

Project	<b>IEEE 802.16 Broadband Wireless Access Working Group</b> < <a href="http://ieee802.org/16">http://ieee802.org/16</a> >	
Title	<b>HARQ for RS Virtual Grouping</b>	
Date Submitted	<b>2007-07-05</b>	
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Re:	This is in response for call for proposals 80216j-07_019.pdf	
Abstract	There is a need for HARQ specification under virtual group operation.	
Purpose	Review and adopt	
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# HARQ for RS Virtual Grouping

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## Introduction

The baseline document defines the capability operating the RSs in a virtual group. This contribution provides HARQ capability for the virtual group in case of 2-hops only.

UL HARQ operation for virtual group in case of more than two hops is not feasible. When MS sends UL HARQ burst in frame N, it expects DL ACK/NAK bitmap IE at-most in the frame N+ 3. In case of virtual grouping, UL ACK/NAK bitmap IE for MSs has to be generated by MR-BS (status of UL HARQ burst reception at each RS in the group could be different and therefore RS can not generate and transmit DL ACK/NAK bitmap IE to MS). If 1 frame offset is assumed for ACK transmission and HARQ burst relaying then it is not possible to support UL HARQ for more than 2 hops.

## Specification changes

*[Insert new sub clause 6.3.17.4.3]*

### 6.3.17.4.3 DL HARQ for RS grouping

For the purpose of HARQ operation the parent RS of the group, which provides the scheduling for the entire group of RSs, generates the MAPs for relay link (parent RS to RSs in the group) and the access link (RSs in the group to MSs).

For the relay link, the parent RS allocates for a data burst a HARQ ACK channel in the UL MAP of parent RS frame. An RS in the group shall transmit in the allocated channel a NAK, if the data failed to be decoded. If the data is received correctly by an RS in the group, it shall transmit nothing. Therefore a NAK based feedback method is used for reporting on the HARQ channel on the relay link to send HARQ report of its own decoding status of HARQ burst. Thus, the parent RSs shall receive the superimposed NAKs reports from those RSs in the group that failed to decode the data correctly. If an RS in the group didn't receive the data correctly, it shall not re-encode and transmit the erroneous data.

Also, in the UL MAP of parent RS, at the appropriate frame number, a HARQ ACK channel is allocated to be used by the RSs in the group to forward the reports that have been received from the MS. The RSs in the group shall forward to the parent RS only the ACKs, and otherwise shall transmit nothing. Therefore an ACK based feedback is used on the HARQ ACK channel on the relay link to forward the MS's HARQ report. Thus, the parent RSs shall receive the superimposed ACKs reports from those RSs in the group that received the ACK report from the MS.

For the access link, the parent RS allocates for a data burst, a HARQ ACK channel in the UL MAP of the group of RSs frame. The MS receives the superimposed bursts from the group of RSs and upon decoding it shall transmit ACK/NAK in the allocated UL HARQ ACK channel. Each RS in the group shall monitor the allocated UL HARQ ACK channel. As mentioned before, an RS shall forward only ACKs to the parent RS.

If the HARQ has been successful for relay link, the parent RS can continue only with the HARQ on the access link, if the MS didn't received correctly the data.

If the parent RS receives a NAK on the relay link, then it knows that at least an RS in the group failed to decode

correctly the data. The parent RS has the option of initiating another retransmission for the relay link before the reports from the access link are available. Another option for the parent RS is to wait for the report from the access link before makes any further decision.

*[Insert new sub clause 6.3.17.5.3]*

#### 6.3.17.5.3 UL HARQ for RS virtual grouping

For the purpose of HARQ operation the parent RS of the group, which provides the scheduling for the entire group of RSs, generates the MAPs for relay link (RSs in the group to parent RS) and the access link (MSs to RSs in the group).

For the access link, all the RSs in the group shall attempt decoding the data transmitted by an MS. For the relay link, the parent RS allocates in the UL MAP of the parent RS frame, at the appropriate frame number, the HARQ ACK channel as well as the allocation for the data burst transmitted by the MS. The RSs in the group that have successfully decoded the data shall forward the ACK and data burst. If an RS in the group failed to decode correctly the data it shall not re-encode and transmit the erroneous data, and shall transmit nothing in the HARQ ACK channel.

If the parent RS receives ACK report but fails to decode the data, it shall perform retransmission only for the relay link. If it receives NAK it can schedule the retransmission across all hops.

The parent RS reports to MSs the ACK or NAK.