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Re:	Category: D1 comment / Section: (D1 – 15.3.6.5.4.6)	
Abstract	The contribution proposes updates to the text related to persistent allocation in the 802.16m/D1	
Purpose	To be discussed and adopted by TGM for the 802.16m amendment.	
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Proposed Changes to the DL and UL Persistent Allocation A-MAP IEs in the IEEE 802.16m/D1

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Introduction

This contribution proposes changes to the DL and UL Persistent Allocation A-MAP IEs currently defined in the 802.16m/D1 [1] to include more efficient signaling for persistent operation.

Current N_ACID calculation has following problems.

1) Max_Delay is determined based on DL HARQ operation and applied to N_ACID calculation both DL and UL Persistent A-MAP IE. In uplink, synchronous HARQ has been applied so that maximum retransmission delay in uplink will be $N_Max_ReTx*Frame_length$ for short TTI case and $N_Max_ReTx*(Frame_length*2)$ for long TTI case. If Max_Delay is not same as maximum retransmission delay in uplink and persistently scheduled resource is retransmitted until Max_Delay , this is the violation of UL HARQ operation and can cause collision of ACID in persistently scheduled resources.

2) Persistent allocation can be applied to all applications. Hence, delay budget of all applications should be determined and this information should be informed to user that is being persistently scheduled. This can cause control overhead and also increase complexity in implementation.

3) Since Allocation Period is expressed in unit of frame length, N_ACID calculation should be changed as

$$N_ACID = \text{Floor}\{Max_Delay / (Allocation\ Period * Frame_length)\} + 1$$

where $Frame_length$ is the frame length.

This contribution proposes following change in calculation in N_ACID .

The maximum HARQ retransmission delay of persistent allocation, $PA_Max_ReTx_Delay$ can be computed from N_Max_ReTx , the maximum number of retransmission and $PA_ReTx_Interval$, the allowable delay between consecutive retransmission of persistent allocation as

$$PA_Max_ReTx_Delay = N_Max_ReTx * PA_ReTx_Interval$$

where $PA_ReTx_Interval$ is determined from $Long\ TTI\ Indicator$ and $Frame_length$, the frame length as $PA_ReTx_Interval = (1 + Long\ TTI\ Indicator) * Frame_length$.

N_ACID is calculated as

$$N_ACID = \text{Floor}\{PA_Max_ReTx_Delay / (Allocation\ Period * Frame_length)\} + 1.$$

This contribution proposes following change.

Allocation Period field in UL Individual Persistent A-MAP IE has been corrected.

The current Draft text in sections 15.3.6.5.4.6 and 15.3.6.5.4.7 has been updated with the proposed text as shown below.

Proposed text has been underlined in red, current Draft is black and Draft text that has been deleted has been struck through.

References

[1] P802.16m Draft Amendment document, P802.16m/D1 July 2009.

Amendment text proposal for inclusion in P802.16m/D1

----- Start Text Proposal -----

15.3.6.5.4.6 DL PA A-MAP IE

The DL persistent A-MAP IE is specified in Table 675.

Table 675: DL Persistent A-MAP IE*

Syntax	Size in bits	Description/Notes
DL Persistent A-MAP_IE() {	-	-
A-MAP IE Type	4	DL Persistent A-MAP IE
if MCRC is masked with Station ID {		
DL Individual Persistent A-MAP_IE()		Refer to Table 676
} else if MCRC is masked with Composite ID {		
DL Composite Persistent A-MAP_IE()		Refer to Table 677
}		
}		

*A 16 bit CRC is generated based on the contents of the DL Individual or Composite Persistent A-MAP IE and the CRC is masked by Station ID or the Composite ID (well-known ID specified in the system, TBD) respectively.

DL Individual PA A-MAP IE

The DL individual persistent A-MAP IE is specified in Table 676.

