Project	**IEEE 802.16 Broadband Wireless Access Working Group** **<http://ieee802.org/16>**
Title	**Contribution to the TG3 and TG4 MAC: MPDU Formats**
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Re:	This is a contribution to the IEEE 802.16 TG3 and TG4 MAC.
Abstract	This document proposes two enhancements to the MPDU formats. First, We propose the introduction of a third MPDU header type, called a super MPDU header, to directly and efficiently support the concatenation of MPDUs with different CIDs. Second, we propose a new arrangement of the header/payload locations in order for the receiver to process the incoming MPDUs more efficiently.
Purpose	Enhance the MPDU formats for the TG3 and TG4.
Notice	
Release	

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Acknowledgements

The following people have contributed to this document:

Revision History

Release Date	Document Number	Author	Change summary
2001-05-01		Lei Wang	First draft
2001-05-10		Lei Wang	Updated with the received comments

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1   Introduction

This document proposes two enhancements to the MPDU formats specified in [Ref1] and [Ref2]. First, We propose the introduction of a third MPDU header type, called a super MPDU header, to directly and efficiently support the concatenation of MPDUs with different CIDs. Second, we propose a new arrangement of the header/payload locations in order for the receiver to process the incoming MPDUs more efficiently.

This contribution is for TG3 and TG4 MAC.

2   Reference

(1)   [Ref1]: Draft Standard Air Interface for Fixed Broadband Wireless Access System, IEEE 802.16/D2-2001.

(2)   [Ref2]: Figures of New MAC Header, IEEE 802.16.1c-01/10r1, 2001-03-13.

3   Three Types of MPDU Headers

A new MPDU Header Type, called a super MPDU header, is proposed to efficiently support the concatenation of multiple MPDUs with different CIDs. With the addition of this new MPDU header type, there will be 3 header types: generic MPDU header, super MPDU header, and bandwidth request MPDU header.

3.1   Formats of MPDU Headers

The size of the Header Type (HT) field in the MPDU header should to be increased to 2 bits, in order to specify 3 different MPDU header types.

The three MPDU headers are shown in FIGURE 1.

1. Generic MPDU Header (HT=00)

HT=00 (2)	EC (1)	PT (6)		CI (1)	EKS (2)	rsv (1)	Length MSB (3)
Length LSB (8)			CID MSB (8)				
CID LSB (8)			HCS (8)				

2. Super MPDU Header (HT=01)

HT=01 (2)	rsv (1)	number of MPDUs (5)	Length MSB (8)
Length LSB (8)			HCS (8)

3. Bandwidth Request MPDU Header (HT=10)

HT=10 (2)	Request Type (4)	rsv (2)	BR MSB (3)
BR LSB (8)			CID MSB (8)
CID LSB (8)			HCS (8)

FIGURE 1.   Formats of MPDU Headers

The length of the super MPDU header is 32 bits. A super MPDU should consist of more than one generic MPDU. A 5-bit field indicates the number of generic MPDUs in a super MPDU. Thus, maximum 32 generic MPDUs can be concatenated into one super MPDU.

3.2 Differences Between Super MDPU and Packing MPDU

As specified in [Ref1] and [Ref2], when the payload type field of a generic MPDU is 0x000010, multiple MSDUs and MSDU segments with the same CIDs can be packed into the same generic MPDU. It is called a packing MPDU. For a packing MPDU, the length field in its generic MPDU header has a special interpretation, which indicates the number of MSDUs or MSDU segments packed in the MPDU, instead of the number of bytes in the MPDU. Each MSDU or segment packed in a packing MPDU has one 16-bit Packing Sub-Header (PSH). The PSH is of 16-bits. It consists of three information fields: 2-bit Fragmentation Control (FC), 4-bit Fragmentation Sequence Number (FSN), and 10-bit length.
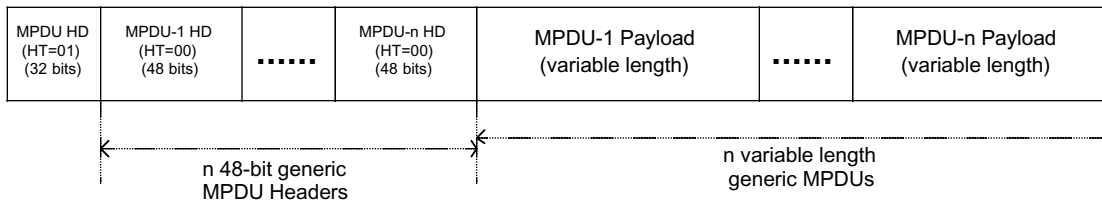
Clearly, both super MPDU and packing MPDU are defined to have multiple payloads concatenated into one MPDU. However, they are different from each other. Their major Differences are listed as follows:

(1)   The multiple generic MPDUs in a super MPDU may have different CIDs, carrying data for different stations or different service types; the multiple MSDUs/segments have the same CID, carrying data for the same station and the same service type;

(2)   The super MPDU contains multiple generic MPDUs; the packing MPDU contains multiple MSDUs/segments;

(3)   Each generic MPDU contained in a super MPDU has a 48-bit MPDU header; each MSDU/segment contained in a packing MPDU has a 16-bit Packing Sub-Header (PSH);

(4)   Each MPDU contained in a super MPDU can have its own choices of the encryption and the CRC; all the MSDUs/segments contained in a packing MPDU share the choices of the encryption and the CRC; and

(5)   A super MDPU may contain a packing MPDU.

4   Locations of the Headers/Sub-Headers and the Payloads

FIGURE 2 shows the proposed locations of the headers/sub-headers in MPDUs containing multiple data payload units, such as a super MPDU and a packing MPDU.

Super MPDU with HT=01 (Multiple MPDUs in a Super MPDU)

MPDU HD (HT=01) (32 bits)	MPDU-1 HD (HT=00) (48 bits)	......	MPDU-n HD (HT=00) (48 bits)	MPDU-1 Payload (variable length)	......	MPDU-n Payload (variable length)

n 48-bit generic MPDU Headers

n variable length generic MPDUs

Packing MPDU (HT=00 and PT=000010, multiple MSDUs for the same CID)

MPDU HD (HT=00 and PT=000010) (48 bits)	PS H1	......	PS Hk	MSDU 1 (variable length)	......	MSDU k (variable length)	CRC (32 bits) (optional)

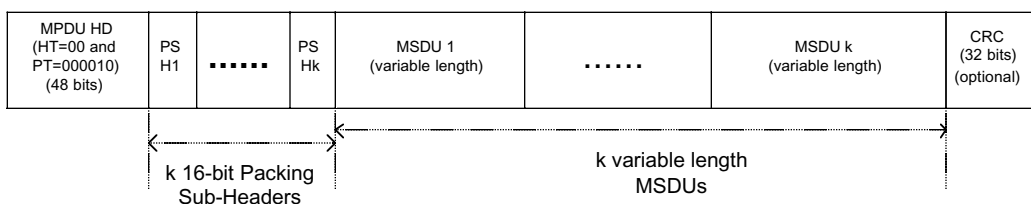k 16-bit Packing Sub-Headers

k variable length MSDUs

FIGURE 2.   **Proposed Locations of the Headers/Sub-Headers and Payloads**

This contribution proposes to gather the multiple headers/sub-headers together and locate the headers/sub-headers before their payloads. At the receiving side, the headers become available to be processed before their payloads arrive, so that such a header/payload location arrangement allows more prompt and efficient header processing for the super MPDUs and packing MPDUs.