Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**RS HARQ ACKCH Region Allocation IE**
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Source(s)	Junichi Suga Voice: +81-44-754-2811 Fujitsu Laboratories Ltd. Fax: +81-44-754-2786 Kamikodanaka 4-1-1, Email: suga.junichi@jp.fujitsu.com Kawasaki, 211-8588, Japan Michiharu Nakamura Voice: +81-46-839-5371 Fujitsu Laboratories Ltd. Fax: +81-46-839-5560 5-5, Hikarinooka Email: michi@labs.fujitsu.com Yokosuka, Japan. 239-0847
Re:	Call for Technical Proposals regarding IEEE Project P802.16j (IEEE 802.16j-07/019)
Abstract	This contribution proposes the RS HARQ ACKCH Region Allocation IE for HARQ in multi-hop relay.
Purpose	Add proposed spec changes in P802.16j Baseline Document
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RS HARQ ACKCH Region Allocation IE

1. Problem statement

The HARQ in non-transparent relaying with centralized scheduling described in 6.3.17.4.1 uses the encoded ACK/NAK feedback mechanism where RS sends an encoded ACK/NAK after the RS receives an encoded ACK/NAK from a subordinate RS or ACK/NAK from a subordinate MS.

On the other hand, it is assumed that the number of links between MR-BS and MS are different for MSs in the multi-hop network. Then it has possibility that MR-BS or an intermediate RS receives some encoded ACK/NAKs from some subordinate RSs simultaneously, after the MR-BS or the intermediate RS relays HARQ bursts to subordinate RSs on different frames, as shown fig.1. In this example, RS1 relays the encoded ACK/NAK on "Frame N+5" to MR-BS corresponding to a burst sent by MR-BS on frame "Frame N+2". While, RS2 also relays the encoded ACK/NAK on "Frame N+5" to MR-BS corresponding to a burst sent by MR-BS on "Frame N". However, the subordinate RSs such as RS1 and RS2 in Fig.1 cannot recognize how to allocate the encoded ACK/NAK on HARQ ACKCH region only by the current HARQ ACKCH Region Allocation IE which indicates only the HARQ ACKCH region.
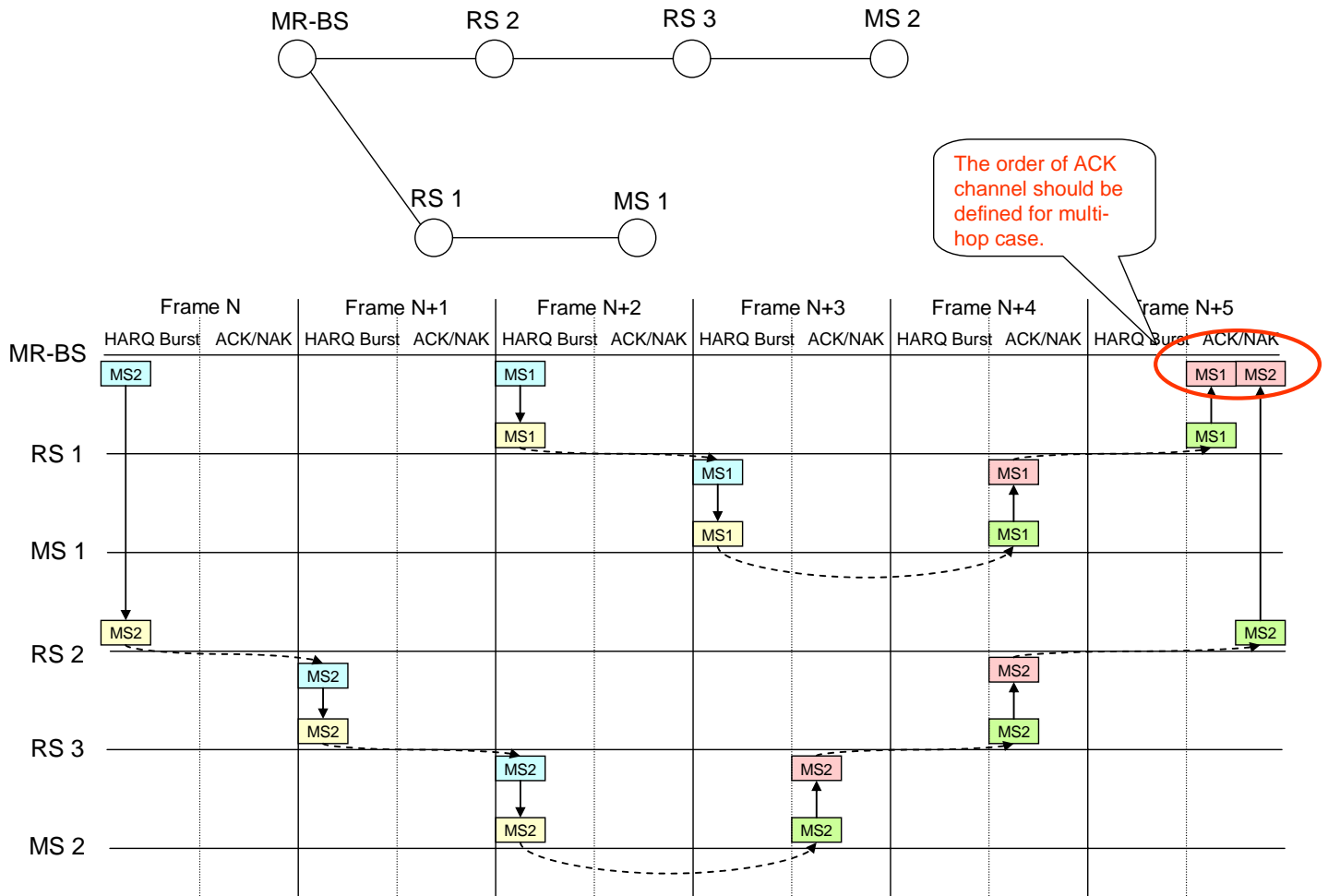
Fig. 1 Problem of ACK/NAK feedback in multi-hop relaying

