Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	A proposal for timing compensation of sleep mode in MR
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Source(s)		
	Keiichi Nakatsugawa Fujitsu Laboratories Ltd. Kamikodanaka 4-1-1, Kawasaki, 211-8588, Japan	Voice: +81-44-754-2811 Fax: +81-44-754-2786 nakatsugawa@jp.fujitsu.com
	Yuefeng Zhou Fujitsu Laboratories of Europe Ltd. Hayes Park Central Hayes Middx., UB4 8FE, UK	Voice: +44 (0) 20 8573 4444 FAX: +44 (0) 20 8606 4539 Yuefeng.zhou@uk.fujitsu.com
	Shiao-Li Tsao, Fang-Ching Ren, Wern-Ho Sheen, I-Kang Fu National Chiao Tung University (NCTU) /Industrial Technology Research Institute (ITRI), Taiwan No. 195, Sec. 4, Chung Hsing Rd., Chutung, Hsinchu, Taiwan 310, R.O.C.	Voice: +886-3-5712121-54717 Fax: +886-3-5721490 E-mail: sltsao@cs.nctu.edu.tw, frank_ren@itri.org.tw

Re:	IEEE802.16j-06/034: “Call for Technical Proposals regarding IEEEP802.16j”
Abstract	This contribution proposes the method of timing compensation for sleep mode in MR.
Purpose	Text proposal for 802.16j Baseline Document
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A proposal for timing compensation of sleep mode in MR

[***This contribution propose a harmonization text proposal on Sleep Mode Timing Compensation in MR***]

Introduction

This contribution proposes a method of timing compensation for timing-related control function, such Sleep mode. In 802.16e specification, several messages such as MOB_TRF-IND are received at the pre-notified timing. However, in a non-transparent RS system[1], the message processing delay in RS makes it hard to fulfill that reception timing requirement. In order for MS to receive messages at the pre-notified timing, MR-BS compensates the timing when MS can receive messages with taking account of RS processing delay.

Details

In this proposed method, based on the following assumptions:

- The MR system is a non-transparent RS system [1].

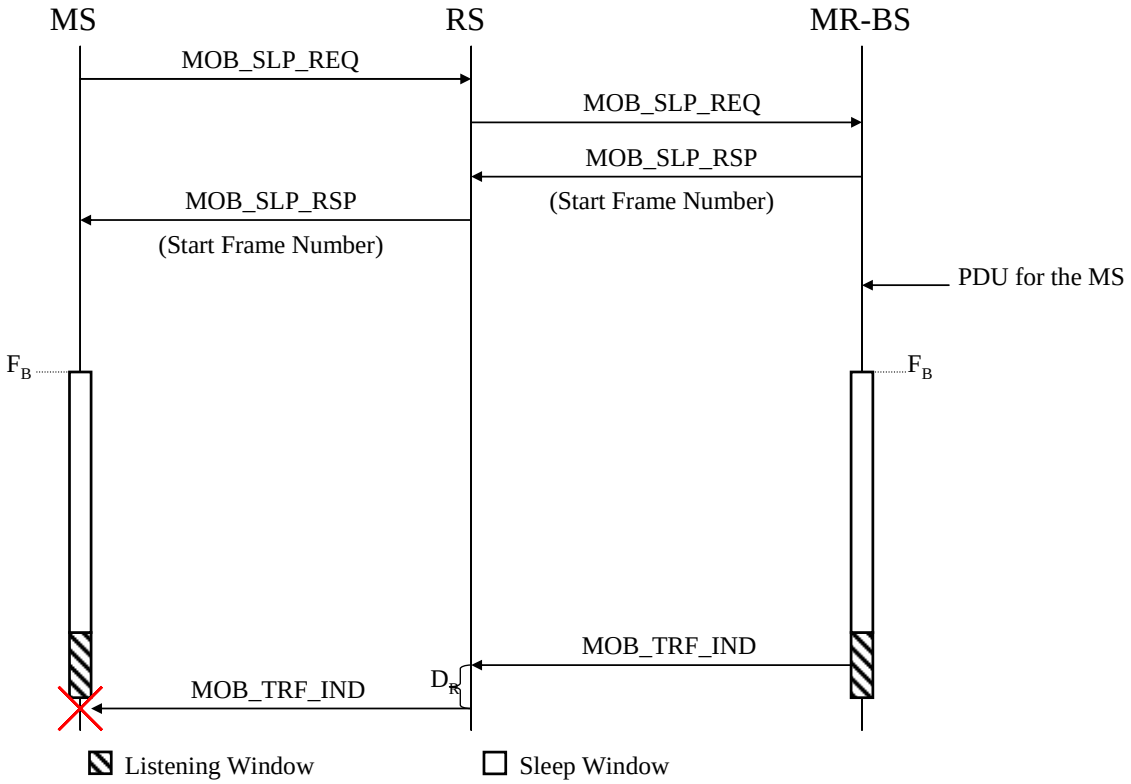
- The RS can not relay message and data within the current frame. The message is delayed for fixed duration on account of relay processing in the RS.

