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Re:	IEEE P802.16e/D7-2004
Abstract	This contribution proposes Enhancement and Clarification of MBS
Purpose	Discuss and adopt this contribution
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Refinement of MBS

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1 Problem Statement

1.1 Difficulty in real-time decoding of MBS data burst

In IEEE802.16e, MBS MAP message, which is located at the latter part of DL subframe, informs MSs of the location of MBS data burst through the MBS_DATA_IE in it. In this case, MS may suffer difficulties ~~have difficult~~ in real time decoding of MBS data bursts ~~in that DL subframe~~ when the MBS Map message indicates the resource allocation of the ~~same~~ frame it presents. Therefore, we ~~we~~~~We~~ modify MBS_DATA_IE in the MBS MAP message such that MBS_DATA_IE ~~o~~ indicates MBS bursts at least 2 frames before the MBS data bursts appear~~after~~.

1.2 Repetition of DSA procedures for several MBS services

In Multicast and Broadcast Service (i.e. MBS) of IEEE802.16e, when MS is registered to certain BS, it shall perform a Dynamic Service Addition (DSA) Procedure as described in 6.3.13.1 in order to get service of MBS from the BS. And according to current MBS scheme, each MBS contents(or channel) shall have a different connection identifier. Therefore, if MS wants to receive several MBS services from BS, it shall perform DSA procedures as many times as the number of MBS contents which MS wish to receive, as shown in the left side of figure 1. It can cause inefficient bandwidth consuming due to the multiple DSA procedure and the long time for complete establishment of MBS services. But in many cases, since MBS contents may not have different service characteristics, if we have a identifier for each service in same service flow, we do not need to use a different identifier such as connection identifier and service flow identifier.

We propose the ‘logical channel ID’ used to distinguish each MBS contents which have the same service flow. A logical channel ID is allocated to MBS contents in order by MBS Contents Identifier TLV encoding included in DSA-RSP message. We also propose the new MBS_DATA_IE which includes the logical channel ID.

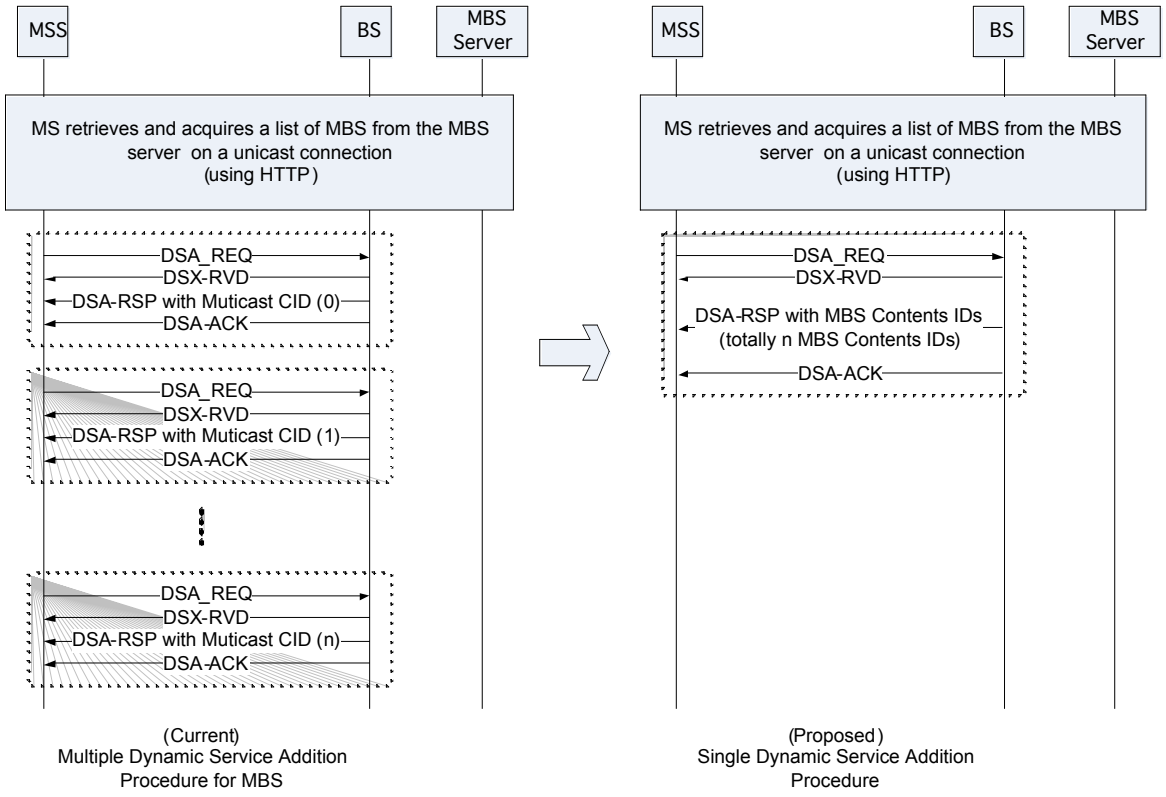

Figure 1. Example of DSA procedure ~~Dynamic Service Addition procedures~~ by MS initiation for multiple ~~several~~ MBS services

