IEEE P802.11
Wireless LANs

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| CR MU EDCA Timer |
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Abstract

This submission proposes resolutions for the following comments received for TGax LB238:

20175

Changes are referenced to TGax D4.1.

**REVISION NOTES:**

**R0**:

Initial

**R2**:

Fixed document property problems

Author list additions

Modified grammar in various places with no technical change

Change Selected AID Bitmap to Affected AID Bitmap

**R3**:

Fixed a spelling error

Swapped the order of two paragraphs in the element description and then merged them to a single paragraph

Clarified language on EDCA behaviour following the MUEDCATimer reset operation.

**R4**:

Fixed a few grammatical errors

9.6.32.2a - Reworded a few phrases for readability

**R5**:

9.6.32.2a – Change name of AAB Elements field to AAB List field in order to avoid confusion with the AAB Element

**R6**:

A few wording changes for readability and clarity

Fixed bit count problem in Starting AID field format diagram

9.6.32.2a – affected ACs bitmap lacked an explicit indication of which value 0 or 1 has which meaning, i.e. reset the timer

**END OF REVISION NOTES**

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.***

**CIDs**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 20175 | Chunyu Hu | 26.2.7 | 307.37 | 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. | Revise - TGax editor to make changes as shown in 11-19/0765r6 that are marked with CID 20175 which generally agree with the commenter’s suggestion. |

**Discussion:**

xxxx

**Proposed Changes to TGax D4.1:**

***TGax Editor: Within subclause 9.4.2.1 of TGax D4.1, add a new row to table 9-94 Element IDs, as shown:***

**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 |
| Affected AID Bitmap element (see 9.4.2.247 (Affected AID Bitmap element)) | 255 | 61 | Yes | No |

***TGax Editor: Insert the following new subclause into an appropriate location within TGax D4.1:***

**9.4.2.256a Affected AID Bitmap (AAB) element**

The Affected AID Bitmap element is used by an HE AP to indicate the Non-AP STAs which are affected by an accompanying indicated operating change within an Action frame. The format of the Affected AID Bitmap element is shown in Figure 9-xxx (Affected AID Bitmap element format).

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

**Figure 9-xxx—Affected AID Bitmap element format**

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

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

|  |  |  |
| --- | --- | --- |
|  | B0 B11 | B12 B15 |
|  | AID12 | Reserved |
| Bits: | 12 | 4 |

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

The AID12 field is defined in 9.3.1.22.1 (General).

The AAB Bitmap subfield contains a bitmap. A value of 1 in bit position n of the AAB Bitmap indicates that the STA with AID12 value equal to Starting AID + n is affected by the operating information included in the Action frame containing the Affected AID Bitmap element. A value of 0 in bit position n of the AAB Bitmap indicates that the STA with AID12 value equal to Starting AID + n is not affected by the operating information included in the Action frame containing the Affected AID Bitmap element.

***TGax Editor: Modify subclause 9.6.32.1 Protected HE Action field as shown:***

**9.6.32 Protected HE Action frame details**

**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 | MU EDCA Control |
| ~~1~~2-255 | Reserved |

***TGax Editor: Insert the following new subclause in an appropriate location:***

**9.6.32.2a MU EDCA Control frame format**

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

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

|  |  |
| --- | --- |
| Order | Information |
| 1 | Category |
| 2 | Protected HE Action |
| 3 | MU EDCA Control |
| 4 | AAB List  |

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 |
|  | Affected ACs | AAB Present Bitmap |
| Bits: | 4 | 4 |

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

The Affected ACs subfield contains a bitmap that indicates the ACs for which the MU EDCATimer[AC] as defined in 26.2.7 (EDCA operation using MU EDCA parameters) are reset to 0 upon receipt of the MU EDCA Control frame for affected STAs. Each bit in the bitmap corresponds to one AC with B0 mapped to AC\_BK, B1 mapped to AC\_BE, B2 mapped to AC\_VI and B3 mapped to AC\_VO. A value of 1 in the bit position corresponding to a given AC indicates that the MU EDCATimer[AC] for that AC is reset to 0, otherwise, the value of the bit is 0.

The AAB Present subfield contains a bitmap indicating for which ACs an AAB element is present in the frame. Each bit in the bitmap corresponds to one AC with B0 mapped to AC\_BK, B1 mapped to AC\_BE, B2 mapped to AC\_VI and B3 mapped to AC\_VO. When a bit in the AAB Present Bitmap present is set to 1, it indicates that an AAB element is present for the corresponding AC and only those STAs identified by an AID value indicated in the AAB element are affected by the operating information carried in the Action frame that carries this element. If no AAB element is present for an AC for which the value 1 is present in the corresponding location in the Affected ACs subfield, then that AC is affected by the accompanying operating information of the Action frame in all STAs that receive the frame.

The AAB List field contains zero or more AAB elements as defined in 9.4.2.256a (Affected AID Bitmap (AAB) element). Each AAB element corresponds to one AC for which a value of 1 is indicated in the corresponding location of the AAB Present Bitmap subfield. AAB elements, if present, are present in the order of significance of the bits of the AAB Present Bitmap with the AAB element corresponding to the least significant bit of the AAB Present Bitmap appearing first.

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

***TGax Editor: Modify subclause 26.2.7 EDCA operation using MU EDCA parameters as shown:***

**26.2.7 EDCA operation using MU EDCA parameters**

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, either by counting down or due to a reset following the reception of an MU EDCA Control frame, 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 receives an individually addressed MU EDCA Control frame from its associated AP may reset the MUEDCATimer[AC] to 0 for an AC if the bit corresponding to that AC in the Affected ACs subfield is equal to 1. The STA may invoke a new EDCA backoff procedure after the MUEDCATimer[AC] is reset for that AC and after CWmin[AC], CWmax[AC] and AIFSN[AC] are updated for that AC, as per this subclause, in response to the MUEDCATimer[AC] reset.

A non-AP HE STA that receives a group addressed MU EDCA Control frame from its associated AP may reset the MUEDCATimer[AC] to 0 for an AC if the bit corresponding to that AC in the Affected ACs subfield is equal to 1 and the bit corresponding to that AC in the AAB Present Bitmap is equal to 0. The STA may invoke a new EDCA backoff procedure after the MUEDCATimer[AC] is reset for that AC and after CWmin[AC], CWmax[AC] and AIFSN[AC] are updated for that AC, as per this subclause, in response to the MUEDCATimer[AC] reset.

A non-AP HE STA that receives a group addressed MU EDCA Control frame from its associated AP may reset the MUEDCATimer[AC] to 0 for an AC if the bit corresponding to that AC in the Affected ACs subfield is equal to 1, the bit corresponding to that AC in the AAB Present Bitmap is equal to 1 and the bit corresponding to the STA’s AID12 value in the AAB element for that AC is equal to 1. The STA may invoke a new EDCA backoff procedure after the MUEDCATimer[AC] is reset for that AC and after CWmin[AC], CWmax[AC] and AIFSN[AC] are updated for that AC, as per this subclause, in response to the MUEDCATimer[AC] reset.

**End of proposed changes.**