

Project	IEEE 802.16 Broadband Wireless Access Working Group < http://ieee802.org/16 >	
Title	A proposal for timing compensation of idle mode in MR	
Date Submitted	2006-11-07	
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
Re:	IEEE802.16j-06/027: "Call for Technical Proposals regarding IEEE802.16j"	
Abstract	This contribution proposes the method of timing compensation for idle mode.	
Purpose	Text proposal for 802.16j Baseline Document	
Notice	This document has been prepared to assist IEEE 802.16. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.	
Release	The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE's name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE's sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that this contribution may be made public by IEEE 802.16.	
Patent Policy and Procedures	The contributor is familiar with the IEEE 802.16 Patent Policy and Procedures < http://ieee802.org/16/ipr/patents/policy.html >, including the statement "IEEE standards may include the known use of patent(s), including patent applications, provided the IEEE receives assurance from the patent holder or applicant with respect to patents essential for compliance with both mandatory and optional portions of the standard." Early disclosure to the Working Group of patent information that might be relevant to the standard is essential to reduce the possibility for delays in the development process and increase the likelihood that the draft publication will be approved for publication. Please notify the Chair < mailto:chair@wirelessman.org > as early as possible, in written or electronic form, if patented technology (or technology under patent application) might be incorporated into a draft standard being developed within the IEEE 802.16 Working Group. The Chair will disclose this notification via the IEEE 802.16 web site < http://ieee802.org/16/ipr/patents/notices >.	

A proposal for timing compensation of idle mode in MR

Keiichi Nakatsugawa, Fujitsu Laboratories LTD.

Yuefeng Zhou, Fujitsu Laboratories of Europe LTD.

Introduction

This contribution proposes a method of timing compensation for timing-related control function, such as idle mode. In 802.16e specification, several messages such as PAG-ADV 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 idle mode

As shown in Fig. 1, MS enters idle mode by receiving DREG-CMD message involving "PAGING_OFFSET" parameter from MR-BS. F_B , the beginning frame of Paging Listening Interval (PLI), is decided by condition defined in section 6.3.24.5.

According to the above assumption, the frame number in MR-BS and RS are same, both F_B decided by MR-BS and MS indicate same frame. So, timing of PLI managed in both MR-BS and MS are synchronized absolutely.

However, MOB_PAG-ADV 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 length of PLI and the timing of that MOB_PAG-ADV message is sent from MR-BS, MOB_PAG-ADV message does not reach within PLI of MS and MS fails to receive the message.

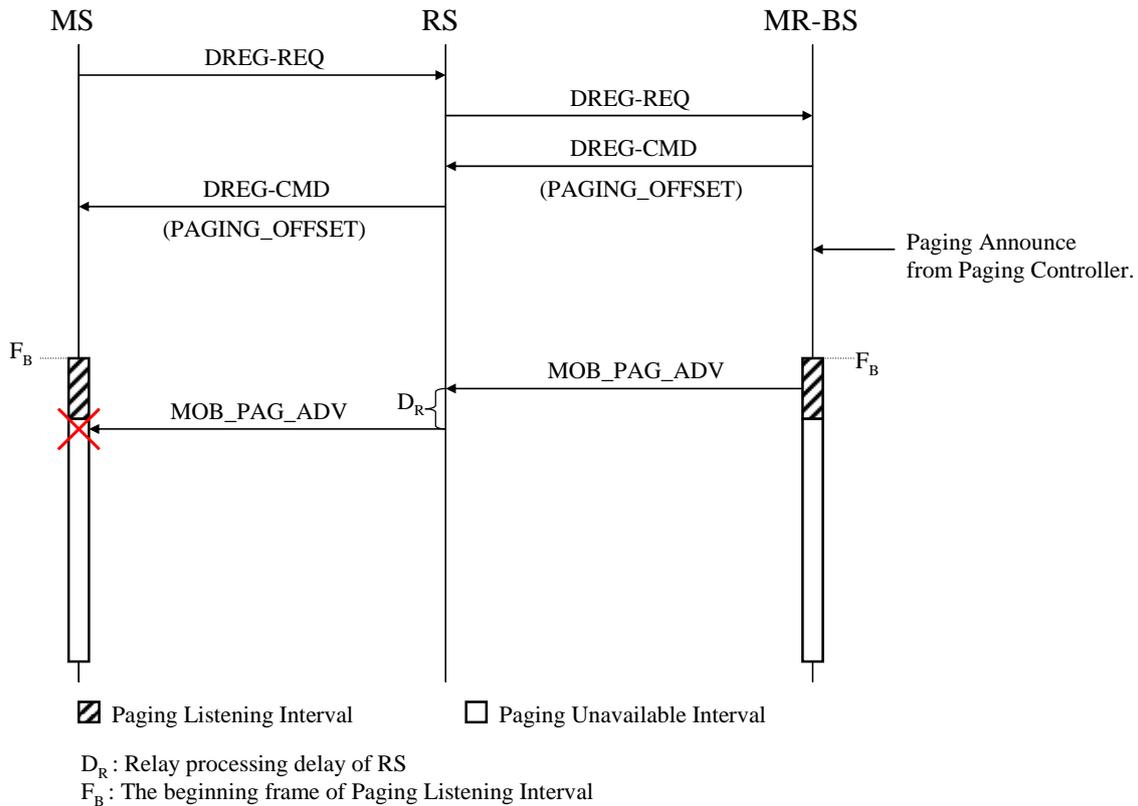


Fig. 1 PLI slipping problem of idle mode in MR

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

When MR-BS receives DREG-REQ message and decides PAGING_OFFSET, MR-BS decides normal PAGING_OFFSET value using regular condition at first. MR-BS notifies MS of the beginning timing of PLI with this normal value. Then, MR-BS also decides modified PAGING_OFFSET value for itself. Modified value will be decided that the PLI managed internally in MR-BS is just shifted D_R earlier from the PLI of MS.

