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Re:	IEEE 802.16d ~~Sponsor~~ Ballot	
Abstract		
Purpose	Material for resolution of comment 245 in LB11a	
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Reformatting the DL and UL map IEs for uniformity

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Introduction

The following text introduces changes in order to address the comment 245 of 802.16 LB11a (Dean Chang), addressing the different way the DL and UL map IEs are structured – the DL map IEs have "Start Time" field, while the UL map IE has "Duration" field, and the start time is computed by accumulation of the durations.

In order to address this comment, the authors propose to use the "Start Time" paradigm both for UL and for DL. The reason for preferring this paradigm is that it is more robust to misinterpretation of preceding map elements – the start time is stated explicitly and is not an accumulation of preceding entities.

In order to further align the processing of UL and DL maps, we propose also to introduce CID field in the beginning of DL map IE. In current usage mode, in which the payloads to different stations are concatenated into longer bursts, this CID shall be set to broadcast CID. For potential future applications, this CID can be set to a multicast group CID or even to a single station CID, allowing to reduce processing activity or allowing a SS to know that a specific burst was directed to it.

Modified Text

The test below uses HIPERMAN DLC document ETSI TS 102 178 V0.0.6 as a baseline text (in particular, this text anyway is to be incorporated into 802.16d as a result of resulution to comment 151 by Nico van Waes). The text to delete is denoted by blue, while the text to add is denoted by red.

4.3.2.1 DL-MAP IE format

DL-MAP Information Elements shall have the format shown in Table 1.

Table 1: DL-MAP information element

Syntax	Size	Notes
DL-MAP_information_element() {		
CID	16 bits	
DIUC	4 bits	
Preamble present	1 bit	0 = not present, 1 = present if DIUC==15, shall be 0
Start Time	11 bits	
if (DIUC == 15)		
Extended DIUC dependent IE	variable	Report_IE() or AAS_DL_IE() or STC_IE()
Padding nibble, if needed	4 bits	Completing to nearest byte
}		

Connection Identifier (CID)

Represents the assignment of the IE to a broadcast, multicast or unicast address.

Downlink Interval Usage Code

A four-bit Downlink Interval Usage Code (DIUC) shall be used to define the burst type associated with that time interval. Burst Descriptor shall be included into DCD Message for each DIUC used in the DL-MAP except those associated with Gap, End of Map and Extended. The DIUC shall be one of the values defined in Table 2.

Preamble present

If set, the indicated burst shall start with the short preamble.

Start Time

Indicates the start time, in units of symbol duration, relative to the beginning of the frame. The end of the last allocated burst is indicated by allocating a NULL burst (DIUC = 14) with zero duration. The time instants indicated by the Start Time values are the transmission times of the first symbol of the burst including preamble (if present).

4.3.2.1.1 DIUC allocations

Table 2 contains the DIUC values used in DL-MAP_IE().

Table 2: OFDM DIUC values

DIUC	Usage
0	Reserved
1-12	Burst Profiles
13	Gap
14	End of Map
15	Extended DIUC

4.3.2.1.2 DL-MAP Report IE format

The BS may use the DL-MAP Report IE to create a gap during which all SSs shall measure the background noise using the RSSI method. When used, the Connection Identifier (CID) of the DL-MAP_IE() shall be set to the broadcast CID.

Table 3: Channel measurement Information Element format

Syntax	Size	Notes
Report_Information_Element() {		
extended DIUC code	4 bits	Channel measurement = 0x0
Length	4 bits	Length = 0x1
Reserved	8 bits	Shall be set to 0x00
}		

4.3.2.1.3 DL-MAP AAS IE format

Within a frame, the switch from non-AAS to AAS-enabled traffic is marked by using the extended DIUC = 15 with the AAS_IE() shown in Table 4 to indicate that the subsequent allocations, until the start of the first UL-MAP allocation using TDD, and until the end of the frame using FDD, shall be for AAS traffic. When used, the CID in the DL-MAP_IE() shall be set to the broadcast CID. Subsequent AAS PHY bursts shall all start with the short preamble.

