### IEEE P802.11Wireless LANs

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| 11ax D1.0 Comment Resolution for Clause 27.5.3 |
| Date: 2017-03-14 |
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Abstract

This submission proposes resolutions for comments in clause

* 27.5.3 of TGax Draft 1.0 with the following 19 CIDs: 4806, 4807, 5725, 5726, 5727, 6009, 6145, 6146, 6147, 6148, 6155, 6721, 6722, 8560, 9535, 9716, 9717, 9921, 9922

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 D0.1 Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGax D0.1 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** | **Page** | **Line** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| 4806 | 175 | 33 | 17.5.3 | It seems that the cascading sequence as defined here does not cover all possible combinations. For example an SU PPDU that has this content can still be called part of a cascading sequence. Unless it is not allowed. | As in comment. | Rejected – The current text explicitly says that “HE MU PPDU” and is clear. |

**Discussion:**

The concept of MU cascading is the sequence that HE MU PPDU is immediately followed by HE Trigger-based PPDUs. So SU PPDU shall be excluded.

The current text explicitly says that “HE MU PPDU” and is clear.

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| 4807 | 175 | 41 | 17.5.3 | Cascading sequence and cascading indication have nothing to do with each other. Please find alternate names for one of them to avoid confusion. | As in comment. | Revised.Make changes as in doc 17/0403r0 |

**Discussion:**

Since the full name here is “MU Cascading”, “cascading sequence” here can be replaced with “MU cascading sequence”

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| 5725 | 175 | 36 | 27.5.3 | I don't think this is correct. The AP could return OFDMA BA to multiple A-MPDUs in the proceeding TRIG PPDU. So the word "at most..." is not correct. | Remove this sentence. | RevisedMake changes as in doc 17/0403r0 |

**Discussion:**

The sentence refers to each HE trigger-base PPDU. To make it more clear, the sentence can be changed into:

“— At most one Ack, BlockAck or Multi-STA BlockAck frame for each of the preceding HE trigger-based PPDU”

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| 5726 | 175 | 43 | 27.5.3 | What does "that AMPDU" mean? I think an HE MU PPDU that contains an AMPDU which aggregates data and trigger starts the cascade sequence. If so, this needs to be clarified. | Clarify | RevisedMake changes as in doc 17/0403r0 |

**Discussion:**

“that A-MPDU” is unclear. To make the text more clear, this sentence can be combined with the previous paragraph:

“The presence of an HE MU PPDU with the following A-MPDU contents starts an MU cascading sequence within that TXOP:

~~An HE MU PPDU transmitted by the AP a SIFS after an HE trigger-based PPDU has the following A-MPDU contents:~~

— At most one Ack, BlockAck or Multi-STA BlockAck frame for the preceding HE trigger-based PPDU and,

— Zero or more MPDUs and,

— One or more Trigger frames or UL MU Response Scheduling A-Control fields if this is not the last PPDU of the MU cascading sequence.”

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| 5727 | 175 | 60 | 27.5.3 | the receives for the DL HE MU PPDU must be different from hat of the following trigger-based PPDU since the former's receive is the non-AP STAs and the latter one's receiver is AP. This sentence does not add anything but can cause misunderstanding. | Remove this sentence. | RevisedMake changes as in doc 17/0403r0 |

**Discussion:**

The sentence refers to the case that some of the receivers of DL MU PPDU do not need to send HE trigger-based PPDUs immediately after the DL MU PPDU.

The sentence can be changed into:

“The cascading sequence may have a different set of receivers in the DL HE MU PPDU as compared to the set of transmitters of the HE trigger-based PPDUs that immediately follows the DL HE MU PPDU within the same TXOP. The cascading sequence may have a different set of receivers in the DL HE MU PPDU as compared to the set of transmitters of the HE trigger-based PPDUs that immediately follows the DL HE MU PPDU within the same TXOP.”

