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Title	UL Rollover A-MAP IE Design (15.3.6.5.4.)	
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Re:	IEEE 802.16m-09/0044, "Letter Ballot #30" Area: "15.3.9.2 Generic HARQ signaling and timing" and "15.3.6 Downlink control structure"	
Abstract	The contribution proposes the text of DL control structure section.	
Purpose	To be discussed and adopted by TGm.	
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UL Rollover A-MAP IE Design (15.3.6.5.4.)

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1. Introduction

In UL transmission, HARQ timing process is operated based on synchronous manner. That is, resource for the retransmission burst is reserved in the corresponding subframe with the same LRU index when the HARQ burst fails at initial transmission. For persistent allocation (PA), even initial transmission (as well as retransmission) is allocated periodically with the same LRU index. It means that resource for the next PA burst is reserved in the subframe after a PA period. With such timing protocol, the period of retransmission can be different to that of PA, generating resource collision between retransmission and PA.

When the allocated resource indexes (RI) of PA burst collides with those of retransmission burst (which can be retransmission for either PA or dynamic allocation burst), one of RI should be changed. If there are available resources to allocate both bursts in the subframe where collision occurs, an UL assignment A-MAP is just required to move PA or retransmission burst within the subframe. As shown in Figure1, however, there can be no available resource in that subframe to allocate both bursts. In this case, one of bursts (either PA or retransmission) needs to be allocated to other subframe.

To handle the situation above, an ABS can de-allocate UL PA bursts with UL PA A-MAP IEs, and keep allocation for the retransmission burst without A-MAP IE transmission. Namely, current D1 [1] only supports de-allocation of PA bursts. But it is inefficient when multiple UL PA bursts need to be de-allocated because multiple UL PA A-MAP IEs should be transmitted for both de-allocation and re-allocation. Moreover, if the retransmission burst is delay-non-sensitive traffic and UL PA bursts are delay-sensitive traffics such as VoIP, de-allocating PA bursts degrades the efficiency of overall system performance. Therefore, a new method is required to shift the retransmission burst to other subframe without de-allocating it.
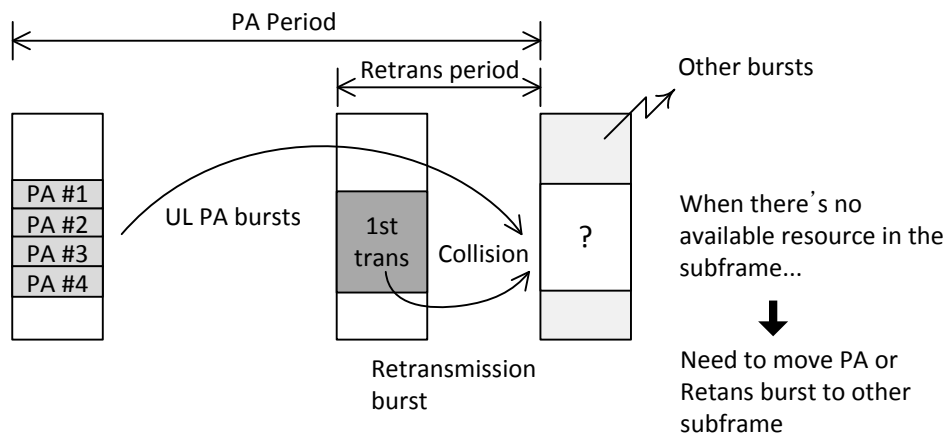

Figure 1 – Collision between UL PA burst and Retransmission burst

2. Proposed Solution

In order to move the retransmission burst to other subframe without de-allocating it, our proposal provides the retransmission burst with allocation chance in the other subframe. As seen in Figure2, when collision happens in the k-th subframe, UL PA bursts are allocated in that subframe. And an ABS informs the AMS with the retransmission burst that the retransmission burst is not allocated in the k-th subframe. For this indication, an ABS transmits the UL Rollover A-MAP IE (Table1) with "Allocation Indicator = 0b0" in the A-MAP region at the DL subframe associated with the k-th UL subframe. If the ABS wants to wait for certain duration (y subframe in the Figure2: procedure-1), "Subframe Offset" is set to the specific index from 0b000 to 0b111. In the (k+y)-th subframe, no additional IE is required to allocate the retransmission burst if RI for that burst is not changed. When there is also no available resource in the (k+y)-th subframe, the ABS can take this procedure once again, but the total delay should not exceed the maximum [T_ReTx_Interval] which is defined in DL HARQ signaling. If "Subframe Offset Flag" is set to 0b0, an AMS should monitor its allocation within maximum [T_ReTx_Interval] (procedure-2 in the Figure2).

