Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**ARQ Synchronization Messages for 802.16a**
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Source(s)	Subbu Ponnuswamy Malibu Networks 1107 Investment Blvd, Suite 250 El Dorado Hills, CA 95762 Voice: 916-941-8815 Fax: 916-941-8850 mailto:subbu@malibunetworks.com
Re:	IEEE 802.16 Working Group Letter Ballot #4 (P802.16a/D1-2001)
Abstract	This contribution specifies two ARQ management messages to support graceful recovery from loss of synchronization, when ARQ peers have inconsistent state information.
Purpose	Incorporate the changes proposed in this document into P802.16a/D1-2001
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1 Introduction

It is possible for the ARQ receiver and transmitter to go out of sync for a variety of reasons. Draft P802.16a/D1-2001 defines the ARQ_SYNC_LOSS_TIMEOUT parameter to detect the possible loss of synchronization. This contribution proposes two additional messages for ARQ peers to communicate the loss of synchronization.

The following section describes the specific changes to be made to P802.16a/D1-2001.

2 Specific Changes to P802.16a/D1-2001

Page 31, line 34, add the following Sections and Tables:

6.2.2.3.32 ARQ Discard Message

This message is applicable to 2 – 11 GHz systems only.

The ARQ receiver sends this message when ARQ_SYNC_LOSS_TIMEOUT is reached and certain ARQ fragments are skipped. The transmitter also sends this message when the transmitter wants to skip a certain number of ARQ fragments. The ARQ Discard message shall be sent as a MAC management message on the basic management connection of the appropriate direction. Table 152 shows the format of the Discard message.

Table 152: ARQ Discard Message

Syntax	Size	Notes
ARQ_Discard_Message_Format() {		
Management Message Type = 35	8 bits	
Connection ID	16 bits	Connection ID for which this message refers to.
Direction Flag	1 bit	0 = Transmitter to Receiver 1 = Receiver to Transmitter
Reserved	4 bits	
FSN	11 bits	Fragment Sequence Number up to which the transmitter/receiver requests the receiver/transmitter to skip.
}		

6.2.2.3.33 ARQ Reset Message

This message is applicable to 2 – 11 GHz systems only.

The transmitter or the receiver may send this message. The recipient must acknowledge this message. The ARQ Reset message shall be sent as a MAC management message on the basic management connection of the appropriate direction. Table 153 shows the format of the Reset message.

Table 153: ARQ Reset Message

Syntax	Size	Notes
ARQ_Reset_Message_Format() {		
Management Message Type = 36	8 bits	
Connection ID	16 bits	Connection ID for which this message refers to.

Acknowledgement Flag	1 bit	0 = Original Message 1 = Acknowledgement
Reserved	7 bits	
}		

Renumber the Management Message Types of all subsequent management messages.

Page 50, Section 6.2.4.6.3, line 60, add the following text:

"On receiving a Reset message with Acknowledgement Flag = 0, the ARQ_TX_WINDOW_START shall be reset to 0 and a Reset message with Acknowledgement Flag set shall be sent to the receiver. A Reset message with Acknowledgement Flag = 0 may also be sent to a receiver, if the transmitter wants the receiver to reset its window. The exact conditions for generating the Reset message are outside the scope of the standard. However, the Reset shall be generated only as a last resort under abnormal conditions, e.g., repeated loss of synchronization or other error conditions. The WINDOW_START shall be reset to 0 and other ARQ state information shall be reset on both sides upon synchronization. The transmitter may discard the ARQ fragments in the buffer for this connection.

A Discard message may be sent to the receiver when the transmitter wants to skip ARQ fragments up to the FSN value specified in the Discard message. Similarly, when a discard message is received from the receiver, the transmitter shall advance the window up to the FSN value specified in the Discard message (and discard the ARQ fragments), provided the FSN value is within the transmitter window"

Page 51, Section 6.2.4.6.4, line 32, add the following text at the end of the paragraph:

"A discard message with FSN = new ARQ_RX_WINDOW_START shall also be sent to the transmitter to indicating the loss of synchronization and requesting to skip up to the new ARQ_RX_WINDOW_START. The receiver shall not send a Discard message to the transmitter under any other circumstances.

Similarly, when a discard message is received from the transmitter, the receiver shall advance the window up to the FSN value specified in the Discard message (and discard the ARQ fragments), provided the FSN value is within the receiver window"

Page 51, Section 6.2.4.6.4, line 56, add the following text:

"On receiving a Reset message with Acknowledgement Flag = 0, the ARQ_RX_WINDOW_START shall be reset to 0 and a Reset message with Acknowledgement Flag set shall be sent to the transmitter. A Reset message with Acknowledgement Flag = 0 may also be sent to a receiver, if the receiver wants the transmitter to reset its window. The exact conditions for generating the Reset message are outside the scope of the standard. However, the Reset shall be generated only as a last resort under abnormal conditions, e.g., repeated loss of synchronization or other error conditions. The WINDOW_START shall be reset to 0 and other ARQ state information shall be reset on both sides upon synchronization. The receiver shall discard all the ARQ fragments in the buffer for this connection."