Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**	
Title	**Fragmentation and packing extended header (FPEH)**	
Date Submitted	**2009-08-26**	
Source(s)	Scott Probasco Nokia	Voice: +1 469 939 9378 E-mail: [scott.probasco@nokia.com] *<http://standards.ieee.org/faqs/affiliationFAQ.html>
Re:	Letter Ballot #30, IEEE 802.16-09/0044	
Abstract	Proposed text for Fragmentation and packing header (FPEH)	
Purpose	Present text for review and acceptance in 16m task group.	
Notice	*This document does not represent the agreed views of the IEEE 802.16 Working Group or any of its subgroups*. It represents only the views of the participants listed in the "Source(s)" field above. It is offered as a basis for discussion. It is not binding on the contributor(s), who reserve(s) the right to add, amend or withdraw material contained herein.	
Release	The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE's name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE's sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that this contribution may be made public by IEEE 802.16.	
Patent Policy and Procedures	The contributor is familiar with the IEEE-SA Patent Policy and Procedures: <http://standards.ieee.org/guides/bylaws/sect6-7.html#6> and <http://standards.ieee.org/guides/opman/sect6.html#6.3>. Further information is located at <http://standards.ieee.org/board/pat/pat-material.html> and <http://standards.ieee.org/board/pat>.	

Fragmentation and packing extended header

Scott Probasco
Nokia (per <http://standards.ieee.org/faqs/affiliationFAQ.html>*

1. Introduction

The current draft defines the “Fragmentation and packing extended header” and also the “Rearrangement Fragmentation and Packing Extended Header (RFPEH)”. The two headers are defined in separate sections in the AWD, 15.2.2.2.1 and 15.2.2.2.2. The syntax of the two headers is identical with exception of two additional fields in The Rearragement Fragmentation and Packing Extended Header, thus this header is actually only an extension of the Fragmentation and packing extended header.

2. Discussion

The second paragraph under section 15.2.2.2.1 specifies that these two extended headers are mutually exclusive in the same MPDU. The two extended headers are distinguished by the Rearrangement header indicator (RI), which has the effect of defining how to interpret the remaining bits in the extended header.

Both header definitions use the same extended header type (FPEH type) and thus these two separately defined extended headers must always remain syntactically the same (and hence mutually exclusive). These headers are actually identical except for the addition of two fields added in the Rearrangement Fragmentation and Packing Extended Header, and the addition of these two fields is indicated by the RI field.

In order to keep the standard simple, to prevent future errors (which would occur if the text in sections 15.2.2.2.1 and 15.2.2.2.2 are not kept syntactically the same), and to simply implementation, the two separate headers can be replaced with one single header. The specified function remains the same.

3. Contribution Text

The text in this paragraph and immediately below, up to the text “Contribution text with edits follows this line“ can be ignored. It’s purpose is to set the proper numbering for subclauses, tables and figures. This is needed to make the proposed changes “cut and paste” friendly to the Editor.

15.2.2.2 Dummy Subclause

Table 658—Dummy Table

Figure 386—Dummy Figure

Dummy Equation (172)

[Contribution text with edits follows this line]

15.2.2.2.1 Fragmentation and packing extended header (FPEH)

The FPEH shall be used when MAC PDU contains payload from single transport connection. Rearrangment (RI = 1) shall be used only for ARQ connections, it is used when a MAC PDU contains ARQ sub-blocks from a single transport connection for retransmission. The FPEH exists after the last extended header (i.e. the extended header with 'Last' = '1') if 'EH' in GMH set to '1' or after the GMH if 'EH' in GMH set to '0'. The FPEH format is defined in Table 659 and its fields are defined in Table 660.

~~Only one of the two extended headers among FPEH and RFPEH is present at any one time.FPEH or RFPEH, when present, shall be the last extended header~~

Table 659—FPEH Format

Syntax	Size (bit)	Notes
FPEH() {		
RI	1	Re-arrangement header indicator ~~Always set to '0'~~
SN	10	payload sequence number
FC	2	Fragmentation control (see Table 661)
AFI	1	ARQ feedback IE indicator
AFP	1	ARQ feedback poll indicator
If (RI == 1) {		
LSI	1	Last ARQ sub-block indicator
SSN	TBD	SUB-SN of the first ARQ sub-block
}		
Do {		
End	1	
if (End == 0) {		
Length	11	Length of SDU or SDU fragment
}		
} while (!End)		
Reserved	variable	
}		

