Project	**IEEE 802.16 Broadband Wireless Access Working Group <**http://ieee802.org/16**>**
Title	**Proposed change on downlink control for multicast communication over IEEE 802.16n**
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Re:	"IEEE 802.16-12-0142," in response to Letter Ballot #37 on P802.16n/D1
Abstract	Downlink control for multicast operation on GRIDMAN Draft Standard
Purpose	To discuss and adopt the proposed text in the draft amendment document on GRIDMAN
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Proposed change on downlink control for multicast communication over IEEE 802.16n

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1. Introduction

This document provides a change on the downlink control for multicast communication to increase number of connections of multicast.

Figure 1 shows the number of connections for multicast communications using HR Multicast DL Assignment A-MAP IE. As shown the figure, number of connections using fragmented transmission is larger than that without fragmented transmission due to variable reason such as limit of resource in a subframe and level of MCS.

Thus, we propose a change on the downlink control for multicast communication (i.e., HR Multicast DL MAP IE).
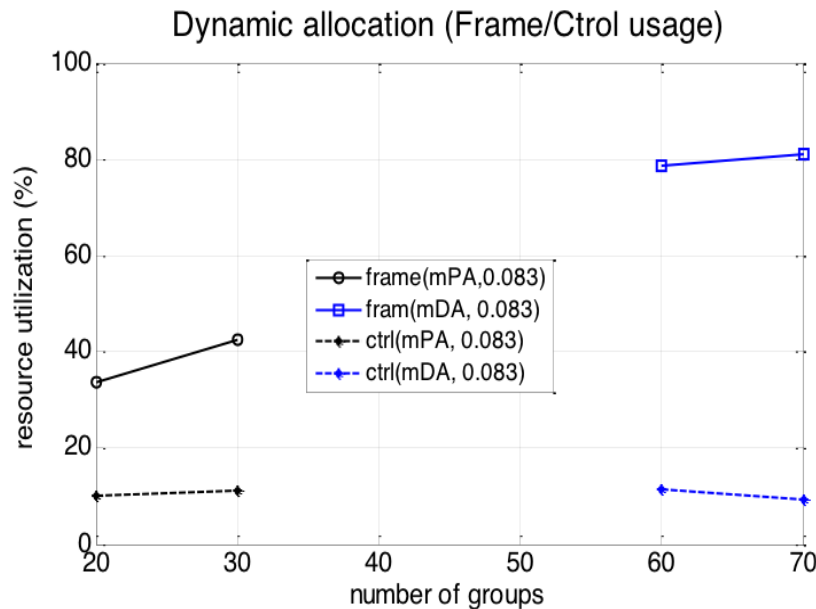

Figure 1—number of connections for multicast communication using HR Multicast DL Assignment A-MAP IE in 10MHz system bandwidth (mPA: no fragmentation, mDA: fragmentation)

2. HR Multicast DL MAP IE

Current HR Multicast DL MAP defined in P802.16n/D1 is transmitted persistently without fragmentation. To provide fragmented transmission of multicast traffic, the transmission indication is proposed and it indicates whether additional traffic is transmitted after transmission of multicast traffic in the time of allocation period. Transmission indication has 2bit information as follows:

- 0b00: no fragment
- 0b01: first fragment
- 0b10: continue
- 0b11: last fragment

3. References

[1] IEEE 802.16-12-0132, GRIDMAN System Requirement Document including SARM annex, January 2012.
[2] IEEE P802.16n[TM]/D1, Air Interface for Broadband Wireless Access Systems - Draft Amendment: Higher Reliability Networks, February 2012.
[3] IEEE P802.16.1a[TM]/D1, WirelessMAN-Advanced Air Interface for Broadband Access Systems - Draft Amendment: Higher Reliability Networks, February 2012.
[4] EEE P802.16Rev3/D4, IEEE Draft Standard for Local and metropolitan area networks; Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems," February 2012.
[5] IEEE P802.16.1[TM]/D4, IEEE Draft for WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems, February 2012.

4. Proposed Text on the IEEE 802.1n Amendment Draft Standard

[-----------------------------------Start of Text Proposal--]

[*Remedy: Change 16.9.2.1 Downlink control channel for multicast communication in page 98 on P802.16n/D1 as follows:*]

16.9.2.1 Downlink control channel for multicast communication

HR-multicast control channel (i.e., HR-Multicast DL MAP IE) carries configuration information (including allocation/change/releasement) for multicast communication for one multicast zone in an HR-BS. In HR-Multicast DL MAP, allocation period indicates a period of persistent allocation of multicast resource and Lifetime is a timer indicating the next instance of HR-Multicast DL MAP IE. During the allocation period, transmission indication indicates whether multicast resource is fragmented. If the transmission indication(TI) is set to 00, it indicates no fragmented traffic is transmitted until the next allocation instance. If TI is set to 01, it indicates the first fragmented traffic and more fragmented traffic is expected to transmit until the TI is set to 11. More fragmented traffic is transmitted with the value of TI setting to 10 or 11. If TI is set to 10, it indicates more fragmented traffic is transmitting until it is set to 11. If TI is set to 11, no more fragmented traffic (i.e., last fragmented traffic) is transmitted. Unless the Lifetime expires, this HR-Multicast DL MAP excluding the value of TI does not change

during the allocation duration. At the time the Lifetime expires, the HR-Multicast DL MAP shall change or release the allocation.