When the ABS allocates the retransmission burst in a certain subframe, the UL Rollover A-MAP IE should be transmitted in the associated DL subframe with "Allocation Indicator = 0b1". [SPID is required to support IR with asynchronous manner, and] RI is signaled to enable resource index change. Once this reallocation procedure is performed for the m-th retransmission, the (m+1)-th retransmission follows the normal UL HARQ retransmission procedure described in 15.3.9.2.1.2 [1].
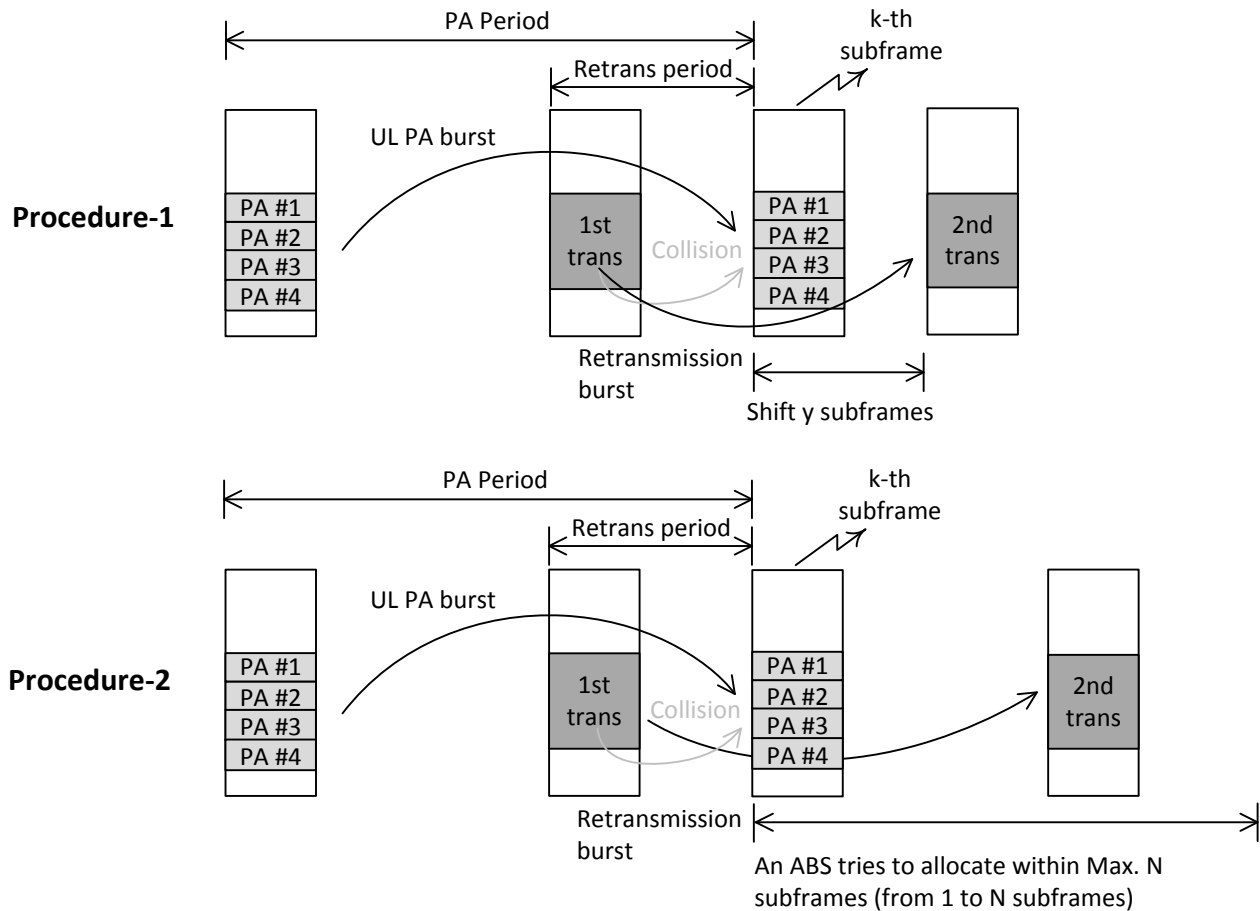
Figure 2 – Proposed Method

The procedure above can be performed using a simple IE (we call it as UL Rollover A-MAP IE). The contents of the proposed IE are as follows.

