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Re:	Re: Sponsor ballot on IEEE P802.16e/D5
Abstract	Early transmission of higher layer packets in the idle mode
Purpose	Adoption of proposed changes into IEEE P802.16e/D5
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Early transmission of higher layer packets in the idle mode

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1. Introduction

When the BS receives some packets targeted to the MSS staying in the idle mode, typically the BS shall initiate the BS terminated network re-entry procedure by sending a Broadcast Paging message. After successfully performing normal or fast network re-entry procedures, provisioned or suspended service flow(s) shall be re-activated in order to re-open the transport connection ID(s) and transmit queued packets. The MSS in the idle mode can have the same situation that prefers to transmit higher layer packets even while the network entry procedures proceed.

However, waiting until the end of the network re-entry procedures is to be inappropriate for delay sensitive applications such as PTT (Push To Talk) and VoIP (Voice Over IP). Those applications require application signaling messages-e.g. SIP (Session Initiation Protocol)-as soon as the BS can transmit to the MSS even when she stays in the idle mode.

2. Proposed Remedy

In order to support the early delivery of application signaling messages in the idle mode, we'd like to propose the new MAC management message from the BS to the MSS, MOB_AOM-IND on primary CID, to bring higher layer packets. MOB_AOM-IND shall encapsulate higher layer packets, especially application signaling messages, in the payload.

When the BS receives packets to be immediately transmitted to the MSS while in the idle mode, the BS shall inform the MSS of this by sending MOB_PAG-ADV with an Action Code 11. The BS shall broadcast MOB_PAG-ADV message at first not only to search the MSS location accurately but also to check whether the MSS has an associated Service Flow that can process suspended packets in the idle mode.

To achieve this, we recommend remedying MOB_PAG-ADV message to include an associated Service Flow's SFID.

However, an early transmission of higher layer packets in the idle mode runs the following procedures,

1) When the BS receives some packets that require the early transmission, she queries the paging interval and also the Service Flow Information that is charged of processing retrieved packets. An upper network component such as 'Page Controller' shall respond with the paging information and session information to the BS if it succeeds to seek session information of a queried MSS.
2) At first, the BS broadcasts the MOB_PAG-ADV with action code '11' to notify the MSS of the early transmission of higher layer packets activated.
3) The MSS performs the ranging procedures. In the ranging procedure, the MSS may include the result of validate the 'SFID' of the MOB_PAG-ADV.
4) The BS shall transmit MOB_AOM-IND on the primary CID. If it is requested to report the acknowledgement of the delivery, it shall require the MSS to send the MOB_AOM-ACK message.

The following figure 1 provides the overview of the early transmission of higher layer packets in the idle mode.

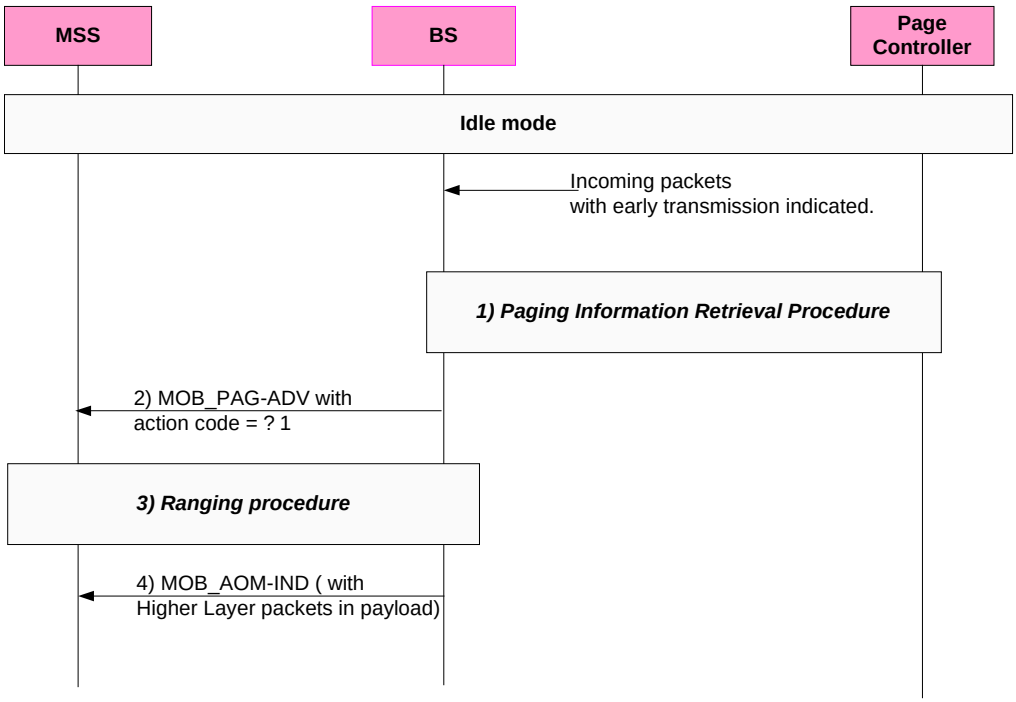

Figure 1. Call flow of early transmission of higher layer packets in idle mode

When the MSS has delay sensitive packets in the idle mode, the MSS may initiate an early transmission of higher layer packets by sending MOB_AOM-IND to the BSS just after performing initial ranging procedure.