Table 786 - HR-Multicast DL MAP IE

Field	Size (bits)	Value/Description
HR-Multicast DL MAP IE() {		
Extended-2 DIUC	4	HR Multicast DL Map IE() = 0xF (Extended-3 DIUC)
Length	8	Length in bytes
Extended-3 DIUC	4	0x01
Region ID Indicator	1	0: not use Region_ID 1: use Region_ID
If (Region_ID use indicator == 0) {		
OFDMA symbol offset	8	Offset from the start of DL subframe
Subchannel offset	7	
Number of OFDMA symbols	7	
Number of subchannels	7	
Rectangular subburst Indication	1	Indicates subburst allocations are time-first rectangular. The duration field in each subburst IE specifies the number of subchannels for each rectangular allocation. This is only valid for AMC allocations and all allocations with dedicated pilots. When this field is clear, subbursts shall be allocated in frequency-first manner and the duration field reverts to the default operation.
Reserved	2	
} else		
Region_ID	8	Index to the DL region defined in DL region definition TLV in DCD
}		
HR_Multicast_DL_Subburst_IE()	variable	Table 787
Padding	variable	Padding to byte for the unspecified portion of this IE (i.e. not including the first two fields, "Extended-2 DIUC" and "Length"); shall be set to 0.
}		

Table 787 - HR Multicast DL Subburst IE format

Field	Size (bits)	Value/Description
HR-Multicast_DL_Subburst_IE() {		
N subburst	4	Number of subbursts in the 2D rectangular region is this field value plus 1.
Resource shifting indicator	1	0 = No Resource shifting 1= Resource shifting
For(j=0;j<Number of subbursts;j++){		
Allocation Flag	1	1 = allocate 0 = de-allocate
Group Indicator	1	TDD mode: *Reserved*, set to 0. Used for FDD/H-FDD case only; to indicate the group assignment of the MS (see 8.4.4.2 and 8.4.4.2.1) 0b0: Group #1 0b1: Group #2
If (Allocation Flag == 0) {		// deallocate
HR Multicast Group ID	16	
If (Resource shifting indicator == 1) {		
Duration	*variable*	Duration in slots. OFDMA Frame duration dependent 7 bits – 2.5 ms frame 8 bits – 5 ms frame 9 bits – 10 ms frame 10 bits – 20 ms frame
Slot Offset	*variable*	Indicates the start of this persistent allocation in OFDMA slots, with respect to the lowest numbered OFDM symbol and the lowest numbered subchannel in the region. OFDMA Frame duration dependent 7 bits – 2.5 ms frame 8 bits – 5 ms frame 9 bits – 10 ms frame 10 bits – 20 ms frame
}		
} else if (Allocation Flag == 1) {		// allocate
HR Multicast Group ID	16	
Persistent Flag	1	0 = Non-persistent 1 = Persistent

Table 787 - HR Multicast DL Subburst IE format

Field	Size (bits)	Value/Description
if(Power boost per subburst == 1){		
Boosting	1	0b000: Normal (not boosted) 0b001: +6dB 0b010: –6dB 0b011: +9dB 0b100: +3dB 0b101: –3dB 0b110: –9dB 0b111: –12dB; Note that if the Persistent flag is set, the boosting value applies to each instance of the persistent allocation
}		
Duration	*variable*	Duration in slots. OFDMA Frame duration dependent 7 bits – 2.5 ms frame 8 bits – 5 ms frame 9 bits – 10 ms frame 10 bits – 20 ms frame
Slot Offset	*variable*	Indicates the start of this persistent allocation in OFDMA slots, with respect to the lowest numbered OFDM symbol and the lowest numbered subchannel in the region. OFDMA Frame duration dependent 7 bits – 2.5 ms frame 8 bits – 5 ms frame 9 bits – 10 ms frame 10 bits – 20 ms frame
If (Persistent Flag == 1) {		
Allocation Period (ap)	5	Period of the persistent allocation is this field value plus 1 (unit is frame)
Lifetime(L)	4	Indicates the time to transmit the information of this allocation and the information except Transmission Indication (*TI*) does not change until lifetime expires. The next transmission of information is at the frame whose frame number, N_{frame}, satisfies the following condition. N_{frame} modulo L + 1 = 0
} else		
Next allocation offset	5	5LSBs of frame number and it indicates next allocation of the allocation of this field
}		

Table 787 - HR Multicast DL Subburst IE format

Field	Size (bits)	Value/Description
DIUC	4	
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
Transmission Indication (TI)	2	Indicates whether additional traffic is transmitting before allocation period 0b00: no (no additional transmission) 0b01: first (first transmission) 0b10: continue (more transmission) 0b11: last (no more transmission)
}		
}		
Padding	*variable*	Padding to nibble; shall be set to 0.
}		

[---------------------------------End of Text Proposal--]