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Title	**RS Uplink HARQ on Dedicated Channel**	
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Re:	This document is in response to call for technical comments and contributions IEEE 802.16j-07/019 dated 2007-06-07.	
Abstract	The UL HARQ support defined in the current baseline is for centralized control. It involves substantial efforts to identify failure link and perform subsequent retransmission allocation. Whenever a failure occurs, all resources allocated beyond the failure link are wasted as well. As UL dedicated channel is a persistence allocation, there is no need for the MR-BS to reschedule retransmission. Hence, there is no needed to identify the failure link as well. This contribution proposes the required mechanism to enable HARQ control signaling and ACK/NACK exchange to support UL HARQ on the dedicated channel.	
Purpose	To incorporate the proposed text into the P802.16j Baseline Document (IEEE 802.16j-06/026r4)	
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RS Uplink HARQ on Dedicated Channel

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Introduction

The UL HARQ support defined in the current baseline is for centralized control. It involves substantial efforts to identify failure link and perform subsequent retransmission allocation. Whenever a failure occurs, all resources allocated beyond the failure link are wasted as well.

Proposal

As the UL dedicated channel is a persistence allocation, there is no need for the MR-BS to reschedule retransmission when a failure occurs. Hence, there is no need to identify the failure link as well. This contribution proposes the required mechanism to enable HARQ control signaling and ACK/NACK exchange to support UL HARQ on the dedicated channel.

The existing ACK/NACK for the UL HARQ transmission bursts from the MSs/RSs are sent using DL HARQ ACK IE. It contains an ACK/NACK bitmap and each bit in the bitmap acknowledges a specific HARQ burst from a specific MS/RS. The order of bits in the bitmap follows the same order of the HARQ sub-burst allocations in the broadcasted UL-MAP. Each MS/RS is required to monitor all sub-burst allocations and the position of each of its allocations. For UL HARQ on the dedicated channel, each RS cannot determine how many HARQ bursts are being transmitted by all the other RSs and their order of transmission. Hence, the existing broadcasted bitmap can not be used to acknowledge HARQ bursts transmitted on the dedicated channel. To effectively enable ACK/NACK signaling for the UL HARQ transmission on the dedicated channel, the MR-BS can allocate dedicated signaling channel in the downlink for the RS. A similar acknowledgement bitmap is used but it is solely for a specific RS and there is no need for the RS to monitor signaling for other RS. The UL HARQ control signaling (i.e. ACID and AI_SN) are sent using an Extended MAC signaling header type II and the ACK/NACK bitmap is sent using a DL MAC control header.

Text Proposal

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[Add the following subclause]

6.3.17.6 Uplink HARQ on Dedicated Channel

HARQ sub-bursts from multiple MSs/RSs are multiplexed and transmitted through the UL DCH. Each DCH region can transmit a single HARQ burst at a time. The corresponding HARQ control signaling are sent in the same frame together with all HARQ bursts in the frame. The signaling are sent using the UL DCH HARQ control header. The control header may be sent using the most robust DCH region amongst all the allocated DCH regions managed by the RS. The DCH region used to send the control header cannot be used to send HARQ burst. A non HARQ burst can be sent together with the control header in the same DCH region.

Under centralized control, the MR-BS may choose to support UL HARQ transmission from the MS on the dedicated channel by allocating DL DCH resource to each RS along the path using the RS_DL_DCH assignment IE for HARQ ACK/NACK bitmap signaling. The ACK/NACK bitmap is sent by the MR-BS or the parent RS using the DL DCH HARQ ACK header. The MR-BS or parent RS that receives HARQ UL burst at i-th frame should transmit ACK signal at (i+j)-th frame. The frame offset "j" is defined by the "HARQ ACK Delay for UL Burst" field in the DCD message.

