Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**802.16e Optional Multi-Frame Lease (MFL) Allocation**
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Source(s)	Daniel Wee Brian Kurtz Weidong Yang David Maez Herbert Ruck Navini Networks 817-235-9599, hruck@navini.com
Re:	IEEE 802.16e/D6 Sponsor Ballot
Abstract	This contribution proposes to include an optional method of multi-frame lease allocation to save overhead for certain traffic types.
Purpose	Adoption
Notice	
Release	
Patent Policy and Procedures	

1 Optional Multi-Frame Lease (MFL) Allocation

1. Comment

Some services need a constant bit rate for an extended time. In such cases the overhead used to allocate bandwidth frame by frame is wasted. We propose a method to allocate multiple frames when requested by the subscriber station without changing the current method of normal burst allocation. To make this possible we change a single bit in the PAPR/Safety Zone IE and create two short IE's.

Assume a 5 MHz Bandwidth system with 512-FFT and 433 sub-carriers. The total throughput capacity of this system is about 17 Mbps with 16 QAM modulation.
For VoIP services with 8 kbps voice codec and N users the required bandwidth is
T = N_8 kbps. The associated bandwidth for the overhead in the downlink is

$$O = N\_R\_A + F. \quad (1)$$

Where R is the repetition rate, F is fixed overhead (83.2 kbps) and A is overhead per user (38.4 kbps). F and A are calculated as bandwidth opportunity lost and assuming that 16QAM modulation is used throughout the system. For N = 80, R = 2, the overhead is
O = 6.1 Mbps.

In the case of a simple multi-frame lease (MFL), if the average lease is D, the new overhead is O' = O(1+a)/D where "a" is the % additional overhead in the MFL scheme. The savings in overhead is:

$$(O-O')/O = 1 - (1+a)/D. \quad (2)$$

If a = 0.67 and D = 10, the savings in overhead is 83% or 5 Mbps. As the number of frames leased (D) increases the saving in overhead improves.

The same leasing concept can be applied to save overhead for bandwidth requests on the uplink.

2. Specific Changes to the Standard

[Add the following Text and table to the end of section 8.4.5.3]

8.4.5.3.26 MFL_DL_Allocation_IE

The MFL_DL_Allocation_IE is issued in conjunction with a DL_MAP to indicate a lease time (in frames) for a specific CID's burst allocation given in the DL_MAP. The burst allocation for the specified CID will then last for a period indicated by the lease time or until the burst is prematurely unassigned. A leased burst can be prematurely unassigned by issuing another MFL_DL_Allocation_IE with a Lease Time = 0.

Table 285t – MFL_DL_Allocation_IE

Syntax	Size	Notes
MFL_DL_Allocation_IE () {		
Extended DIUC	4 bits	
Length	4 bits	Length = 0x5
CID	16 bits	
Lease Time (D)	7 bits	D indicates the number of Frames the allocation is leased. 0 = Unassign all allocations for this CID 1-126 = Allocation Leased for D Frames 127 = Assigned till Unassigned
Periodic (p)	4 bits	Burst Allocation is valid every p frames
Reserved	5 bits	Set to 0
}		

[Change Section 8.4.5.4.2 as indicated]

8.4.5.4.2 PAPR reduction/Safety zone/Sounding zone/MFL zone allocation IE format

[Change Table 289 as indicated]

Table 289 – PAPR reduction, safety zone, and sounding zone, and MFL allocation IE format

Syntax	Size	Notes
PAPR_Reduction_Safety_Zone_Sounding_Zone_MFL_Zone_Allocation_IE () {		
OFDMA symbol offset	8 bits	
Subchannel offset	7 bits	
No. OFDMA symbols	7 bits	
No. subchannels	7 bits	
PAPR Reduction/Safety Zone	1 bits	0=PAPR Reduction Zone Allocation 1=Safety Zone Allocation
Sounding Zone	1 bits	0=PAPR/Safety Zone 1=Sounding Zone Allocation
~~Reserved~~ MFL Zone	1 bits	0=PAPR/Safety/Sounding Zone 1=MFL Zone
}		

[Add the following Text and table to the end of section 8.4.5.4.28]

8.4.5.4.28 MFL_UL_Allocation_IE

The MFL_UL_Allocation_IE is issued to indicate a lease time (in frames) and the location of specific CID's burst allocation within a MFL Zone. The burst allocation for the specified CID will then last for a period indicated by the lease time or until the burst is prematurely unassigned. A leased burst can be prematurely unassigned by issuing another MFL_DL_Allocation_IE with a Lease Time = 0.

Table 302s - MFL_UL_Allocation_IE

Syntax	Size	Notes
MFL_UL_Allocation_IE () {		
Extended UIUC	4 bits	
Length	4 bits	Length (D = 0) = 0x3 (D > 0) = 0x7
UIUC	4 bits	
Lease Time (D)	7 bits	D indicates the number of Frames the allocation is leased. 0 = Unassign All allocations for this CID 1-126 = Allocation Leased for D frames 127 = Assigned till Unassigned
Periodic (p)	4 bits	Burst Allocation is valid every p frames
If(D>0) {		
OFDMA Symbols offset	8 bits	
Subchannel offset	6 bits	
No. OFDMA Symbols	7 bits	
No. subchannels	6 bits	
Repetition Coding Indication	2 bits	
}		
Padding	4 bits	If D>0, Padding = 4 bits. If D=0, Padding = 1 bit.
}		