Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**DL-MAP and UL-MAP CID Table IEs**
Date Submitted	**2005-01-26**

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Re:	Response to Sponsor Ballot on IEEE802.16e/D5a document
Abstract	The proposed DL-MAP and UL-MAP CID table IEs can be used to not only improve DL subframe efficiency but also significantly reduce unnecessary power consumption.
Purpose	To incorporate the text changes proposed in this contribution into the 802.16e/D6 draft.
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DL-MAP and UL-MAP CID Table IEs

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1. Problem Statement

According to current standard draft IEEE P802.16e-D5a-2004, MAP messages are used to perform DL and UL allocation to the MSSs. The current MAP format for OFDMA mode presents the following two problems:

- **Excessive power consumption**: As defined in the current 802.16e standard, a MSS has to, at the minimum, finish listening to the whole DL-MAP and UL-MAP regardless there is DL traffic or UL traffic for the MSS in the current frame.
- **Extensive overhead on DL for MAP messages**: As defined in the current 802.16e standard, the DL data burst allocation can optionally include the list of CIDs designated. However, if the list of CIDs is not included in the DL MAP, it imposes a high requirement on MSS's processing power and drastically increases the MSS's battery consumption. To reduce MSS processing complexity and prolong battery life, the list of CIDs should always be included in the DL-MAP for the mobile network. However, when the CIDs are included, there can extensive overhead on DL caused by DL MAP transmission since the size of DL-MAP can be very large.

2. Proposed Solutions

To overcome the problems mentioned above, we would like to propose the following solution:

- Introduce an extended DL MAP message for OFDMA mode. This extended DL MAP message should follow the current DL MAP message. The definition of current DL MAP remains the same as defined in IEEE P802.16e-D5a-2004 section 6.3.2.3.2 and 8.4.5.3. The extended DL MAP message should only contain the IEs defined in IEEE P802.16e-D5a-2004 section 8.4.5.3.
- Introduce two new IEs, DL CID Table IE and UL CID Talbe IE. The CID table contains a list of CIDs for the MSSs with traffic allocated to in the current frame.
- The DL CID table contains list of CIDs for the MSS with DL traffic allocation in the current frame. The DL CID table is composed of multiple CID records. There are two types of CID records:
    - Normal CID Record: Each normal CID record either contains a broadcast indication or a list of CID that is corresponding to an allocated data burst in DL_MAP.
    - Extended IE CID Record: Extended IE CID Record contains the all CIDs that can be included in extended IEs. There is only one Extended IE CID Record in a DL CID table.
- The association of CID records and DL_MAP allocations are shown in Figure 1.

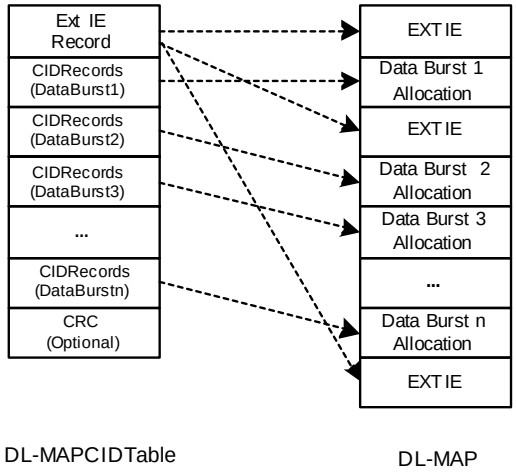

Figure 1. Association for CID Records and DL MAP Data Burst Allocation

To see the potential power saving and possible BW overhead, we performed a simple analysis to demonstrate the merit of this scheme. In particular, we study two most likely applications for a MSS operating on a battery. The power consumption is measured by the percentage of MSS's average ON time over a frame. We assume 80% loading factor in a typical 3-sector PUSC application, with 8 data burst per frame. Other system parameters are: 1K FFT over 10MHz BW, frame size of 5mS, DL/UL ratio of 2:1 and 16QAM and code rate = ¾. The two applications are the internet browsing and voice/IP. The traffic models used for these two applications are typical ones used in similar systems.

First, we study the performance in normal mode. In particular, we show the results for 100% Internet, 100% voice/IP and 80% voice/IP and 20% Internet applications. The results are shown in Table 1. If we assume that a MSS battery is spent at 10% and 90% for sleep/idle and active mode, respectively. Further we assume that in active mode 70% of battery life is spent on Tx. Based on these assumptions and the result in the table, the battery life can be extended by about 10%, 5% and 6% for Internet only, voice only and mixed applications.

Table 1 MSS's average ON time over a frame

Average On Time (%)	Internet Only	Voice/IP Only	20% Internet 80% Voice/IP
Current Scheme	0.22	0.32	0.3
Proposed Scheme	0.14	0.26	0.23

BW overhead is estimated by the memory size of additional IEs. We assume 2-time repetition is used with mandatory coding rate. Other system parameters are the same as above. If in the proposed scheme 8 bit truncated CID is used, we result in about 6 extra bytes per frame.

