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Title	The MSS operation at max-sleeping-window value in IEEE 802.16e Sleep Mode	
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Source(s)	Changhoi Koo Sohyun Kim Yeongmoon Son Jungje Son Samsung Elec. 416, Maetan-3dong, Paldal-gu Suwon-si, Gyeonggi-do Korea	Voice: +82-31-279-5091 Fax: +82-31-279-5130 chkoo@samsung.com binde.kim@samsung.com ym1004.son@samsung.com jungje.son@samsung.com
Re:	IEEE 802.16e Sleep mode operation	
Abstract	This document provides the MSS operation that reaches the max-sleeping-window value according to sleep-interval update algorithm of sleeping mode operation. This document is to re-introduce the one of proposals presented in the last meeting (IEEE802.16e-03-31)	
Purpose	Present how the IEEE802.16a can be enhanced in order to support mobility.	
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The MSS operation at max-sleeping-window value in IEEE802.16e Sleep Mode

Changhoi Koo, Sohyun Kim, Yeongmoon Son and Jungje Son
Samsung Elec.

1 Problem Statement

There was no exact description of the MSS operation when the MSS reached the max-sleeping-window value according to sleep-interval update algorithm. Current draft is just mentioning as follows

“ 6.2.16.2 Sleep-interval update algorithm

*An SS shall enter sleep-mode after receiving an SLP-RSP message from the BS. In the first time it enters sleep-mode, it shall use the min-sleeping window value for the sleep interval. If during the following listening interval the BS has not signaled that traffic has been addressed for the SS, the SS shall re-enter sleep-mode an double the duration of the sleep-interval. **This procedure shall be repeated as long as the resulting sleep interval does not exceed the max-window value.**”*

Therefore, the current description for MSS operation at max-sleeping window value gives some confusion and unclear operation between the MSS and BS when the MSS reached the maximum sleeping window value. Thus, it shall be required that the exact explanation of the MSS operation at the max-sleeping window value is described as proposed remedy. The proposed remedy is to provide less power consumption, link maintenance and synchronization with BS as well as exact explanation of the MSS operation.

For example, if the particular MSS reached the max-sleeping window value several times, it can be estimated that the traffic (PDU) would not be generated into that MSS for the time being in the future. Therefore, the BS can allocate the longer sleeping interval to that MSS based on longer min-sleeping window value. Because the sleeping interval currently is increased based on exponential update algorithm, the sleeping interval depends on the min-sleeping window value allocated by the BS. Thus, according to the min-sleeping window value, the MSS can have a chance to save more power consumption due to monitoring time in decrease. Thus, it can be able to re-allocate appropriate min-sleeping window value based on how many times the MSS retries (sends MOB_SLP_REQ message) at the max-sleeping window value.

Therefore, we propose the new information element on the MOB_SLP_REQ message, 6bits (exact number: TBD), which indicates the number of retries at the max-sleeping window value. This information element definitely provides the flexibility of the MSS sleeping interval that consists of min-window and max-window values.

2 Proposed Remedy (Text changes)

The following additional description for the sleep-interval update algorithm will be useful for link maintenance and synchronization in good environment of between BS and MSS as well as clarification for the unclear MSS operation at max-sleeping window value.

6.2.16.2 Sleep-interval update algorithm

[...] This procedure shall be repeated as long as the resulting sleep interval does not exceed the max-window value and the MSS shall send a MOB_SLP_REQ message when it reaches the max-sleeping window value being lastly increased.

6.2.2.3.40 Sleep Request message (MOB_SLP-REQ)

MSS supporting sleep-mode uses the MOB_SLP-REQ message to request permission from the BS to enter sleep-mode. The MOB_SLP-REQ message is sent from MSS to the BS on the MSS's basic CID.

Table 56aa: Sleep-Request (MOB_SLP-REQ) message format

Syntax	Size	Notes
SLP-REQ Message Format() {		
Management message type = 45	8 bit	
min-sleeping interval	6 bit	
max-sleeping window	10 bit	
listening interval	8 bit	
<u>num-max-sleeping window retry</u>	<u>6 bit</u>	
}		

Parameters shall be as follows:

Min window

Requested start value for the sleep interval (measured in MAC frames).

Max window

Requested stop value for the sleep interval (measured in MAC frames).

Listening interval

Requested listening interval (measured in MAC frames)

Num-max-sleeping window retry

The number of retries at max-sleeping window (including the current retry in which the message has been transmitted) after the MSS enters the first sleep-interval.

References

- [1] IEEE P802.16a/D7-2002 "Part 16: Air Interface for Fixed Broadband Wireless Access Systems – Medium Access Control Modifications and Additional Physical Layer Specifications for 2-11 GHz"
- [2] IEEE 802.16.3c-01/30r1 "Traffic Model for 802.16 TG3 MAC/PHY Simulations"
- [3] IEEE 802.16e-03/02, "Call for Proposals on IEEE Project 802.16e: Mobility Enhancements to IEEE Standard 802.16/802.16a"
- [4] IEEE 802.16e-03/07r2, "Part 16: Air interface for Broadband Wireless Access Systems- Amendment 4: Mobility Enhancement"
- [5] IEEE 802.16e-03/31 "IEEE802.16e Sleep mode enhancement"