IEEE P802.11
Wireless LANs

|  |
| --- |
| Resolution for CIDs related to MU EDCA procedure |
| Date: May 10, 2019 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Zhou Lan | Broadcom Inc. | 250 Innovation Drive, San Jose, CA 95134 | +1 669 254 6084   | zhou.lan@broadcom.com |
| Chunyu Hu | Broadcom Inc. |  |  | chunyu.hu@broadcom.com |
| Matthew Fischer | Broadcom Inc. |  |  |  |
| Laurent Cariou | Intel |  |  | laurent.cariou@intel.com |

 Abstract

This submission proposes resolutions for comments received for TGax LB238:

20175

Revisions:

* Rev 0: Initial version of the document.

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGax Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGax Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGax Editor: Editing instructions preceded by “TGax Editor” are instructions to the TGax editor to modify existing material in the TGax draft. As a result of adopting the changes, the TGax editor will execute the instructions rather than copy them to the TGax Draft.***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Section** | **Page** | **Line** | **Comment** | **Proposed Change** | **Resolution** |
| 20175 | Chunyu Hu | 26.2.7 | 303 | 37 | The MU EDCA procedure is lack of an explicit or implicit signaling mechanism that allows AP or non-AP STAs to exit current MU EDCA backoff period when AP stops triggering. The lack of the mechanism can cause non-AP STAs' UL traffic being delayed significantly. | Define an explicit or implicit signaling mechanism to solve this problem. | Revised-Agree with the comment. Discussion is available:<https://mentor.ieee.org/802.11/dcn/19/11-19-0427-01-00ax-cr-mu-edca-parameter.pptx> TGax editor, please make changes as shown in 11-19/765 CID 20175 |

***TGax Editor: Please change the subclause 9.4.2.1***

**9.4.2 Elements**

**9.4.2.1 General**

***Insert the following new rows into Table 9-94 (Element IDs) (header row shown for convenience):***

Table 9-94-Element IDs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Element | Element ID | Element ID Extension | Extensible | Fragmentable |
| Scheduled AID Bitmap element (see 9.4.2.247 (Scheduled AID Bitmap element)) | 255 | 61 | Yes | No |

**9.4.2.242.2 HE MAC Capabilities Information field**

***TGax Editor: Please use one bit in the MAC CAP(e.g. take bit 24) for this new capabilities***

The Scheduled AID Bitmap element is used by an HE AP to indicate the Non-AP STAs for certain options such as MU EDCA Timer termination. The format of the Scheduled AID Bitmap Control element is shown in Figure 9-xxx (Scheduled AID Bitmap element format).

Table 9-321a—Subfields of the HE MAC Capabilities Information field

|  |  |  |
| --- | --- | --- |
| Subfield | Definition | Encoding |
| MU EDCA Control Frame RX | Indicates support for the reception of a MU EDCA Control Frame. | For a non-AP STA: Set to 1 if the STA supports reception of an HE MU EDCA Control Frame based on the description in 9.6.32.3 (HE MU EDCA Control frame). Set to 0 otherwise. An AP sets the MU EDCA Control Frame RX subfield to 0. |

***TGax Editor: Please add this subclause after subclause 9.4.2.256***

**9.4.2.257 Scheduled AID Bitmap (SAB) element**

The Scheduled AID Bitmap element is used by an HE AP to indicate the Non-AP STAs for certain options such as MU EDCA Timer termination. The format of the Scheduled AID Bitmap Control element is shown in Figure 9-xxx (Scheduled AID Bitmap element format).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
|  | Element ID | Length | Element ID Extension | Starting AID | Bitmap |
| Octets: | 1 | 1 | 1 | 2 | 0-251 |

**Figure 9-xxx—MU EDCA Control element format**

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1 (General).

The Starting AID field is defined in Figure 9-xx(Starting AID field format).

|  |  |  |
| --- | --- | --- |
|  | B0 B11 | B12 B15 |
|  | AID 12 | Reserved |
| Bits: | 12 | 6 |

**Figure 9-xx—Starting AID field format**

The AID12 field is defined in section 9.3.1.22.1.

The Bitmap subfield contains a bitmap for STA indication. B0 indicates the STA with the AID12 equals to the value of Starting AID field. B#*n* indicates the STA with AID12 equals to the value in the Starting AID field plus *n*.

**9.6.32 Protected HE Action frame details**

***TGax Editor: Please make the changes as shown below to this subclause***

**9.6.32.1 Protected HE Action field**

A Protected HE Action field, in the octet immediately after the Category field, differentiates the Protected HE Action frame formats. The Protected HE Action field values associated with each frame format within the HE category are defined in Table 9-524a (HE Action field values).

Table 9-524e-Protected HE Action field values

|  |  |
| --- | --- |
| Value | Meaning |
| 0 | HE BSS Color Change Announcement |
| 1 | HE MU EDCA Control |
| ~~1~~2-255 | Reserved |

***TGax Editor: Please insert this subclause 9.6.32.3 after subclause 9.6.32.2***

**9.6.32.3 HE MU EDCA Control frame format**

The HE MU EDCA Control frame is an Action or Action No ACK frame of category Protected HE. The Action field of an HE MU EDCA Control frame contains the information shown in Table 9-5xx (HE MU EDCA Control frame Action field format).