3. Proposed Text Change

[Add the following text to 6.3.2.3, Table 14.a]

64	MOB_AOM-IND	Application Signaling message over MAC management message.	primary CID
65	MOB_AOM-ACK	AOM Acknowledge message.	primary CID

[Replace 6.3.2.3.56 with the following table and text]

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	~~**11 = reserved**~~ **11 : Perform Ranging to establish AOM delivery path.**
~~reserved~~ MSS SFID hash	6bits	**This field is validated when it brings the SFID when Action code : '11'**
}		

[..]

Action code

~~11 = reserved.~~
11 = MSS SFID hash value obtained by computing a CRC6 on the SFID 16bits.

[Add the following text to 6.3.2.3.57]

Table xxx – Early transmission of Higher Layer packets (MOB_AOM-IND) message format.

Syntax	Size	Notes
MOB_PAG_ADV_Message_Format() {		
Management Message Type = ?	8 bits	
AOM Sequence number	8 bits	
AOM_ack_required	1 bits	
SFID	16 bits	
Num_AOM	15 bits	
AOM_array	8 x Num_AOM	
}		

[..]

AOM Sequence number
AOM_ack_required
0 : MOB_AOM-Ack is not required as a response of this message
1 : MOB_AOM-Ack is required.
SFID
The SFID of a service flow that will process the payload contained in 'AOM_array'
Num_AOM
The length of 'AOM_array'
AOM_array
11 = MSS SFID hash value obtained by computing a CRC6 on the SFID 16bits.

[Add the following text to 6.3.2.3.58]

Table xxx – Early transmission of Higher Layer packets (MOB_AOM-Ack) Ack message format.

Syntax	Size	Notes
MOB_AOM-Ack_Message_Format() {		
Management Message Type = ?	8 bits	
AOM Sequence number	8 bits	
SFID	16 bits	
Return code	2bits	
reserved	6bits	
}		

[..]

AOM Sequence number
The sequence number of MOB_AOM-IND
SFID
The SFID of a service flow that will process the payload contained in 'AOM_array'
Return code
This field indicates the result of processing MOB_AOM-IND

'00' : AOM Accepted

'01' : AOM Rejected (Service Flow unavailable)
'10' and '11' : reserved.

[Remedy 6.3.21.7 with the following text]

The BS broadcast Paging message shall also include Action Code directing each MSS notified via the inclusion of its MSS MAC Address hash to either:

00 : no action required
01 : performing Ranging to establish location and acknowledge message
10 : perform initial network entry
~~11 : resreved~~
11 : MSS SFID hash value obtained by computing a CRC6 on the SFID 16bits.

[Add the following text to 6.3.21.7]

After transmitting the Broadcast Paging message with Action Code 11, if the BS does not receive RNG-REQ from the MSS paged until the next transmission interval, the BS shall retransmit the Broadcast Paging message with an Action Code 'Enter Network'

[Add the following text to 6.3.21.8.1]

An MSS may terminate idle mode and perform ranging procedure only or re-enter the network if it decodes a BS Broadcast Paging message that contains the MSS MAC address hash and an Action Code '11'. In this case, the MSS may examine the validation of the Service Flow indicated by MSS SFID hash of the Broadcast Paging message and report its result in RNG-REQ. When the MSS sends RNG-REQ with a success indication, it shall process early transmission of higher layer packets presented at 6.3.21.9

[Add the following text to 6.3.21.9]

6.3.21.9 Early Transmission of Higher Layer packets.

6.3.21.9.1 MS side

After performing ranging, the MSS may expect to receive MOB_AOM-IND that is transmitted just after RNG-RSP from the BS if an early transmission of Higher Layer packets. The MSS shall transfer encapsulated higher layer packets to an associated Service Flow identified via SFID of MOB_AOM-IND. The MSS shall send MOB_AOM-ACK if transmitting higher layer packets is succeeded and AOM_Ack_Required of retrieved MOB_AOM-IND is set to 1.

When an early transmission of higher layer packets is initiated by the MSS, the MSS may send the MOB_AOM-IND just after performing initial ranging procedure.

Whether to go back to the idle mode after a short suspended time or continue performing initial network entry procedures depends on the decision of the application who is an owner of encapsulated higher layer packets.

6.3.21.9.2 BS side

When the BS receives some packets that are marked or indicated for the BS to delivery them in an urgent manner, the BS may first of all send Broadcast Paging message with an associated Service Flow's SFID to notify the MSS of the presence of delay sensitive packets. After receiving RNG-REQ with a success indication, it shall send MOB_AOM-IND that brings an encapsulated higher layer packet. Otherwise, it shall send a Broadcast Paging message again with an Action Code 'Enter Network'.

If the BSS receives the MOB_AOM-IND from the BSS, it may transfer encapsulated higher layer packets to an associated service flow indicated by SFID of MOB_AOM-IND. The BSS shall send MOB_AOM-ACK with Return_Code having either 'AOM Accepted' or 'AOM rejected' if AOM_Ack_Required of retrieved MOB_AOM-IND is set to 1.

The way of marking the incoming packets whether are delay sensitive or not is out of scope in this document.

[Add the following text to 11.5 Table 362a]

AOM Paging Acceptance	nn	1	This value indicates whether an Early transmission is permitted. 0 : Transmission allowed 1 : Transmission disallowed but Enter network.