2 Suggested Remedy

[Insert new subclause 11.13.36 in Line 1, Page 564 of IEEE P802.16e/D7 document as follows]

11.13.36 MBS Contents Identifier and its Logical Channel ID

If MS sends DSA-REQ message which requests a MBS service as described in 11.13.20, BS may respond to it with DSA-RSP message including MBS Contents Identifier TLV in order to establish an MBS connection with multiple MBS contents.
TLV values shall be composed of 2 byte-long MBS Contents IDs to distinguish the logical MBS connection for each MBS contents. Since MBS Contents ID is vendor-specific and dependent on application-level implementation, it is unnecessary to specify in IEEE802.16e specification.
A 1 byte-long Logical Channel ID, which pairs with Multicast CID in MBS_DATA_IE, is allocated to each 2 byte-long MBS Contents IDs in order that it is included in TLV value. For example, Logical Channel ID '0' is allocated to MBS Contents ID(0), Logical Channel ID '1' is allocated to MBS Contents ID(1) and so on. Logical Channel ID is used for MS to discriminate the MBS message in MBS data burst.
According to Dynamic Service Addition (DSA) procedure described in 6.3.13.1, BS may send MS a DSA-REQ message to establish connection. Therefore, BS may also send MS a DSA-REQ message including MBS Contents Identifier TLV in order to make an establishment of MBS connection with multiple MBS contents.

Type	Length	Value	Scope
[145/146].xx	Variable (2*n)	MBS Contents ID(0), MBS Contents ID(1) …….MBS Contents ID(n-1)	DSA-REQ DSA-RSP DSA-ACK

[Modify Table 108q — MBS_MAP_Type in Line 4, Page 121 of IEEE P802.16e/D7 document as follows]

Table 108q— MBS_MAP_Type

MBS_MAP_Type	Description
0	MBS_DATA_IE
1	MBS_DATA~~A~~_Time_Diversity_IE
2	Extended_MBS_DATA_IE
~~2~~3~~-255~~	Reserved

[Modify Table 108r — MBS_DATA_IE in Line 21, Page 121 of IEEE P802.16e/D7 document as follows]

Table 108r — MBS_DATA_IE

Syntax	Size (bits)	Notes
MBS_DATA_IE() {		
MBS_MAP_Type = 0	~~3~~2	MBS_DATA_IE
MBS_Burst_Frame_Offset	2	This indicates the burst located~~indicated~~ by this IE will be shown after MBS_Burst_Frame_offset + 2 frames.
Next MBS MAP change indication	1	This indicates whether the size of MBS MAP message of next MBS frame for these multicast CIDs included this IE will be different from the size of this MBS MAP message.
No. of Multicast CID	3	
For(i=0; i<No. of Multicast CIDs; i++) {		
Multicast CID	12	12 LSBs of CID for multicast
}		
MBS DIUC	4	
OFDMA symbol offset	8	OFDMA symbol offset with respect to start of the next (MBS_Burst_Frame_offset + 2)th frame~~ of the MBS portion~~
Subchannel offset	6	OFDMA subchannel offset with respect to start of the next (MBS_Burst_Frame_offset + 2)th frame~~MBS portion~~
Boosting	3	
No. OFDMA symbols	7	The size of MBS data
No. subchannels	6	
Repetition coding indication	2	0b00 = No repetition coding 0b01 = Repetition coding of 2 used 0b10 = Repetition coding of 4 used 0b11 = Repetition coding of 6 used
Next MBS frame offset	8	The Next MBS frame offset value is lower 8 bits of the frame number in which the BS shall transmit the next MBS frame.
Next MBS OFDMA symbol offset	8	The offset of the OFDMA symbol in

		which the next MBS portion starts, measured in OFDMA symbols from the beginning of the downlink frame in which the MBS-MAP is transmitted.
If(Next MBS MAP change indication = 1){		
Next MBS No. OFDMA symbols	2	It is to indicate the size of MBS_MAP message in Next MBS portion where the BS shall transmit the next MBS frame for multicast CIDs in this IE.
Next MBS No. OFDMA subchannels	6	It is to indicate the size of MBS_MAP message in Next MBS portion where the BS shall transmit the next MBS frame for multicast CIDs in this IE.
}		
}		