Table 9-xxx-HE MU EDCA Control frame Action field format

|  |  |
| --- | --- |
| Order | Information |
| 1 | Category |
| 2 | Protected HE Action |
| 3 | MU EDCA Control |
| 4 | SAB Elements  |

The Category field is defined in Table 9-53 (Category values).

The Protected HE Action field is defined in Table 9-524e (Protected HE Action field values).

The MU EDCA Control field is defined in Figure 9.4.xxx.

|  |  |  |
| --- | --- | --- |
|  | B0 B3 | B4 B7 |
|  | AC Bitmap | SAB Present Bitmap |
| Bits: | 4 | 4 |

**Figure 9-xx—MU EDCA Control field format**

The AC Bitmap subfield contains a bitmap indicating which ACs the MU EDCATimer[AC] as defined in 26.2.7 (EDCA operation using MU EDCA parameters) are set to 0. Each bit in the bitmap corresponds to one AC with B0 being mapped to AC\_BK, B1 being mapped to AC\_BE, B2 being mapped to AC\_VI and B3 being mapped to AC\_VO.

The SAB present subfield contains a bitmap indicating for which ACs there is a following SAB element present in the frame. The AC Bitmap and SAB Present Bitmap setting fields as defined in table 9-xxx determine if there is a following SAB element present in the same action frame and if the MU EDCA timer of certain STAs will be terminated.

Table 9-xx-AC Bitmap and SAB Present Bitmap values

|  |  |  |
| --- | --- | --- |
| AC Bitmap value | SAB Present Bitmap value | Meaning |
| 0 | 0 | N/A |
| 0 | 1 | N/A  |
| 1 | 0 | A STA that received an individually addressed HE MU EDCA Control Action frame with RA address equals to its address terminates the MU EDCA Timer on the corresponding AC.A STA that received a HE MU EDCA Control Action frame with a Broadcast RA and the TA equal to its associated AP’s address terminate the MU EDCA Timer on the corresponding AC.  |
| 1 | 1 | A STA that received a HE MU EDCA Control Action frame with a Broadcast RA and the TA equals to its associated AP’s address terminate the MU EDCA Timer on the corresponding AC if the bit corresponding to the STA’s AID is set to 1 in the Bitmap field of the corresponding SAB element. Note- An AP shall not send an individually addressed HE MU EDCA Control Action frame with SAB element present. |

The SAB Elements field contains zero or more SAB elements defined in 9.4.2.258 (Scheduled AID Bitmap (SAB) element). A SAB element corresponds to one AC and is present in the SAB Elements field if the bit corresponding to the AC in the SAB Present Bitmap in the MU EDCA Control fiels is set to 1. If there are more than one SAB element in the SAB Elements field, the SAB elements are included in the increasing order of their corresponding AC.

No Vendor-Specific elements are present in the HE MU Control frame.

**26.2.7 EDCA operation using MU EDCA parameters**

***TGax Editor: Please change the following subclause 26.2.7***

A non-AP STA that receives an MU EDCA Parameter Set element from the AP to which it is associated follows the procedure defined in this subclause.

An HE AP may announce MU EDCA parameters for non-AP HE STAs by including the MU EDCA Parameter Set element in selected Beacon frames and in all Probe Response and (Re)Association Response frames it transmits. If an HE AP announces both EDCA parameters and MU EDCA Parameters, the MU EDCA Parameter Set element shall be included in all Beacon frames that contain an EDCA Parameter Set element. An HE AP shall set the QoS Info field of an MU EDCA Parameter Set element (if present) to the same value as the QoS Info field of an EDCA Parameter Set element (if present). An HE AP may change the MU EDCA parameters by including the MU EDCA Parameter Set element with updated MU EDCA parameters in the Beacon frames and Probe Response frames it transmits. The EDCA Parameter Set Update Count subfield in the QoS Info field of the EDCA Parameter Set element is incremented every time any of the AC parameters or the MU AC parameters change.

An HE STA shall update its MIB attributes that correspond to fields in an MU EDCA Parameter Set element within an interval of time equal to one beacon interval after receiving an updated EDCA parameter set. When updating its MIB attributes, an HE STA stores the value of the EDCA Parameter Set Update Count subfield in the QoS Info field of the received EDCA Parameter Set element.

An HE STA shall check the EDCA Parameter Set Update Count subfield value in the QoS Info field of the QoS Capability element in the most recently received Beacon frame against the stored value to determine if the HE STA is using the current EDCA and MU EDCA parameters. If the EDCA Parameter Set Update Count subfield value is different from the stored value, then the HE STA shall send a Probe Request frame to the AP to solicit an update.

NOTE—The QoS Capability element is only present in a Beacon frame if the EDCA Parameter Set element and the MU EDCA Parameter Set element are not present. In this case, the only way for an HE STA to obtain the updated parameters is to send a Probe Request frame to the AP.

