IEEE P802.11
Wireless LANs

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| Resolution for CID 1589, 1590, 2668, and 2669 on Multi-TID Aggregation in Sub-clause 25.10.4 |
| Date: 2016-06-18 |
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Abstract

This submission contains resolution texts to CIDs 1589, 1590, 2668, and 2669 and related motions that should be incorporated in P802.11ax D0.03:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Page No.** | **Line No.** | **Comment** | **Proposed Change** | **Resolution** |
| 1589 | 25.10.3 | 64 | 63 | "Multiple TIDs Capable subfield of the HE Capabilities element" -- no such subfield | Refer to a subfield that exists | **Revised**Agreed in principle; please refer to the following draft text in document 11-16-0938-00-00ax-Multi-TID\_aggregation\_Sub-clause\_25\_10\_4.doc for the proposed resolution  |
| 1590 | 25.10.3 | 65 | 2 | "is A-MPDU With Multiple TIDs capable." -- this concept is not defined. Ditto next para | Just refer to the (non-existent) bit in HE Capabiltiies | **Revised**Agreed in principle; please refer to the following draft text in document 11-16-0938-00-00ax-Multi-TID\_aggregation\_Sub-clause\_25\_10\_4.doc for the proposed resolution  |
| 2668 | 25.10.3 | 64 | 63 | Multiple TIDs Capable subfield is not defined in the HE Capabilities element (9.4.2.213). | Define Multiple TIDs Capable subfield in subclause 9.4.2.213.  | **Revised**Agreed in principle; please refer to the following draft text in document 11-16-0938-00-00ax-Multi-TID\_aggregation\_Sub-clause\_25\_10\_4.doc for the proposed resolution  |

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| **CID** | **Clause** | **Page No.** | **Line No.** | **Comment** | **Proposed Change** | **Resolution** |
| 2669 | 25.10.3 | 65 | 8 | In case a STA supports multiple TIDs within an A-MPDU, it is not clear what is the rule for aggregating multiple TIDs in an A-MPDU. For example, it is not clear if a STA can aggregate any MPDUs in any TID, or if there's any specific rule in aggregating MPDUs from different TID to better support QoS. | Clarify rules for aggregating multiple TIDs in an A-MPDU as mentioned in the comment. | **Revised**Agreed in principle; please refer to the following draft text in document 11-16-0938-00-00ax-Multi-TID\_aggregation\_Sub-clause\_25\_10\_4.doc for the proposed resolution |

The recipient indicates the maximum number of TIDs of the MPDUs that the originator can aggregate in a multi-TID A-MPDU in MU PPDU.

[MAC Motion 68, March 2016, see 16/362r1]

Within a single A-MPDU containing MPDUs with different value of TIDs, the MPDUs with the same TID value are not required to be in contiguous A-MPDU subframes.

[MAC Motion 69, March 2016, see 16/362r1]

The maximum number of TIDs of QoS data frames that an originator can aggregate in a multi-TID A-MPDU is indicated in the HE Capabilities element sent by the recipient

* A nonzero value also indicates that the recipient supports reception of multi-TID A-MPDUs
	+ Note: A multi-TID A-MPDU allows the aggregation of an Action Ack frame as well

A STA that transmits a trigger-based PPDU as an immediate response to the Basic variant Trigger frame follows the indication of max number of TIDs contained in the Trigger Dependent Per User Info field of the Trigger frame addressed to the STA (i.e., AID of the Per User Info field is that of the STA) and can transmit an A-MPDU that contains a number of aggregated TIDs in the A-MPDU that is up to that value.

[May 2016, see 16/616r1]

The basic variant Trigger frame shall contain the TID Aggregation Limit subfield in the Trigger Dependent Per User Info field that indicates the limit of the number of TIDs that can be aggregated by a STA in a multi-TID A-MPDU carried in the responding Trigger-based PPDU

* The responding STA shall not aggregate QoS Data frames in the multi-TID A-MPDU with a number of TIDs that exceeds the value indicated in the TID Aggregation Limit sub-field intended to it

[May 2016, see 16/667r0]

**Revision History**:

* 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.***

**Resolution to CIDs 1589, 1590, and 2668**

**TGax Editor: Modify the Sub-clause 9.4.2.213 *(HE Capabilities element) of 11ax Draft 0.2 as follows:***

* HE Capabilities element

An HE STA declares that it is an HE STA by transmitting the HE Capabilities element.

The HE Capabilities element contains a number of fields that are used to advertise the HE capabilities of an HE STA. The HE Capabilities element is defined in Figure 9-ax1 (HE Capabilities element format)..

