

Cumulated HARQ Reports

IEEE 802.16 Presentation Submission Template (Rev. 9)

Document Number:

IEEE S802.16m-09/0526

Date Submitted:

2009-3-2

Source:

Adrian Boariu, Shashikant Maheshwari, Yousuf Saifullah, Peter Wang, Joon Chun

NSN

E-mail: adrian.boariu@nsn.com

Zexian Li

Nokia

E-mail: zexian.li@nokia.com

Venue:

IEEE 802.16m AWD

Base Contribution: N/A

Re: 802.16m AWD Call for Contributions on Project 802.16m Amendment Working Document (AWD) Content

Purpose: To be discussed and approval by IEEE 802.16m TG

Notice:

This document does not represent the agreed views of the IEEE 802.16 Working Group or any of its subgroups. It represents only the views of the participants listed in the “Source(s)” field above. It is offered as a basis for discussion. It is not binding on the contributor(s), who 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:

The contributor is familiar with the IEEE-SA Patent Policy and Procedures:

<http://standards.ieee.org/guides/bylaws/sect6-7.html#6> and

<http://standards.ieee.org/guides/opman/sect6.html#6.3>.

Further information is located at <http://standards.ieee.org/board/pat/pat-material.html> and <http://standards.ieee.org/board/pat>.

Introduction

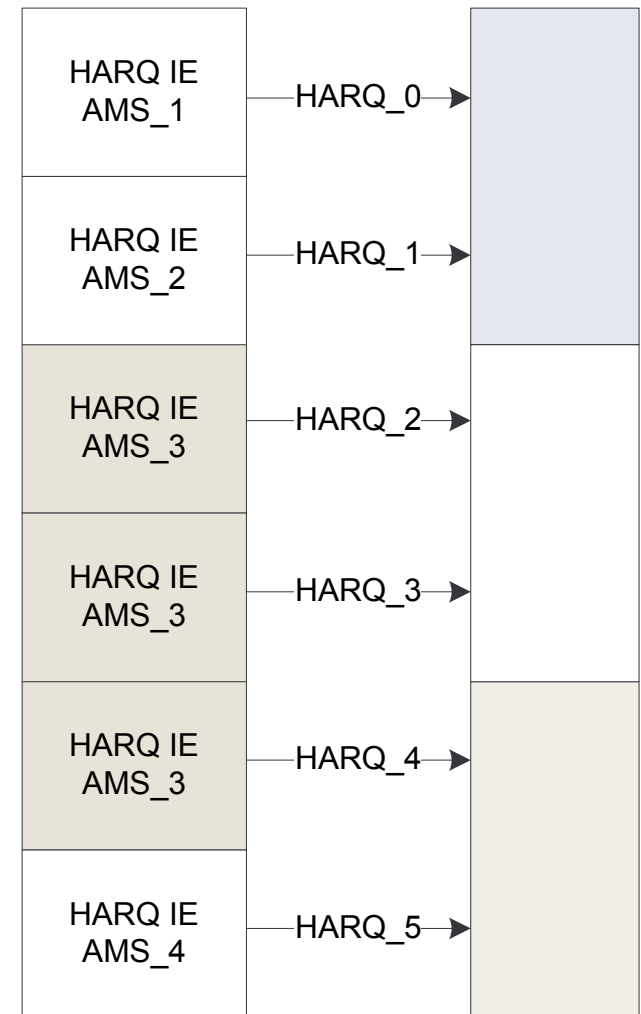
- In the UL Ctrl DG has been proposed using cumulated HARQ report, in the situation where an AMS has more than one concurrent transmissions on the DL (i.e. > 2 ACIDs).
- Mainly two options are on the table in order to achieve this:
 - Cumulating 2 reports in 1 HARQ channel (1/2 HMT)
 - Cumulating 2 HARQ channels in 1 HMT.

Assumptions

- The A-MAP carries *fixed* size IE to indicate the HARQ allocations.
- Separate mapping is used per AMS.
- An AMS identifies its HARQ channel index based on the position of its IE in the group of IEs for HARQ.
- An AMS may have concurrent transmissions on DL due to different states of each ACID.
- When concurrent DL TX occurs, the HARQ IEs are consecutive for an AMS.