Table 4: AAS DL information element format

Syntax	Size	Notes
AAS_DL_Information_element() {		
extended DIUC	4 bits	AAS = 0x2
Length	4 bits	Length = 0x0
}		

4.3.2.1.4 DL-MAP STC IE format

In the DL-MAP, an STC enabled BS may transmit DIUC=15 with the STC_IE() shown in Table 5 to indicate that the subsequent allocations shall be STC encoded. No preceding DL allocations shall be STC encoded and all subsequent DL allocations until the end of the frame shall be STC encoded. After this allocation, the BS shall transmit from both its antennas until the end of the frame. The first DL allocation following the STC_IE shall contain a preamble. The number of OFDM data symbols between two preambles and the number of OFDM data symbols between the last preamble and the end of the DL subframe must be even.

Table 5: STC Information Element format

Syntax	Size	Notes
STC_Information_element() {		
extended DIUC code	4 bits	STC = 0x1
Length	4 bits	Length = 0x0
}		

4.3.2.1.5 DL-MAP DUMMY IE format

A SS shall be able to decode the DL-MAP DUMMY IE for forward compatibility. A BS shall not transmit this IE (unless under test). A SS may skip decoding DL bursts scheduled after the Start Time of this IE within the current frame.

Table 6: DL-MAP DUMMY Information Element format

Syntax	Size	Notes
DUMMY_Information_element() {		
extended DIUC	4 bits	0x2...0xF
Length	4 bits	0..15
Unspecified data	Length*8 bits	
}		

4.3.2.2 UL-MAP IE format

The UL-MAP Information Element defines the physical parameters and the start time for UL PHY bursts. The format of UL-MAP elements is shown in Table 7.

When sub-channelization is active (see 4.3.2.2.4), UIUCs 1 and 3 shall not be used.

Table 7: OFDM UL-MAP information element format

Syntax	Size	Notes
UL-MAP_information_element() {		
CID	16 bits	
UIUC	4bits	
Reserved	1 bit	
Start Time	11 bits	
Duration	12 bits	
if (UIUC == 4)		
Focused_contention_IE()	16 bits	
if (UIUC == 15)		
Extended UIUC dependent IE	Variable	AAS_UL_IE() or subchannelization_IE()
else if (subchannelization) {		See 4.3.2.2.4.
Duration	11 bits	
Start Time	11 bits	
Subchannel Index	5 bits	
Reserved	2 bits	Set to 0b00
Midamble Present	2 bits	0b00 = Preamble only 0b01 = Midambles after every 8 data symbols 0b10 = Midambles after every 16 data symbols 0b11 = Midambles after every 32 data symbols
}		
Padding nibble	0/4 bits	Shall be set to 0x0
}		

Connection Identifier (CID)

Represents the assignment of the IE to a unicast, multicast, or broadcast address. When specifically addressed to allocate a bandwidth grant, the CID may be either the Basic CID of the SS or a Traffic CID for one of the connections of the SS.

Uplink Interval Usage Code (UIUC)

Shall be used to define the type of uplink access and the burst type associated with that access. A Burst Descriptor shall be included into an UCD message for each Uplink Interval Usage Code that is to be used in the UL-MAP. The UIUC shall be one of the values defined in Table 8.

Start Time

Indicates the start time, in units of symbol duration, relative to the Allocation Start Time given in the UL-MAP message. For non-subchannelized allocations, the duration of the burst is indicated as the difference between the start times of current and next map elements. The end of the last allocated burst is indicated by allocating a NULL burst (CID = 0 and UIUC = 14). The time instants indicated by the Start Time values are the transmission times of the first symbol of the burst including preamble.