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  | Element ID | Length | HE Capabilities Information | PPE Thresholds (optional) |
| Octets: | 1 | 1 | 2 | variable |
| * HE Capabilities element format
 |

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

The format of the HE Capabilities Information field is defined in Figure 9-ax2 (HE Capabilities Information field format)(#617).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 | B3 B4  | B5 B7  | B8 B15 |
|  | PPE Thresholds Present | TWT Requester Support | TWT Responder Support | Fragmentation Support | Multi-TID Aggregation Support | Reserved |
| Bits: | 1 | 1 | 1 | 2  | 3 | 8(#725) |
|  | * HE Capabilities Information field format
 |

The PPE Thresholds Present field indicates if the PPE Thresholds field(#1330) is present or not. A value of 1 in this field means that the PPE Thresholds field is present. A value of 0 in this field means that the PPE Thresholds field(#1331) is not present because no packet extension is ever required for the STA transmitting this field.

The TWT Requester Support field indicates support by an HE STA for the role of TWT requesting STA as described in 10.44 (Target wake time (TWT)). The field is set to 1 if dot11TWTOptionActivated is true, the STA is an HE STA and the STA supports TWT requester STA functionality (see 10.44 (Target wake time (TWT))). Set to 0 otherwise.

The TWT Responder Support field indicates support by an HE STA for the role of TWT responder STA as described in 10.44 (Target wake time (TWT)). The field is set to 1 if dot11TWTOptionActivated is true, the STA is an HE STA and the STA supports TWT responder STA functionality (see 10.44 (Target wake time (TWT))). Set to 0 otherwise.

The Fragmentation Support field indicates the level of HE fragmentation that is supported by a STA. The encoding of this field is described in Table 9-ax13 (Fragmentation Support field encoding).

|  |
| --- |
| * Fragmentation Support field encoding
 |
| Fragmentation Support field value | Meaning |
| 0 | No support for HE fragmentation(#1336) |
| 1 | Support for fragments that are contained within a VHT single MPDU, no support for fragments within an A-MPDU |
| 2 | Support for up to one fragment per MSDU within a single A-MPDU |
| 3 | Support for multiple fragments per MSDU within an A-MPDU |

The format of the PPE Thresholds field is defined in Figure 9-ax3 (PPE Thresholds field format)(#2834).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B0 B1 | B2 B3 |  |  |
|  | NSS M1 | RU Count | PPE Threshold Info | PPE Pad |
| Bits: | 3 | 2 | variable | variable |
| * PPE Thresholds field format
 |

The NSS M1 subfield contains an unsigned integer that is equal to the number of NSS values minus one for which PPE threshold information is included in the PPE Thresholds field.(#1334)

The RU Count subfield contains an unsigned integer that is equal to the number of RU allocation values for which HE PPE threshold information is included in the PPE Thresholds field. The value of zero for this field is reserved. The value of three for this field is reserved.

The PPE Threshold Info field is (NSS M1 + 1)  RU Count  6 bits(#1337) in length. The format of the PPE Threshold Info field is defined in Figure 9-ax4 (PPE Thresholds Info field format)(#2835).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |
|  | PPET16 for NSS1 for RU1 | PPET8 for NSS1 for RU1 | ... | PPET16 for NSS1 for RU*m* | PPET8 for NSS1 for RU*m* | ... | PPET16 for NSS*n* for RU*m* | PPET8 for NSS*n* for RU*m* |
| Bits: | 3 | 3 |  | 3 | 3 |  | 3 | 3 |
| * PPE Thresholds Info field format
 |

Each PPET8 for NSS*n* for RU*m* subfield and PPET16 for NSS*n* for RU*m* subfield contains a constellation index as defined in Table 9-ax14 (Constellation index).(#1349)(#619).

|  |
| --- |
| * Constellation index
 |
| Constellation Index | Corresponding Transmission Constellation |
| 0 | BPSK |
| 1 | QPSK |
| 2 | 16-QAM |
| 3 | 64-QAM |
| 4 | 256-QAM |
| 5 | 1024-QAM |
| 6 | Reserved |
| 7 | None |

All the PPET8 for NSS*n* for RU*m* subfield and PPET16 for NSS*n* for RU*m* subfield values are combined to encode the minimum duration of the post-FEC padding and packet extension for HE PPDUs that are transmitted to the STA sending this field, for each value of NSS and RU specified by the field and implicitly, for values of NSS and RU not explicitly indicated in the field. The encoding is described in Table 9-ax15 (PPET8 and PPET16 encoding).