Table 676: DL Individual Persistent A-MAP IE

Syntax	Size in bits	Description/Notes

DL Persistent A-MAP_IE() {	-	-
Allocation Period	2	<p>Period of persistent allocation</p> <p>If (Allocation Period ==0b00), it indicates the deallocation of a persistently allocated resource.</p> <p>0b00: deallocation 0b01: 2 frames 0b10: 4 frames 0b11: 8 frames</p> <p>N_ACIDs: Number of ACIDs for implicit cycling of HARQ channel identifier</p> <p>When Allocation Period > 0</p> <p>N_ACID=Floor{(Max_Delay)/Allocation Period }+1-</p>
If (Allocation Period ==0b00){		
Resource Index	11	<p>Confirmation of the resource index for a previously assigned persistent resource that has been deallocated</p> <p>5 MHz: 0 in first 2 MSB bits + 9 bits for resource index 10 MHz: 11 bits for resource index 20 MHz: 11 bits for resource index</p> <p>Resource index includes location and allocation size</p>
Long TTI Indicator	1	<p>Indicates number of subframes spanned by the allocated resource.</p> <p>0b0: 1 subframe (default) 0b1: 4 DL subframes for FDD or all DL subframes for TDD</p>
HFA	5	Explicit Index for HARQ Feedback Allocation to acknowledge receipt of deallocation A-MAP IE
} else if (Allocation!= 0b00){		
<i>I_{SizeOffset}</i>	5	Offset used to compute burst size index
MEF	2	<p>MIMO encoder format</p> <p>0b00: SFBC 0b01: Vertical encoding 0b10: Horizontal encoding 0b11: n/a</p>
if (MEF == 0b01){		Parameters for vertical encoding
if(Nt == 2){		
Mt	1	<p>Number of streams in transmission for Nt = 2 ($M_t \leq N_t$)</p> <p>0b0: 1 stream 0b1: 2 streams</p>

}else if(Nt == 4){		
Mt	2	Number of streams in transmission for Nt = 4 ($M_t \leq N_t$) 0b00: 1 stream 0b01: 2 streams 0b10: 3 streams 0b11: 4 streams
}else if(Nt == 8){		
Mt	3	Number of streams in transmission for Nt = 8 ($M_t \leq N_t$) 0b000: 1 stream 0b001: 2 streams 0b010: 3 streams 0b011: 4 streams 0b100: 5 streams 0b101: 6 streams 0b110: 7 streams 0b111: 8 streams
}		
} else if(MEF == 0b10){		
if(Nt == 2){		
PSI	1	Allocated pilot stream index for Nt = 2 0b0: #1 stream 0b1: #2 stream
Mt	1	Number of streams in transmission for Nt = 2 ($M_t \leq N_t$) 0b0: 1 stream 0b1: 2 streams
M _p	2	Modulation constellation of the paired user 0b00: QPSK 0b01: 16 QAM 0b10: 64 QAM 0b11: n/a
} else{		
PSI	2	Allocated pilot stream index for Nt = 4 or 8 0b00: #1 stream 0b01: #2 stream 0b10: #3 stream 0b11: #4 stream
Mt	2	Number of streams in transmission for Nt = 4 or 8 ($M_t \leq N_t$)

		0b00: 1 stream 0b01: 2 streams 0b10: 3 streams 0b11: 4 streams
}		
}		
Resource Index	11	5 MHz: 0 in first 2 MSB bits + 9 bits for resource index 10 MHz: 11 bits for resource index 20 MHz: 11 bits for resource index Resource index includes location and allocation size
Long TTI Indicator	1	Indicates number of subframes spanned by the allocated resource. 0b0: 1 subframe (default) 0b1: 4 DL subframes for FDD or all DL subframes for TDD
HFA	5	Explicit Index for HARQ Feedback Allocation
ACID	4	HARQ channel identifier. The ACID field shall be set to the initial value of HARQ channel identifier for implicit cycling of HARQ channel identifiers. <u>N_ACIDs: Number of ACIDs for implicit cycling of HARQ channel identifier</u> <u>$N_ACID = \text{Floor}\left\{ \frac{PA_Max_ReTx_Delay}{(Allocation_Period * Frame_length)} \right\} + 1$</u>
}		
Reserved	<i>TBD</i>	Reserved bits
Padding	<i>Variable</i>	Padding to reach byte boundary
}	-	-

The Resource Index field in the DL Individual Persistent A-MAP IE is interpreted as in the DL Basic Assignment A-MAP IE.

