Project	**IEEE 802.16 Broadband Wireless Access Working Group <**http://ieee802.org/16**>**
Title	**Proposed Changes in 16m/D2 Related to Carrier Management Procedures in Multicarrier Systems (15.2.8)**
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Re:	IEEE 802.16 Working Group Letter Ballot #30a on P802.16m/D2
Abstract	The contribution proposes the changes in 16m/D2 regarding carrier management procedures in multicarrier systems.
Purpose	To be discussed and adopted by TGm for the 802.16m DRAFT amendment.
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Proposed Changes in 802.16m/D2 Related to Carrier Management Procedures in Multicarrier Systems (15.2.8)

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1 Introduction

In the carrier management procedure, the AAI_CM-CMD message is used for the ABS to instruct the AMS to perform certain actions, and then the AAI-CM-IND message is used for the AMS to confirm its completion of the given actions. There are two issues with the current procedure:

a) what if the AMS cannot successfully complete the given actions as instructed by the AAI_CM-CMD from the ABS?

b) why not allow the AMS to initiate a carrier management procedure? at least some of them, e.g., primary carrier change.

This contribution proposes the changes in 802.16m/D2 to address the above issues in the multicarrier systems.

2 Discussions

Based on the 802.16m/D2, the secondary carriers can be used for data transportations after secondary carrier assignment and secondary carrier activation. The secondary carrier assignment is performed at MC operation initialization which is right after the AMS's normal network entry, and the secondary carrier activation will be conducted through the carrier management procedure with AAI_CM-CMD / AAI_CM-IND messages only after the secondary carrier assignment. Note that the carrier management procedure can be initiated by the ABS at any time during normal MC operation. In the mobile environment, the assigned but not-activated secondary carriers may experience significant changes after the secondary carrier assignment, so that the carrier management actions given in the AAI_CM-CMD from the ABS, e.g., secondary carrier activation, primary carrier change, or secondary carrier switching, may not be completed successfully. The current AAI_CM-IND design does not have any mechanisms for the AMS to report any exceptions in its execution of the action requested by the AAI_CM-CMD message. This is problematic, particularly, to the periodic carrier switching case. We propose to modify the AAI_CM-IND by adding the info field to indicate the execution status of the AMS for the action requested by the ABS in the AAI_CM-CMD message.

In addition, the current carrier management procedure can only be initiated by the ABS. However, in some cases it is useful and important that the AMS can also initiate carrier management processes. For example, based on the AMS's measurements and monitoring of its assigned multiple carriers, it may detects one of the fully configured secondary carrier is more suitable to be used as its primary carrier, in this case the AMS may want to initiate a carrier management process to make the primary carrier change. This is very similar to the use case of AMS-initiated HO, as the primary carrier is actually the anchor for the AMS to connect to the ABS in the multicarrier operation. We propose a new MAC control message, called AAI_CM-REQ, that is sent by the AMS to initiate carrier management procedures.

3 Suggested changes in the 802.16m/D2

Based on the above discussion, we propose the following changes in the 802.16m/D2. Note that the new text is marked with blue and underline; the deleted text are marked with red and strikethrough.

Suggested change #1: page 163, line 41

Replace the Table 727 by the following table:

Table 727—AAI_CM-IND MAC Control Message Format

Field	Size (bit)	Description
Control message type	8	AAI_CM-IND
Action Code	2	0b00: secondary carrier management 0b01: primary carrier change 0b10: carrier switching 0b11: reserved
Action Execution Status	1	0b0: completed successfully 0b1: not completed successfully
If (Action Execution Status == 1) {		
Exception code	[TBD]	The code to identify the reason and/or details of the exception.
}		

Suggested change #2: page 159 line 49

Insert the following text before line 49 on page 159:

The secondary carrier management procedure for activation or deactivation of secondary carrier(s) can also be initiated by the AMS through sending the AAI_CM-REQ message to the AMS.

Suggested change #3: on page 160, line 30

Insert the following text before line 30 on page 160:

The primary carrier change procedure can also be initiated by the AMS through sending the AAI_CM-REQ message.

Suggested change #4: on page 160, line 60

Insert the following text before line 60 on page 160:

The carrier switching procedure can also be initiated by the AMS through sending the AAI_CM-REQ message.

Suggested change #5: on page 163, line 56

Insert the following text before line 56 on page 163:

15.2.8.11.4.3 Carrier Management Request (AAI_CM-REQ) MAC Control message

The carrier management request MAC control message, AAI_CM-REQ, is sent by the AMS to the ABS to initiate a carrier management action, e.g., secondary carrier activation or deactivation, primary carrier change, and carrier switching. Its format is defined in Table 727a.

Table 727a—AAI_CM-REQ MAC Control Message Format

Field	Size (bit)	Description
Control message type	8	AAI_CM-REQ
Action Code	2	0b00: secondary carrier management 0b01: primary carrier change 0b10: carrier switching 0b11: reserved
If (action code ==0b00) {		
Secondary carrier management specific info	[TBD]	Further info that the AMS provides to the ABS about the requested secondary management action, e.g., activation or deactivation, etc.
}		
If (action code ==0b01) {		
Primary carrier change specific info	[TBD]	Further info that the AMS provides to the ABS about the

		requested primary carrier change.
}		
If (action code ==0b10) {		
Carrier switching specific info	[TBD]	Further info that the AMS provides to the ABS about the requested carrier swtiching.
}		

Suggested change #6: on page 35 line 31

Append the following two rows at the end of Table 673 in line 31 on page 35:

Message Name	Message description	Security	connection
AAI_CM-REQ	Carrier Management Request	<TBD>	Basic

4 References

[1] IEEE Std 802.16-2009

[2] IEEE P802.16m/D2, "DRAFT Amendment to IEEE Standard for Local and metropolitan area networks"