Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Harmonized Downlink Notification with Submap Pointer IE~~Clarification and Enhancements to SubMAP Pointer IE~~**
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Re:	Response to the P802.16e/D6 Ballot Resolution Committee Recirculation Announcement IEEE 802.16-04/79

Abstract	This contribution recommends clarifications to SubMAP Pointer IE and adding a new IE for improved power savings for idle and sleep mode as it relates to monitoring system broadcast updates.
Purpose	To be discussed and considered in preparation of new text for idle and sleep mode sections.
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Corrections and Enhancements to SubMAP Pointer IE

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This contribution proposes a variation of original contribution on Universal DL notification message by the harmonizing that with the Submap Pointer IE recently proposed and adopted in 801.16-d6. The functionalities proposed in contribution IEEE C802.16e 05/043r2 are split in two pieces and offered by a new IE for broadbast control messages and minor corrections to exiting Submap pointer IE.

Problem:
The ~~current~~ latest draft of IEEE802.16e introduces a new~~defines~~ HARQ Submap~~MAP~~ pointer IE's to be used by users in normal, idle and sleep mode users to indicate to users if there are any paging or allocation messages for them in the respective submaps. This IE is particularly helpful in improving MSS's power saving during idle and sleep modes. However the current definition of this IE, uses CID hashing to map users to each of bits in the mask. However the idle users do not have an CID to use as basis for this hashing. Also the maximum size of this IE needs to be increased to reduce the probability of false positives.

Remedy:
This contribution proposes that the MAC Address be used as a basis for hashing to the currently defined binary CID mask and also change the name of this mask to binary indication mask. Other procedures related to this pointer IE remain the same.

Problem:
Another issue that can be conveniently addressed by adding a simple and short IE is the problem of changes in DCD and/or UCD. Sleep Mode, and especially Idle Mode MSS can waste substantial frames decoding the beginning of each and every frame looking for the updated DCD/UCD to regain burst mode synch, upon detecting a change in the Configuration Change Counter of the DL-MAP. Increasing the spacing between DCD/UCD changes and/or transmission is hardly helpful as it only increases the duration of this constant decoding period. Decreasing the spacing between DCD/UCD changes and/or transmissions beyond what is desirable for optimal system performance unnecessarily increases overhead.

Remedy:
This contribution suggest adding a new IE that explicitly points to the frame number of the next DCD/UCD transmission to remove MSS's obligation to search each frame for updated DCD/UCD.. With the frame number in hand, MSS could continue their mode operation without the burden of unnecessarily decoding the beginning of frames outside of their listening interval, awakening when the proscribed DCD/UCD transmission frame time arrives, decoding the transmission, and becoming again immediately available to return to normal operation with minimal synchronization; minimized call setup latency. With this method, MSS in both Idle and Sleep Mode remain constantly updated to DCD/UCD changes with the minimum of frame decoding requirements.

The contribution suggests including support for other change notification and frame mapping for some other configuration change and emergency notification purposes. Specifically, the contribution makes allowance for changes to some as yet undefined configuration items and/or allowance for scheduled receipt of emergency services multicast bulletins (e.g. location specific emergency advisories like avalanche, flash flood, tornado, Amber alert, etc…). These additions can be extremely beneficial in that they allow for the timely dispersal of timing critical information/updates while not requiring a massed network re/entry with resumption of normal operations by all MSS in sleep and idle modes.

[In 6.3.19.1 Introduction, page 122, line 33, modify paragraphs as]:
During Availability interval the MSS is expected to receive all DL transmissions same way as in the state of normal operations (no sleep). In addition, the MSS shall examine the DCD and UCD change counts and the frame number of the DL-MAP PHY Synchronization Field to verify synchronization with the BS. Upon detecting a changed DCD and/or UCD count in the DL MAP, unless using the Broadcast Control ~~Update~~ Pointer IE for tracking and updating DCD and/or UCD changes, the MSS shall continue reception until receiving the corresponding updated message.

- If the BS transmits the Broadcast Control~~Update~~ Pointer IE, the MSS shall read and react to this message according to the following:
  - If the DCD_UCD Configuration Change Counter has changed since MSS last decoding of this IE, even if scheduled to be in a sleep interval the MSS shall awaken at DCD_UCD Transmission Frame in time to synchronize to the DL and decode the DCD and UCD message in the frame, if present. If the MSS fails to decode one or both of DCD and UCD, or no DCD or UCD was transmitted by the BS, the MSS shall continue decoding all subsequent frames until it has acquired both updated DCD and UCD. Upon successful completion of DCD and UCD decoding, the MSS shall immediately return to regular Sleep Mode operation.
  - If Skip Broadcast_System_Update is set to '0', even if scheduled to be in a sleep interval, the MSS shall awaken at Broadcast_System_Update_Transmission_Frame in time to synchronize to the DL and decode and read the DL-MAP and any message, if present. Upon completion, the MSS shall immediately return to regular Sleep Mode operation.