- Each frame sent by MR-BS and RS are synchronized and has same frame number.

Timing compensation for sleep mode

As shown in Fig. 1, MS enters Sleep mode by receiving MOB_SLP-RSP message involving “Start Frame Number” parameter from MR-BS. F_B, the beginning frame of first Sleep Window(SW), is decided by the Start Frame Number.

According to the above assumption, MOB_TRF-IND message sent from MR-BS will delay of “D_R” in RS, it is received at MS D_R frame later. Therefore, it depends on the size of Listening Window(LW) and the timing of that MOB_TRF-IND message is sent from MR-BS, MOB_TRF-IND message does not reach within LW of MS correctly and MS fails to receive the message.



D_R : Relay processing delay of RS
F_B : The beginning frame of Sleep Window

Fig. 1 LW slipping problem of sleep mode in MR

To avoid this problem, the timing of LW managed in MR-BS and MS should be compensated. Proposed method is shown in Fig. 2.

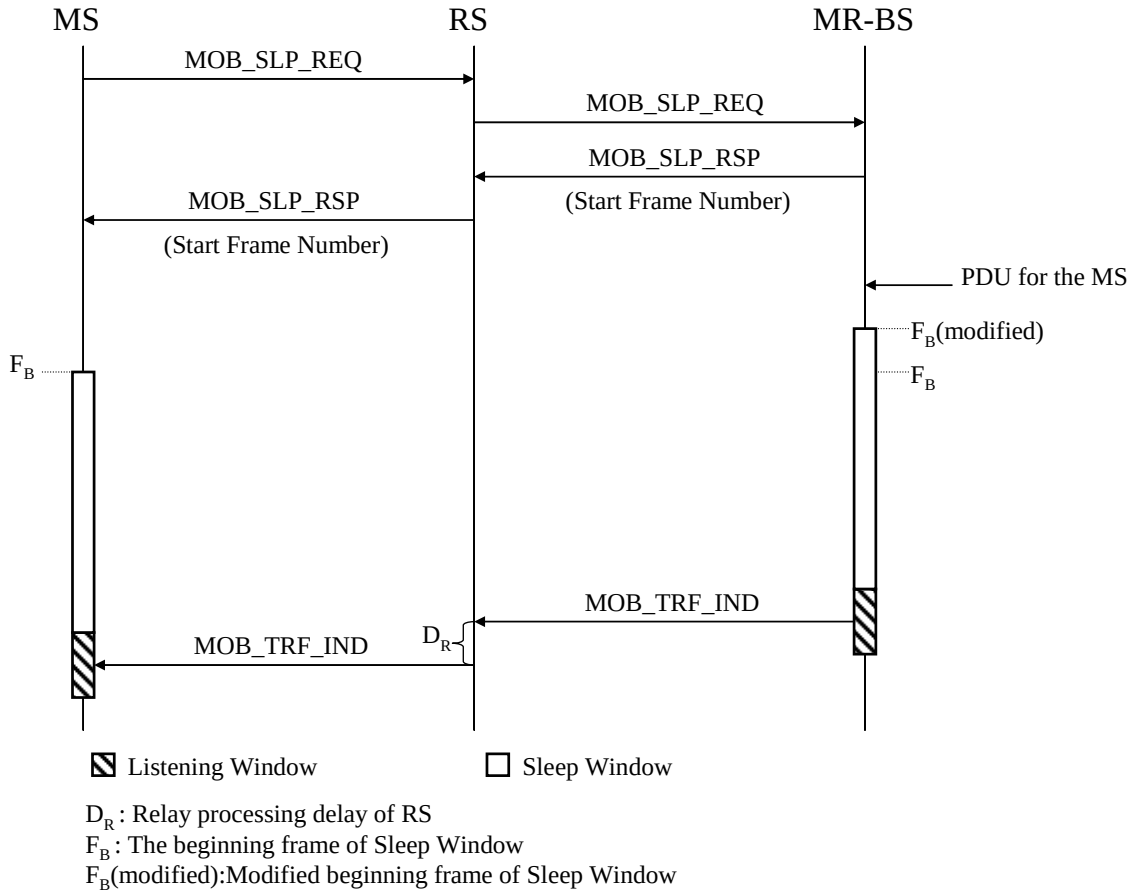


Fig. 2 Compensation for timing of LW

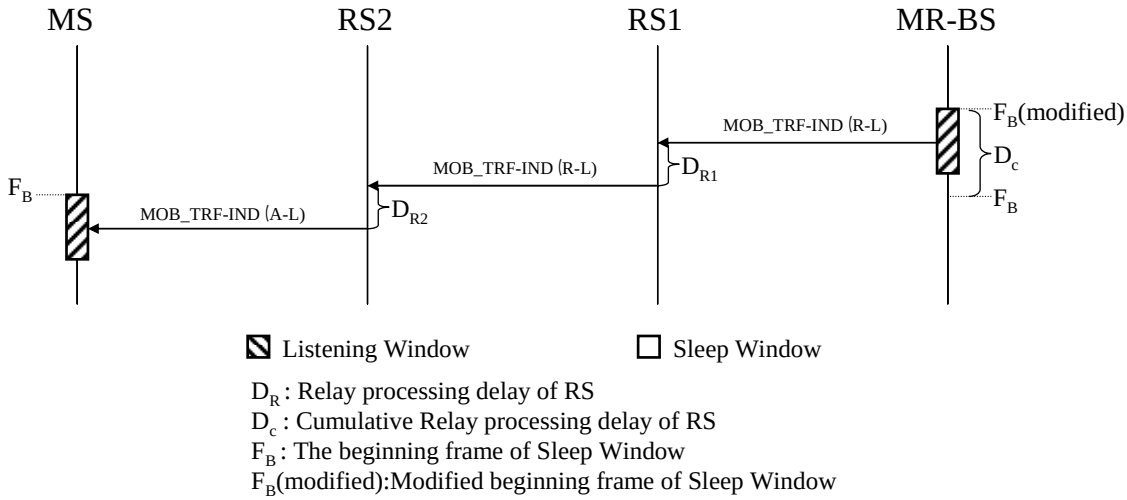
When MR-BS receives MOB_SLP-REQ message and decides Start Frame Number, MR-BS decides normal Start Frame Number value with regular manner at first and notifies MS of it by MOB_SLP-RSP message. And, MR-BS also decides modified Start Frame Number value for itself. Modified value will be decided to that the SW and LW managed internally in MR-BS are just shifted D_R earlier from the SW and LW of MS.

With this compensation method, MOB_TRF-IND sent over the R-DL at any frame within LW managed in MR-BS is received successfully within MS' LW via RS relaying.

In order to decide the modified Start Frame Number value in MR-BS, MR-BS needs to know D_R of RS. The value of RS's delay is given to MR-BS as a capability parameter of SBC-REQ message.