The maximum HARQ retransmission delay of persistent allocation, $PA_Max_ReTx_Delay$ can be computed from N_Max_ReTx , the maximum number of retransmission and $PA_ReTx_Interval$, the allowable delay between consecutive retransmission of persistent allocation as

$$PA_Max_ReTx_Delay = N_Max_ReTx * PA_ReTx_Interval$$

where $PA_ReTx_Interval$ is determined from $Long_TTI_Indicator$ and $Frame_length$, the frame length as
 $PA_ReTx_Interval = (1 + Long_TTI_Indicator) * Frame_length$

~~The maximum HARQ retransmission delay, Max_ReTx_Delay can be computed from $T_ReTx_Interval$, the maximum delay between consecutive retransmissions and N_Max_ReTx , the maximum number of retransmissions as~~

$$\text{Max_ReTx_Delay} = \text{ReTx_Interval} * N_Max_ReTx$$

Delay_Budget is the maximum delay that can be tolerated by the packet based on the application characteristics, e.g., 50ms for VoIP. This value can be configured based on the attributes of the connection that is being persistently scheduled.

$$\text{Max_Delay} = \min(\text{Max_ReTx_Delay}, \text{Delay_Budget})$$

DL Composite PA A-MAP IE

The DL composite persistent A-MAP IE is specified in Table 677.

Table 677: DL Composite Persistent A-MAP IE

Syntax	Size in bits	Description/Notes
DL Composite Persistent A-MAP IE() {	-	-
Number of allocations	5	Number of allocation specified
RCID Type	2	0b00: Normal CID 0b01: RCID11 0b10: RCID7 0b11: RCID3
For (j=0;j<Number of allocations; j++) {		For loop where each loop element specifies information for one allocation.
Persistent Flag	1	0 = non-persistent 1 = persistent
RCID	variable	Specifies the station ID in RCID format, type defined by RCID Type
if (Persistent Flag == 1) {		
Allocation Period	2	Period of persistent allocation If (Allocation Period ==0b00), it indicates the deallocation of a persistently allocated resource. 0b00: deallocation 0b01: 2 frames 0b10: 4 frames 0b11: 8 frames N_ACIDs: Number of ACIDs for implicit cycling of HARQ channel identifier When Allocation Period > 0 N_ACID = Floor{(Max_Delay) / Allocation Period } + 1

Allocation Period and ACID Indicator	1	If Allocation Period and ACID Indicator is 1, it indicates that allocation information (allocation period, Number of ACID (ACID) is explicitly assigned for this allocation. Otherwise, this allocation will use the same allocation period as the previous allocation. If j is 0 then this indicator shall be 1.
if (Allocation Period and ACID Indicator == 1) {	-	-
Allocation Periodicity (AP)	5	Period of the persistent allocation is this field value plus 1 (unit is sub-frame/frame TBD)
}		
ACID	4	Number of HARQ channels associated with this persistent assignment is this field value plus 1 <u>N_ACIDs: Number of ACIDs for implicit cycling of HARQ channel identifier</u> <u>N_ACID=Floor{ PA_Max_ReTx_Delay/ (Allocation Period*Frame length) }+1</u>
if (Persistent Flag ==1 & Allocation Period==0b00){		
Resource Index	11	Confirmation of the resource index for a previously assigned persistent resource that has been deallocated 5 MHz: 0 in first 2 MSB bits + 9 bits for resource index 10 MHz: 11 bits for resource index 20 MHz: 11 bits for resource index Resource index includes location and allocation size
Long TTI Indicator	1	Indicates number of subframes spanned by the allocated resource. 0b0: 1 subframe (default) 0b1: 4 DL subframes for FDD or all DL subframes for TDD
HFA	5	Explicit Index for HARQ Feedback Allocation to acknowledge receipt of deallocation A-MAP IE
}else{		
Allocation MCS indicator	1	If Allocation MCS Indicator is 1, it indicates that $I_{SizeOffset}$ is explicitly assigned for this allocation. Otherwise, this allocation will use the same $I_{SizeOffset}$ as the previous subburst. If j is 0 then this indicator shall be 1.
if (Allocation MCS indicator == 1) {		
$I_{SizeOffset}$	5	Offset used to compute burst size index
}		
MEF	2	MIMO encoder format

