Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	Support of Short Data Burst Transmission to/from an MSS in Idle Mode
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Source(s)	Hang Zhang, Mo-Han Fong, Peiying Zhu, Wen Tong Nortel Networks 3500 Carling Avenue, Ottawa Ontario, Canada K2H 8E9 mhfong@nortelnetworks.com Voice: +1-613-765-8983 Fax: +1-613-765-6717
Re:	IEEE P802.16e/D5a-2004
Abstract	This contribution proposes the mechanism to support short data burst transmission/reception to/from a MSS in Idle Mode. This feature enable the support short messaging type of service regardless of the MSS' mode of operation.
Purpose	Review and Adopt the suggested changes into P802.16e/D5a
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1 Introduction

Short data burst (SDB) support for Sleep mode and Idle mode MSS is an important feature to enable the support of short messaging type of services in 802.16e. The support of SDB to Sleep mode and Idle mode MSS means that the SDB transmission/reception should not interrupt the mode of the MSS. SDB traffic associated with short messaging type of service is typically characterized by small amount of traffic with most likely irregular traffic arriving pattern. However, there are also other types of short data burst traffic with predictable traffic arrival pattern, such as system broadcast messages (e.g. DCD, UCD). This contribution addresses SDB traffic with both irregular and regular traffic arrival pattern.

Support of SDB for Idle Mode MSS, for traffic with irregular arrival pattern

The current p802.16e/D5a text does not support SDB transmission/reception for MSS in Idle mode. Based on the current standard, any DL or UL traffic, regardless the amount of the traffic, the MSS has to go back to normal mode before the data transmission can occur, and then go back to Idle mode again after the transmission. This will cause unnecessary signaling and processing overhead.

We propose the following to enable SDB for Idle mode MSS:

- Support of DL SDB:
  - When the MSS enters Idle mode, the connection CID associated with SDB traffic or application, shall be kept at both MSS and the Paging Controller. All security related profiles shall be also kept by both sides
  - When the BS intends to send SDB to the MSS, the BS shall send the MOB-PAG-ADV message to the MSS during the MSS' Paging Listening interval. The MSS performs paging-response by sending ranging code and RNG-REQ message. The purpose of this is to establish the location of the MSS.
  - The BS uses the RNG-RSP to indicate that the purpose of this paging is to send SDB to the MSS and to indicate to the MSS to skip certain network entry procedures.
  - The SDB is transmitted to the MSS similar to normal operation.
  - The MSS shall resume Idle mode operation after receiving the DL SDB if the connection is a non-ARQ-enabled or after normal ARQ acknowledgment procedure if the connection is ARQ-enabled

- Support of UL SDB:
  - MSS performs initial ranging
  - MSS sends RNG-REQ to the target BS to indicate the BS ID from which the MSS has entered into Idle mode and to indicate an UL SDB request
  - The target BS obtains the security keying profiles from the BS from which the MSS has entered Idle mode
  - The target BS then uses normal UL MAP IE to assign UL resource
  - The target BS may send ARQ message if the connection is ARQ enabled
  - The MSS shall resume Idle mode operation after the completion of SDB transmission (with completion of acknowledgment procedure if the connection is ARQ-enabled)

Support of SDB for Idle Mode MSS, for traffic with regular arrival pattern

For regular or predicable DL SDB traffic, such as UGS type of services and system configuration management message transmission, the chain-type pre-scheduling can be used to alert one or multiple MSS(s) in Idle mode to wake up to listen to DL traffic at a specific time offset. To enable the pre-scheduling, an SDB_forecast_IE is defined.

2 Proposed Text Changes

Remedy 1 - Support of SDB for Idle Mode MSS, for traffic with irregular arrival pattern

[Modify the following text in Section 6.3.2.3.5 Ranging Request (RNG_REQ) message, page 28, starting line 48]

The following TLV parameter shall be included in the RNG-REQ message when the MSS is attempting to perform re-entry, ~~or~~ handover or short data burst transmission:

HO Indication

Presence of item in message in combination with serving BS ID BSID indicates the MSS is currently attempting to HO; or in combination with Paging Controller ID the MSS is attempting Network Re-entry from Idle Mode to the BS.

Location Update Request/SDB Indication

Bit 0 set to 1 in this TLV ~~Presence of item in message~~ indicates MSS action of Idle Mode Location Update Process.

Bit 1 set to 1 in this TLV indicates MSS action to initiate short data burst transmission

[Modify the following text in Section 6.3.2.3.6 Ranging Response (RNG_RSP) message, page 30, starting line 15]

Location Update Response/SDB Indication

Response to Idle Mode Location Update Request:
0x00=Failure of Idle Mode Location Update. The MSS shall perform Network Re-entry from Idle Mode
0x01=Success of Idle Mode Location Update
~~0x10, 0x11: Reserved~~

[Add the following text in Section 6.3.2.3.6 Ranging Response (RNG_RSP) message, page 30, after line 32]

When a BS sends a RNG-RSP message to indicate to the MSS that there is DL short data burst to be transmitted to the MSS, the BS shall include the following TLV parameter in the RNG-RSP message:

Location Update Response/SDB Indication

Short data burst indication:
0x10 = Indication that BS will transmit short data burst on the DL to the MSS

[Modify the TLV "Location update request" in Table 362a – RNG_REQ Message Encodings].

Table 362a - RNG_REQ Message Encodings

Name	Type (1byte)	Length	Value
Location Update Request/SDB Indication	8	1	Bit 0: ~~Presence of item in message~~ If set to 1 indicates MSS action of Idle Mode Location Update Process, regardless of value Bit 1: If set to 1 indicates MSS action to initiate short data burst transmission Bits 2-7: reserved

[Modify the TLV "Location update response" in Table 365a – RNG_RSP Message Encodings].

Table 362a - RNG_RSP Message Encodings

Name	Type (1byte)	Length	Value
Location Update Response/SDB indication	23	1	0x00 = Failure of Location Update. The MSS shall perform Network Re-entry from Idle Mode 0x01 = Success of Location Update 0x10 = Indication that BS will transmit short data burst on the DL to the MSS ~~0x10,~~ 0x11: Reserved

Remedy 2 – Support of SDB for Idle Mode MSS, for traffic with regular arrival pattern

[Insert Section 8.4.5.3.19 SDB_Forecast IE]

8.4.5.3.19 SDB Forecast IE

This IE is used by a BS to alert MSSs regarding the future DL transmission and UL resource allocation. After receiving this IE, a MSS with its CID is included in this IE, shall monitor the DL-MAP and UL-MAP at the frame indicated by Frame_offset in this IE. The MSS shall remain in normal operation until the next SDB_Forecast_IE is received.

Table XXX. SDB Forecast IE format

Syntax	Size	Notes
SDB_Forecast_IE() {		
Extended DIUC	4 bits	0x07
Length	4 bits	
Num_MSSs	4 bits	
For (i=0;i< Num_MSSs;i++) {		
CID	16 bits	
Frame_offset (p)	4 bits	To indicate the frame offset of 2^P from the current frame when the MSS shall monitor the DL-MAP and UL-MAP for DL or UL access allocation.
}		
}		