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Re:	IEEE P802.16e/D6-2004
Abstract	This contribution proposes a method for an omission of UL-MAP IE used to allocate ranging region in UL subframe.
Purpose	Discuss and adopt proposed text and Downlink Frame Prefix in FCH
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An omission of UL-MAP IE for allocated ranging region

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1 Motivation

In general, shorter is the length of broadcast message, better to the efficient use of Bandwidth is it. However, BS has to use a robust coding and modulation for the transmission of broadcast message so that Broadcast message is properly transmitted to MS located in the edge of BS. Therefore, it causes inefficiency on usage of Bandwidth. In IEEE802.16e, Initial Ranging region may be frequently allocated to UL frame by BS for MSs trying a network entry. Each allocation of Initial Ranging region always requires UL-MAP IE with UIUC = 12 in UL-MAP message which looks like overhead in the environment of robust coding and modulation. This overhead needs to be eliminated as scheme of periodic ranging region, as it is possible. We propose the scheme for omission of UL-MAP IE for allocated ranging region and modifies the DLFP for the scheme.

2 Proposed Text

We propose two remedies.

Remedy 1 :

[Modify the Table 266 in Line 34, Page 503 of IEEE802.16-REVd/D5-2004 document as follows]

Table 266 — OFDMA downlink Frame Prefix format

Syntax	Size	Notes
DL_Frame_Prefix_Format() {		
Used subchannel bitmap	6 bits	Bit #0: Subchannels 0-11 are used Bit #1: Subchannels 12-19 are used Bit #2: Subchannels 20-31 are used Bit #3: Subchannels 32-39 are used Bit #4: Subchannels 40-51 are used Bit #5: Subchannels 52-59 are used
Ranging_Change_Indication	1 bit	
Repetition_Coding_Indication	2 bits	00 - No repetition coding on DL-MAP 01 - Repetition coding of 2 used on DL-MAP 10 - Repetition coding of 4 used on DL-MAP 11 - Repetition coding of 6 used on DL-MAP
Coding_Indication	3 bits	0b000 - CC encoding used on DL-MAP 0b001 - BTC encoding used on DL-MAP 0b010 - CTC encoding used on DL-MAP 0b011 = ZT CC used on DL-MAP

		0b100 to 0b111 -Reserved
DL-MAP_Length	8 bits	
Existence_of_UL-MAP_IE_for Initial Ranging	1 bit	
Allocation_or_Change for Initial Ranging	1 bit	
reserved	4̶2 bits	Shall be set to zero

Used subchannel bitmap

A bitmap indicating which groups of subchannel are used on the PUSC zone.

Ranging_Change_Indication

A flag that indicates whether this frame contains a change of the allocation of Periodic Ranging/BW Request uplink regions comparing to the previous frame. A value of '1' means that a change has occurred, and value of '0' means that the allocations of Periodic Ranging/BW Request regions in the current frame are the same as in the previous frame.

Repetition_Coding_Indication

Indicates the repetition code used for the DL-MAP. Repetition code may be 0 (no additional repetition), 1 (one additional repetition), 2 (three additional repetitions) or 3 (five additional repetitions).

Coding_Indication

Indicates the FEC encoding code used for the DL-MAP. The DL-MAP shall be transmitted with QPSK modulation at FEC rate 1/2. Note that the BS must ensure that DL-MAP (and other MAC messages required for SS operation) are sent with the mandatory coding scheme often enough to ensure uninterrupted operation of SS supporting only the mandatory coding scheme.

DL-Map_Length

Defines the length in slots of the DL-Map message that follows immediately the DL_Frame_Prefix.

Existence of UL-MAP IE for Initial Ranging

The Existence of UL-MAP IE for Initial Ranging indicates whether UL-MAP message includes or not UL-MAP IE with UIUC = 12 for initial ranging.

0 : UL-MAP IE with UIUC = 12 is not included in UL-MAP message

1 : UL-MAP IE with UIUC = 12 is included in UL-MAP message

Allocation or Change for Initial Ranging

Allocation or Change for Initial Ranging has the different meaning according to Existence of UL-MAP IE for Initial Ranging as follows.

In case of Existence of UL-MAP IE for Initial = 0, this field indicates the allocation of Initial Ranging region to UL subframe.

0 : UL-MAP IE with UIUC = 12 is not included in UL-MAP message. As a result, Initial Ranging region is not also allocated to UL subframe.

1 : UL-MAP IE with UIUC = 12 is not included in UL-MAP message. But, Initial Ranging region is allocated and located in the same region as the previous uplink subframe.

In case of Existence of UL-MAP IE for Initial = 1, this field indicates whether UL-MAP IE with UIUC contains or not a change of allocation of Initial Ranging comparing to previous uplink subframe.

0 : UL MAP message includes UL-MAP IE with UIUC = 12 indicating that Initial Ranging region is located in the same region as one in the previous uplink subframe.

1 : UL MAP message includes UL-MAP IE with UIUC = 12 indicating that Initial Ranging region is different from one in the previous uplink subframe.

Before being mapped to the FCH, the 24-bit DL Frame Prefix shall be duplicated to form a 48-bit block, which is the minimal FEC block size.

