Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Transmission of the last complete SDU without subheader**
Date Submitted	**2004-05-10**
Source(s)	Kang-gyu Lee Yunsung Kim, Sunny Chang, Taein Hyon Samsung Electronic, Suwon P.O.Box 105, 416, Maetan-3dong, Paldal-gu, Suwon-si,Gyeonggi-do, Korea 442-742 Voice : +82-31-279-5337 Fax : +82-31-279-5515 yleekg@samsung.com tseliot@samsung.com sunny94@samsung.com taein.hyon@samsung.com
Re:	This contribution is response to call for contribution about IEEE802.16e-D2
Abstract	This contribution is to propose the effective packing and fragmentation algorithm.
Purpose	Discuss and Adopt in the IEEE802.16e group.
Notice	This document has been prepared to assist IEEE 802.16. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) 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 802.16 Patent Policy and Procedures <http://ieee802.org/16/ipr/patents/policy.html>, including the statement "IEEE standards may include the known use of patent(s), including patent applications, provided the IEEE receives assurance from the patent holder or applicant with respect to patents essential for compliance with both mandatory and optional portions of the standard." Early disclosure to the Working Group of patent information that might be relevant to the standard is essential to reduce the possibility for delays in the development process and increase the likelihood that the draft publication will be approved for publication. Please notify the Chair <mailto:chair@wirelessman.org> as early as possible, in written or electronic form, if patented technology (or technology under patent application) might be incorporated into a draft standard being developed within the IEEE 802.16 Working Group. The Chair will disclose this notification via the IEEE 802.16 web site <http://ieee802.org/16/ipr/patents/notices>.

Transmission of the last complete SDU without subheader

Kang-gyu Lee, Yunsung Kim, Sunny Chang, Taein Hyon
SAMSUNG ELECTRONICS

***Problem**:*

In 802.16REVd/D4, chapter 6 (MAC common part sublayer) says as follows.

If more than one MAC SDU is packed into the MAC PDU, the type field in the MAC header indicates the presence of Packing subheaders (PSHs). Note that unfragmented MAC SDUs and MAC SDU fragments may both be present in the same MAC PDU.

Simultaneous fragmentation and packing allows efficient use of the airlink, but requires guidelines to be followed so it is clear which MAC SDU is currently in a state of fragmentation. To accomplish this, when a Packing subheader is present, the fragmentation information for individual MAC SDUs or MAC SDU fragments is contained in the corresponding Packing subheader.

Now we can imagine the following situation shown in figure1. If the room of the MAC PDU is equal to 'C' ~ 'C + (PSH size – 1)', transmitter shall perform 1, 2, 3 in figure1.

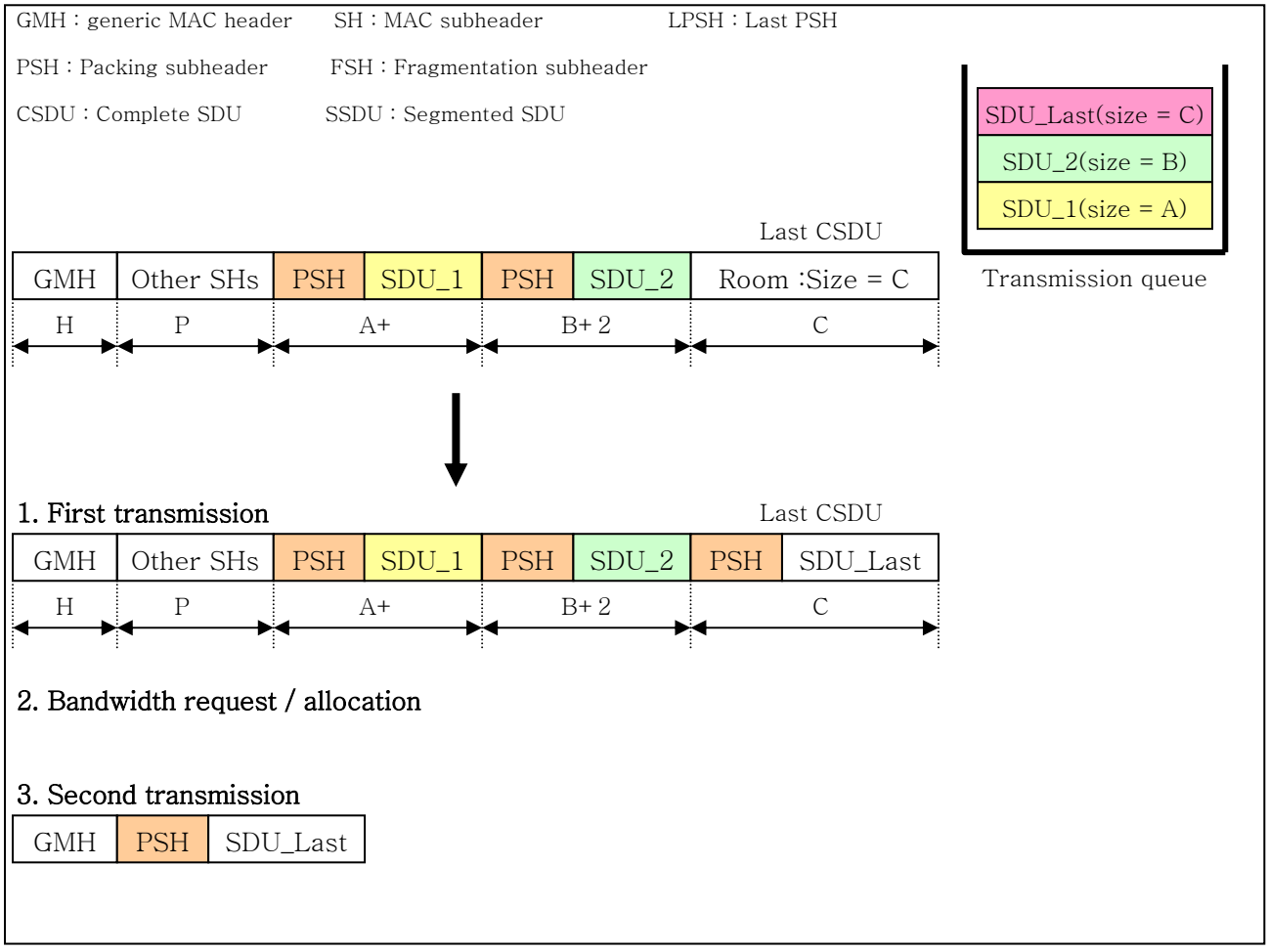

Figure 1 "insufficient room in a MAC PDU"