Table 660—FPEH fields

Names	Size (bit)	Description
RI	1	Re-arrangement header indicator ~~0 = FPEH format follows after RI bit~~ ~~1 = RFPEH format follows after RI bit~~ 0 = fragmentation and packing only. no rearrangement 1 = rearrangement, fragmentation and packing. only used for ARQ connections
SN	10	Payload sequence number
FC	2	Fragmentation Control bits (encoding shown in Table 661)
AFI	1	ARQ feedback IE indicator 0 = ARQ feedback IE is not present in the MAC PDU 1 = ARQ feedback IE follows after FPEH
AFP	1	ARQ feedback poll indicator. 0 = No ARQ feedback poll 1 = ARQ feedback poll for the connection indicated in GMH
LSI	1	Last ARQ sub-block indication 0 = Indicating the last ARQ sub-block from the single ARQ block is not included in this MAC PDU 1 = Indicating the last ARQ sub-block from the single ARQ block is included in this MAC PDU
SSN	1	SUB-SN of the first ARQ sub-block
End	1	Indication of more information 0 = Indicating another "Length" and "End" fields are followed 1 = Indicating no more "Length" and "End" fields are followed
Length	11	This field indicates the length of SDU or SDU fragment. If a payload consists of 'N' SDU/SDU fragments, N-1 'Length' fields are present in FPEH. The length of the first SDU or SDU fragment in the payload is indicated by the 'Length' field in GMH.
Rsvd	variable	Reserved bits are added at the end of FPEH for byte alignment

Table 661—Encoding of FC field

FC	Meaning	Examples
00	The first byte of data in the MPDU payload is the first byte of a MAC SDU. The last byte of data in the MPDU payload is the last byte of a MAC SDU.	• One or Multiple Full SDUs packed in an MPDU
01	The first byte of data in the MPDU payload is the first byte of a MAC SDU. The last byte of data in the MPDU payload is not the last byte of a MAC SDU.	• MPDU with only First fragment of an SDU • MPDU with one or more unfragmented SDUs, followed by first fragment of subsequent SDU
10	The first byte of data in the MPDU payload is not the first byte of a MAC SDU. The last byte of data in the MPDU payload is the last byte of a MAC SDU.	• MPDU with only Last fragment of an SDU • MPDU with Last fragment of an SDU, followed by one or more unfragmented subsequent SDUs
11	The first byte of data in the MPDU payload is not the first byte of a MAC SDU. The last byte of data in the MPDU payload is not the last byte of a MAC SDU.	• a) MPDU with only middle fragment of an SDU • MPDU with Last fragment of an SDU, followed by zero or more unfragmented SDUs, followed by first fragment of a subsequent SDU

~~**15.2.2.2.2 Rearrangement Fragmentation and Packing Extended Header (RFPEH)**~~

~~RFPEH shall be used only for ARQ connection. It is used when a MAC PDU contains ARQ sub-blocks from a single transport connection for retransmission. The location of this header exists after the last extended header (i.e. the extended header with 'Last' = '1') if 'EH' in GMH set to '1' or after the GMH if 'EH' in GMH set to '0'. The RFPEH format is defined in Table 662 and its fields are defined in Table 663.~~

Table 662—~~RFPEH Format~~

~~Syntax~~	~~Size (bit)~~	~~Notes~~
~~FPEH() {~~		
~~RI~~	~~1~~	~~Re-arrangement header indicator Always set to '0'~~
~~SN~~	~~10~~	~~payload sequence number~~
~~FC~~	~~2~~	~~Fragmentation control (see Table 661)~~
~~AFI~~	~~1~~	~~ARQ feedback IE indicator~~
~~AFP~~	~~1~~	~~ARQ feedback poll indicator~~
~~LSI~~	~~1~~	~~Last ARQ sub-block indicator~~

Table 662—RFPEH Format

Syntax	Size (bit)	Notes
SSN	TBD	SUB-SN of the first ARQ sub-block
Do {		
End	1	
if (End == 0) {		
Length	11	Length of SDU or SDU fragment
}		
} while (!End)		
Reserved	variable	
}		

Table 663—RFPEH fields

Names	Size (bit)	Description
RI	1	Re-arrangement header indicator 0 = FPEH format follows after RI bit 1 = RFPEH format follows after RI bit
SN	10	Payload sequence number
FC	2	Fragmentation Control bits (encoding shown in Table 661)
AFI	1	ARQ feedback IE indicator 0 = ARQ feedback IE is not present in the MAC PDU 1 = ARQ feedback IE follows after FPEH
AFP	1	ARQ feedback poll indicator. 0 = No ARQ feedback poll 1 = ARQ feedback poll for the connection indicated in GMH
LSI	1	Last ARQ sub-block indication 0 = Indicating the last ARQ sub-block from the single ARQ block is not included in this MAC PDU 1 = Indicating the last ARQ sub-block from the single ARQ block is included in this MAC PDU
SSN	1	SUB-SN of the first ARQ sub-block
End	1	Indication of more information 0 = Indicating another "Length" and "End" fields are followed 1 = Indicating no more "Length" and "End" fields are followed
Length	11	This field indicates the length of SDU or SDU fragment. If a payload consists of 'N' SDU/SDU fragments, N-1 'Length' fields are present in FPEH. The length of the first SDU or SDU fragment in the payload is indicated by the 'Length' field in GMH.
Rsvd	variable	Reserved bits are added at the end of FPEH for byte alignment