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Re:	Corrigendum to IEEE Std 802.16-2004
Abstract	Intermittent short packets cause network delays if bandwidths are allocated with contention-based CDMA bandwidth requests mechanism for OFDMA. This contribution proposes a contention-based bandwidth request mechanism for fast uplink bandwidth allocation so that OFDMA system can deliver intermittent short packets fast.
Purpose	Review and adoption of the proposed text change into Corrigendum to IEEE Std 802.16-2004
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Fast Uplink Bandwidth Allocation for Intermittent Short Packets

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1. Problem Statements

For delivering the intermittent short packets, an SS needs to request uplink bandwidth using contention-based OFDMA BW requests described in 6.3.6.5. Figure 1 shows the contention-based OFDMA BW allocation mechanism described in 6.3.6.5. It requires minimum five message transfers between BS and SS: three from BS and two from SS until the SS starts to send data. This overhead can be reduced to three messages: two from BS and one from SS, if the SS informs a BS that data to be transmitted are short.

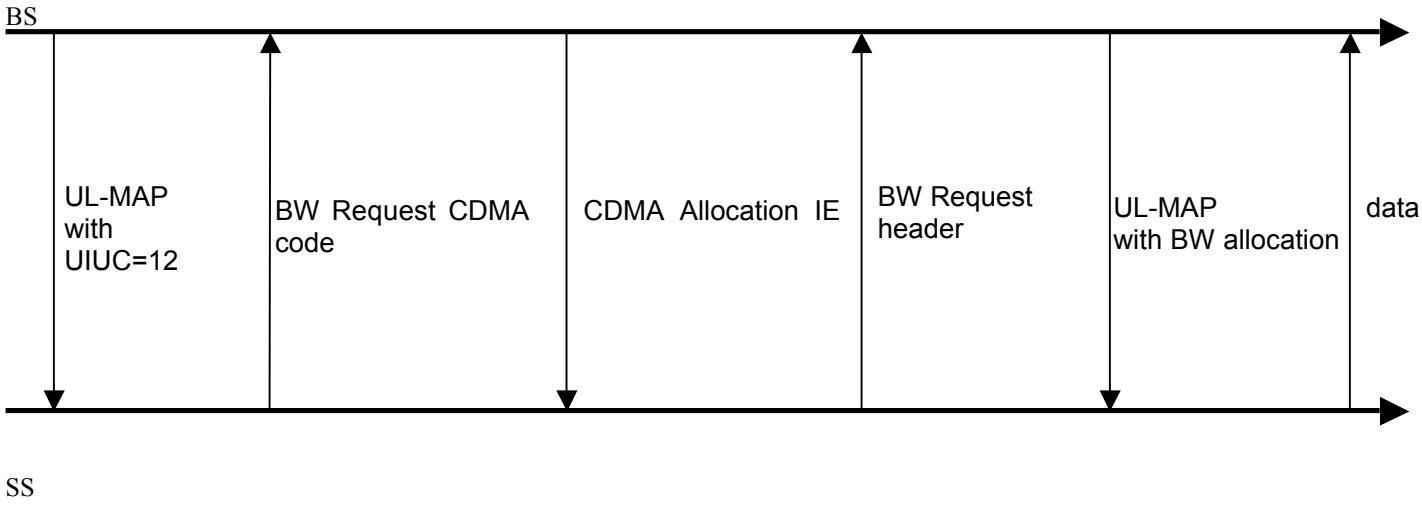

Figure 1: Contention-based OFDMA BW Allocation Mechanism

2. Remedy

1. A SS sends a bandwidth request using the Fast BW Request CDMA code, if the amount of the packets is less than *m* bytes, where *m* is implementation specific.
2. If the Fast BW Request code is identified successfully, the BS sends Fast_BW_Allocation_IE to the SS with duration allocated.
3. The SS transmits data over the bandwidth allocated.

Figure 2 illustrates how the BS allocates bandwidth for short packets using the proposed method.

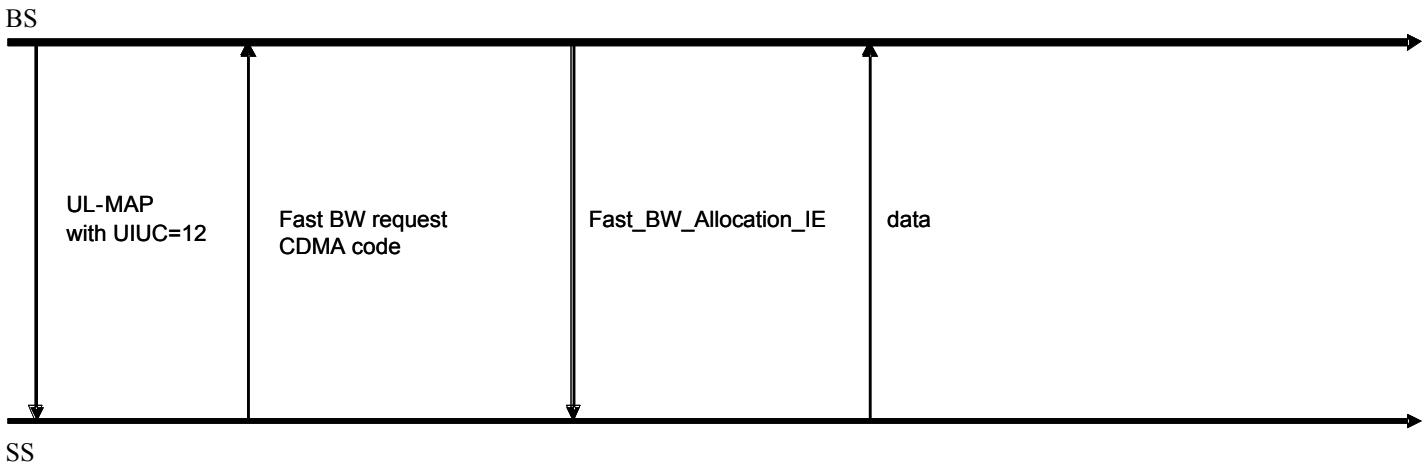

Figure 2: Contention-based OFDMA BW Allocation Mechanism with Fast_ BW_Allocation_IE

