IEEE P802.11
Wireless LANs

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| CIDs related to MU Cascading |
| Date: May 6, 2018 |
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Abstract

This submission proposes resolutions for following 9 CIDs received for TGax LB230 (16):

* Clause 27.5.4: 12510, 13284, 13922, 12509, 13923, 11032, 13094, 11712
* Clause 9.4.2.237.2: 13238

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Changes based on the further comments from Alfred.
* Rev 2: Update “TRS Control field” to replace “UMRS Control field”

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.***

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| **CID** | **Commenter** | **Page/Line** | **Comment** | **Proposed Change** | **Resolution** |
| 11032 | Abhishek Patil | 256.55 | Delete paragraph starting line 55 & 59. The 1st paragraph of this section already covers this. | As in comment | **Agreed**Make changes as in doc 11-18/0707r1. |
| 11712 | Evgeny Khorov | 257.05 | It is possible to change communicating STAs during TXOP. So, similar rule shall be applied in the middle of TXOP if the response is not obtained from a STA which did not need to respond before in this TXOP | As in comment | **Rejected**The error happened in the middle of TXOP has been described in clause 10.22.2.7. There is no difference in MU Cascading sequence. Hence, it is not necessary to repeat it here. |
| 12509 | Liwen Chu | 256.45 | UMRS can't be used in MU cascade if there is no Trigger in DL MU. | Fix the issue mentioned in comment. | **Revised**An MU cascading sequence consists of two control frames, one which is the Ack or Blockack sent in response to the immediately preceding HE TBPPDU and a Control frame (Trigger or TRS control information carried in the MDPU) that solicits another response from that STA within SIFS time following the MU PPDU carrying that A-MPDU. As such the capability bit is intended to cover this additional combination of frames in the A-MPDU. .Make changes as in doc 11-18/0707r1. |
| 12510 | Liwen Chu | 256.01 | A MU cascade exchange in a TXOP can be starting with Trigger + UL MU + DL MU... | Fix the issue mentioned in comment. | **Rejected**This has been discussed in the previous contribution 11-16/1457r3. Trigger+UL MU is a typical UL MU transmission. It is not part of MU cascading.  |
| 13094 | Patrice Nezou | 256.59 | "If the MU Cascading Support field in the HE MAC Capabilities Information field of the HE Capabilities elementis set to 0 by a non-AP HE STA, the HE AP with which the non-AP HE STA is associated shall not initiatean MU cascading sequence to the non-AP HE STA in its TXOP(s)."It means if at least one non-AP STA does not support the MU Cascading Support field and supports the UL OFDMA RA Support subfield, no random access RU can be inserted during the cascaded TF. | Do not forbid the AP initiating a MU cascading sequence if only one non-AP STA does not support this feature.Modify the sentence such as: "If the MU Cascading Support field in the HE MAC Capabilities Information field of the HE Capabilities elementis set to 0 by a non-AP HE STA, the non-AP STA does not consider the following cascaded TF." | **Revised**Agree with the commenter that the original rule is too strong. AP can initiate MU cascading including some STA if this STA supports MU cascading. That is, at least one STA supporting MU cascading is good enough to allow AP to initiate MU cascading sequence that includes any of the STAs supporting MU cascading.Make changes as in doc 11-18/0707r1. |
| 13284 | Robert Stacey | 256.03 | This subclause is very poorly written and the requirements on an implementation are not clear at all. The subclause needs to be rewritten so that the requirements on an AP with MU Cascading Support = 1 are clear and the requirements on a non-AP STA with MU Cascading Support = 1 are clear. The subclause is written as if all the STAs involved in the sequence need to support cascading. This is not necessarily true: a non-AP STA that does not support cascading could participate in the seqeunce. It is the A-MPDU content directed at each STA that matters. | Write clear guidance to the STA implementor focused on the A-MPDU content. For example, "An AP that supports cascading may transmit to a non-AP STA that supports cascading an A-MPDU that contains a Trigger frame with the TID Aggregation Limit subfield set to a value greater than 0 and a QoS Data frame or Management frame that solicts and acknowledgement." | **Revised**Agree with the commenter that the original rule is too strong. AP can initiate MU cascading including some STA if this STA supports MU cascading. That is, at least one STA supporting MU cascading is good enough to allow AP to initiate MU cascading sequence that includes any of the STAs supporting MU cascading.Also agree with the commenter that the current text is not good enough. Make changes as in doc 11-18/0707r1. |
| 13922 | Yongho Seok | 256.43 | "-- Zero or more MPDUs and,"It should be changed to one or more MPDUs. Otherwise, there is no difference with an HE DL MU operation. | As in comment. | **Revised**Agree with the commenter that MU cascading should be limited to the case that trigger and other frames are aggregated in downlink transmissions.Make changes as in doc 11-18/0707r1. |
| 13923 | Yongho Seok | 256.53 | "-- Zero or more MPDUs"It should be changed to one or more MPDUs. Otherwise, there is no difference with an HE DL MU operation. | As in comment. | **Revised**Agree with the commenter that MU cascading should be limited to the case that ack and other frames are aggregated in uplink transmissions.Make changes as in doc 11-18/0707r1. |
| 13238 | Robert Stacey | 136.04 | The exact requirement for "MU Cascading Supported" are not clear. The requirements are also very different for an AP and non-AP STA. | Clarify the requirements for "MU Cascading Supported" in both non-AP STA and AP. In an AP, cascading support means that the AP is capable of transmitting an A-MPDU that includes a Basic Trigger frame with TID Aggregation Limit > 0 plus a QoS Data frame or Management frame soliciting ack/block ack. Since the AP sets the TID Aggregation Limit it doesn't really need to declare it receive capability. In a non-AP STA, cascading support means that the STA is capable of receving Ack/BA + Data and that it is capable of transmitting Ack/BA + Data in response to a Trigger frame with TID Aggreegation Limit > 0. | **Revised**Agree with the commenter that the statement need to be clarified aligning with the corresponding clause (27.5.4).Make changes as in doc 11-18/0707r1. |

