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Title	Intra Frame Power Save (IFPS) in OFDMA PHY
Date Submitted	2004-05-14
Source(s)	Yigal Eliaspur Yigal.eliaspur@intel.com Voice: +972-547-884877 Intel
Re:	IEEE P802.16e/D2-2004
Abstract	Intra Frame Power Save support in OFDMA
Purpose	The purpose of this document is to achieve better MSS power consumptions based on the usage of CID indicator on OFDMA DL-MAP.
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Intra Frame Power Save (IFPS) in OFDMA

Yigal Eliaspur

Motivation:

Knowing the target of each burst at the beginning of a frame will eliminate the MSS need to process unnecessary DL bursts within that frame.

In particular, when there is no data toward an MSS within a frame, the MSS will be able to reduce its power through the entire duration of the DL frame.

Details:

The OFDMA DL-MAP syntax will be changed to mandate CID list indication on DL-MAP-IE per DL burst. To reduce the overhead implication of such indication on the network wide allocation two CID allocation enhancements defined:

A method for shortening the Basic CID size on the OFDMA DL-MAP.

The idea is to define the range of each 16 bit length Basic CID in between 0x0001 and m, where m is the maximum number of SS's that can be supported. m may assume different values for each BS and the range is usually between 200 and 1000. For example, if m is 255 the range of Basic CID can be represented by values between 0x0001 and 0x00ff, which means that the Basic CID's can be distinguished by using only the lower 8 bits. Thus, instead of using all 16 bits to represent the Basic CID, it would be possible to express the whole range by using a Short Basic CID that uses only the lower 8 bits. By reducing the lengths of the Basic CID's the total message size has the potential to be reduced significantly.

However, since the value of m can differ from BS to BS, the number of bits needed to represent a Short Basic CID may vary. To indicate the length of the Short Basic CID, a 4-bit CID_length field is necessary. Since the CID_length field is 4 bits, it can assume values from 0 to 15, where the value '0' means that the Short Basic CID can be represented with 1 bit, '1' means that the Short Basic CID can be represented with 2 bits, and '15' means that the Short Basic CID can be represented with 16 bits.

Some recommendation definition to the CID appearance on OFDMA DL-MAP.

1. Broadcast CID that is part of a burst must be explicitly indicated in the OFDMA DL-MAP IE.
2. Multicast CID that is part of a burst must be explicitly indicated in the OFDMA DL-MAP IE if:
 - a. Non of the burst's CIDs are broadcast CID
 - b. One of the MSSs of the CID does not match to previously indicated Multicast CID.
3. Unicast CID of a specific MSS that is part of a burst must not be indicated in the OFDMA DL-MAP IE. Alternately the MSS's Basic CID should be indicated if:
 - a. Non of the burst's CIDs are broadcast CID
 - b. The MSS does not match to previously indicated Multicast CID or Basic CID.

Changes summary:

11.3.1 UCD channel encodings

Table 306—UCD PHY-specific channel encodings — WirelessMAN-OFDMA

Add the following row to the table:

Name	Type	Length	Value
Short_CID_Length	157	1	OFDMA Short Basic CID length on MAP IE = Short_CID_length + 1. Valid values are 0-15. This value is based on parameter m from the Basic CID definition (see Table 298—CIDs)

8.4.5.3 DL-MAP IE format

Original :

Table 248—OFDMA DL-MAP_IE format

Syntax	Size	Notes
DL-MAP_IE() {		
DIUC	4 bits	
if(DIUC == 15) {		
Extended DIUC dependent IE	<i>variable</i>	See clauses following 8.4.5.3.1
} else {		
if(INC_CID == 1) {		The DL-MAP starts with INC_CID =0. INC_CID is toggled between 0 and 1 by the CIDSWITCH IE() (8.4.5.3.6)
N_CID	8 bits	Number of CIDs assigned for this IE
for (n=0; n<N_CID; n++) {		
CID	16 bits	
}		
}		
OFDMA Symbol offset	10 bits	
Subchannel offset	5 bits	
Boosting	3 bits	000: normal (not boosted); 001: +6dB; 010: -6dB; 011: +9dB; 100: +3dB; 101: -3dB; 110: -9dB; 111: -12dB;

No. OFDMA Symbols	9 bits	
No. Subchannels	3 bits	
}		
}		

Changed:

Table 248—OFDMA DL-MAP_IE format

Syntax	Size	Notes
DL-MAP_IE() {		
DIUC	4 bits	
N_CID	8 bits	Number of CIDs assigned for this IE
for (n=0; n<N_CID; n++) {		
CID	16 bits	
}		
N_Basic_CID	8 bits	Number of Short Basic CIDs assigned for this IE
for (n=0; n<N_Basic_CID; n++) {		
Short Basic CID	(Short_CID_Length +1) bits	Short Basic CID value obtained from the lower Short_CID_Length +1 bits of the Basic CID (i.e. BCID[Short_CID_Length:0])
}		
OFDMA Symbol offset	10 bits	
Subchannel offset	5 bits	
Boosting	3 bits	000: normal (not boosted); 001: +6dB; 010: -6dB; 011: +9dB; 100: +3dB; 101: -3dB; 110: -9dB; 111: -12dB;
No. OFDMA Symbols	9 bits	
No. Subchannels	3 bits	
}		

8.4.5.3.7 CID Switch IE

Section to be deleted.

8.4.5.3.1 DIUC allocation

Add new section:

8.4.4.3.x CID allocation recommendation on OFDMA DL-MAP IE

Broadcast CID that is part of a burst must be explicitly indicated in the OFDMA DL-MAP IE.

Multicast CID that is part of a burst must be explicitly indicated in the OFDMA DL-MAP IE if:

- Non of the burst's CIDs are broadcast CID
- One of the MSSs of the CID does not match to previously indicated Multicast CID.

Unicast CID of a specific MSS that is part of a burst must not be indicated in the OFDMA DL-MAP IE.

Alternately the MSS's Basic CID should be indicated if:

- Non of the burst's CIDs are broadcast CID
- The MSS does not match to previously indicated Multicast CID or Basic CID.