No cumulative TX

- In each HARQ channel there is a TX, irrespective if an AMS has DL transmission concurrent or not.
- *AMS_3 has to TX 2 HARQ reports in the 2nd HMT.*



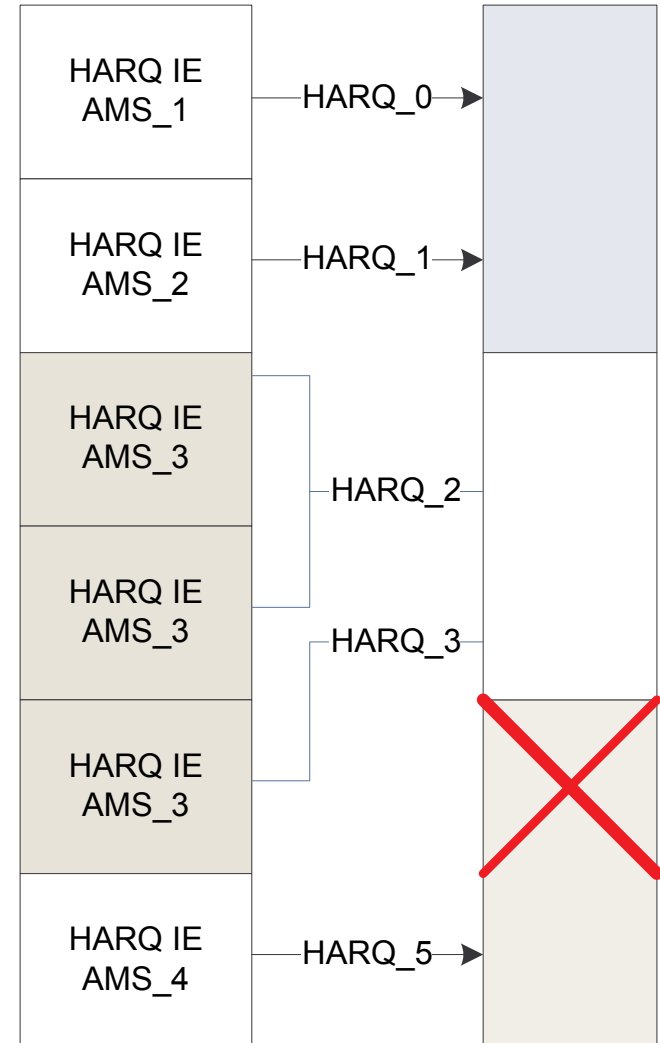
Cumulating 2 reports in 1 HARQ channel

- One solution for this case proposes to TX 2 reports per 1 HARQ channel, being it even or odd channel in HMT.
- This creates some *gaps* in the utilization of the HMT.

<u>Sequence index</u>	<u>Orthogonal sequence</u>	<u>2-bit Feedback (even/odd channel)</u>
<u>0</u>	<u>[+2 0 +2 0]</u>	<u>ACK/ACK</u>
<u>1</u>	<u>[0 +2 0 +2]</u>	<u>ACK/NACK</u>
<u>2</u>	<u>[+1+j +1-j +1+j +1-j]</u>	<u>NACK/ACK</u>
<u>3</u>	<u>[+1-j +1+j +1-j +1+j]</u>	<u>NACK/NACK</u>
<u>4</u>	<u>[+2 0 -2 0]</u>	<u>ACK/ACK</u>
<u>5</u>	<u>[0 +2 0 -2]</u>	<u>ACK/NACK</u>
<u>6</u>	<u>[+1+j +1-j -1-j -1+j]</u>	<u>NACK/ACK</u>
<u>7</u>	<u>[+1-j +1+j -1+j -1-j]</u>	<u>NACK/NACK</u>

Cumulating 2 reports in 1 HARQ channel

- According to the IE order, AMS_3 cumulates the reports for 1st and 2nd IEs in the HARQ_2; its 3rd report goes into HARQ_3.
- AMS_4 *does NOT know* that the previous 3 IEs are for the same AMS.
- So based on the order, AMS_4 TX in HARQ_5. HARQ_4 is *NOT used*.
- HMT_2 is overused, while HMT_3 is underused.
- *Remapping* required at A-MAP to fully use the HMT_3.