Duration

Indicates the length duration, in units of OFDM symbols, of the subchannelized allocation. The duration is inclusive of the preamble and the midambles contained in the allocation. The start time of the first allocation shall be the Allocation Start Time given in the UL-MAP message. The last allocated burst shall be indicated by allocating a NULL burst (CID = 0 and UIUC = 14) with zero duration. If the UIUC ==15, then the duration indicates the number of OFDM symbols over which the extended UIUC remains active whereas the length of the allocation for the IE, in units of OFDM symbols, is zero. For all subsequent allocations, with a cumulative duration less or equal than indicated in the IE, the condition set by the extended UIUC shall be considered valid.

Subchannel Index

See Table 1.

Midamble Present

Indicates the preamble repetition interval in OFDM symbols.

4.3.2.2.1 UIUC allocations

Table 8 contains the UIUC values used in the UL-MAP_IE()

Table 8: UIUC values

UIUC	Usage
0	Reserved
1	initial ranging
2	REQ Region Full
3	REQ Region Focused
4	Focused Contention IE
5-12	Burst Profiles
13	Gap
14	End of Map
15	Extended UIUC

4.3.2.2.2 UL-MAP Focused Contention IE format

Table 9 defines the UL-MAP IE for allocation Bandwidth (BW) for a SS that requested bandwidth using Focused Contention Reservation Requests. This UL-MAP IE is identified by UIUC = 4 (see Table 8). A SS responding to a bandwidth allocation using the Focused Contention IE shall start its burst with a short preamble (see 5.6) and use only the most robust mandatory burst profile in that burst.

Table 9: Focused Contention Information Element format

Syntax	Size	Notes
Focused_Contention_IE() {		
Transmit Opportunity Index	6 bits	
Contention Channel Index	6 bits	
Contention Code Index	3 bits	
Reserved	1 bit	Shall be set to 0b0
}		

Transmit Opportunity Index

Index number of the Transmit Opportunity that was used in the Bandwidth Request, which this message is responding to. Focused Contention Reservation Requests Transmit Opportunities are numbered from 63 to 0, starting from the beginning of the frame where the UL-MAP is transmitted.

Contention Channel Index

Index number of the Contention Channel that was used in the Bandwidth Request, which this message is responding to.

Contention Code Index

Index number of the Contention Code that was used in the Bandwidth Request, which this message is responding to.

4.3.2.2.3 UL-MAP AAS IE format

Within a frame, indication of AAS-enabled traffic is marked by using the extended UIUC = 15 with the AAS_IE() shown in Table 10 to indicate that the subsequent allocations be for AAS traffic. When used, the CID in the UL-MAP_IE() shall be set to the broadcast CID. Subsequent AAS PHY bursts shall all start with the short preamble. Stations not supporting the AAS functionality may treat the AAS_IE as a gap of "Duration" OFDM symbols. Note that allocations for AAS-enabled traffic do not follow after the AAS_IE(). The AAS_IE() shall not be used in AAS private map messages.

Table 10: AAS UL IE format

Syntax	Size	Notes
AAS_Information_element() {		
extended UIUC code	4 bits	AAS = 0x02
Length	4 bits	Length=0x0
}		

4.3.2.2.4 UL-MAP Subchannelization IE format

Within a frame, the BS may allocate a portion of the UL allocations to sub-channelized traffic.

Table 11: Subchannelization IE format

Syntax	Size	Notes
subchannelization_Information_element() {		
extended UIUC code	4 bits	Subchannelization = 0x03
Length	4 bits	Length = 0x2
Length of Allocations	1612 bits	
}		

Length of allocations

The number of bytes, following the subchannelization_IE, that are used to define subchannelized allocations. A SS not capable of using subchannelization may skip interpreting this number of bytes in the UL-MAP.

4.3.2.2.5 UL-MAP DUMMY IE format

An SS shall be able to decode the UL-MAP DUMMY IE for forward compatibility. A BS shall not transmit this IE (unless under test).

Table 12: UL-MAP DUMMY Information Element format

Syntax	Size	Notes
DUMMY_Information_element() {		
extended UIUC	4 bits	0x4...0xF
Length	4 bits	0…15
Unspecified data	Length * 8 bits	
}		