During Unavailability intervals for MSS the BS may buffer (or it may drop) MAC SDUs addressed to unicast connections bound to an MSS. The BS may choose to delay transmission of SDUs addressed to multicast connections until to following Availability Interval, common for all MSSs participating in the multicast connection. …..

[In 6.3.21.5 MSS Paging Listening Interval, page 166, modify as]:
6.3.21.5 MSS Paging Listening Interval
The MSS shall scan, decode the DCD and DL-MAP, and synchronize on the DL for the Preferred BS in time for the MSS to begin decoding any BS Broadcast Paging message during the entire BS Paging Interval. At the end of MSS Paging Listening Interval, providing that the MSS does not elect to terminate the MSS Idle Mode, the MSS may return to MSS Paging Unavailable Interval.

If the BS transmits the Broadcast Control~~Update~~ Pointer IE, the MSS shall read and react to this message as follows:

- If the DCD_UCD Configuration Change Counter has changed since MSS last decoding of this IE, even if scheduled to be in a paging unavailable interval the MSS shall awaken at DCD_UCD Transmission Frame in time to synchronize to the DL and decode the DCD and UCD message in the frame, if present. If the MSS fails to decode one or both of DCD and UCD, or no DCD or UCD was transmitted by the BS, the MSS shall continue decoding all subsequent frames until it has acquired both updated DCD and UCD. Upon successful completion of DCD and UCD decoding, the MSS shall immediately return to regular Idle Mode operation.
- If Skip Broadcast_System_Update is set to '0', even if scheduled to be in a paging unavailable interval, the MSS shall awaken at Broadcast_System_Update_Transmission_Frame in time to synchronize to the DL and decode the DL-MAP and any message, if present. Upon completion, the MSS shall immediately return to regular Idle Mode operation.....

[In 8.4.5.3 DL-MAP IE format, page 269, append new sections as]:

8.4.5.3.26 ~~-~~Broadcast Control Pointer IE

The structure of this IE is captured in Table 285t.

Table 285t— Broadcast Control Pointer~~Notification~~ IE Format

Syntax	Size	Notes
Broadcast Control Pointer ~~Universal_DL_Notification~~ IE{		
Extended DIUC	4 bits	FDN = 0x0A
Length	4 bits	Length of IE in Bytes
DCD_UCD Configuration Change Counter	4 bits	A composite configuration change counter incremented for each change in either DCD or UCD
DCD_UCD Transmission Frame	8 bits	The least significant eight bits of the frame number of the next DCD and/or UCD transmission.
Skip Broadcast_System_Update	1 bit	
If (Skip Broadcast_System_Update == 0) {		
Broadcast_System_Update_Type	3 bits	Shows the type of Broadcast_System_Update 000 For NBR_ADV Update 001 For Emergency Services Message 010 – 111 Reserved
Broadcast_System_Update_Transmission_Frame	8 bits	The least significant eight bits of the frame number of the next Broadcast_System_Update transmission.
}		
}		

8.4.5.3.10 H-ARQ MAP Pointer IE

[Change 8.4.5.3.10 as indicated:]

~~This IE shall only be used by a BS supporting H-ARQ, for MSS supporting H-ARQ.~~

Table 283 H-ARQ MAP or Sub-MAP Pointer IE Format

Syntax	Size	Note
H-ARQ and Sub- MAP Pointer IE {		
Extended DIUC	4 bits	H-ARQ MAP Pointer = 0x07
Length ~~= 2x N~~	4 bits	~~N is the number of H-ARQ MAP or Sub MAP bursts~~Length of IE in Bytes
While (data remains) {		
~~AMC~~ DIUC	4 bits	
No. Slots	8 bits	
Repetition Coding Indication	2 bits	
MAP Version	2 bits	0b00 – H-ARQ MAP v1 0b01 – Sub-MAP
~~CID~~Binary Indication mask included	1 bits	0 –Binary Indication ~~CID~~ mask not included 1 –Binary Indication ~~CID~~ mask included
If (Binary Indication ~~CID~~ mask included) {		
Idle users	1 bit	Bursts for Idle users included in the Sub MAP
Sleep users	1 bit	Bursts for Sleep users included in the Sub MAP
Use mask	1 bits	
If (use mask ==1){		
~~CID Mask~~Binary Indication Mask Length	2 bits	00: 10~~1~~ bits 01: 18~~9~~ bits 10: 34 bits 11: 58 bits
~~CID~~ Binary Indication mask	n bits	n = The number of bits of ~~CID~~ binary indication mask is determined by ~~C~~ Binary Indication Mask Length.. ~~ID Mask Length.~~ When the MAP message pointed by this pointer IE includes any MAP IE for an ~~awake mode~~ MSS, the bit number ((~~MAC Address~~Basic CID ~~of the~~ MSS ID) MOD n) ~~the LSB of CID mask shall~~ in this field shall be set to 1. Otherwise, it may be set to 0.. If Idle Users bit is set to "1", MAC Address shall be used as MSS ID If Idle User bit is set to "0", Basic CID shall be used as MSS ID
}		
~~-~~}		
}		
}		