

MECHANISM FOR HANDLING PDCCH SKIPPING AND WAKE UP SIGNALING

5 FIELD

[0001] Embodiments of the present disclosure generally relate to the field of telecommunication and in particular, to methods, apparatuses and computer readable storage media for handling physical downlink control channel (PDCCH) skipping and wake up signaling.

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BACKGROUND

[0002] Discontinuous reception (DRX) is designed to reduce power consumption by allowing a communication device to discontinuously receive information from another communication device. For example, when the DRX is enabled, user equipment (UE)
15 may be configured with one or more DRX cycles, each comprising a DRX on-duration for monitoring a downlink control channel from a network device. As such, the UE only needs to discontinuously monitor the downlink channel. Otherwise, the UE needs to continuously monitor the downlink channel.

[0003] Wake up signaling (WUS) is designed to allow the UE to skip monitoring the
20 downlink channel when there is no transmission to be done, such that the power consumption can be further reduced. For example, if the network device intends to schedule the UE, it needs to send WUS to the UE during one or more WUS occasions so as to wake up the UE first. The UE will then monitor the control channel for scheduling information during a coming DRX on-duration. Further, the PDCCH skipping has been
25 proposed in order to save UE power. The network devices may indicate the UE to skip a number of PDCCH monitoring occasions.

SUMMARY

[0004] In general, example embodiments of the present disclosure provide a solution for
30 handling PDCCH skipping and wake up signaling.

[0004a] In a first aspect, the present disclosure refers to a first device comprising: at least

one processor; and at least one memory including computer program codes; the at least one memory and the computer program codes are configured to, with the at least one processor, cause the first device to: receive, at the first device and from a second device, first information indicating that candidate occasions are to be skipped for monitoring physical downlink control channel; determine a target occasion from the candidate occasions based on second information indicating that skipping monitoring is applicable to a physical downlink control channel with a downlink control information format for scheduling downlink assignment or uplink grant, wherein the skipping monitoring does not apply to wake up signaling occasions; and skip monitoring the physical downlink control channel on the target occasion.

[0004b] In a second aspect, the present disclosure refers to a second device comprising: at least one processor; and at least one memory including computer program codes; the at least one memory and the computer program codes are configured to, with the at least one processor, cause the second device to: transmit, to a first device, first information indicating that candidate occasions are to be skipped for monitoring physical downlink control channel; determine a target duration for transmitting a wake up signaling based on second information indicating that skipping monitoring is applicable to a physical downlink control channel with a downlink control information format for scheduling downlink assignment or uplink grant, wherein the skipping monitoring does not apply to wake up signaling occasions; and transmit the wake up signaling on the target duration.

[0004c] In a third aspect, the present disclosure refers to a method comprising: receiving, at a first device and from a second device, first information indicating that candidate occasions are to be skipped for monitoring physical downlink control channel; determining a target occasion from the candidate occasions based on second information indicating that skipping monitoring is applicable to a physical downlink control channel with a downlink control information format for scheduling downlink assignment or uplink grant, wherein the skipping monitoring does not apply to wake up signaling occasions; and skipping monitoring the physical downlink control channel on the target occasion.

[0004d] In a fourth aspect, the present disclosure refers to a method comprising: transmitting, to a first device and from a second device, first information indicating that candidate occasions are to be skipped for monitoring physical downlink control channel; determining a target duration for transmitting a wake up signaling based on second information indicating that skipping monitoring is applicable to a physical downlink control channel with a downlink control information format for scheduling downlink assignment or

uplink grant, wherein the skipping monitoring does not apply to wake up signaling occasions; and transmitting the wake up signaling on the target duration.

[0004e] In a fifth aspect, the present disclosure refers to a computer readable storage medium comprising program instructions stored thereon, the instructions, when executed by an apparatus, causing the apparatus to perform the method of the third aspect.

[0004e] In a sixth aspect, the present disclosure refers to a computer readable storage medium comprising program instructions stored thereon, the instructions, when executed by an apparatus, causing the apparatus to perform the method of the fourth aspect.

[0005] In a first ~~aspect~~example, there is provided a first device. The first device comprises at least one processor; and at least one memory including computer program codes; the at

least one memory and the computer program codes are configured to, with the at least one processor, cause the first device to receive, at the first device and from a second device, first information indicating that candidate occasions are to be skipped for monitoring physical downlink control channel. The first device is also caused to determine a target
5 occasion from the candidate occasions based on second information about a physical downlink control channel which is applicable to skipping monitoring. The first device is further caused to in response to the target occasion overlapping with a duration for monitoring wake up signaling, skip monitoring the wake up signaling on the duration.

[0006] In a second example aspect, there is provided a second device. The second device
10 comprises at least one processor; and at least one memory including computer program codes; the at least one memory and the computer program codes are configured to, with the at least one processor, cause the second device to transmit, to a first device, first information indicating that candidate occasions are to be skipped for monitoring physical downlink control channel. The second device is also caused to determine a target duration
15 for transmitting a wake up signaling based on second information about a physical downlink control channel which is applicable to skipping monitoring. The second device is further caused to transmit the wake up signaling on the target duration.

[0007] In a third example aspect, there is provided a method. The method comprises receiving, at a first device and from a second device, first information indicating that
20 candidate occasions are to be skipped for monitoring physical downlink control channel. The method also comprises determining a target occasion from the candidate occasions based on second information about a physical downlink control channel which is applicable to skipping monitoring. The method further comprises in response to the target occasion overlapping with a duration for monitoring wake up signaling, skipping monitoring the
25 wake up signaling on the period.

[0008] In a fourth example aspect, there is provided a method. The method comprises transmitting, to a first device and from a second device, first information indicating that
candidate occasions are to be skipped for monitoring physical downlink control channel. The method also comprises determining a target duration for transmitting a wake up
30 signaling based on second information about a physical downlink control channel which is applicable to skipping monitoring. The method further comprises transmitting the wake up signaling on the target duration.

[0009] In a fifth exampleaspect, there is provided an apparatus. The apparatus comprises means for receiving, at a first device and from a second device, first information indicating that candidate occasions are to be skipped for monitoring physical downlink control channel; means for determining a target occasion from the candidate occasions based on second information about a physical downlink control channel which is applicable to skipping monitoring; and means for response to the target occasion overlapping with a duration for monitoring wake up signaling, skipping monitoring the wake up signaling on the period.

[0010] In a sixth exampleaspect, there is provided an apparatus. The apparatus comprises means for transmitting, to a first device, first information indicating that candidate occasions are to be skipped for monitoring physical downlink control channel; means for determining a target duration for transmitting a wake up signaling based on second information about a physical downlink control channel which is applicable to skipping monitoring; and means for transmitting the wake up signaling on the target duration.

[0011] In a seventh exampleaspect, there is provided a computer readable medium comprising program instructions for causing an apparatus to perform at least the method according to the above third exampleaspect.

[0012] In an eighth exampleaspect, there is provided a computer readable medium comprising program instructions for causing an apparatus to perform at least the method according to the above fourth exampleaspect.

[0013] It is to be understood that the summary section is not intended to identify key or essential features of embodiments of the present disclosure, nor is it intended to be used to limit the scope of the present disclosure. Other features of the present disclosure will become easily comprehensible through the following description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] Some example embodiments will now be described with reference to the accompanying drawings, where:

[0015] Fig. 1 illustrates an example communication network in which embodiments of the present disclosure may be implemented;

[0016] Fig. 2 illustrates a flowchart of an example method according to some example embodiments of the present disclosure;