|  |
| --- |
| * PPET8 and PPET16 encoding
 |
| Result of comparison of the constellation index *x* of an HE PPDU with NSS value *n* and RU value m to the value in the PPET8 for NSS*n* for RU*m* subfield | Result of comparison of the constellation index of an HE PPDU with NSS value *n* and RU value m to the value in the PPET16 for NSS*n* for RU*m* subfield | Combined minimum total duration of the post-FEC padding and packet extension requirement for an HE PPDU transmitted to this STA using the constellation index = *x*, NSS = *n* and RU = *m* |
| *x* < PPET8 or PPET8 = None | *x* < PPET16 or PPET16 = None | 0 µs |
| *x* > PPET8 | *x* < PPET16 or PPET16 = None | 8 µs |
| *x* > PPET8 or PPET8 = None | *x* > PPET16 | 16 µs |
| PPET8 = None(#1341) | PPET16 = None(#1338) | 0 |
| PPET8 not present | PPET16 not present | 0 |

The RU Allocation Index encoding is indicated in Table 9-ax16 (RU Allocation Index encoding).

|  |
| --- |
| * RU Allocation Index encoding
 |
| RU Allocation Index value | RU allocation value |
| 0 | 2996(#1337) |
| 1 | 996 |
| 2 | 484 |
| 3 | 242 |

The PPE Pad field contains all zeros. The number of bits in the PPE Pad field is the number of bits required to round the length of the PPE Thresholds field up to the next integer number(#1895) of octets.

A STA that declares(#1165) support for HE trigger-based PPDUs(#1342) shall also declare whether they belong to class A or class B. Class A STAs (#575)are high capability devices and class(#1345) B STAs are low capability devices.

The Multi-TID Aggregation Support field indicates the number of TIDs -1 of QoS Data frames that an HE STA can aggregate in a multi-TID A-MPDU as described in 25.10.3 (A-MPDU with multiple TIDs). The value in this field is set to 0 when dot11AMPDUwithMultipleTIDOptionImplemented is false.

**Resolution to CID 2689**

**TGax Editor: Change the following paragraph *in 9.3.1.23.1 (Trigger frame format)* of 11ax Draft 0.2 and comment resolution document 11-16/0725r2 as follows*:***

If the Trigger frame is of Type Basic Trigger, the type dependent Per User Information field includes the MPDU MU Spacing Factor, and TID Aggregation Limit, AC Preference Level, and Preferred AC subfields. The Type dependent Common Info field length is 0.The format of the type dependent Per User Information subfield is shown below:

 

**FIG-xxx Type dependent per user information field for Basic trigger frame**

**TGax Editor: Insert the following paragraphs *at the end of 9.3.1.23.1 (Trigger frame format)* of 11ax Draft 0.2 and comment resolution document 11-16/0725r2 as follows:**

The value in the TID Aggregation Limit subfield in Trigger frame is less than or equal to the value indicated in the Multi-TID Aggregation Support field in the HE Capabilities element (see 9.4.2.213 HE Capabilities element).

The AC Preference Level subfield is set to 1 to indicate that MPDUs with TIDs that correspond to the AC indicated in the Preferred AC subfield are recommended with respect to TIDs from other ACs; if the AP does not have a recommendation, the value in this subfield is 0. .

The Preferred AC subfield indicates the AC that is recommended for aggregation of MPDUs of ACs belonging to the same AC as indicated or higher priority AC(s) within a multi-TID A-MPDU sent as a response to the Trigger frame (see 9.3.1.23 Trigger frame format). The encoding of the Preferred AC subfield is shown in Table xyz (Preferred AC).

**Table xyz – Preferred AC**

|  |  |
| --- | --- |
| Value | Definition |
| 00 | AC\_VO |
| 01 | AC\_VI |
| 10 | AC\_BE |
| 11 | AC\_BK |

**TGax Editor: Modify the following sub-clause *25.5.2.2.2 (Allowed settings of the Trigger frame fields)* of 11ax Draft 0.2 as follows:**

* Allowed settings of the Trigger frame fields

If dot11MultiBSSIDActivated is true and at least two of the Trigger frame recipient STAs are associated with two different BSSIDs, then the TA shall be set to a common address TBD; in all other cases the TA shall be set to the BSSID of the AP to which all recipient STAs are associated.

An AP shall not set any subfields of the Common Info field(#1529) to a value that is not supported by all the recipient STAs of the Trigger frame.

An AP shall not set any subfields of a User Info field to a value that is not supported by the recipient STAs of the User Info field.

If a Trigger frame is transmitted in a broadcast RU of an(#2829) HE MU PPDU, then the Trigger frame shall not include any User Info fields addressed to a STA that is identified as recipient of another RU or spatial stream of the same HE MU PPDU.

The AP shall set the value in the TID Aggregation Limit subfield in the Type dependent Per User Information field to 0 for an HE STA with STA that has indicated a zero value in the Multi-TID Support field of the HE Capabilities element it transmits and is identified by the User Identifier subfield of the Per User Information field of a basic variant Trigger frame (see 9.3.1.23 Trigger frame format).

The AP may assign any value between 0 and 7 in the TID Aggregation Limit subfield in the Type dependent Per User Information field to 1 for an HE STA with STA that has indicated a nonzero value in the Multi-TID Support field of the HE Capabilities element it transmits and is identified by the User Identidier subfield of the Per User Information field of a basic variant Trigger frame.