[Change Table 19a in Subclause 6.3.2.1.2.2.2 as indicated]

Table <X1>—Extended Type field encodings for Extended MAC signaling header type II

Extended Type field	MAC header Type	Reference figure	Reference table
0	RS BR header		
1	RS UL_DCH request header		
2	Acknowledgement header		
3	HARQ RS error report header		
4	UL DCH control header		
~~4~~5-7	Reserved		

[Add the following subclause]

6.3.2.1.2.2.2.5 UL DCH control header

The UL DCH control header is used by the RS to send control signaling to MR-BS or parent RS. The header format is as follows:

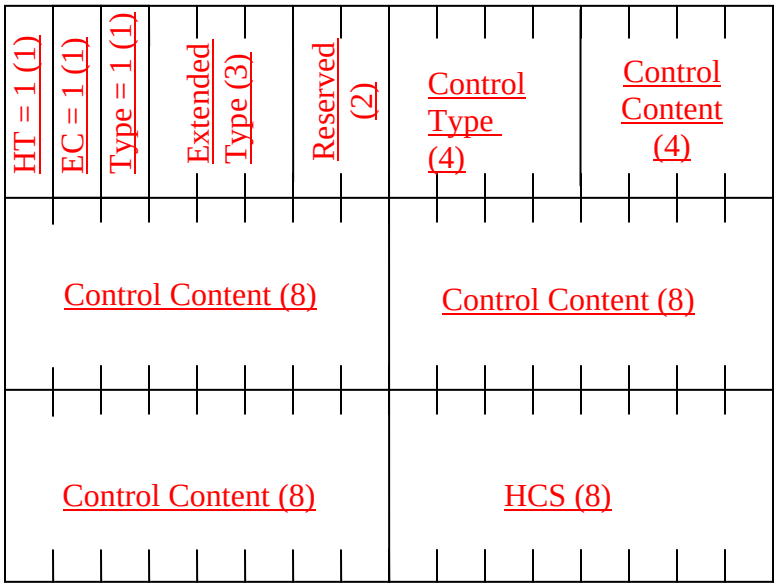

Figure XXX – UL DCH control header

Table XXX - UL DCH control header format

Syntax	Size	Notes
MAC Header(){		
HT	1 bit	Shall be set to 1
EC	1 bit	Shall be set to 1
Type	1 bit	Shall be set to 1
Extended TYPE	3 bits	Shall be set to 100 for UL DCH control header
Reserved	2 bits	
Control Type	4 bits	0000 = UL DCH HARQ control 0001-1111 = Reserved
Control Content	28 bits	
HCS	8 bits	Header check sequence
}		

[Add the following subclause]

6.3.2.1.2.2.2.5.1 UL DCH HARQ control header

The UL DCH HARQ control header is used by the RS to send HARQ control signaling to MR-BS or parent RS. The control content is sub-divided into 7 groups of 4 bits which allow up to seven UL DCH regions for HARQ burst transmission. The first group of 4 bits corresponding to the first allocated DCH region and so on. The first bit, when set to 1, indicates HARQ enabled. The next 2 bits indicate ACID (up to 4 HARQ channels per DCH region). The last bit indicates AI_SN. The header format is as follows:

Table XXX - UL DCH HARQ control header format

Syntax	Size	Notes
MAC Header(){		
HT	1 bit	Shall be set to 1
EC	1 bit	Shall be set to 1
Type	1 bit	Shall be set to 1
Extended TYPE	3 bits	Shall be set to 100 for UL DCH control header
Reserved	2 bits	
Control Type	4 bits	Shall be set to 0000 for UL DCH HARQ control
For (i=0; i<7; i++) {		
HARQ Enable	1 bit	Set to 1 to enable HARQ
ACID	2 bits	HARQ CH ID
AI_SN	1 bit	HARQ ID Seq. No
}		
HCS	8 bits	Header check sequence
}		

[Add the following subclause]

6.3.2.1.3 DL MAC Header without payload (DL MAC control header)

The DL MAC header without payload (control MAC header) is sent on DL only. The DL MAC control header is used by MR-BS or RS(s) to send control signaling to its child RS(s). The format of DL control MAC header is shown in Figure XXX.