		0b00: SFBC 0b01: Vertical encoding 0b10: Horizontal encoding 0b11: n/a
if (MEF == 0b01){		Parameters for vertical encoding
if(Nt == 2){		
Mt	1	Number of streams in transmission for Nt = 2 (Mt <= Nt) 0b0: 1 stream 0b1: 2 streams
}else if(Nt == 4){		
Mt	2	Number of streams in transmission for Nt = 4 (Mt <= Nt) 0b00: 1 stream 0b01: 2 streams 0b10: 3 streams 0b11: 4 streams
}else if(Nt == 8){		
Mt	3	Number of streams in transmission for Nt = 8 (Mt <= Nt) 0b000: 1 stream 0b001: 2 streams 0b010: 3 streams 0b011: 4 streams 0b100: 5 streams 0b101: 6 streams 0b110: 7 streams 0b111: 8 streams
}		
} else if(MEF == 0b10){		Parameters for horizontal encoding
if(Nt == 2){		
PSI	1	Allocated pilot stream index for Nt = 2 0b0: #1 stream 0b1: #2 stream
Mt	1	Number of streams in transmission for Nt = 2 (Mt <= Nt) 0b0: 1 stream 0b1: 2 streams
M _p	2	Modulation constellation of the paired user 0b00: QPSK

		0b01: 16 QAM 0b10: 64 QAM 0b11: n/a
} else{		
PSI	2	Allocated pilot stream index for $N_t = 4$ or 8 0b00: #1 stream 0b01: #2 stream 0b10: #3 stream 0b11: #4 stream
Mt	2	Number of streams in transmission for $N_t = 4$ or 8 ($M_t \leq N_t$) 0b00: 1 stream 0b01: 2 streams 0b10: 3 streams 0b11: 4 streams
}		
}		
RAI	2	Resource Allocation Indicator (RAI) 0b00: It indicates that resource allocation information is explicitly assigned for this subburst. 0b01: It indicates that resource offset is explicitly assigned for this subburst and this subburst will use the same duration as the previous subburst. 0b10: It indicates that this subburst will use the same duration as the previous subburst and follow the previous subburst. 0b11: Rsvd If j is 1 then this indicator shall be 0b00.
if (RAI == 0b00) {		
Resource Index	11	5 MHz: 0 in first 2 MSB bits + 9 bits for resource index 10 MHz: 11 bits for resource index 20 MHz: 11 bits for resource index Resource index includes location and allocation size
}		
} else if (RAI == 0b01) {		
Resource offset	7	It indicates the start position of resource region for this subburst
}		
Long TTI Indicator	1	Indicates number of subframes spanned by the allocated resource. 0b0: 1 subframe (default) 0b1: 4 DL subframes for FDD or all DL subframes for TDD

HFA	5	Explicit Index for HARQ Feedback Allocation
}		
}		
}		

The Resource Index field in the DL Composite Persistent A-MAP IE is interpreted as in the DL Basic Assignment A-MAP IE.

15.3.6.5.4.7 UL PA A-MAP IE

The UL persistent A-MAP IE is specified in Table 678.

Table 678: UL Persistent A-MAP IE*

Syntax	Size in bits	Description/Notes
UL Persistent A-MAP_IE() {	-	-
A-MAP IE Type	4	UL Persistent A-MAP IE
If MCRC is masked with Station ID {		
UL Individual Persistent A-MAP_IE()		Refer to Table 668
} else if MCRC is masked with Composite ID {		
UL Composite Persistent A-MAP_IE()		Refer to Table 669
}		
}		

*A 16 bit CRC is generated based on the contents of the UL Individual or Composite Persistent A-MAP IE and the CRC is masked by Station ID or the Composite ID (well-known ID specified in the system, TBD) respectively.

UL Individual PA A-MAP IE

The UL individual persistent A-MAP IE is specified in Table 679.

