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Title	Support of Small Packet Data Transmission to/from an MSS in Idle Mode	
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Re:	IEEE P802.16e/D5a-2004	
Abstract	This contribution proposes the mechanism to support small packet data transmission/reception to/from a MSS Idle Mode. This feature enables the support short messaging type of service.	
Purpose	Review and Adopt the suggested changes into P802.16e/D5a	
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## Support of Small Packet Data Transmission to/from an MSS in Idle Mode

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### 1 Introduction

Small Packet Data (SPD) 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 SPD to Sleep mode and Idle mode MSS means that the SPD transmission/reception should not interrupt the mode of the MSS. SPD traffic associated with short messaging type of service is typically characterized by small amount of traffic with most likely irregular traffic arriving pattern. In this contribution, the support of SPD to Idle Mode is described.

#### Support of SPD for Idle Mode MSS

The current p802.16e/D5 text does not support SPD 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 SPD for Idle mode MSS:

- Support of DL SPD:
  - When the MSS enters Idle mode, the connection CID associated with SPD 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 SPD to the MSS, the BS shall send the MOB-PAG-ADV message to the MSS during the MSS' Paging Listening interval in order to indicate sending SPD. The MSS performs paging-response by sending ranging code and RNG-REQ message to receive SPD. The purpose of this is both to establish the location of the MSS and to tell the readiness of SPD receipt.
  - The BS uses the RNG-RSP to indicate to the MSS to skip certain network entry procedures. It is assumed that the MSS and the BS setup the IP management CID at the registration stage during network entry procedure. The IP management CID is used for exchanging Layer 3 protocol between MSS and the BS.
  - The SPD is transmitted to the MSS over IP management CID
  - The MSS shall resume Idle mode operation after receiving the DL SPD if the connection is a non-ARQ-enabled or after normal ARQ acknowledgment procedure if the connection is ARQ-enabled
- Support of UL SPD:
  - 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 SPD request
  - The target BS obtains the security keying profiles from the BS from which the MSS has entered Idle mode
  - The target BS sends RNG-RSP to the MSS to indicate to skip certain network entry procedures and to tell the readiness of SPD receipt.
  - 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 SPD transmission (with completion of acknowledgment procedure if the connection is ARQ-enabled)

## 2 Proposed Text Changes

### Remedy 1 - Support of SPD for Idle Mode MSS

[Insert the following at the end of Section 6.3.2.3.5 Ranging Request (RNG\_REQ) message]

The location update request TLV (see 11.5) can be used to indicate a location update request or UL SPD indication by a MSS in idle mode. When used to indicate an UL SPD, the MSS is informing a BS that the purpose of ranging is to adjust time, power and so on in order to send UL small packet data. For any UL SPD transmission from a MSS in idle mode, the BS shall update the location of the MSS.

[Insert the following at the end of Section 6.3.2.3.6 Ranging Response (RNG\_RSP) message]

The location Update request TLV (see 11.6) can be used as a location update response or a DL SPD indication. When used as DL SPD indication, the MSS shall understand that the BS is going to send DL SPD.

[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/ <u>SPD Indication</u>		1	<u>Bit 0: location update request</u> <u>Bit 1: SPD indication</u> <u>Bits 2-7: reserved</u>

[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 Request/ <u>SPD Indication</u>		1	<u>Bit 0: location update response</u> <u>Bit 1: SPD indication</u> <u>Bits 2-7: Reserved</u>

[Update Action Code field in Table 106n BS Broadcast Paging(MOB\_PAG-ADV)Message format].

Table 106m-BS Broadcast Paging (MOB\_PAG-ADV) message format.

Syntax	Size	Notes
MOB_PAG_ADV_Message_Format() {	[..]	[..]
[..]	[..]	
For (j = 0; j < Num_MACs; j++) {		
MSS MAC Address hash		[..]
Action code	2bits	Paging action instruction to MSS 00=No Action Required 01=Perform Ranging to establish location and acknowledge message 10=Enter Network 11= <del>Reserved</del> <u>Perform Ranging to send SPD and acknowledge message</u>

Reserved	6bits	
}		

[..]

