# Pipeline HARQ in Multi-hop Relay System

**IEEE 802.16 Presentation Submission Template (Rev. 8.3)**

Document Number:

IEEE S802.16j-07/185r2

Date Submitted: 2007-03-15

Source:

| | | |
|---|---|---|
| Kanchei (Ken) Loa, Youn-Tai Lee, | Voice: | 886-2-2739-9616 |
| Shiann-Tsong Sheu, Yi-Hsueh Tsai, Hua-Chiang Yin, | | |
| Yung-Ting Lee, Heng-Iang Hsu, Frank C.D. Tsai, | | |
| Institute for Information Industry | Fax: | 886-2-2378-2328 |
| 8F., No. 218, Sec. 2, Dunhua S. Rd., | E-mail: | loa@iii.org.tw |
| Taipei City, Taiwan. | | |

| | | |
|---|---|---|
| Hang Zhang, Mo-Han Fong, G.Q. Wang ,Peiying Zhu, | Voice: | +1 613 7631315 |
| Wen Tong,  David Steer, Gamini Senarath, Derek Yu, | E-mail: | WenTong@nortel.com |
| Mark Naden | | |
| Nortel | | |
| 3500 Carling Avenue | | |
| Ottawa, Ontario K2H 8E9 | | |

Venue:

IEEE 802.16 Session #48, Orlando, USA

Base Document:

IEEE C802.16j-06/026r2 and URL <http://ieee802.org/16/… C80216j-06_026r2.pdf>

Purpose:

Propose the text regarding pipeline HARQ in a multi-hop relay system.

# *Introduction*

- **This contribution proposes a procedure for handling retransmission of HARQ failure attempts in a relay system**

# *Pipeline HARQ*

- **From system-wise viewpoint, unnecessary retransmissions caused from ACK lost will degrade system performance**

  - Per UL/DL HARQ channel, MR-BS should allocates one dedicated ACK channel for each RS on relay path
  - Both centralized and distributed MAP allocation schemes could be adopted in multi-hop relay system with pipeline HARQ

