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Title	**Aggregated H-ARQ**
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Re:	
Abstract	**MAP_IE for Aggregated H-ARQ operation**
Purpose	Adoption of proposed changes into P802.16e /D4-2004
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1 Introduction

1.1 Problem statement

Currently DL H-ARQ burst should be destined to only one terminal. Therefore, a BS should transmit multiple DL H-ARQ bursts when the BS has many packets destined to multiple H-ARQ enabled terminals. This increases MAP overhead because each H-ARQ transmission requires at least one Compact MAP IE and H-ARQ control IE in the H-ARQ MAP message.

In this document, we propose an aggregated H-ARQ operation for DL. An aggregated H-ARQ burst may contain multiple MAC PDUs destined to different terminals so that a BS may transmit a single H-ARQ DL burst for multiple terminals. This will reduce the H-ARQ MAP message overhead.

1.2 Proposed solution

The basic idea is that a BS allocates multiple ACK channel for an aggregated H-ARQ DL burst while BS allocates only one ACK channel for the original H-ARQ burst. For the aggregated H-ARQ burst, only ACK signaling is possible. This means that MSS can't transmit NACK signal.

2 Proposed Text

In page 32, Line 10, section 6.3.2.3.43.4 H-ARQ control IE, change Table 89.

Table 89—H-ARQ_Control IE format

Syntax	Size	Notes
H-ARQ_Control_IE {	_	_
Prefix	1 bits	0 = Temporary disable H-ARQ 1 = enable H-ARQ
if (Prefix == 1) {		
AI_SN	1 bits	H-ARQ ID Seq. No
SPID/Reserved	2 bits	Subpacket ID when IR is defined by the FEC mode, otherwise reserved (encoded 00)
if(RCID == broadcast CID && ACK Channel type == 0) {		
ACID	2 bits	
nACK channel	2 bits	0b00: 2 ch. / 0b01: 3 ch. 0b10: 4 ch. / 0b11: 5 ch.
}else {		
ACID	4 bits	H-ARQ CH ID
}		
}else {		
reserved	3 bits	Shall be set to zero
}		
}		

ACID
Defines H-ARQ Channel ID, which is used to identify H-ARQ channels. Each connection can have multiple HARQ channels, each of which may have an encoder packet transaction pending.
When aggregated H-ARQ is used with ACK channel, the size of the field is 2 bits.

nACK channel
This field is used for aggregated H-ARQ with ACK channel. To activate this field, RCID should be set to broadcast CID and the ACK channel type set to 0. The value indicates the number of MSS which should receive this aggregated H-ARQ burst and transmit ACK signal to BS.

In page 92, Line 13, add the following section.

6.3.2.3.59.8 Aggregated H-ARQ support

This section describes the aggregated H-ARQ operation.

A BS which has multiple packets destined multiple H-ARQ enabled MSS constructs an aggregated H-ARQ burst which contains multiple MAC PDUs for different users. For the transmission of the aggregated H-ARQ burst, the H-ARQ MAP message must contains a Compact MAP IE for the aggregated H-ARQ burst. The RCID field of the Compact MAP IE is set to broadcast CID and the Prefix of H-ARQ Control IE is set to 1 while the Compact MAP IE for original H-ARQ burst has the basic CID of the destined MSS. The Compact MAP IE for the aggregated H-ARQ burst also contains the H-ARQ Control IE. The size of H-ARQ control IE for an aggregated H-ARQ burst is same as the original H-ARQ control IE but the format is different from the original.

The modified format for Aggregated H-ARQ Control IE is shown in Table 89. When the RCID field of the Compact MAP IE is set to broadcast CID, the 4 bits ACID field is divided into two fields. The first field is 2 bits ACID field which has same meaning as the original and the other is nACK channel field which indicates how many ACK channels are allocated for the aggregated H-ARQ burst.