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

In order to decide the modified PAGING_OFFSET value in MR-BS, MR-BS needs to know D_R of RS. The value of D_R will be given to the MR-BS as a capability parameter of SBC-REQ message.

Note that modification for capability parameter of SBC-REQ message will be proposed in other contribution [2].

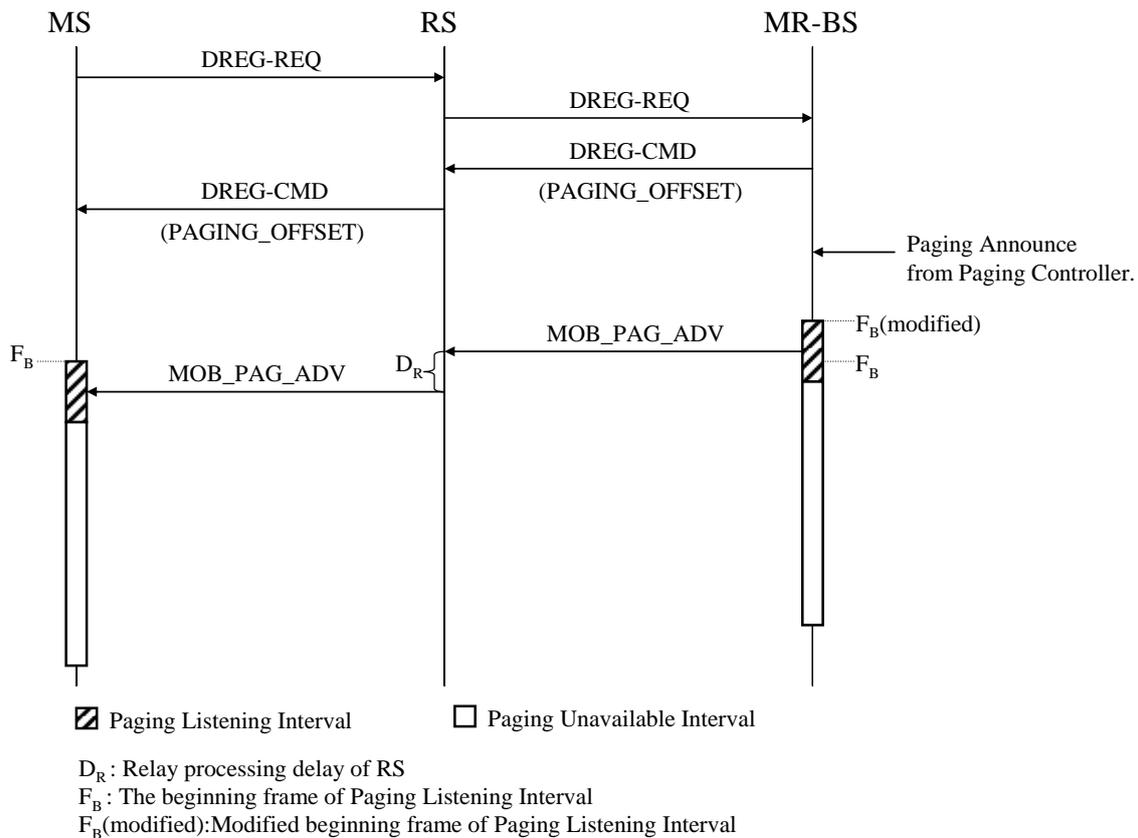


Fig. 2 Compensation for timing of PLI

Consider the case the MS moves across the areas of MR-BS and RS during the idle mode.

As shown in Fig. 3, MS1 entered idle mode under MR-BS and MS2 entered idle mode under RS. MR-BS can't recognize the location of each MS1 and MS2 because of idle mode. Both MS1 and MS2 are managing normal PLI timing, and MR-BS are managing normal PLI timing for MS1 and modified PLI timing for MS2.

In order for both MSs to receive MOB_PAG-ADV, MR-BS shall send both MOB_PAG-ADV#1 for normal PLI over the access link and MOB_PAG-ADV#2 for modified PLI over the relay link.

If there are multiple RS exist and each delay of RS are not same, MR-BS shall examine the maximum delay of RS and notify all RS of it. The MR-BS send MOB_PAG-ADV#2 earlier the maximum delay of RS than MOB_PAG-ADV#1. In each RS, after the duration notified by MR-BS, all RS transmit MOB_PAG-ADV#2 synchronously to MS over the access link data with the slowest RS. Such the maximum delay will be notified in SBC-RSP message.

If the MR-BS detects that the maximum delay of RS is replaced with the greater value, MR-BS may send unsolicited SBC-RSP message and notifies all RS of it.

Note that RS doesn't receive MOB_PAG-ADV#1 because it is sent over the access link. RS relays only MOB_PAG-ADV#2.

Insert new subclause 11.8.3.7:

11.8.3.7.X Maximum RS Downlink Delay for Paging Group

<u>Type</u>	<u>Length</u>	<u>Value</u>	<u>Scope</u>
<u>TBA</u>	<u>1</u>	<u>Maximum RS Downlink Delay for Paging Group (unit: frame)</u>	<u>SBC-RSP</u>

References

- [1] IEEE C802.16j-06/132, "Relaying methods proposal for 802.16j"
- [2] IEEE C802.16j-06/143, "Network entry procedure for non-transparent relay station"