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Source(s)	Yeongmoon Son, Hyunjeong Kang, Jungje Son, Panyuh Joo Samsung Electronics Co. Ltd. Yongjoo Tcha, Seong-Choon Lee KT Corp.	Voice: +82-31-279-5845 FAX. : +82-31-279-5130 ym1004.son@samsung.com yjtcha@kt.co.kr
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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MBS Refinement

Yeongmoon Son*, Hyunjeong Kang*, Jungje Son*, Panyuh Joo*,
Yongjoo Tcha**, Seong-Choon Lee**

Samsung Electronics Co. Ltd*, KT*

1 Problem Statement

1.1 MBS MAP message with the overhead such as MAC Header

In IEEE802.16e, current MBS MAP message is assigned in a MAC frame with a MAC Header. But, other MAP messages do not have MAC headers. The reason is that they are for broadcast not for unicast, not need encryptions nor subheaders and assigned in a fixed position or pre-assigned position so that they can be easily detected. MBS MAP message have also similar characteristics. Therefore, using alternative identifier of MAC Header can get advantage of reducing message overhead and not affect detection of MAP message.

We propose the modified MBS MAP message not using MAC Header but using alternative identifier. The modified MBS MAP message has the similar identifier such as the map identifier in SUB-DL-UL-MAP message. We consider all the map identifier of MAP message and the HT, EC and Type field in MAC Header. As a result, we propose 5 bit-long map identifier in modified MBS MAP message.

1.2 Difficulty in realtime decoding of MBS data burst

In IEEE802.16e, MBS MAP message, which is located in the middle of DL subframe, informs MSs of the location of MBS data burst through the MBS_DATA_IE in it. In this case, MS may not perform realtime-decoding of MBS data burst in current DL frame Therefore, MBS_DATA_IE in MBS MAP message need to indicate next MBS frame if MS's realtime decoding is impossible.

We propose the modified MBS_DATA_IE with 'Next MBS frame indicator'. Next MBS frame indicator in MBS_DATA_IE indicates that Information of MBS data burst is relevant in whether current or next MBS frame.

1.3 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 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.

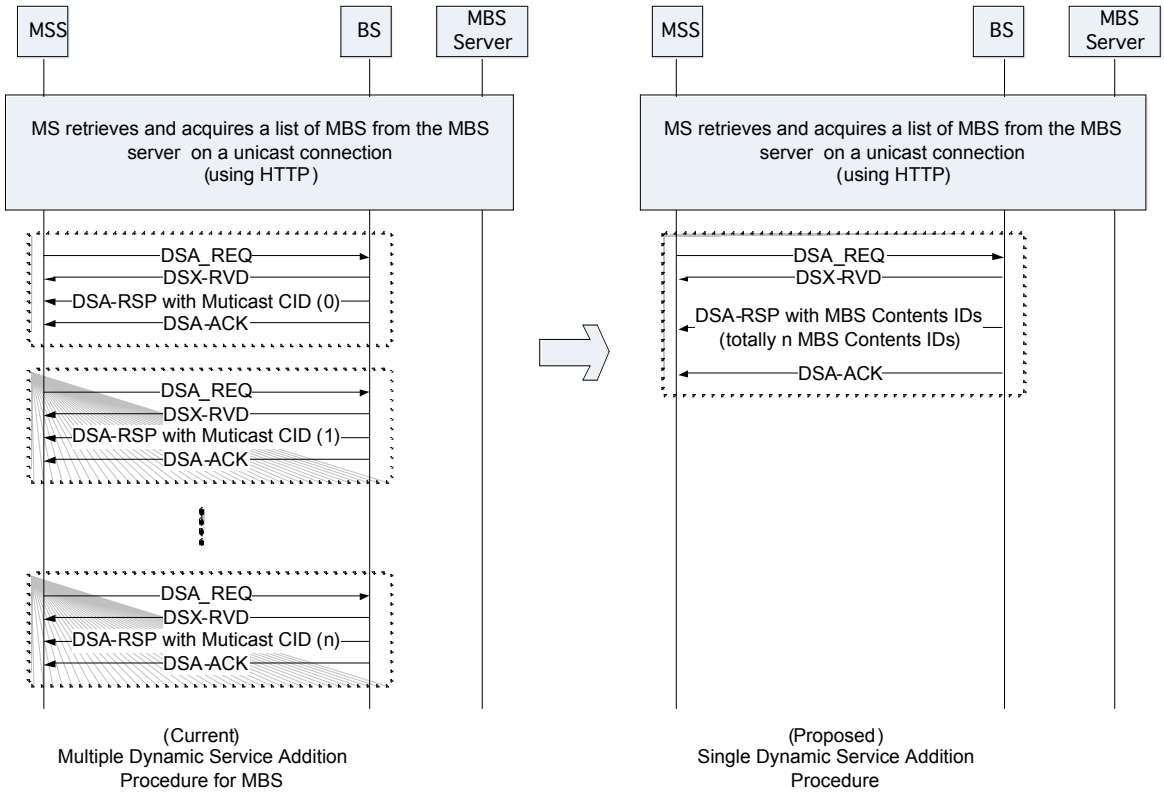

Figure 1. Dynamic Service Addition procedures for several MBS services

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 the multiple logical MBS connections within a Multicast CID.
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 dependent on the vendor-specific and application-level Implementation, it is unnecessary to specify in IEEE802.16e specification.
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.