Because the RCID field of the aggregated H-ARQ burst is set to broadcast CID and the prefix is set to 1, every MSS which has an aggregated H-ARQ capability will receive the aggregated H-ARQ burst. Other MSS which does not have the aggregated H-ARQ capability will ignore the burst because the Compact MAP IE for the original H-ARQ burst can't have broadcast CID.

For proper operation of the H-ARQ, a MSS should transmit ACK signal if it successfully receives an H-ARQ burst and NACK signal if it fails to receive the burst though the ACK channel allocated for the burst. Similar operation is also applied for the aggregated H-ARQ burst. A MSS which receives an aggregated H-ARQ burst successfully should transmit ACK signal through the ACK channel. However MSS transmits no NACK signals when it fails to receive certain aggregated H-ARQ burst. Only ACK signal exits for aggregated H-ARQ.

There are two possible scenarios for the aggregated H-ARQ ACK channel allocation. The first scenario is to use the original H-ARQ ACK region. We can divide the original H-ARQ ACK region into two sub-regions. The front part of the H-ARQ ACK region is used for original H-ARQ ACK channel and the remaining part is used for aggregated H-ARQ ACK channel. Because the ACK region for original H-ARQ is located in the front region, the old terminal does not need to aware the region for aggregated H-ARQ burst. The start offset of the aggregated H-ARQ ACK region and the operation scenario mode are indicated by the aggregated H-ARQ Configuration IE shown in Table 2. To avoid collision of ACK signals from the multiple MSS which receive an aggregated H-ARQ burst, each MSS should have a dedicated ACK channel. The location of aggregated H-ARQ ACK channel is determined by the order of the aggregated H-ARQ Compact MAP IE and the order of MAC PDU in the burst. Assume that $nAckCh_j$ denotes the number of ACK channels allocated for the *j-th* aggregated H-ARQ burst. If a MSS receives the *i-th* MAC PDU in the *k-th* aggregated H-ARQ burst, it will transmits the ACK signal through the $\sum_{j=1}^{k-1} nAckCh_j + i$ *-th* aggregated H-ARQ ACK channel. Every MSS can detect $nAckCh_j$ because H-ARQ Control IE in MAP message contains the *nACK Channel* field. Figure 1 shows an example of the ACK channel allocation for aggregated H-ARQ operation.

