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Re:	IEEE P802.16-REVd/D5		
Abstract	This contribution introduces clarifications for OFDMA private maps		
Purpose	Adopt into P802.16d/D5 corrigenda		
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Clarify OFDMA private maps

Dave Pechner, Doug Dahlby

1 Problem Statement

The 802.16d standard refers to private maps, for example in section 6.3.7.6.1, without defining what private maps are, how they may be used, or whether support for private maps is mandatory. In particular, there is no specification of where private maps may occur in the DL subframe, or whether their PHY burst allocation refers to the frame containing the private map, or a subsequent frame.

The current definition of DL maps (both regular and compressed) suggest that there is only a single DL map per frame, and that this DL map must occur immediately following the FCH. Therefore, by this interpretation, the current standard does not support private maps.

2 Proposed Solution

It is proposed to define an unambiguous OFDMA-PHY private map format, to specify where the private map may occur in the frame, to specify which frame contains the PHY burst allocation referenced in the private map, and to clarify that support for private maps is optional.

3 Proposed Text Changes

[Add new section 8.4.5.8]

8.4.5.8 Private Maps

Private maps may be located in positions in the frame other than immediately following the DL Frame Prefix. Private maps have the most significant two bits of the first byte set to 1. This distinguishes the private map message from a standard MAC header in the same manner as compressed maps. The private map message is distinguished from the compressed map message by context. Compressed maps must occur immediately after the DL Frame Prefix. Private maps may occur anywhere in the DL subframe other than immediately after the DL Frame Prefix.

8.4.5.8.1 Private DL-MAP

The private DL-MAP format is presented in Table XXX. The multiple IE private DL-MAP message presents the same information as the compressed DL-MAP format. The single IE private DL-MAP message eliminates the fields that are not relevant when the message is targeted to a single CID.

Table XXX—Private DL-MAP message format

Syntax	Size	Notes
Private_DL-MAP() {		
Private map indicator	2 bits	Set to binary 11 for private format
reserved	1 bit	Shall be set to zero

UL-MAP appended	1 bit	
Private map type	1 bit	0 = multiple IE, 1 = single IE
if (Private map type == 0) {		
Map message length	11	
PHY Synchronization Field	32 bits	
DCD Count	8 bits	
Operator ID	8 bits	
Sector ID	8 bits	
DL IE count	8 bits	
for (*i* = 1; *i* <= DL IE count; *i*++) {		
DL-MAP_IE()	*variable*	
}		
if !(byte boundary) {		
Padding Nibble	4 bits	Padding to reach byte boundary.
}		
CRC-32	32 bits	If a private UL-MAP is appended, the CRC field is located after the private UL-MAP. The CRC is computed across all bytes of the private map(s) starting with the byte containing the private map indicator through the last byte of the map(s) as specified by the Map message length field. The CRC calculation is the same as that used for standard MAC messages.
} else {		
CID Included	1 bit	1 = CID Included The CID must be included in the first private MAP if it was pointed to by a DL-MAP IE with INC_CID == 0.
Preamble Shift Index Included	1 bit	1 = Preamble shift index included. Preamble modification is only relevant in the AAS DL subframe portion. Private maps in non-AAS subframe portions will not include the preamble shift index.
if (CID Included) {		
CID	16 bits	
}		
if (Preamble Shift Index Included) {		
Preamble Select	1 bit	0 = Frequency shifted preamble 1 = Time shifted preamble
Preamble Shift Index	4 bits	Updated preamble shift index to be used starting the with the frame specified by the Frame Offset.
reserved	3 bits	Set to zero
}		
DIUC	4 bits	Only burst profile DIUCs allowed
Frame Offset	3 bits	
OFDMA Symbol Offset	8 bits	
Subchannel Offset	7 bits	
No.OFDMA symbols	7 bits	
No. Subchannels	7 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
Padding bits	3 bits	If a private UL-MAP is appended,

		no intervening padding bits are used.
CRC-16	16 bits	If a private UL-MAP is appended, the CRC field is located after the private UL-MAP. A CRC16-CCITT value, as defined in ITU-T Recommendation X.25, is computed across all bytes of the private DL-MAP and if present, the associated private UL-MAP.
}		
}		

Private map indicator
A value of binary 11 in this field indicates the map message conforms to the private format described here. The exception is when the message immediately follows the DL Frame Prefix, in which case a binary 11 indicates a compressed map message (see 8.4.5.6).

UL-MAP appended
A value of 1 indicates a private UL-MAP (see 8.4.5.6.2) is appended to the current private DL-MAP data structure.

Map message length
This value specifies the length of the private map message(s) beginning with the byte containing the Private map indicator and ending with the last byte of the private DL-MAP message if the UL-MAP appended bit is not set or the last byte of the private UL-MAP message if the UL-MAP appended bit is set. The length includes the computed 32-bit CRC value.

PHY Synchronization
This field holds frame number and frame duration information. See 8.4.5.1 and Table 271

DCD Count
Matches the value of the configuration change count of the DCD, which describes the downlink burst profiles that apply to this map.

Operator ID
This field holds the least significant 8 bits of the most significant 24 bits of the 48-bit Base Station ID.

Sector ID
This field holds the least significant 8 bits of the 48-bit Base Station ID.

DL IE count
This field holds the number of IE entries in the following list of DL-MAP IEs.

Connection Identifier (CID)
Represents the assignment of the IE to a unicast address.