Type	Length	Value	Scope
[145/146].xx	Variable (2*n)	MBS Contents ID(0), MBS Contents ID(1) …….MBS Contents ID(n-1)	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_DATAA_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	MBS_DATA_IE
Next MBS frame indicator	1	0 = MBS data burst of the current MBS frame 1 = MBS data burst of the next MBS frame
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 MBS portion
Subchannel offset	6	OFDMA subchannel offset with respect to start of 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.
}		
}		

Next MBS frame indicator

This field indicates the MBS data burst has relevance to the current MBS frame or the next MBS frame.

0 = The MBS data burst has relevance to the current MBS frame.

1 = The MBS data burst has relevance to the next MBS frame.

[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	MBS_DATA_IE
Next MBS frame indicator	1	0 = MBS data burst of the current MBS frame 1 = MBS data burst of the next MBS frame
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 MBS portion
Subchannel offset	6	OFDMA subchannel offset with respect to start of 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.
}		
}		

Next MBS frame indicator

This field indicates the MBS data burst has relevance to the current MBS frame or the next MBS frame.

0 = The MBS data burst has relevance to the current MBS frame.

1 = The MBS data burst has relevance to the next MBS frame.

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. The order of MBS messages included in MBS data burst is the order that the combination of Multicast CID and Logical Channel ID is defined in Extended_MBS_DATA_IE.

[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. This message shall be sent without a generic MAC header.

Table 108p — MBS-MAP

Syntax	Size (bits)	Notes
MBS-MAP Message format () {		
~~Management Message Type =~~	~~4~~	
MBS MAP indicator	5	Shall be set to 0b11101
Reserved	3	Shall be set to zero
Frame number	4	The frame number is identical to the frame number in the DL-MAP
MBS_DIUC_Change_Count	8	
#MBS_DATA_IE	4	Number of included MBS_DATA_IE
For(i=0;i<n;i++) {		n = #MBS_DATA_IE
MBS_DATA_IE	Variable	
}		
#Extended_MBS_DATA_IE	4	Number 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	Number 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	
}		
TLV encoding element		
}		

MBS MAP indicator

A value of 0b11101 in this field indicates the presence of a MBS-MAP message.

MBS DIUC Change Count

It is used to notify the Burst Profile used for Multi-BS-MBS data has been changed. If MBS_DIUC_Change_Count change, MS should wait until receiving DCD message unless Downlink Burst Profile TLV is included in MBS_MAP message.

[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, multiple MBS connections can be established by using MBS Contents Identifier TLV encoding in DSA-RSP message 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. 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 a variety of MBS messages for MBS Service (i.e. MBS contents) which is distinguished by Logical Channel ID belonging to a Multicast CID.

[Modify Table 108x — SUB-DL-UL-MAP message format in Line 4, Page 129 of IEEE P802.16e/D7 document as follows]

Table 108x — SUB-DL-UL-MAP message format

Syntax	Size (bits)	Notes
SUB-DL-UL-MAP() {		
~~Compressed map indicator~~	~~3~~	~~Set to 0b111~~
Sub-dl-ul map indicator	5	Set to 0b11100
Reserved	1	Shall be set to zero
Map message length	10	
RCID_Type	2	0b00 = Normal CID 0b01 = RCID11 0b10 = RCID7 0b11 = RCID3
Reserved	1	Shall be set to zero
HARQ ACK offset indicator	1	
If(HARQ ACK offset indicator ==1) {		
DL HARQ ACK offset	8	
UL HARQ ACK offset	8	
}		
DL IE count	8	

For(i=0; i<=DL IE count; i++) {		
DL-MAP_IE()	Variable	
}		
OFDMA symbol offset	8	This value indicates start Symbol offset of subsequent sub-bursts in this UL Allocation start IE
Subchannel offset	7	This value indicates start Subchannel offset of subsequent sub-bursts in this UL Allocation start IE
Reserved	1	Shall be set to 0
While(map data remains){		
UL-MAP_IE()	Variable	
}		
If!(byte boundary) {		
Padding nibble	Variable	Padding to reach byte boundary
}		
}		

Sub-dl-ul map indicator

A value of 0b11100 in this field indicates the presence of a SUB-DL-UL-MAP message.

Map message length

The length of the submap message in bytes including the compressed map indicator and the CRC.

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