[Modify Table 108s — MBS_DATA_Time_Diversity_IE in Line 21, Page 121 of IEEE P802.16e/D7 document as follows]

Table 108s — MBS_DATA_Time_Diversity_IE

Syntax	Size (bits)	Notes
MBS_DATA_Time_Diversity_IE(){		
MBS_MAP_Type = 1	2	
MBS_Burst_Frame_Offset	2	This indicates the burst located~~indicated~~ by this IE will be shown after MBS_Burst_Frame_offset + 2 frames.
Multicast CID	12	
OFDMA symbol offset	8	This indicates starting position of the region of MBS Bursts with respect to start of the next (MBS_Burst_Frame_offset + 2)th frame
N_EP code	4	
N_SCH code	4	
AI_SN	1	
~~Reserved~~	~~1~~	
SPID	2	
ACID	4	
Next MBS MAP change indication	1	This indicates whether the size of MBS MAP message of next MBS frame for these multicast CIDs included this IE will be different from the size of this MBS MAP message.
Next MBS frame offset	8	
Next MBS OFDMA Symbol offset	8	
If(Next MBS MAP change indication = 1) {		
Next MBS No. OFDMA symbols	2	It is to indicate the size of MBS_MAP message in Next MBS portion where the BS shall transmit the next MBS frame for multicast CIDs in this IE.
Next MBS No. OFDMA subchannels	6	It is to indicate the size of MBS_MAP

		message in Next MBS portion where the BS shall transmit the next MBS frame for multicast CIDs in this IE.
}		
}		

OFDMA symbol offset

This indicates starting position of the region for MBS Bursts at the next (MBS_Burst_Frame_offset + 2)th frame. That region begins from the first subchannel of that OFDM symbol and in this region, MBS burst, indicated by MBS_DATA_Time_Diversity_IE at the same MBS_MAP message, are allocated in 1-dimensional way in the order of MBS_DATA_Time_Diversity_IE at a MBS_MAP message.

[Insert Table 108nn — Extended_MBS_DATA_IE in Line 42, Page 122 of IEEE P802.16e/D7 document as follows]

Table 108nn— Extended_MBS_DATA_IE

Syntax	Size (bits)	Notes
MBS_DATA_IE ( ){		
MBS_MAP_Type = 2	~~3~~2	MBS_DATA_IE
MBS_Burst_Frame_Offset	2	This indicates the burst indicated by this IE will be shown after MBS_Burst_Frame_offset + 2 frames.
Next MBS MAP change indication	1	This indicates whether the size of MBS MAP message of next MBS frame for these multicast CIDs included this IE will be different from the size of this MBS MAP message.
No. of Multicast CID	3	
For(i=0; i<No. of Multicast CIDs; i++) {		
Multicast CID	12	12 LSBs of CID for multicast
No. of Logical Channel ID	4	
For(j=0; j<No. of Logical Channel ID; j++) {		
Logical Channel ID	8	
}		
}		
MBS DIUC	4	
OFDMA symbol offset	8	OFDMA symbol offset with respect to start of the next (MBS_Burst_Frame_offset + 2)th frame ~~the MBS portion~~
Subchannel offset	6	OFDMA subchannel offset with respect to start of the next (MBS_Burst_Frame_offset + 2)th frame~~the MBS portion~~
Boosting	3	
No. OFDMA symbols	7	The size of MBS data
No. subchannels	6	
Repetition coding indication	2	0b00 = No repetition coding 0b01 = Repetition coding of 2 used 0b10 = Repetition coding of 4 used 0b11 = Repetition coding of 6 used
Next MBS frame offset	8	The Next MBS frame offset value is lower 8 bits of the frame number in

		which the BS shall transmit the next MBS frame.
Next MBS OFDMA symbol offset	8	The offset of the OFDMA symbol in which the next MBS portion starts, measured in OFDMA symbols from the beginning of the downlink frame in which the MBS-MAP is transmitted.
If(Next MBS MAP change indication = 1){		
Next MBS No. OFDMA symbols	2	It is to indicate the size of MBS_MAP message in Next MBS portion where the BS shall transmit the next MBS frame for multicast CIDs in this IE.
Next MBS No. OFDMA subchannels	6	It is to indicate the size of MBS_MAP message in Next MBS portion where the BS shall transmit the next MBS frame for multicast CIDs in this IE.
}		
}		

Multicast CID

CID which is used for MBS connections

Logical Channel ID

This field is used to distinguish logical MBS connections which belong to the same Mulitcast CID. It is allocated to each logical MBS connection(i.e. MBS contents) in DSA-RSP message during Dynamic Service Addition procedure as described in 11.13.36.