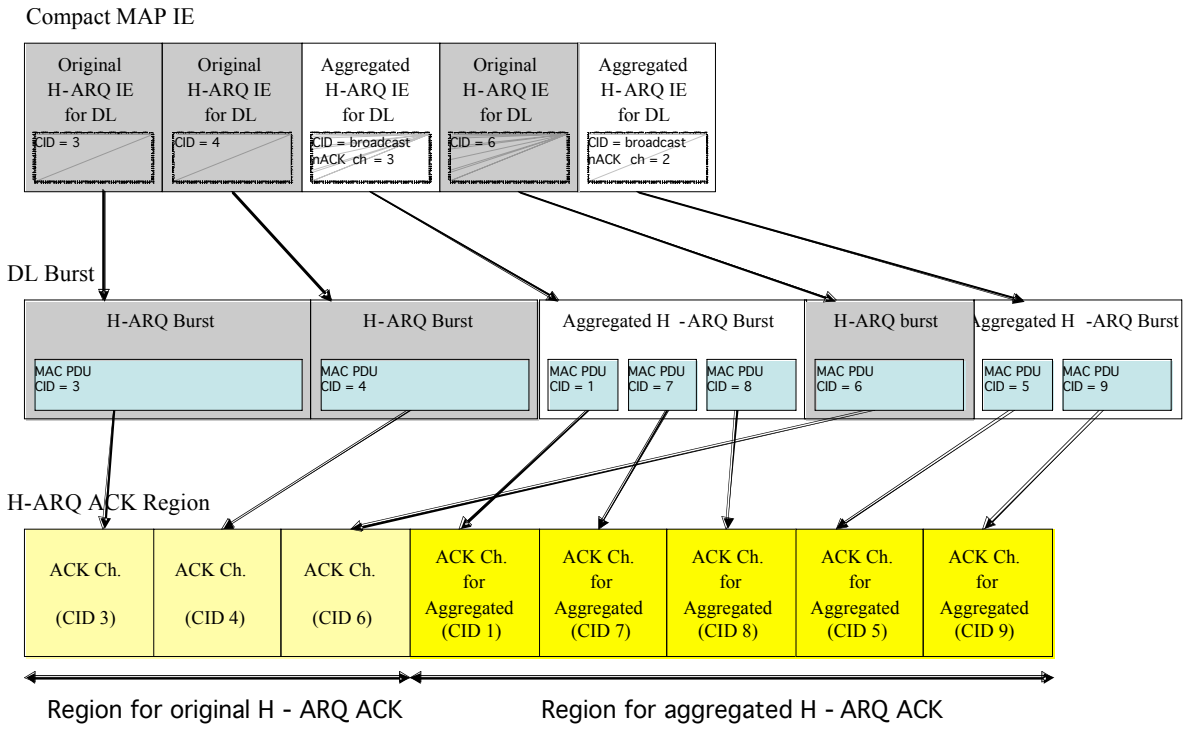

Figure 1 Example of aggregated H-ARQ ACK channel allocation in H-ARQ ACK region

The second scenario is to use CQI channel for aggregated H-ARQ ACK channel. As in first scenario, the front part of CQI region is used for ordinary CQI operation and the remaining part is used for the aggregated H-ARQ ACK channel. The start offset for the aggregated H-ARQ ACK channel is also indicated by the aggregated H-ARQ Configuration IE. The difference is that BS allocates only one CQI channel for one aggregated H-ARQ burst. All MSS who successfully receive a MAC PDU from the first aggregated H-ARQ burst in a frame will transmit an ACK signal at the first H-ARQ ACK channel in the aggregated H-ARQ ACK region. However each MSS shall use different *codeword* for ACK signal so that BS can distinguish which MSS sent the ACK signal. An example of aggregated H-ARQ ACK channel allocation in CQI region is shown in Figure 2. Hence, a MSS who receives *i-th* MAC PDU in the *k-th* aggregated H-ARQ burst shall transmit the ACK signal through the *k-th* aggregated H-ARQ ACK channel with *i-th* codeword. Because the calculation of ACK channel location is simpler than the first scenario, the H-ARQ Control IE used for the second scenario does not require the *nACK channel* field. When a MSS receives two or more MAC PDU destined to itself in a single aggregated H-ARQ burst, the MSS shall transmit only one ACK signal for the first MAC PDU.

The retransmission operation for aggregated H-ARQ is same as the ordinary H-ARQ operation. A BS may retransmit aggregated H-ARQ burst when any MSS fails to receive the burst.