The AP may assign any value in the AC Preference Level subfield in the Type dependent Per User Information field for an HE STA identified by the User Identidier subfield of the Per User Information field of a basic variant Trigger frame.

The AP may assign any value defined in Table xyz (Preferred AC) in the AC Preference Level subfield in the Type dependent Per User Information field to 1 for an HE STA and identified by the User Identidier subfield of the Per User Information field of a basic variant Trigger frame.

### NOTE - STA follows the rules in 25.10.4 for aggregating the QoS Data frames with multiple TIDs in the trigge-based PPDUs.

**TGax Editor: Modify the following sub-clause *25.10.4 (A-MPDU with multiple TIDs)* of 11ax Draft 0.2 as follows:**

* A-MPDU with multiple TIDs

An HE STA with dot11AMPDUwithMultipleTIDOptionImplemented set to true shall set the A-MPDU with Multiple TIDs Capable subfield of the HE Capabilities element it transmits to 1; otherwise, the HE STA shall set it to 0.

An HE AP shall not send A-MPDU with multiple TIDs to an HE non-AP STA that associates with the AP, unless the HE non-AP STA is A-MPDU With Multiple TIDs capable.

An HE non-AP STA shall not send an A-MPDU with multiple TIDs to its associated HE AP, unless the HE AP is A-MPDU With Multiple TIDs capable.

In an HE MU PPDU, an HE STA may aggregate the frames in an A-MPDU with multiple TIDs as defined in Table 9-426a (Multiple TID A-MPDU contents in the data enabled immediate response context) or Table 9-426b (Multiple TID A-MPDU contents in the data enabled no immediate response context). An A-MPDU with multiple TIDs shall not be transmitted in an SU PPDU.

The Multi-STA BlockAck frame shall be used to acknowledge the MPDUs in a multiple TID A-MPDU. The value of the TID field in the Multi-STA BlockAck frame is TBD.(#1292)

The responding HE STA with dot11AMPDUwithMultipleTIDOptionImplemented set to true shall not aggregate QoS Data frames in the multi-TID A-MPDU with a number of TIDs that exceeds the value indicated in the (TID Aggregation limit +1) subfield in the Type Dependent Per User Info field of a basic variant Trigger frame (9.3.1.23.1 Basic Trigger) intended to it.

For an HE STA with dot11AMPDUwithMultipleTIDOptionImplemented set to true and having a single A-MPDU containing MPDUs with different value of TIDs, the MPDUs with the same TID value may be aggregated in non-contiguous A-MPDU subframes.

When the AP specifies a value defined in Table xyz (Preferred AC) in the Preferred AC subfield and a value of 1 in the AC Preference Level subfield in the Type dependent Per User Information field of a basic variant Trigger frame, then an HE STA with dot11AMPDUwithMultipleTIDOptionImplemented set to true and with buffered traffic in the indicated preferred AC should aggregate MPDUs from any one of the TIDs from the same AC or higher AC as indicated in the Preferred AC subfield of the Trigger dependent Per User Information field in the Trigger frame.

When the AP specifies a value defined in Table xyz (Preferred AC) in the Preferred AC subfield and a value of 1 in the AC Preference Level subfield in the Type dependent Per User Information field of a basic variant Trigger frame, then an HE STA with dot11AMPDUwithMultipleTIDOptionImplemented set to true may aggregate MPDUs from any other TID.

The STA may aggregate MPDUs from TIDs in other ACs within the remaining time to the UL PPDU duration value indicated in the Length subfield in the Common Info field of the Trigger frame.

The total number of TIDs from which QoS Data MPDUs are aggregated by the STA shall not exceed the limit indicated in the TID Aggregation Limit subfield of its Per User Information field in the Trigger frame.

When the AP specifies a value of 0 in the AC Preference Level subfield in the Type dependent Per User Information field of a basic variant Trigger frame, then an HE STA with dot11AMPDUwithMultipleTIDOptionImplemented set to true may aggregate MPDUs from any AC/TID or combination of TIDs, up to the limit indicated in the TID Aggregation Limit subfield in Type dependent Per User Information field of the Trigger frame.

An HE STA with dot11AMPDUwithMultipleTIDOptionImplemented set to false should select any one of the TID value within the AC value indicated in the Preferred AC subfield and AC Preference Level subfield is 1 in the Type dependent Per User Information field of a basic variant Trigger frame.

An HE STA with dot11AMPDUwithMultipleTIDOptionImplemented set to false may select a TID from any AC when the AC Preference Level subfield is 0 in the Type dependent Per User Information field of a basic variant Trigger frame.

NOTE - A multi-TID A-MPDU allows the aggregation of an Action Ack frame as well.