Table 679: UL Individual Persistent A-MAP IE

Syntax	Size in bits	Description/Notes
UL Persistent A-MAP_IE() {	-	-
Allocation Period	2	Period of persistent allocation If (Allocation Period == 0b00), it indicates the deallocation of a persistently allocated resource. 0b00: 0 <u>deallocation</u> 0b01: 2 frames 0b10: 4 frames 0b11: 6 <u>8</u> frames

		N_ACIDs: Number of ACIDs for implicit cycling of HARQ channel identifier When Allocation Period > 0 N_ACID = Floor{(Max_Delay)/Allocation Period} + 1
if (Allocation Period == 0b00){		
Resource Index	11	Confirmation of the resource index for a previously assigned persistent resource that has been deallocated 5 MHz: 0 in first 2 MSB bits + 9 bits for resource index 10 MHz: 11 bits for resource index 20 MHz: 11 bits for resource index Resource index includes location and allocation size
Long TTI Indicator	1	Indicates number of subframes spanned by the allocated resource. 0b0: 1 subframe (default) 0b1: 4 DL subframes for FDD or all DL subframes for TDD
HFA	5	Explicit Index for HARQ Feedback Allocation to acknowledge receipt of deallocation A-MAP IE
} else if (Allocation Period != 0b00){		
<i>I_{SizeOffset}</i>	5	Offset used to compute burst size index
Mt	1	Number of streams in transmission ($M_t \leq N_t$), up to 2 streams per AMS supported 0b0: 1 stream 0b1: 2 streams
TNS	2	Total number of streams in the LRU for CSM 0b00: reserved 0b01: 2 streams 0b10: 3 streams 0b11: 4 streams
if (TNS > Mt){		Parameters for CSM
if(TNS == 2){		
SI	1	First pilot index for CSM with TNS = 2
} else{		
SI	2	First pilot index for CSM with TNS = 3,4
}		
}		
else if (TNS == Mt) {		Parameters without CSM
MEF	1	MIMO encoder format 0b0: SFBC

		0b1: Vertical encoding
}		
PF	1	Precoding Flag 0b0: non adaptive precoding 0b1: adaptive codebook precoding using the precoder of rank M_t of MS's choice
}		
Resource Index	11	5 MHz: 0 in first 2 MSB bits + 9 bits for resource index 10 MHz: 11 bits for resource index 20 MHz: 11 bits for resource index Resource index includes location and allocation size
Long TTI Indicator	1	Indicates number of subframes spanned by the allocated resource. 0b0: 1 subframe (default) 0b1: 4 UL subframes for FDD or all UL subframes for TDD If number of DL subframes, D is less than number of UL subframes, U , Long TTI Indicator= 0b1
HFA	{4} 5	TBD Explicit Index for HARQ Feedback Allocation
ACID	3	HARQ channel identifier <u>N_{ACIDs}: Number of ACIDs for implicit cycling of HARQ channel identifier</u> <u>$N_{ACID} = \text{Floor}\{ \frac{PA \text{ Max ReTx Delay}}{\text{Allocation Period} * \text{Frame length}} \} + 1$</u>
}		
Reserved	TBD	Reserved bits
Padding	Variable	Padding to reach byte boundary
}	-	-

The Resource Index field in the UL Individual Persistent A-MAP IE is interpreted as in the DL Basic Assignment A-MAP IE.

UL Composite PA A-MAP IE

The UL composite persistent A-MAP IE is specified in Table 680.

