Project	**IEEE 802.16 Broadband Wireless Access Working Group** <http://ieee802.org/16>
Title	**Persistent Allocation – Error handling procedures**
Date Submitted	**2008-05-09**

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Re:	Ballot 26c
Abstract	Error handling procedures can be simplified if we were to tie error procedures of the MS to the allocation of a MAP NACK channel.
Purpose	Accept the proposed changes on IEEE P802.16Rev2/D4.
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Simplified Error Procedures for Persistent Allocations

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Introduction

Error handling procedures can be simplified if we were to tie the MS error procedures to the allocation of a MAP NACK channel.

It is noted that R2/D4 allows the base station to optionally allocated persistent resources without allocating a MAP NACK channel, but that the error procedures defined in R2/D4 do not have an adequate description of the MS behavior in the case where MAP NACK channel is not assigned. Moreover, the MS uses the assigned MAP NACK channel to report MAP decoding errors for the primary MAP and that sub map decoding errors are not reported using the MAP NACK channel. There is a need to clarify the system behavior in the case the MS is allocated persistent resources using a sub map and the MS has experienced a decoding error in that sub map in subsequent frames

Proposed Solution

- Allow Base Station to control the type of error procedures the MS should follows: Primary or Secondary
- We observe that error handling procedures are made trivial if it is known that resource shifting is not used or HARQ region has not changed, both of which are under the control of the base station.
- We also observe that some systems would not invoke resource shifting, or would use it sparingly, and therefore would be motivated to take advantage of the simplified error handling procedures.
- It is noted that MAP NACK channel assignment is optional in R2/D4 and that we need to clarify MS operations in the case where MAP NACK channel has not been assigned.
- The benefit of the simplified error procedures is that it will result in a more robust system which is less prone to MAP (and sub MAP) errors.

Simplified Error Procedures – without resource shifting

- MAP ACK for allocation
- MAP ACK for de-allocation
- Change indicator to allow BS to control MS error procedures – primary or secondary

Benefits

- MS can lose multiple MAPs, e.g. K, K+4, K+8, and resume at the next allocation period, in which it successfully decoded the MAP, e.g. K+12
- MS can lose MAPs K and K+1 and resume at K+4, without having to resort to secondary error

procedures.
- NO need for MAP NACK; MAP NACK channel allocation set to 1's

The benefit of the simplified error procedures is that it will result in a more robust system which is less prone to MAP (and sub MAP) errors.

Add clarifications to R2/D4 as follows:
- If MAP NACK channel is not assigned (MAP NACK index = 111111), the MS uses 'simplified' error procedures.
- It should be noted that without the MAP NACK channel, resource shifting procedures and HARQ region changes are prone to errors which may go undetected. Therefore, resource shifting or HARQ region changes should not be used if any of the MSs in a given HARQ region ID is assigned a persistent resource without an associated MAP NACK channel.

Proposed Text Changes

Remedy 1:

Add text as shown below in green to section 6.3.27.1.2 to clarify that the error procedures described in that section are applicable to MSs with a MAP NACK channel assignment. Added text is shown in green

6.3.27.~~3~~1.2 MAP NACK Channel

The following downlink and uplink error procedures apply to MSs with MAP NACK channel assignment.

Remedy 2:

Create a new section under section 6.3.27.1 Error Handling procedures describing the error procedures for MS without a MAP NACK channel assignment. This section should be inserted after section 6.3.27.1.2, but it is left up to the editor to choose the best place to incorporate this text. Added text is shown in green

6.3.27.1.x MS Error procedures if MAP NACK channel is not assigned

The following downlink and uplink error procedures apply to MSs without MAP NACK channel assignment.

6.3.27.1.x.2 Downlink Operation

If the MS fails to decode the DL-MAP in a frame which is relevant to a frame in which it has a persistent DL resource allocation (frame *K*), the MS shall not transmit data bursts or control signals in the relevant UL sub-frame (including CDMA ranging, CQICH, HARQ ACK/NAK or sounding signals).

The MS that failed to decode the DL-MAP in frame *K* may resume using the persistent allocation in frame *K* + N*Allocation Period (*ap*), where *ap* is a field of the Persistent HARQ DL MAP IE (Section 8.4.5.3.29) and N is the number of relevant MAPs the MS has lost, if any one of the following conditions is true in frame *K + N*ap*:
- The MS receives a Persistent HARQ DL MAP IE for the assigned Persistent Region ID with the allocation flag set to 1, which includes the MS's RCID
- The MS receives a Persistent HARQ DL MAP IE, which has the Change Indicator for the assigned Persistent Region ID set to 0.

If the MS successfully decodes the DL-MAP at frame K + N*ap and none of the conditions above is true, the MS should attempt to send the Persistent Allocation Secondary Error extended subheader to the BS and shall terminate the persistent assignment including the data allocation, and the ACK channel allocation.

Note that the MS can recover from multiple MAP losses, i.e. loss of MAP in frames K and K+1 or loss of MAP in frames K, K+ap, K+2*ap, etc.

It should further be noted that without the MAP NACK channel, resource shifting procedures and HARQ region changes are prone to errors which may go undetected. Therefore, resource shifting or HARQ region changes should not be used if any of the MSs in a given HARQ region is assigned a persistent resource without an associated MAP NACK channel.

6.3.27.1.x.2 Uplink Operation

If the MS fails to decode the UL-MAP in a frame which is relevant to a frame in which it has a persistent UL resource allocation (frame *K*), the MS shall not transmit data bursts or control signals in the relevant UL sub-frame (including CDMA ranging, CQICH, HARQ ACK/NAK or sounding signals).

The MS that failed to decode the UL-MAP in a frame ($frame_{MAP}$), which is relevant to a frame in which it has a persistent UL resource allocation (frame *K*), shall resume using the persistent allocation in the frame relevant to frame *K* + N*Allocation Period (*ap*), where *ap* is a field of the Persistent HARQ UL MAP IE (Section 8.4.5.3.28) and N is the number of relevant MAPs the MS has lost, if any one of the following conditions is true in $frame_{MAP} + N*ap$:

- The MS receives a Persistent HARQ UL MAP IE for the assigned Persistent Region ID with the allocation flag set to 1, which includes the MS's RCID
- The MS receives a Persistent HARQ UL MAP IE, which has the Change Indicator for the assigned Persistent Region ID set to 0.

If the MS successfully decodes the UL-MAP at frame K + N*ap and none of the conditions above is true, the MS should attempt to send the Persistent Allocation Secondary Error extended subheader to the BS and shall terminate the persistent assignment.

Note that the MS can recover from multiple MAP losses, i.e. loss of MAP in frames K and K+1 or loss of MAP in frames K, K+ap, K+2*ap, etc.

It should further be noted that without the MAP NACK channel, resource shifting procedures and HARQ region changes are prone to errors which may go undetected. Therefore, resource shifting or HARQ region changes should not be used if any of the MSs in a given HARQ region ID is assigned a persistent resource without an associated MAP NACK channel.