# DL Pipeline HARQ

MS     RS2     RS1     MR-BS

Data* 1

Dummy 2

NACK(RS1) 2

NACK(RS2) 3

NACK(RS2) 4

NACK(MS) 5

NACK(MS) 6

**start reTX**

Data 3

Data 4

Data* 5

ACK(RS1) 4

ACK(RS2) 6

ACK(RS2) 7

NACK(MS) 6

NACK(MS) 7

NACK(MS) 8

Data 11

ACK(MS) 12

ACK(MS) 13

ACK(MS) 14
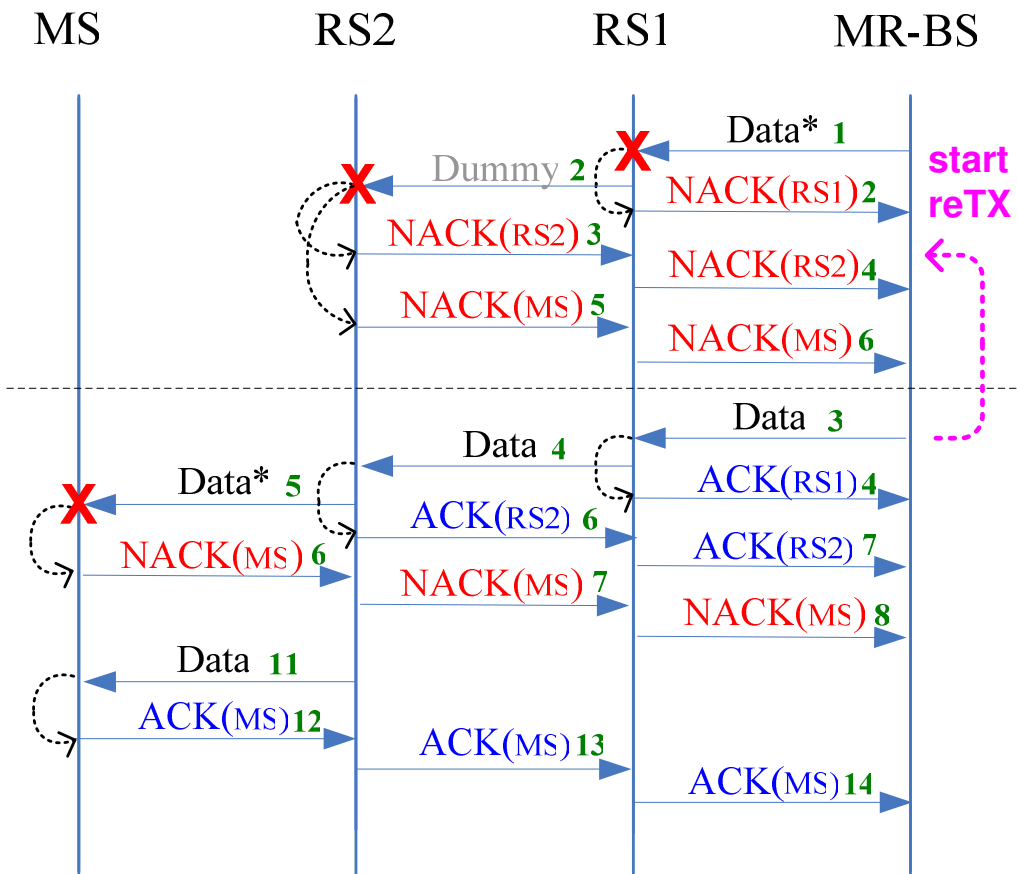
1. ACK/NACK shall be generated by RS/MS.
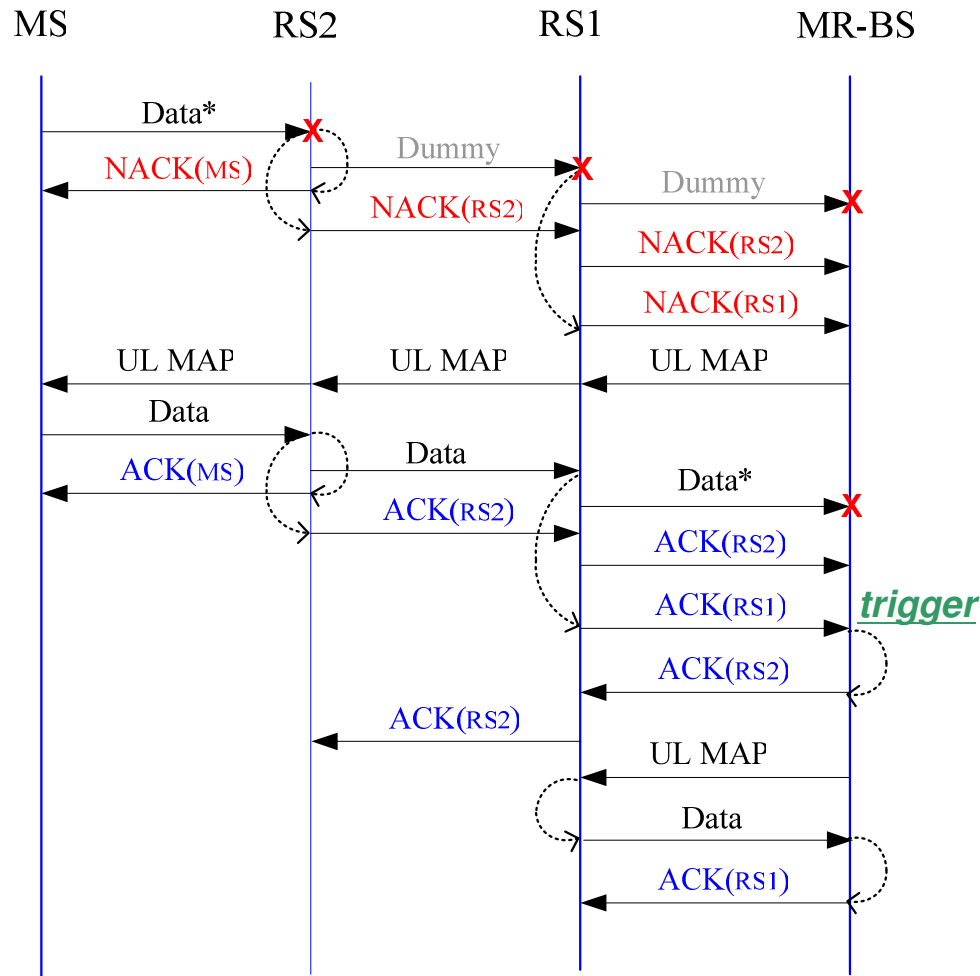2. ACK/NACK shall be forwarded to MR-BS by RS.
3. RS does not forward erroneous HARQ packet, instead it sends predefined dummy information on relay links.
4. If access RS does not have correct packet yet, it
   1. generates NACK on behalf of MS
   2. replaces MS CID in DL HARQ sub-burst IE as RS CID
5. Failure is detected at the 2nd frame. BS can early start retransmissions at the 3rd frame.
6. Retransmission occurs on effected links only.

Data* : indicate data packet is failed during transmission
Data : indicate data packet is successfully transmitted
Dummy : indicate RS sending the dummy information on HARQ sub-burst

4

# UL Pipeline HARQ



There are two kinds of ACK/NACK per HARQ channel : **DL ACK/NACK** and **UL ACK/NACK**

1. UL ACK/NACK shall be generated by RS and forwarded to BS.
2. DL ACK/NACK destining to MS shall be generated by access RS.
3. DL ACK destining to RS shall be generated by BS.
4. DL NACK destining to RS may be generated by BS.

➲ UL ACK from intermediate RS **triggers** BS to send DL ACK to the successor of that RS

Data* : indicate data packet is failed during transmission
Data : indicate data packet is successfully transmitted
Dummy : indicate RS sending the padding bits on HARQ sub-burst

**5**

# *Summary*

- **This contribution proposes that**

  1) **Per HARQ channel, MR-BS should allocate one ACK channel to every RS on the path**

  2) **RS should send separate ACK/NACK to MR-BS to assist MR-BS to precisely find out those effected links required for retransmissions**

- **To insert new sub-clause 6.3.17.5 into**

  – 6.3.17.5 RS supporting pipeline HARQ in centralized scheduling