Background information for proposed remedy:

With the help of Figure 2 and Table 1, the transmitter is able to send the last complete SDU and the receiver is able to correctly receive the last SDU without a packing subheader.

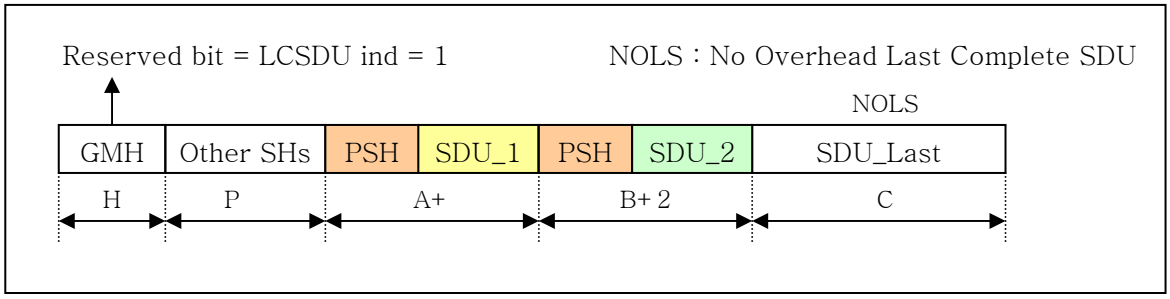

Figure 2 "SDU_Last a MAC PDU/ Without packing subheader"

Table 1 "Possible FC values in NOLS case"

'FC' value of PSH	Description
00	This subheader is for the complete SDU and but is not the LPSH. So one or more PSH shall follow within the MAC PDU.
01	This subheader is not the LPSH. So one or more PSH shall follow within the MAC PDU.
10	This subheader is the LPSH. So NOLS payload shall follow after this complete SDU.
11	This subheader is the LPSH. So NOLS payload shall follow after this segmented SDU.

The 1bit of the 2bits 'reserved' in generic MAC header can be used to indicate that the MAC PDU contains more than one packed payload and NOLS (no overhead last complete SDU). That is, 1bit 'reserved' bit may be used as an 'NOLS presence' bit.

As illustrated in Figure 2, when the remaining space for the MAC PDU payload is 'C' ~ 'C + (PSH size – 1), transmitter shall set 'NOLS presence' = 1 and insert NOLS payload into the corresponding MAC PDU and the receiver shall decode the 'NOLS Presence' bit and unpack the NOLS payload from the received MAC PDU.

Important thing is to determine 'Which PSH of multiple PSHs within the corresponding MAC PDU is the last PSH, which is followed by the NOLS payload'. We will call it 'LPSH'. The solution for this problem is at the FC field in PSH. When an NOLS case occurs, the possible FC values of PSH in the MAC PDU are either 00 or 01. Other values, 10 or 11, should not occur if following the existing convention. In light of this fact, we can introduce new meaning to the MSB of the FC field to indicate that the PSH with FC = 1x is the LPSH in the corresponding MAC PDU.

The FSN for NOLS is signaled implicitly. The FSN value for NOLS is the 'FSN value in LPSH + 1'.

Proposed Text Change:

:

[Add the following text to section4]

4. Abbreviations and acronyms

NOLS No Overhead Last complete MAC SDU

[Add the following text to section 6.3.2.1]

6.3.2.1 MAC header formats

Two MAC header formats are defined. The first is the generic MAC header that begins each MAC PDU containing either MAC management messages or CS data. The second is the bandwidth request header used to request additional bandwidth. The single-bit Header Type (HT) field distinguishes the generic MAC header and bandwidth request header formats. The HT field shall be set to zero for the Generic Header and to one for a bandwidth request header.

The MAC header formats are defined in Table 4a.

Table 4a – MAC header format

Syntax	Size	Notes
MAC Header( ) {		
HT	1 bit	0 = Generic MAC header 1 = Bandwidth request header
EC	1 bit	
if(HT==0) {		
Type	6 bits	
NOLS_Presence	1 bit	0 = absence of NOLS 1 = presence of NOLS NOLS stands for the last complete SDU in a MAC PDU. After NOLS, there is no room or (1byte ~ [byte size of packing subheader – 1]) room for data in that MAC PDU.
CI	1 bit	
EKS	2 bits	
reserved	1 bit	Set to 0
LEN	11 bits	
}		
Else {		
Type	3 bits	
BR	19 bits	

}		
CID	16 bits	
HCS	8 bits	
}		

[Add the following text to section 6.3.3.4.1.2]

When the MAC PDU contains more than one packed MAC SDUs or MAC SDU fragment and the room in which any MAC SDU or (any MAC SDU + Packing subheader size –1) can be included, the Packing subheader for the last payload(NOLS) in that MAC PDU may be removed. At this time, transmitter shall set ‘NOLS_Presence’ bit to one to inform the corresponding reciever of the presence of NOLS in the MAC PDU.