2. Proposed solution

In this contribution, the RS HARQ ACKCH Region Allocation IE for relaying the encoded ACK/NAK in more than two hop relay and a rule for allocation of the encoded ACK/NAK to MR HARQ ACKCH Region are proposed.

To recognize the ACKCH region for each RS, the RS HARQ ACKCH Region allocation IE indicates the region for each RS by the number of ACK channels. Each RS relays the encoded ACK/NAK in continual half-slots on the RS HARQ ACKCH region.
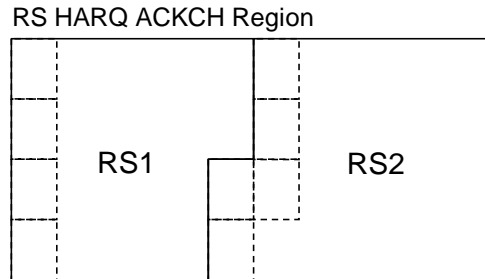
RS HARQ ACKCH Region

Fig. 2 RS HARQ ACKCH Region

When RS receives the ACK/NAK from subordinate MSs on Access-Link and the encoded ACK/NAK from subordinate RSs on Relay-Link, the RS may relay them to the upstream RS on the same Relay-Link frame. In this case, the RS allocates the encoded ACK/NAK from subordinate RS ahead of the ACK/NAK from subordinate MS.

3. Proposed text changes

[Change table 496c as indicated]

Table 496c – R-link specific IE types

Type (hexadecimal)	Usage
00	RS_UL_DCH assignment IE
0x01 ~~-1F~~	~~*Reserved*~~ RS HARQ ACKCH Region Allocation IE
0x02-1F	*Reserved*

[Insert new sub-clause 8.4.5.9.3]
8.4.5.9.3 RS HARQ ACKCH Region Allocation IE

This IE is used for RS to relays the ACK/NAK or the encoded ACK/NAK on R-link.

Table xxx – RS HARQ ACKCH Region Allocation IE

Syntax	**Size (bit)**	**Notes**

RS_HARQ_ACKCH_Region_IE() {		
Type	5 bits	
Length	4 bits	
OFDMA Symbol offset	4 bits	
Subchannel offset	4 bits	
No. OFDMA symbols		
No. subchannels	16 bits	
No. RSs	4 bits	
For (i=0; i<No. RSs; i++) {		
RSCID	8 bits	Reduced basic CID of the RS
N_ACKCH	5 bits	Number of ACK channels
}		
}		

When a RS relays the ACK/NAK from subordinate MS and the encoded ACK/NAK from subordinate RS on the same HARQ ACKCH region indicated by the MR HARQ ACKCH Region Allocation IE, the RS allocates the encoded ACK/NAK ahead of the ACK/NAK from MS.

4. References

[1] IEEE 802.16j-06/026r4