Whenever there occurs a change of the allocation of Periodic Ranging/BW Request uplink regions, Ranging Change Indication in DLFP is set to 1. In case of Ranging_Change_Indication = 1, if there is UL-MAP IE for Periodic Ranging/BW Request in UL-MAP message, Periodic Ranging/BW Request uplink regions is allocated to uplink subframe. In this case, MS may send the appropriate ranging code to BS through the Periodic Ranging/BW Request uplink region which UL MAP IE points out. As the other case, if UL-MAP message does not include UL-MAP IE for Periodic Ranging/BW Request, MS shall defer the transmission of ranging code due to no existence of its ranging region in uplink frame. During Ranging_Change_Indication = 0, the allocation state in Ranging_Change_Indication = 1 lasts. In other words, thereafter, this allocation state of Periodic Ranging/BW Request uplink region shall go on regardless of the existence of UL-MAP IE for Periodic Ranging/BW Request till Ranging_Change_Indication = 1 in future

DLFP. If MS does not know whether a ranging region exists or not in uplink subframe, it shall wait the next Ranging_Change_Indication set to 1 of DLFP. Therefore, BS shall assign a ranging region periodically or arbitrarily for an MS's Periodic Ranging or BW Request.

MS, which tries Initial Ranging for network entry, shall refer to combination of Existence of UL-MAP IE for Initial Ranging and Allocation or Change for Initial Ranging. In case of Existence of UL-MAP IE = 1, MS may decode or not UL-MAP IE for Initial Ranging according to change flag such as Allocation or Change for Initial Ranging. Thereafter, this allocation state of Initial Ranging uplink region shall go on till Existence of UL-MAP IE for Initial Ranging = 1 in future DLFP. In case of Existence of UL-MAP IE = 0, MS shall detect the allocation of Initial Ranging uplink region including comparison with the previous frame according to allocation flag such as Allocation or Change for Initial Ranging. If MS does not know whether a ranging region exists or not in uplink subframe, it shall wait the next Ranging_Change_Indication set to 1 of DLFP. Therefore, BS shall assign ranging region once at least within Initial Ranging Interval for an MS's network entry.

MSS shall perceive the allocation for data transmission after an allocation of ranging regions.

[Modify the Table 268 – OFDMA downlink Frame Prefix format for all FFT sizes except 128 in Line1, Page 233 of IEEE802.16e/D6 document as follows]

Table 266 — OFDMA downlink Frame Prefix format

Syntax	Size	Notes
DL_Frame_Prefix_Format() {		
Used subchannel bitmap	6 bits	Bit #0: Subchannel group 0 Bit #1: Subchannel group 1 Bit #2: Subchannel group 2 Bit #3: Subchannel group 3 Bit #4: Subchannel group 4 Bit #5: Subchannel group 5
Ranging_Change_Indication	1 bit	
Repetition_Coding_Indication	2 bits	00 - No repetition coding on DL-MAP 01 - Repetition coding of 2 used on DL-MAP 10 - Repetition coding of 4 used on DL-MAP 11 - Repetition coding of 6 used on DL-MAP
Coding_Indication	3 bits	0b000 - CC encoding used on DL-MAP 0b001 - BTC encoding used on DL-MAP 0b010 - CTC encding used on DL-MAP 0b011 = ZT CC used on DL-MAP 0b100 = LDPC encoding used on DL-MAP 0b100 to 0b111 -Reserved
DL-MAP_Length	8 bits	
Existence of UL-MAP IE for Initial Ranging	1 bit	
Allocation_or_Change for Initial Ranging	1 bit	
reserved	42 bits	Shall be set to zero

Remedy 2 :

[Modify the Table 266 in Line 34, Page 503 of IEEE802.16-REVd/D5-2004 document as follows]

Table 266 — OFDMA downlink Frame Prefix format

Syntax	Size	Notes
DL_Frame_Prefix_Format() {		
Used subchannel bitmap	6 bits	Bit #0: Subchannels 0-11 are used Bit #1: Subchannels 12-19 are used Bit #2: Subchannels 20-31 are used Bit #3: Subchannels 32-39 are used Bit #4: Subchannels 40-51 are used Bit #5: Subchannels 52-59 are used
Periodic_Ranging_Change_Indication	1 bit	
Iniitial_Ranging_Change_Inidtaion		
Repetition_Coding_Indication	2 bits	00 - No repetition coding on DL-MAP 01 - Repetition coding of 2 used on DL-MAP 10 - Repetition coding of 4 used on DL-MAP 11 - Repetition coding of 6 used on DL-MAP
Coding_Indication	3 bits	0b000 - CC encoding used on DL-MAP 0b001 - BTC encoding used on DL-MAP 0b010 - CTC encding used on DL-MAP 0b011 = ZT CC used on DL-MAP 0b100 to 0b111 -Reserved
DL-MAP_Length	8 bits	
reserved	43 bits	Shall be set to zero

Used subchannel bitmap
    A bitmap indicating which groups of subchannel are used on the PUSC zone.