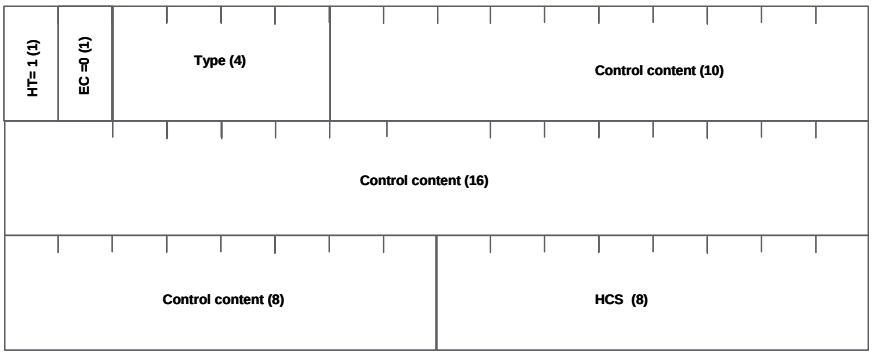

Figure XXX. Format of DL MAC control header.

The DL MAC control header field encoding is show in Table XXX.

Table XXX - DL MAC control header field encoding.

Name	Length (bits)	Description
HT	1	Header type. Shall be set to 1
EC	1	Encryption control. Shall be set to 0
Type	4	0000 = DL DCH HARQ ACK signaling 0001-1111 = Reserved
Control content	34	Content of control
HCS	8	Header check sequence

[Add the following subclause]

6.3.2.1.3.1 DL DCH HARQ ACK header

The DL DCH HARQ ACK header is used by the MR-BS or parent RS to send the HARQ ACK/NACK bitmap to acknowledge the corresponding RS UL DCH HARQ bursts. The MR-BS or parent RS that receives HARQ UL burst at i-th frame should transmit ACK signal at (i+j)-th frame. The frame offset "j" is defined by the "HARQ ACK Delay for UL Burst" field in the DCD message. The format of the header is shown in Figure XXX.

Table XXX - DL DCH HARQ ACK header format

Name	Length (bits)	Description
HT	1	Header type. Shall be set to 1
EC	1	Encryption control. Shall be set to 0
Type	4	Shall be set to 0000 for DL DCH HARQ ACK signaling
ACK/NACK bitmap	7	HARQ ACK/NACK bitmap for the corresponding UL DCH HARQ bursts specified by the UL DCH HARQ control header (maximum 7 bursts)
Reserved	27	
HCS	8	Header check sequence

[Add the following subclause]

8.4.5.9.2 RS DL DCH assignment IE

This IE is used for the initial allocation and subsequent updates of the downlink dedicated channel.

Table XXX. RS_DL_DCH assignment IE format.

Syntax	Size	Notes
RS_DL_DCH assignment IE {		
Type	5 bits	
Length	4 bits	
RSCID	8 bits	Reduced basic CID of the RS
Update type	2 bits	00 = Normal 01 = Service flow based 10 = Access zone 11 = Reserved
If (Update type == 01) {		**If service flow based update**
Throughput size	24 bits	Amount of throughput update in byte/s
Access RSCID	8 bits	Reduced basic CID of the access RS of the MS that completed the service flow event
}		
Assignment type	2 bits	00 = Incremental (Add the specified resource to DL DCH) 01 = Removal (Remove the specified resource from DL DCH) 10 = Aggregate (An aggregate assignment with no resource means DL DCH removal) 11 = Reserved
DIUC	4 bits	
Boosting	3 bits	
Repetition coding indication	2 bits	
Num_region_id	4 bits	Number of region IDs in the assignment list of resources allocated to DCH
For (i=0; i<Num_region_id; i++) {		
Region_ID	6 bits	Index to the DL region defined in DL region definition TLV in DCD
}		
Frequency (N)	4 bits	Allocation repeats once every N frames
}		

++++++++++++++++ End Text Proposal ++