**Action Code**

Paging action instruction to MSS to perform the following action:

00=No Action Required

01=Perform Ranging to establish location and acknowledge message

10=Enter Network

11=~~reserved~~ [Perform Ranging to send SPD and acknowledge message](#)

[In P802.16e/D5, Section 10.4, p. 274, line 37-60, modify the existing text in Table 343 as shown below:]

**Table 343 CIDs**

CID	Value	Description
Initial Ranging	0x0000	Used by SS and BS during initial ranging process.
Basic CID	0x0001 – m	The same value is assigned to both the DL and UL connection.
Primary management	m+1 – 2m	The same value is assigned to both the DL and UL connection.
Transport CIDs, <del>and</del> Secondary Mgt CIDs, <a href="#">and IP Management CIDs</a>	2m+1 – 0xFE9F	For the secondary management connection, the same value is assigned to both the DL and UL connection. <a href="#">For the IP management connection, the same value is assigned to both the DL and UL connection.</a>
Multicast CIDs	0xFEAA – 0xFEFE	For the downlink multicast service, the same value is assigned to all MSSs on the same channel that participate in this connection.
AAS initial ranging CID	0xFEFF	A BS supporting AAS shall use this CID when allocating a Initial Ranging period for AAS devices.
Multicast polling CIDs	0xFF00 – 0xFFFFD	A BS may be included in one or more multicast polling groups for the purposes of obtaining bandwidth via polling. These connections have no associated service flow.
Padding CID	0xFFFFE	Used for transmission of padding information by SS and BS.
Broadcast CID	0xFFFF	Used for broadcast information that is transmitted on a downlink to all SS.

[In P802.16e/D5, Section 11.7.6, p. 286, line 20-24, modify the existing text in section 11.7.6 as shown below:]

**11.7.6 Number of CID supported**

This field shows the number of Uplink and downlink CIDs the MSS can support. The minimum value in the uplink is three for managed SSs and two for unmanaged SSs. An MSS shall support a Basic CID, a Primary Management CID, and 0 or more Transport CIDs. A managed MSS shall also support a Secondary Management CID. [IP management supported MSS shall also support an IP Management CID.](#)

[In P802.16e/D5, add the Section 11.7.9 as shown below:]

**11.7.9 IP management Connection Support**

[This field indicates whether or not Layer 3 protocol can be exchanged over the IP management connection. When the MSS indicates in the REG-REQ that it is IP managed, the BS and MSS shall use this connection for handshaking the IP management messages.](#)

Type	Length	Value	Scope
18	1	0: no IP management connection	REG-REQ

		<a href="#">1: IP management connection</a>	<a href="#">REG-RSP</a>
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[In P802.16e/D5, Modify the text from the IEEE Std. 802.16-2004, Section 6.3.2.3.7, p. 52, line 7-11; modify the existing text in section 6.3.2.3.7 as shown below:]

### 6.3.2.3.7 Registration request (REG-REQ) message

For PMP operation, the REG-REQ shall contain the following TLVs:

Uplink CID Support (11.7.6)

SS management support (11.7.2)

IP management mode (11.7.3)

[IP management connection support \(11.7.9\)](#)

[In P802.16e/D5, Modify the text from the IEEE Std. 802.16-2004, Section 6.3.2.3.8, p. 53, line 10-18; modify the existing text in section 6.3.2.3.8 as shown below:]

### 6.3.2.3.8 Registration response (REG-RSP) message

The REG-RSP shall contain the following TLVs:

#### SS management support (11.7.2)

Response to REG-REQ indicating the mode of SS management operation.

#### Secondary Management CID (11.7.5)

Present only if the SS has indicated in the REG-REQ that it is a managed SS.

#### [IP Management CID \(11.7.10\)](#)

[Present only if the MSS has indicated in the REG-REQ that it is IP management connection supported.](#)

#### HMAC Tuple (11.1.2)

The HMAC Tuple attribute shall be the final attribute in the message's TLV attribute list.

In Mesh Mode, message digest is calculated using HMAC\_KEY\_D.

[In P802.16e/D5, add the Section 11.7.10 as shown below:]

### [11.7.10 IP Management CID](#)

[This parameter contains the IP Management CID issued to an MSS.](#)

<a href="#">Type</a>	<a href="#">Length</a>	<a href="#">Value</a>	<a href="#">Scope</a>
<a href="#">19</a>	<a href="#">2</a>	<a href="#">IP Management CID</a>	<a href="#">REG-RSP</a>