Pipeline HARQ in Multi-hop Relay System

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

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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 allocate 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
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
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

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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
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