Consider the case that multiple RSs exist between the MR-BS and MS, as shown in Fig. 3.

In this case, the MR-BS calculates the cumulative processing delay of the RSs between the MR-BS and the MS. As shown in Fig. 3, the cumulative delay "D_C" is equal to $D_{R1}+D_{R2}$. The MR-BS decides modified Start Frame Number value for itself. Modified value will be decided to that the SW and LW managed internally in MR-BS are just shifted D_C earlier from the SW and LW of MS.



D_R : Relay processing delay of RS
D_c : Cumulative Relay processing delay of RS
F_B : The beginning frame of Sleep Window
F_B(modified):Modified beginning frame of Sleep Window

Fig. 3 Compensation for timing of LW over multiple RSs

Conclusion

According to this compensation method, the MOB_TRF-IND messages are surely delivered from MR-BS to MS through RS relaying.

Specific text changes

[Insert the following text at the end of 6.3.21.2:]

For MR, to guarantee the sleep-mode MS receiving traffic indication in time in the presence of processing delay of RS, which is D_R, the MR-BS may transmit MOB_TRF-IND over R-DL and access link separately. If multiple RSs exist, the MR-BS shall find the cumulative processing delay of RSs, which is D_C, for the path between the MR-BS and the MS. The MR-BS sends MOB_TRF-IND over the R-DL as a pre-transmission D_R or D_C frame earlier than the normal MOB_TRF-IND transmission time over access link. The RS delay, D_R, is given to MR-BS as a capability parameter of SBC-REQ message.

[Insert the new subclause in 11.8.3.7:]

11.8.3.7.X RS Downlink Processing Delay

Type	Length	Value	Scope
TBA	1	RS Downlink Processing Delay (unit: frame)	SBC-REQ

References

[1] IEEE C802.16j/132, “Relaying methods proposal for 802.16j”