Table 1 – UL Rollover A-MAP IE

Syntax	Size [bits]	Notes
A-MAP IE Type	4	
Allocation Indicator	1	0b0: No allocation 0b1: Reallocation
If (Allocation Indicator == 0b0){		
ACID	3	HARQ channel identifier
Subframe Offset Flag	1	0b0: Allows reallocation in any subframe within maximum [T_ReTx_Interval]. 0b1: Explicit indication for the reallocable subframe index
If (Subframe Offset Flag == 0b1) {		
Subframe Offset	3	Offset value in the unit of subframe. This index doesn't count the DL subframe. 0b000: 1 subframe 0b001: 2 subframes 0b010: 3 subframes 0b011: 4 subframes 0b100: 5 subframes 0b101: 6 subframes 0b110: 7 subframes 0b111: 8 subframes
}		
}		
Else {		
ACID	3 [4]	HARQ channel identifier
AI_SN	1	HARQ identifier sequence number
[SPID]	2	This field is interpreted as in the DL Basic A-A-MAP IE.
Resource Index	11	This field is interpreted as in the DL Basic A-A-MAP IE.
}		
Reserved	TBD	

3. References

[1] P802.16m/D1, "Advanced Air Interface (Draft 1)".

4. Text Proposal for Inclusion in P802.16m/D1

--- Text Start --

--------------------------------[Recommended Text Proposal #1]-------------------------------------

15.3.9.2.1.2 Uplink

…

In the retransmission procedure, if AMS does not receive a UL Basic Assignment A-MAP IE for the HARQ data burst in failure, AMS shall transmits the next subpacket through the resources assigned at the latest subpacket transmission with the same ACID. A UL Basic Assignment A-MAP IE may be sent to signal control information for retransmission with the corresponding ACID and AI_SN being not toggled. Upon receiving the UL Basic Assignment A-MAP IE, AMS shall perform the HARQ retransmission as instructed in this UL Basic Assignment A-MAP IE. When an UL Rollover A-MAP IE is received, the HARQ retransmission is not performed in the corresponding subframe and AMS shall transmit the subpacket in other subframe as instructed in this UL Rollover A-MAP IE.

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----------[Recommended Text Proposal #2: Between 15.3.6.5.4.9 and 15.3.6.5.4.10]------------

15.3.6.5.4.x

Table xxx describes the fields in an UL Rollover A-MAP IE used for dynamically moving or reallocating UL retransmission burst.

If Allocation Indicator field is set to 0b0, a subpacket specified by the ACID field is not allocated in the corresponding subframe. When Subframe Offset Flag field is set to 0b1, the subpacket can be allocated in the specific subframe which is indicated by Subframe Offset field. Otherwise, the subpacket can be allocated in any subframes within the maximum [T_ReTx_Interval]. Note that the delay between two consecutive HARQ transmissions of the same data burst shall not exceed the maximum [T_ReTx_Interval].

Allocation Indicator field shall be set to 0b1 to reallocate the HARQ data burst which was commanded not to be allocated by the UL Rollover A-MAP IE with Allocation Indicator field set to 0b0. The UL Rollover A-MAP IE may not be transmitted if RI field is not changed in the subframe specified by Subframe Offset field. The HARQ data burst follows the timing defined in 15.3.9.2.2 initiated with the UL Rollover A-MAP IE instead of the UL Basic Assignment A-MAP IE.

Table xxx – UL Rollover A-MAP IE

Syntax	Size [bits]	Notes
A-MAP IE Type	4	
Allocation Indicator	1	0b0: No allocation 0b1: Reallocation
If (Allocation Indicator == 0b0){		
ACID	3 [4]	HARQ channel identifier
Subframe Offset Flag	1	0b0: Allows reallocation in any subframe within maximum [T_ReTx_Interval].

		0b1: Explicit indication for the reallocable subframe index
If (Subframe Offset Flag == 0b1) {		
Subframe Offset	3	Offset value in the unit of subframe. This index doesn't count the DL subframe. 0b000: 1 subframe 0b001: 2 subframes 0b010: 3 subframes 0b011: 4 subframes 0b100: 5 subframes 0b101: 6 subframes 0b110: 7 subframes 0b111: 8 subframes
}		
}		
Else {		
ACID	3 [4]	HARQ channel identifier
AI_SN	1	HARQ identifier sequence number
Resource Index	11	Resource index includes location and allocation size. This field is interpreted as in the DL Basic A-A-MAP IE.
}		
Reserved	TBD	

-- Text End --