3. Proposed Changes

[Add the text to the end of Section 6.3.6.5 Contention-based CDMA Bandwidth Requests for WirelessMAN-OFDMA as follows:]

Also, the WirelessMAN-OFDMA PHY supports optional contention-based fast bandwidth request mechanism for short packets. The SS may request the bandwidth for the short packets using the fast bandwidth request mechanism, if the amount of the data is less than *m* bytes where *m* depends on implementation. The SS may transmits a Fast BW Request code defined in 8.4.7.3 for requesting bandwidth using Fast BW Request mechanism, when Fast BW Request opportunity is given as defined in Table 285, Section 8.4.5.4. If the Fast BW Request code is identified successfully by the BS, the BS sends Fast_BW_Allocation_IE defined in Table 301, Section 8.4.5.4.15 to the SS with duration allocated. This allows the SS to send short packets over the bandwidth allocated by Fast_BW_Allocation_IE.

[Modify the row 9 of Table 285, Section 8.4.5.4 as follows:]

Syntax	Size	Notes
Ranging Method	2 bits	0b00 –Initial Ranging over two symbols 0b01- Initial Ranging over four symbols 0b10- Fast BW Request/BW Request/Periodic Ranging over one symbol 0b11 – Fast BW Request/BW Request/Periodic Ranging over three symbols

[Add Table 301 and the text into Section 8.4.5.4.15 Fast Bandwidth Allocation IE as follows:]

Table 301-Fast_BW_Allocation_IE

Syntax	Size	Notes
Fast_BW_Allocation_IE(){		
Extended UIUC	4 bits	Fast bandwidth allocation = 0x04
Length	4 bits	Length = 0x06
Duration	6 bits	
Repetition Coding Indication	2 bits	0b00 – No repetition coding 0b01 – Repetition coding of 2 used 0b10 – Repetition coding of 4 used 0b11 – Repetition coding of 6 used
Fast Bandwidth Request Code	8 bits	
Symbol Index	8 bits	
Subchannel Index	7 bits	
reserved	1 bit	
}		

Duration

Indicates the duration, in units of OFDMA slots, of the allocation less than 63 slots.

Repetition coding indication

Indicates the repetition code used inside the allocated burst.

Fast Bandwidth Request Code

Indicates the CDMA code sent by the SS for Fast Bandwidth Request.

Symbol Index

Indicates the index of starting OFDMA symbol used by the SS.

Subchannel Index

Identifies the subchannel used by the SS to send the CDMA code.

[Add the text into the first and second paragraphs of Page 582, Section 8.4.7.3 Ranging codes as follows:]

The number of available codes is 256, numbered 0..255. Each BS uses a sub-group of these codes, where the sub-group is defined by a number *S*, 0 <= *S* <= 255. The group of codes will be between *S* and ((*S*+*N*+*M*+*L*+*P*) *mod* 256).

- The first *N* codes produced are for initial-ranging. For example, for the default case of two sub-channels in the ranging channel, clock the PRBS 144 *x* (*S mod* 256) times to 144 *x* ((*S* + *N*) *mod* 256) - 1 times.
- The next *M* codes produced are for periodic-ranging. For example, for the default case of two subchannels in the ranging channel, clock the PRBS 144 *x* ((*N* + *S*) *mod* 256) times to 144 *x* ((*N* + *M* +*S*) *mod* 256) -1 times.
- The next *L* codes produced are for bandwidth-requests. For example, for the default case of two subchannels in the ranging channel, clock the PRBS 144 *x* ((*N* + *M* + *S*) *mod* 256) times to 144 *x* ((*N* +*M* + *L* + *S*) *mod* 256) -1 times.
- The next *P* codes produced are for fast-bandwidth-requests. For example, for the default case of two subchannels in the ranging channel, clock the PRBS 144 *x* ((*N* + *M* +*L*+ *S*) *mod* 256) times to 144 *x* ((*N* +*M* + *L* + *P* + *S*) *mod* 256) -1 times.

[Add to Table 351, Section 11.3.1 UCD PHY-specific channel encodings-- WirelessMAN-OFDMA as follows:]

Name	Type (1 byte)	Length	Value (variable length)
Fast-bandwidth-request codes	173	1	Number of fast bandwidth request codes. Possible values are 0-255.

[Modify Table 351, Section 11.3.1 UCD PHY-specific channel encodings-- WirelessMAN-OFDMA as follows:]

Name	Type (1 byte)	Length	Value (variable length)
Start of ranging code groups	155	1	Indicates the starting number, S, of the group of codes used for this uplink. All the ranging codes used on this uplink

			will be between S and ((S+N+M+L+P) mod 256). Where, N is the number of initial-ranging codes, M is the number of periodic ranging codes, L is the number of bandwidth-request codes, P is the number of fast-bandwidth-request codes. The range of values is $0 \leq S \leq 255$.