Table 680: UL Composite Persistent A-MAP IE

Syntax	Size in	Description/Notes
--------	---------	-------------------

	bits	
UL Composite Persistent A-MAP_IE() {	-	-
Number of allocations	5	Number of allocation specified
RCID Type	2	0b00: Normal CID 0b01: RCID11 0b10: RCID7 0b11: RCID3
For (j=0;j<Number of allocations;j++) {		For loop where each loop element specifies information for one allocation.
Persistent Flag	1	0 = non-persistent 1 = persistent
RCID	variable	Specifies the station ID in RCID format, type defined by RCID Type
if (Persistent Flag == 1) {		
Allocation Period	2	Period of persistent allocation If (Allocation Period ==0b00), it indicates the deallocation of a persistently allocated resource. 0b00: deallocation 0b01: 2 frames 0b10: 4 frames 0b11: 8 frames N_ACIDs: Number of ACIDs for implicit cycling of HARQ channel identifier When Allocation Period > 0 N_ACID=Floor{(Max_Delay)/ Allocation Period }+1
Allocation Period and ACID Indicator	1	If Allocation Period and ACID Indicator is 1, it indicates that allocation information (allocation period, Number of ACID (ACID) is explicitly assigned for this allocation. Otherwise, this allocation will use the same allocation period as the previous allocation. If j is 0 then this indicator shall be 1.
if (Allocation Period and ACID Indicator == 1) {	-	-
Allocation Periodicity (AP)	5	Period of the persistent allocation is this field value plus 1 (unit is sub-frame/frame TBD)
}		
ACID	4	Number of HARQ channels associated with this persistent assignment is this field value plus 1 <u>N_ACIDs: Number of ACIDs for implicit cycling of HARQ channel identifier</u> <u>N_ACID=Floor{ PA_Max_ReTx_Delay/ (Allocation</u>

		<u>Period*Frame length) }+1</u>
if (Persistent Flag ==1 && Allocation Period==0b00){		
Resource Index	11	Confirmation of the resource index for a previously assigned persistent resource that has been deallocated 5 MHz: 0 in first 2 MSB bits + 9 bits for resource index 10 MHz: 11 bits for resource index 20 MHz: 11 bits for resource index Resource index includes location and allocation size
Long TTI Indicator	1	Indicates number of subframes spanned by the allocated resource. 0b0: 1 subframe (default) 0b1: 4 DL subframes for FDD or all DL subframes for TDD
HFA	5	Explicit Index for HARQ Feedback Allocation to acknowledge receipt of deallocation A-MAP IE
}else{		
Allocation MCS indicator	1	If Allocation MCS Indicator is 1, it indicates that MCS is explicitly assigned for this allocation. Otherwise, this allocation will use the same MCS as the previous subburst. If j is 0 then this indicator shall be 1.
if (Allocation MCS indicator == 1) {		
<i>I_{SizeOffset}</i>	5	Offset used to compute burst size index
}		
Mt	1	Number of streams in transmission ($M_t \leq N_t$), up to 2 streams per AMS supported 0b0: 1 stream 0b1: 2 streams
TNS	2	Total number of streams in the LRU for CSM 0b00: reserved 0b01: 2 streams 0b10: 3 streams 0b11: 4 streams
if (TNS > Mt){		Parameters for CSM
if(TNS == 2){		
SI	1	First pilot index for CSM with TNS = 2
} else{		
SI	2	First pilot index for CSM with TNS = 3,4
}		
}		
else if (TNS == Mt) {		Parameters without CSM
MEF	1	MIMO encoder format

		0b0: SFBC 0b1: Vertical encoding
}		
PF	1	Precoding Flag 0b0: non adaptive precoding 0b1: adaptive codebook precoding using the precoder of rank M_t of MS's choice
RAI	2	Resource Allocation Indicator (RAI) 0b00: It indicates that resource allocation information is explicitly assigned for this subburst. 0b01: It indicates that resource offset is explicitly assigned for this subburst and this subburst will use the same duration as the previous subburst. 0b10: It indicates that this subburst will use the same duration as the previous subburst and follow the previous subburst. 0b11: Rsvd If j is 1 then this indicator shall be 0b00.
if (RAI == 0b00) {		
Resource Index	11	5 MHz: 0 in first 2 MSB bits + 9 bits for resource index 10 MHz: 11 bits for resource index 20 MHz: 11 bits for resource index Resource index includes location and allocation size
} else if (RAI == 0b01) {		
Resource offset	7	It indicates the start position of resource region for this subburst
}		
Long TTI Indicator	1	Indicates number of subframes spanned by the allocated resource. 0b0: 1 subframe (default) 0b1: 4 DL subframes for FDD or all DL subframes for TDD If number of DL subframes, D is less than number of UL subframes, U , Long TTI Indicator = 0b1
HFA	5	Explicit Index for HARQ Feedback Allocation
}		
}		
}		

The Resource Index field in the UL Composite Persistent A-MAP IE is interpreted as in the DL Basic

2009-08-29

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Assignment A-MAP IE.

----- End of Proposed Amendment Text -----