[Modify the section 6.3.2.3.56 Muilticast Broadcast Service Map (MBS-MAP) message in Line26, Page 119 of IEEE P802.16e/D7 document as follows]

6.3.2.3.56 Multicast Broadcast Service Map (MBS-MAP) message

The BS may send an MBS-MAP message on an MBS portion to describe the MBS connections serviced by the MBS portion. When a MBS-MAP is sent, the connections need be described in the DL-MAP, but a MBS_MAP_IE() shall be substituted instead. The MBS-MAP message format is presented in Table 108p. This message includes the MBS_DATA_IE and Extended_MBS_DATA_IE which define the access information for the downlink and uplink MBS burst.

Table 108p — MBS-MAP

Syntax	Size (bits)	Notes
MBS-MAP Message format () {		
Management Message Type =	4	62
Frame number	4	The frame number is identical to the 4 LSBs of the frame number in the DL-MAP
MBS_DIUC_Change_Count	8	
#MBS_DATA_IE	4	The n~~N~~umber of included MBS_DATA_IE
For(i=0;i<n;i++) {		n = #MBS_DATA_IE
MBS_DATA_IE()	Variable	
}		
#Extended_MBS_DATA_IE	4	The n~~N~~umber of included Extended_MBS_DATA_IE
For(i=0;i<n;i++) {		n = #Extended_MBS_DATA_IE
Extended_MBS_DATA_IE()	Variable	
}		
#MBS_DATA_Time_Diversity_IE	4	The n~~N~~umber of included MBS_DATA_Time_Diversity_IE
For(i=0;i<m;i++) {		m = #MBS_DATA_Time_Diversity_IE

MBS_DATA_Time_Diversity_IE()	Variable	
}		
If(!byte boundary) {		
Padding nibble	~~8~~4	
}		
TLV encoding element		
}		

[Modify the section 6.3.13.2 Multi-BS Access in Line 60, Page 134 of IEEE P802.16e/D7 document as follows]

6.3.13.2 Multi-BS Access

Multi-BS-MBS is defined as a kind of service that all MSs successfully registered to the specific Multi-BSMBS connection, simultaneously each MS need register to MBS service at the network level, can receive on the cell the encrypted MAC PDUs of the multicast and broadcast content that multiple BSs transmit anywhere under the given time period. It requires the multiple BS participating in same Multi-BS-MBS service to be synchronized in the transmissions of common multicast/broadcast data. To ensure proper multicast operation on networks of BS employing synchronized transmissions of common multicast data, the CID used for a multi-BS-MBS connection shall be the same for all BS and ~~S~~MSs on the same channel that participate in the connection.

Multicast service synchronized across multiple BS enables an MS to receive the multicast or broadcast transmission from multiple BS, and thereby improve the reliability of reception. In contrast to Single-BS access, Multi-B access does not require that the MS be registered to the BS from which it receives the transmission, or to any other BS. In this case, transmitted MAC PDUs shall use the same CID, and transport the same data synchronized across the group of BS across the group of BS. A multicast and broadcast zone identifier (MBS_ZONE) is used to indicate the group of BS through which a CID and SA for a broadcast and multicast service flow are valid.

During a Dynamic Service Addition procedure, a MBS connection for multiple MBS contents~~connections~~ can be established by using MBS Contents Identifier TLV encoding in DSA-REQ or DSA-RSP message sent by BS as described in 11.13.36. In other words, when MS sends DSA-REQ message with the MBS service request as described in 11.13.20, BS may respond to it with DSA-RSP message including MBS Contents Identifier TLV encoding. BS may also send MS a DSA-REQ message including MBS Contents Identifier TLV encoding in order to make an establishment of MBS connection. Logical Channel ID, which pairs with Multicast CID in MBS_DATA_IE, is allocated to each MBS Contents IDs in order that it is included in TLV value. As a result, MS can receive multiple ~~a variety of~~ MBS messages for an MBS connection with different MBS contents~~Service (i.e. MBS contents) which is~~ distinguished by Logical Channel ID belonging to a Multicast CID. BS~~MS~~ shall allocate ~~recoginize~~ MBS PDUs s~~messages~~ in the order that the combination of Multicast CID and Logical Channel ID is defined in Extended_MBS_DATA_IE.