Periodic_Ranging_Change_Indication
    A flag that indicates whether this frame contains a change of the allocation of Periodic Ranging/BW Request uplink regions comparing to the previous frame. A value of '1' means that a change has occurred, and value of '0' means that the allocations of Periodic Ranging/BW Request regions in the current frame are the same as in the previous frame.

Initial_Ranging_Change_Indication
    A flag that indicates whether this frame contains a change of the allocation of Initial Ranging comparing to the previous frame. A value of '1' means that a change has occurred, and value of '0' means that the allocations of Periodic Ranging/BW Request regions in the current frame are the same as in the previous frame.

Repetition_Coding_Indication
    Indicates the repettition code used for the DL-MAP. Repetition code may be 0 (no additional repetition),
    1 (one additional repetition), 2 (three additional repetitions) or 3 (five additional repetitions).

Coding_Indication
    Indicates the FEC encoding code used for the DL-MAP. The DL-MAP shall be transmitted with
    QPSK modulation at FEC rate 1/2. Note that the BS must ensure that DL-MAP (and other MAC

messages required for SS operation) are sent with the mandatory coding scheme often enough to ensure uninterrupted operation of SS supporting only the mandatory coding scheme.

DL-Map_Length

Defines the length in slots of the DL-Map message that follows immediately the DL_Frame_Prefix.

Before being mapped to the FCH, the 24-bit DL Frame Prefix shall be duplicated to form a 48-bit block, which is the minimal FEC block size.

Whenever there occurs a change of the allocation of Periodic Ranging/BW Request uplink regions, Periodic Ranging Change Indication in DLFP is set to 1. In case of Periodic_Ranging_Change_Indication = 1, if there is UL-MAP IE for Periodic Ranging/BW Request in UL-MAP message, Periodic Ranging/BW Request uplink regions is allocated to uplink subframe. In this case, MS may send the appropriate ranging code to BS through the Periodic Ranging/BW Request uplink region which UL_MAP IE points out. As the other case, if UL-MAP message does not include UL-MAP IE for Periodic Ranging/BW Request, MS shall defer the transmission of ranging code due to no existence of its ranging region in uplink frame. During Periodic_Ranging_Change_Indication = 0, the allocation state in Periodic_Ranging_Change_Indication = 1 lasts. In other words, thereafter, this allocation state of Periodic Ranging/BW Request uplink region shall go on regardless of the existence of UL-MAP IE for Periodic Ranging/BW Request till Periodic_Ranging_Change_Indication = 1 in future DLFP. If MS does not know whether a ranging region exists or not in uplink subframe, it shall wait the next Periodic_Ranging_Change_Indication set to 1 of DLFP. Therefore, BS shall assign a ranging region periodically or arbitrarily for an MS's Periodic Ranging or BW Request.

In the same manner, MS, which tries Initial Ranging for network entry, shall refer to Initial_Ranging_Change_Indication. In case of Initial Ranging_Change_Indication = 1, if there is UL-MAP IE for Initial Ranging in UL-MAP message, Initial Ranging uplink regions is allocated to uplink subframe. In this case, MS may send the appropriate ranging code to BS through the Initial Ranging uplink region.; Otherwise, MS shall wait Initial Ranging region in future uplink frame whose Initial Ranging_Change_Indication = 1. The allocation state of Initial Ranging uplink region shall go on till Existence of UL-MAP IE for Initial Ranging = 1 in future DLFP. In case of Initial Ranging Change Indication = 0, MS shall detect the allocation of Initial Ranging uplink region including comparison with the previous frame according to allocation flag such as Allocation or Change for Initial Ranging. If MS does not know whether a ranging region exists or not in uplink subframe, it shall wait the next Ranging_Change_Indication set to 1 of DLFP. Therefore, BS shall assign ranging region once at least within Initial Ranging Interval for an MS's network entry.

MSS shall perceive the allocation for data transmission after an allocation of ranging regions.

[Modify the Table 268 – OFDMA downlink Frame Prefix format for all FFT sizes except 128 in Line1, Page 233 of IEEE802.16e/D6 document as follows]

Table 266 — OFDMA downlink Frame Prefix format

Syntax	Size	Notes
DL_Frame_Prefix_Format() {		
Used subchannel bitmap	6 bits	Bit #0: Subchannel group 0 Bit #1: Subchannel group 1 Bit #2: Subchannel group 2 Bit #3: Subchannel group 3 Bit #4: Subchannel group 4 Bit #5: Subchannel group 5
Periodic Ranging_Change_Indication	1 bit	
Iniitial_Ranging_Change_Inidtaion	1 bit	
Repetition_Coding_Indication	2 bits	00 - No repetition coding on DL-MAP 01 - Repetition coding of 2 used on DL-MAP 10 - Repetition coding of 4 used on DL-MAP 11 - Repetition coding of 6 used on DL-MAP

Coding_Indication	3 bits	0b000 - CC encoding used on DL-MAP 0b001 - BTC encoding used on DL-MAP 0b010 - CTC encding used on DL-MAP 0b011 = ZT CC used on DL-MAP 0b100 = LDPC encoding used on DL-MAP 0b100 to 0b111 -Reserved
DL-MAP_Length	8 bits	
reserved	4̶3 bits	Shall be set to zero