Preamble Shift Index
The preamble shift index in time or frequency, as specified by the Preamble Select.

DIUC
DIUC used for the burst.

Frame Offset
The frame in which the burst is located. A value of zero indicates an allocation in the subsequent frame.

OFDMA Symbol offset
The offset of the OFDMA symbol in which the burst starts, measured in OFDMA symbols from beginning of the downlink frame referred to by the Frame Offset.

Subchannel offset
The lowest index OFDMA subchannel used for carrying the burst, starting from subchannel 0.

No. OFDMA Symbols
The number of OFDMA symbols that are used (fully or partially) to carry the downlink PHY Burst.

No. of subchannels
The number of subchannels with subsequent indexes, used to carry the burst.

Repetition coding Indication
Indicates the repetition code used inside the allocated burst.

8.4.5.8.2 PrivateUL-MAP

The private UL-MAP format is presented in Table YYY. The message may only appear after a private DL-MAP message to which it shall be appended. The private UL-MAP uses multiple/single IE format to match the format of the associated private DL-MAP.

Table YYY—Private UL-MAP message format

Syntax	Size	Notes
Private_UL-MAP() {		
if (Private map type == 0) {		
UCD Count	8 bits	
Allocation Start Time	32 bits	
while (map data remains){		
UL-MAP_IE()	*variable*	
}		
if !(byte boundary) {		
Padding Nibble	4 bits	Padding to reach byte boundary.
}		
} else {		
CID Included	1 bit	1 = CID included. If (CID Included == 0) then the targeted CID is the CID of the UL connection paired with the DL connection that the private DL-MAP is directed to.
UCD Count Included	1 bit	1 = UCD Count included. If the broadcast DL-MAP that pointed to the first private map didn't have an associated UL-MAP, then the first private UL-MAP must include the UCD Count.
Preamble Shift Index Included	1 bit	1 = Preamble shift index included. Preamble modification is only relevant in the AAS UL subframe portion. Private maps in non-AAS subframe portions will not include the preamble shift index.
Power Control Included	1 bit	1 = Power control value included
if (CID Included) {		
CID	16 bits	
}		
if (Preamble Shift Index Included) {		
Preamble Select	1 bit	0 = Frequency shifted preamble 1 = Time shifted preamble
Preamble Shift Index	4 bits	Updated preamble index to be used starting the with the frame specified by the Frame Offset
reserved	3 bits	Set to zero
}		
if (Power Control Included) {		
Power Control	8 bits	Signed integer in 0.25 dB units
}		
if (UCD Count Included) {		
UCD Count	8 bits	
}		
UIUC	4 bits	Only burst profile UIUCs allowed
Frame Offset	3 bits	
if (AAS subframe portion) {		
OFDMA Symbol Offset	8 bits	
Subchannel Offset	7 bits	
No. OFDMA symbols	7 bits	

No. Subchannels	7 bits	
Padding Bits	1 bit	
} else {		
Slot Offset	11 bits	
Zone Start	8 bits	
Zone Duration	7 bits	
Duration	10 bits	
Padding Bits	2 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
}		
}		

UCD Count
Matches the value of the Configuration Change Count of the UCD which describes the uplink burst profiles which apply to this map.

Allocation Start Time
Effective start time of the uplink allocation defined by the UL-MAP.

Connection Identifier (CID)
Represents the assignment of the IE to a unicast address.

Preamble Shift Index
The preamble shift index in time or frequency, as specified by the Preamble Select.

Power Control
The change in transmit power level that the SS should apply starting on the frame specified by the Frame Offset.

UIUC
UIUC used for the burst.

Frame Offset
The frame in which the burst is located. A value of zero indicates an allocation in the subsequent frame.

OFDMA Symbol offset
The offset to the starting location of the uplink burst is referenced to the DL preamble of the subsequent frame, and consists of an integer symbol offset specified here, as well as the addition of the TTG known from DCD messages. If TTG is not present in the DCD (for FDD) it is assumed to be zero.

Subchannel offset
The lowest index OFDMA subchannel used for carrying the burst, starting from subchannel 0.

No. OFDMA Symbols
The number of OFDMA symbols that are used (fully or partially) to carry the uplink burst.

No. subchannels
The number of subchannels with subsequent indexes, used to carry the burst.

Slot Offset
The starting location of the uplink burst is the sum of the Zone start, the slot offset, and the TTG. The slot offset is in units of slots.

Zone Start
The starting location of the zone containing the uplink burst is the Zone start, measured in OFDMA symbols from the beginning of the frame specified by the Frame Offset, and the TTG.

Zone Duration
The duration of the zone containing the uplink burst, measured in OFDMA symbols.

Duration
Indicates the duration, in units of OFDMA slots, of the allocation.

Repetition coding Indication
Indicates the repetition code used inside the allocated burst.

[Add new section 11.8.3.7.6]

11.8.3.7.6 OFDMA private map support

This field indicates the private map parameters supported by a WirelessMAN-OFDMA SS.

Type	Length	Value	Scope
155	1	Bits #0-1: private map support 0: private maps not supported 1: support private maps with any Frame Offset 2: support private maps with Frame Offset >= 1 3: support private maps with Frame Offset >= 2 Bits #2-5: private map chain concurrency 0 indicates no limit 1-15 indicate maximum concurrent private map chains Bits #6-7: reserved	SBC-REQ (see 6.3.2.3.23) SBC-RSP (see 6.3.2.3.24)