***TGax Editor: Please make the following changes to clause 27.5.4 (11ax D2.0 P256-257):***

**27.5.4 MU cascading sequence**

~~If the MU Cascading Support field in the HE MAC Capabilities Information field of the HE Capabilities element is set to 1 by both HE AP and non-AP HE STA(s), an HE AP may initiate an MU cascading sequence in a TXOP, allowing alternating HE MU PPDUs and HE TB PPDUs starting with an HE MU PPDU in the same TXOP, as illustrated in Figure 27-4 (An example of an MU cascading sequence).~~

An MU cascading sequence is a frame exchange sequence between an AP and a non-AP STA carried in an HE MU PPDU in the downlink and HE TB PPDU in the uplink and characterized by the exchange of Control, Data and/or Management frames in both directions. An example of an MU cascading sequence is shown in Figure 27-4. [13284, 13094]

~~The presence of an HE MU PPDU with the following A-MPDU content may start an MU cascading sequence within that TXOP:~~

~~— At most one Ack, BlockAck or Multi-STA BlockAck frame for each of the preceding HE TB PPDUs and,~~

~~— Zero or more MPDUs and,~~

~~— One or more Trigger frames or frames with a UMRS Control field that allocates an RU for the STA to transmit a subsequent HE TB PPDU if this HE MU PPDU is not the last PPDU of the MU cascading sequence.~~

An AP shall not transmit an A-MPDU to a non-AP STA that includes an Ack or BlockAck frame together with a Trigger frame or a frame carrying TRS Control field unless the non-AP STA has indicated support by setting the MU Cascading Support subfield in the MAC Capabilities Information field in the HE Capabilities element it transmits to 1. The A-MPDU may additionally contain one or more MPDUs and is constructed following the rules defined in 27.10 (A-MPDU operation) [13284, 13094, 12509, 13922]

~~An HE TB PPDU in the MU cascading sequence has the following A-MPDU contents:~~

~~— At most one Ack or BlockAck frame for the preceding HE MU PPDU and,~~

~~— Zero or more MPDUs~~

An AP shall not transmit an A-MPDU that includes an Ack or BlockAck frame together with a Trigger frame or TRS Control field unless it has set the MU Cascading Support subfield in the MAC Capabilities Information field in the HE Capabilities element it transmits to 1. [13284, 13094, 13923]

~~If the MU Cascading Support field in the HE MAC Capabilities Information field of the HE Capabilities element is set to 0 by an HE AP, the HE AP shall not initiate an MU cascading sequence in its TXOP(s).~~ [11032]

~~If the MU Cascading Support field in the HE MAC Capabilities Information field of the HE Capabilities ele-ment is set to 0 by a non-AP HE STA, the HE AP with which the non-AP HE STA is associated shall not initiate an MU cascading sequence to the non-AP HE STA in its TXOP(s).~~[11032]

The MU cascading sequence may have a different set of transmitters in HE TB PPDUs as compared to the receivers of the HE MU PPDU that immediately follows the HE TB PPDUs within the same TXOP. The MU cascading sequence may have a different set of receivers in the HE MU PPDU as compared to the set of transmitters of HE TB PPDUs that immediately follow the HE MU PPDU within the same TXOP.

An AP that does not receive an immediate response from a STA addressed by a Trigger frame or frame carrying a ~~UMRS~~TRS Control field contained in the HE MU PPDU sent at the beginning of or during the TXOP, shall follow the backoff procedure described in 10.22.2.2 (EDCA backoff procedure).

***TGax Editor: Please make the following changes to Table 9-262z (11ax D2.0 P136):***

**Table 9-262z—Subfields of the HE MAC Capabilities Information field *(continued)***

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| MU Cascading Supported | Indicates support for participating in an MU cascading sequence  | ~~Set to 1 if the STA supports MU cascading operation. Set to 0 otherwise.~~For an HE AP:Set to 1 to indicate that the AP is capable of transmitting an A-MPDU that is constructed following the MU cascade sequence rules (see 27.5.4) under MU cascade operation.Set to 0 otherwise.For a non-AP HE STA:Set to 1 to indicate that the non-AP STA is capable of receiving an A-MPDU that is constructed following the MU cascade sequence rules (see 27.5.4).Set to 0 otherwise. [13238] |