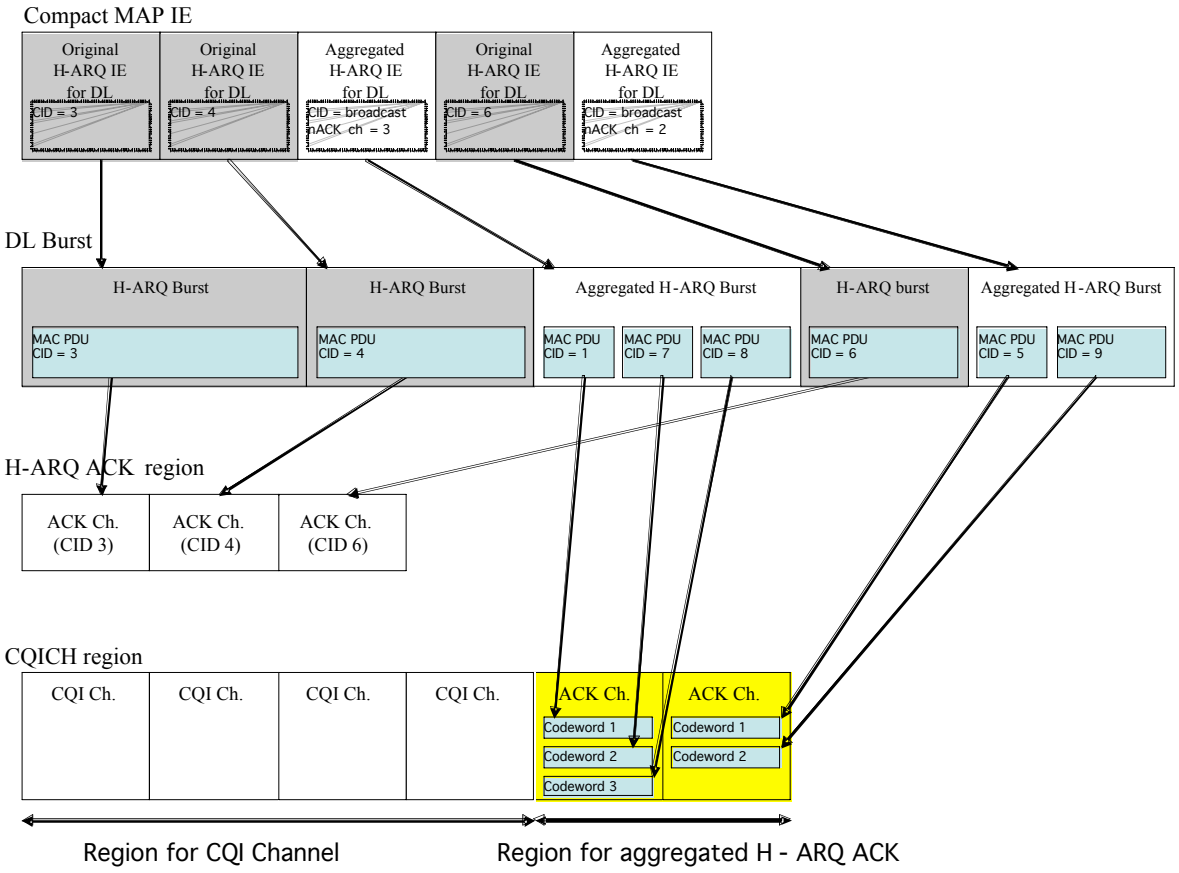

Figure 2 Example of aggregated H-ARQ ACK channel allocation in CQI region

Table 2 Aggregated H-ARQ Configuration IE

Syntax	size	Note
Compact_DL-MAP_IE for Aggregated H-ARQ Configuration{		
DL-MAP Type = 7	3 bits	
DL-MAP sub-type = 3	5 bits	Aggregated H-ARQ Configuration
Length	4 bits	
ACK channel type	1 bits	0: use H-ARQ ACK channel for aggregated H-ARQ 1: use CQI channel for aggregated H-ARQ
ACK channel start offset	7 bits	
}		

ACK channel type
This field indicates the type ACK channel used for aggregated H-ARQ. When this value is 0, all MSS which is allocated aggregated H-ARQ burst in the frame should transmit ACK signal on the H-ARQ ACK channel. Otherwise, MSS should transmit ACK signal on the CQI channel.
ACK channel start offset

This field indicates the start offset of channel allocated for aggregated H-ARQ ACK. The aggregated H-ARQ ACK channel can be allocated on H-ARQ ACK channel or CQI channel and is indicated by the ACK channel type field.

In page 293, Line 28, change following text.

[Add the following section:]

11.8.3.7.6 OFDMA MAP Capability

This field indicates the different MAP options supported by a WirelessMAN-OFDMA PHY. This field is not used for other PHY specifications. A bit value of 0 indicates "not supported" while 1 indicates "supported."

Type	Length	Value	Scope
155	1	bit #0: H-ARQ MAP Capability bit #1-2: 00- No aggregated H-ARQ capability 01- Aggregated H-ARQ with ACK channel 10- Aggregated H-ARQ with CQI channel 00- Reserved bit #~~1~~3-7: reserved	SBC-REQ (see 6.3.2.3.23) SBC-RSP (see 6.3.2.3.24)