A non-AP HE STA that receives a Basic Trigger frame that contains a User Info field addressed to the STA, and that receives an immediate response from the AP for the transmitted HE TB PPDU, shall update its CWmin[AC], CWmax[AC], AIFSN[AC] and MUEDCATimer[AC] state variables to the values contained in the most recently received MU EDCA Parameter Set element sent by the AP to which the STA is associated, for all the ACs from which QoS Data frames were transmitted successfully in the HE TB PPDU. The MUEDCATimer[AC] state variable is updated with the value contained in the MU EDCA Timer subfield of the MU EDCA Parameter Set element. The backoff counter maintenance corresponding to the updated state variables shall follow the rules in 10.22.2.2 (EDCA backoff procedure), and the updated MUEDCATimer[ AC] shall start at the end of the immediate response.

In a non-AP HE STA, each MUEDCATimer[AC] shall uniformly count down without suspension to 0 when its value is nonzero.

NOTE 1—A non-AP STA that sends a frame to the AP with an OM Control subfield containing a value of 1 in the UL MU Disable subfield or a value of 0 in the UL MU Disable subfield and a value of 1 in the UL MU Data Disable subfield does not participate in UL MU operation. As such it is exempt from updating its EDCA access parameters to the values contained in the MU EDCA Parameter Set element as defined in this subclause.

NOTE 2—A non-AP STA that sends a QoS Data frame with Ack policy set to No Ack updates its state variables to the values contained in the MU EDCA Parameter Set element irrespective of receiving immediate response from the AP. The updated MUEDCATimer starts at the end of the HE TB PPDU.

NOTE 3—A non-AP STA is not required to update its state variables to the values contained in the MU EDCA Parameter Set element when:

— The Trigger frame addressed to the STA is not a Basic Trigger frame

— The STA does not include QoS Data frames in the HE TB PPDU response sent in response to the Basic Trigger frame

— The STA transmits the HE TB PPDU in response to a Basic Trigger frame following the rules defined in 26.5.5 (UL OFDMA-based random access (UORA)).

NOTE 4—The TxOPLimit[AC] state variables are not updated by the procedure defined in this subclause, but in 10.22.2.8 (TXOP limits).

Frames sent by a non-AP STA that are addressed to a STA that is not its associated AP may use the EDCA parameters values that are contained in the most recently received EDCA Parameter Set element sent by the AP with which the STA is associated, or to the default EDCA parameter values (see Table 9-137 (Default EDCA Parameter Set element parameter values if dot11OCBActivated is false)) if an EDCA Parameter Set element has not been received.

When the MUEDCATimer[AC] of a non-AP HE STA reaches zero, then the STA may update CWmin[AC], CWmax[AC] and AIFSN[AC] either to the values that are contained in the most recently received EDCA Parameter Set element sent by the AP with which the STA is associated, or to the default EDCA parameter values (see Table 9-137 (Default EDCA Parameter Set element parameter values if dot11OCBActivated is false)) if an EDCA Parameter Set element has not been received.

A non-AP HE STA that sends a frame with an OM Control subfield with the UL MU Disable subfield set to 1 or with the UL MU Disable subfield set to 0 and the UL MU Data Disable subfield set to 1 as defined in 26.9.3 (Transmit operating mode (TOM) indication) may set the MUEDCATimer[AC] for all ACs to 0 on receiving an immediate acknowledgment from the OMI responder. The STA continues the current EDCA backoff procedure without modifying the QSRC[AC], QLRC[AC] or the backoff counter for the associated EDCAF, regardless of whether the MUEDCATimer[AC] has reached zero, until the STA invokes a new EDCA backoff procedure. The STA follows the rules defined in 10.22.2.2 (EDCA backoff procedure) for updating CW[AC].

A non-AP HE STA that received an individually addressed HE MU EDCA Control Action frame from its associated AP with the RA field set to the non-AP STA’s address with the bit corresponding the an AC in the AC Bitmap subfield set to 1 and the bit corresponding to the AC in the SAB Present Bitmap set to 0 may reset the MUEDCATimer[AC] to 0 for the AC. The STA may invoke a new EDCA backoff procedure after the MUEDCATimer[AC] reset for the AC.

A non-AP HE STA that received an HE MU EDCA Control Action frame from its associated AP with the RA field set to the broadcast address with the bit corresponding the an AC in the AC Bitmap subfield set to 1 and the bit corresponding to the AC in the SAB Present Bitmap set to 0 may reset the MUEDCATimer[AC] to 0 for the AC. The STA may invoke a new EDCA backoff procedure after the MUEDCATimer[AC] reset for the AC.

A non-AP HE STA that received an HE MU EDCA Control Action frame from its associated AP with the RA field set to the broadcast address with the bit corresponding the an AC in the AC Bitmap subfield set to 1, with the bit corresponding to the AC in the SAB Present Bitmap set to 1 and with the bit corresponding to the STA’s AID set to 1 in the Bitmap field of the SAB element corresponding to the AC may reset the MUEDCATimer[AC] to 0 for the AC. The STA may invoke a new EDCA backoff procedure after the MUEDCATimer[AC] reset for the AC.

Note-The SAB element shall not be present in an individually addressed HE MU EDCA Control Action frame.