.

3638. The apparatus according to claim 3335, where the one of the radio resource connection setup procedure and the radio resource connection re-configuration procedure relates to a handover operation.

3739. The apparatus according to claim 3234, where a duration of the timer is set based on information received from the communication network.

3840. The apparatus according to claim 3234, further comprising: means, based on an expiration of the timer, for sending a power preference indication message towards the network.

3941. The apparatus according to claim 3840, where the power preference indication message comprises a powerprefindication value.

4042. The apparatus according to claim 3941, where the powerprefindication value indicates that the device is in one of a low power consumption mode or a normal power consumption mode.

~~43. The apparatus according to claim 34, where starting the timer comprises restarting a T340 timer.~~

4144. The apparatus according to claim 3234, where the duration of the timer is based

on a duration of the T340 timer.

4245. The apparatus according to claim 3234 comprising a mobile terminal.

4346. The apparatus according to claim 3234, where the means for starting comprises a timer, and a computer readable medium including computer program code, the computer program code executed by at least one processor.