

Project	<b>IEEE 802.16 Broadband Wireless Access Working Group</b> < <a href="http://ieee802.org/16">http://ieee802.org/16</a> >	
Title	Enhancement to Normal Mode to Sleep Mode Transition – Harmonization Ad-hoc Consensus Contribution	
Date Submitted	<b>2004-08-17</b>	
Source(s)	Hang Zhang, Mo-Han Fong, Peiying Zhu, Wen Tong Nortel Networks	<a href="mailto:mhfong@nortelnetworks.com">mhfong@nortelnetworks.com</a>
	Kang Il Koh SK Telecom	<a href="mailto:melomo@nate.com">melomo@nate.com</a>
	Yongjoo Tcha KT	<a href="mailto:yjtcha@kt.co.kr">yjtcha@kt.co.kr</a>
	Philip Barber Broadband Mobile Technologies, Inc.	<a href="mailto:pbarber@BroadbandMobileTech.com">pbarber@BroadbandMobileTech.com</a>
	Inkyu Paek Hanarotelecom	<a href="mailto:inkyu@hanaro.com">inkyu@hanaro.com</a>
Re:	IEEE P802.16e/D4-2004	
Abstract	This contribution proposes enhancement to the messages involved in normal mode to sleep mode transition	
Purpose	Review and Adopt the suggested changes into P802.16e/D4	
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 < <a href="http://ieee802.org/16/ipr/patents/policy.html">http://ieee802.org/16/ipr/patents/policy.html</a> >, 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>>.

---

## 1 Introduction

In p802.16e/D4, the sleep state is introduced to enable power efficient operation of MSSs. Based on current standard, a MSS can initiate a sleep mode by sending MOB-SLP-REQ with proposed sleep mode operation parameters (such as initial-sleep window, final-sleep window, and etc), the BS then sends MOB-SLP-RSP message. The BS can either accept or reject the request of transition from normal mode to sleep mode by using “Sleep-approved” indicator. Also, a BS can send an unsolicited MOB-SLP-RSP to request a MSS to enter sleep mode. In the current text, after the MSS enters sleep mode, the MSS can autonomously go back to the normal mode by sending UL PDU. For BS load control purpose, if the system is highly loaded, the BS may request the MSS to enter sleep mode so as to reduce the number of MSSs in the normal mode, in order to conserve system resource. Under such scenario, it will be undesirable if the MSS keeps coming back to normal mode after being told to enter sleep mode.

## 2 Proposed Enhancement

In this proposal, the current MOB-SLP-RSP message is enhanced to allow the BS to request the MSS to enter sleep mode for a specific period of time, during which the MSS shall not return to normal mode unless a MOB-TRF-IND containing its SLPID is received. This allows the BS to put certain MSSs into sleep mode for load control purpose.

## 3 Proposed Text Changes

The following modification is based on p802.16e/D4.

*[Modify Section 6.3.19]*

[.....]

If a MSS enters sleep mode with sleep duration set to 0, the MSS may terminate sleep-mode and return to Normal Operation anytime (i.e. there is no need to wait until the sleep-interval is over). If a MSS enters sleep mode with Sleep duration set to any value other than 0, the MSS shall not terminate sleep-mode within the Sleep duration, except when HO MAC management messages need to be sent. After the expiry of the Sleep duration, the MSS may terminate sleep-mode and return to Normal Operation anytime (i.e. there is no need to wait until the sleep-interval is over). If a Serving BS receives a PDU from an MSS that is supposed to be in sleep-mode, the BS shall assume that the MSS is no longer in sleep-mode, except for RNG-REQ or DBPC-REQ. An MSS which sends the RNG-REQ or DBPC-REQ message to the BS remains in awake mode during the operation of downlink burst profile management and then returns to sleep mode after the operation. Any UL message from the MSS to the Serving BS shall interrupt the sleep-interval, shall signal the Serving BS that the MSS is still active and connected and has not dropped connection during its sleep-interval.

[.....]

*[Modify Table 106b – Sleep-Response (MOB-SLP-RSP) message format]*

**Table 106b– Sleep-Response (MOB-SLP-RSP) message format**

Syntax	Size	Notes
MOB-SLP-RSP_Message_Format() {		
Management Message Type = 51	8 bits	
Sleep-approved	1 bit	0: Sleep-mode request denied 1: Sleep-mode request approved
If (Sleep-approved == 0) {		
After-REQ-action	1 bit	0: The MSS may retransmit the MOB-SLP-REQ message after the time duration (REQ-duration) given by the

		BS in this message 1: The MSS shall not retransmit the MOB-SLP-REQ message and shall await the MOB-SLP-RSP message from the BS
REQ-duration	4 bits	Waiting value for MOB-SLP-REQ message retransmission (measured in MAC frames)
Reserved	2 bits	
}		
Else {		
Start frame	6 bits	
Initial-sleep window	6 bits	
Final-sleep window	10 bits	
Listening interval	4 bits	
Final-sleep window exponent	3 bits	
SLPID	10 bits	
<u>Sleep duration</u>	<u>8 bits</u>	<u>In units of 20 frames</u>
}		
}		

*[Add the following text below Table 106b]*

**Sleep duration**

The duration after entering sleep mode, during which the MSS shall not initiate transition to Normal Operation except when HO MAC management messages need to be sent. The Sleep duration is specified in units of 20 frames.