3. Specific Text Changes

[Insert the following sections:]

8.4.5.3.20 DL-MAP CID table IE

The association of DL-MAP CID table IE records and DL_MAP allocations are shown in Figure 208c.

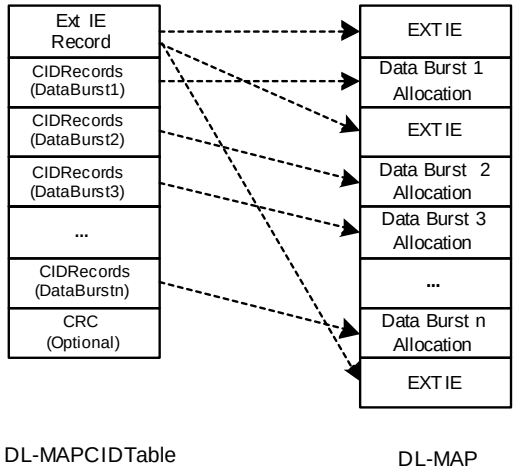

Figure 208c. Association for DL-MAP CID Records and DL/UL MAP Data Burst Allocation

Table 284k—DL-MAP CID Table IE

Syntax	Size	Notes
DL-MAP CID table IE () {		
Extended DIUC	4 bits	0x??
Length	4 bits	Length in bytes of following fields
CID Table Sequence	2 bits	00: First page 01: Middle page 10: Last page 11: Single Page
If (“CID Table Sequence” = “00”)		
{		
CID Format	2 bits	00: 16 bits 01: 12 bits LSB 10: 8 bits LSB 11: 4 bits LSB
H-ARQ MAP INC	1 bits	0: H-ARQ MAP Pointer IE not included in DL_MAP 1: H-ARQ MAP Pointer IE included In DL_MAP
MBS MAP INC	1 bits	0: MBS Service MAP IE not included in DL_MAP 1: MBA Service MAP IE included in DL_MAP
}		
Begin CID records		Each CID record contains the list of CIDs. Two types of CID records: Normal CID Record: Each normal CID record contains a list of CID that is corresponding to a allocated data burst in DL_MAP Extended CID Record: Only one extended CID record, it contains the all CIDs that can be

		included in extended IE.
for (i=0; i<n; i++)		0 to n records can be included in a DL_MAP_CID_Table_IE. n doesn't need to be defined, it can be deducted based on length field
{		
Broadcast Burst	1 bit	0: not a broadcast burst 1: broadcast burst
If (Broadcast Burst = 0)		Number of CIDs left from the last CID Table
{		
Record Type	1 bit	0: Normal CID Record 1: Extended IE CID Record
Continuation Flag	1 bit	0: This record will not be continued 1: This record will be continued in the first record of next IE
NUM CIDs	6 bits	Number of CIDs in this record
for (i=0; j < NUM CIDs; j++)		
{		
CID	N bits	N = 16 when "CID Format" = "00" N = 12 when "CID Format" = "01" N = 8 when "CID Format" = "10" N = 6 when "CID Format" = "11"
} //end for-loop NUM CIDs		
} //if !broadcast burst		
}		
If ("CID Table Sequence" = "10" or = "11")		
{		
CRC INC	1	0: CRC is not included 1: CRC is included
CRC	32 bits	CRC-32 calculation for the DL-MAP CID Table IE (including all pages) is the same as that used for standard MAC messages
}		
Padding bits	Variable	Set to zeros to align octet boundary

[Insert the following section:]

8.4.5.4.23 UL-MAP CID table IE

The association of UL-MAP CID table IE records and UL-MAP allocations are shown in Figure 208d.

Table 284k—Field description of UL-MAP CID table IE

Syntax	Size	Notes
UL-MAP CID table IE () {		
Extended DIUC	4 bits	0x??
Length	4 bits	Length in bytes of following fields

CID BITMAP Format	2 bits	00: 64 bits 01: 32 bits 10: 16 bits 11: 8 bits LSB
CID BITMAP	N bits	N = 64 when “CID BITMAP Format” = “00” N = 32 when “CID BITMAP Format” = “01” N = 16 when “CID BITMAP Format” = “10” N = 8 when “CID BITMAP Format” = “11” CID BITMAP shall be set according to the following: If the UL-MAP includes an allocation for a MSS in awake mode, the i-th LSB bit of the CID BITMAP shall be set to “1” where i = (Basic CID of the MSS) Mod N
CRC INC	1	0: CRC is not included 1: CRC is included
CRC	32 bits	CRC-32 calculation for the DL-MAP CID Table IE (including all pages) is the same as that used for standard MAC messages
Padding bits	Variable	Set to zeros to align octet boundary

4. References

[1] IEEE 802.16- 2004 IEEE Standards for local and metropolitan area networks part 16: Air interface for fixed broadband wireless access systems

[2] IEEE P802.16e-D5a-2004