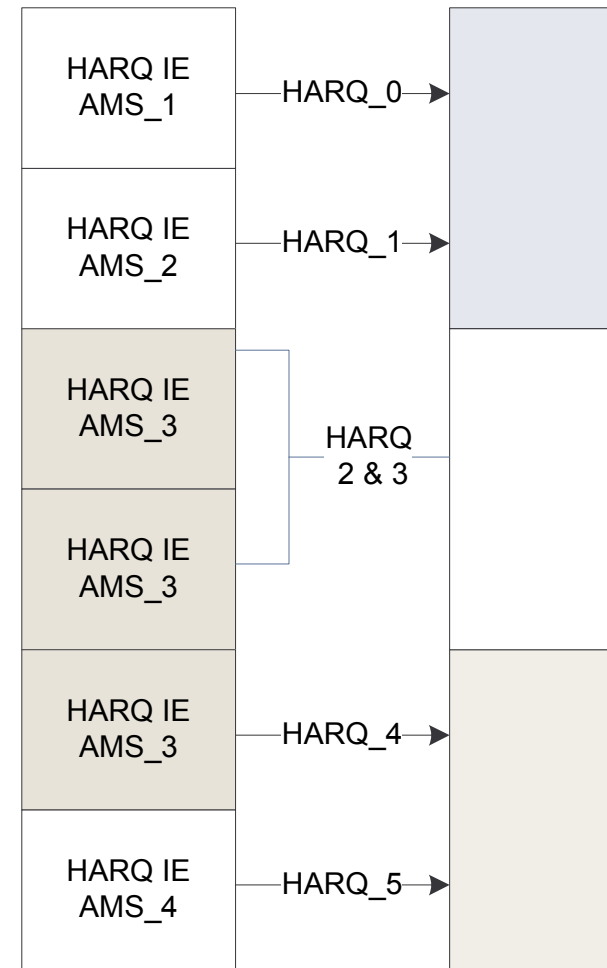
Cumulating 2 HARQ channels in 1 report per HMT

- 2 concurrent DL TX are reported with 1 report in an HMT.

Sequence index	Orthogonal sequence	1-bit Feedback	<u>2-bit Feedback (even/Odd channel)</u>
0	[+1 +1 +1 +1]	Even numbered channel ACK	<u>ACK/ACK</u>
1	[+1 -1 +1 -1]	Even numbered channel NACK	<u>ACK/NACK</u>
2	[+1 +1 -1 -1]	Odd numbered channel ACK	<u>NACK/ACK</u>
3	[+1 -1 -1 +1]	Odd numbered channel NACK	<u>NACK/NACK</u>

Cumulating 2 HARQ channels in 1 report per HMT

- AMS_3 cumulates its 1st and 2nd IEs in 1 report, transmitted in the HMT_2.
- Its report for the 3rd IE is normal, in the HMT_3
- No under/over-utilization of the HMT.



Conclusion

- Cumulating 2 HARQ channels in 1 report per HMT:
 - Avoids over/under-utilization of the HARQ channels.
 - No need for remapping.
- Cumulating 2 reports in 1 HARQ channel
 - Has over/under-utilization of the HARQ channels.
 - Requires remapping if in order to compact the HARQ allocation.
- *First option is desirable.*

Proposed Text

[In C80216m-09/0386 on p. 13 line 12, delete the sentence “The support and details...”, and insert on line 14 the following]

When AMS has multiple concurrent HARQ transmissions on DL, one HARQ report per HMT that carries 2-bit feedback is used for providing the decoding status of 2 HARQ bursts, as defined in Table x1.

Table x1. Orthogonal sequences for 2-bit feedback UL HARQ

Sequence index	Orthogonal sequence	2-bit Feedback (per HMT channel)
0	[+1 +1 +1 +1]	ACK/ACK
1	[+1 -1 +1 -1]	ACK/NACK
2	[+1 +1 -1 -1]	NACK/ACK
3	[+1 -1 -1 +1]	NACK/NACK