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| 6009 | 174 | 32 | 27.5.3 | The sentence:" A TXOP can include both ..." is confusing. The cascading operation is described more clearly starting form line 34. | Delete the sentence in the line 32. | AgreedMake changes as in doc 17/0403r0 |
| 6721 | 174 | 33 | 27.5.3 | Descriptive text used where it seems normative text must have been intended: "A TXOP can include". If the intention is to clarify that this is permitted, it is essential to say so. | Change the sentence to "An AP may include both DL MU and UL MU transmissions in a TXOP." | RevisedMake changes as in doc 17/0403r0 |

**Discussion:**

For HE MU transmission, if AP sends HE MU PPDU, it can request the receivers to acknowledge simultaneously by carrying a trigger frame in one of the RU. Each of the acknowledgement is sent in a HE Trigger-base PPDU. This sequence is DL MU and UL MU transmissions in one TXOP and Mandatory. Hence, the sentence here is reduntant and can be removed.

“~~A TXOP can include both DL MU and UL MU transmissions.~~”

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| 6145 | 175 | 40 | 27.5.3 | Clarify what the last PPDU of MU cascading sequence means. Should it be DL HE PPDU or UL HE trigger-based PPDU, or either of them? | as the comment | Rejected |

**Discussion:**

There are many possible cases:

The last PPDU of MU cascading sequence can be a SU PPDU only including M-BA.

The last PPDU can also be a HE MU PPDU that does not need any responses.

The last PPDU can also be a HE Trigger-based PPDU that does not need any response, if AP does not transmit one more HE MU PPDU. Obviously, an HE MU PPDU cannot be an HE Trigger-based PPDU.

But I think the sentence here just refer to the case that an HE MU PPDU is not at the end of the MU cascading sequence.

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| 6146 | 175 | 56 | 27.5.3 | Clarify the contents possibly including in the HE trigger-based PPDU in the MU cascading sequence for avoiding confusion. | as the comment | RevisedMake changes as in doc 17/0403r0 |

**Discussion:**

Compared to UL MU transmission, An HE trigger-based PPDU in MU cascading may carry ACK to its previous HE MU PPDU. In this case, we can add the following text:

“An HE trigger-based 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”

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| 6147 | 175 | 5 | 27.5.3 | Clarify the operation in case of that HE MU PPDU and HE trigger-based PPDU exchange failure happens during the MU cascading sequence transmission. E.g. in Figure 27-2, if the first exchange of HE MU PPDU of AP and HE trigger-based PPDUs from STA1 and STA2, should AP invoke backoff procedure for the next try? | as the comment | RevisedMake changes as in doc 17/0403r0 |
| 6148 | 175 | 62 | 27.5.3 | Recovery procedure should be specified in MU cascading sequence operation | as the comment | RevisedMake changes as in doc 17/0403r0 |
| 9535 | 175 |  | 27.5.3 | It is not clear what happens if a transmission error occurs during the cascading sequence. | Detailed specification is needed. | RevisedMake changes as in doc 17/0403r0 |

**Discussion:**

All the HE Triggre-based PPDUs in cascading follow the procedure of UL MU transmission, including the ACK to frames in HE MU PPDU and/or A-MPDUs triggered by the trigger frame.

As described in 27.5.2.2.3 AP access procedures for UL MU operation, “When an AP does not receive an immediate response with at least one MPDU from at least one STA solicited by a Trigger frame, i.e., transmission failure, the backoff procedure described in 9.22.2.2 (EDCA backoff procedure) applies.”

To make this clear in MU cascading sequence, the following text can be added:

“When an AP does not receive an immediate response with at least one MPDU from at least one STA solicited by a Trigger frame or UL MU Response Scheduling A-Control field in the previous HE MU PPDU, i.e., transmission failure, the backoff procedure described in 9.22.2.2 (EDCA backoff procedure) may apply.”

Besides, the following rule for transmission error in a TXOP also applies.

“NOTE—A STA can perform a PIFS recovery, as described in 10.22.2.7, or perform a backoff, as described in the

previous paragraph, as a response to transmission failure within a TXOP. How it chooses between these two is

implementation dependent.”

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| 6155 | 175 | 35 | 27.5.3 | Multi-STA Block Ack frame is a variant of BloackAck frame. | change to "at most one Ack or BlockAck frame...." | Rejected |

**Discussion:**

Multi-STA BlockAck is widely used together with BlockAck in current draft. Have it there can make the text more clear.

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| 6722 | 174 | 36 | 27.5.3 | Descriptive text used where it seems normative text must have been intended: "an HE AP can initiate". If the intention is to clarify that this is permitted, it is essential to say so. | Change "can" to "may". | AgreedMake changes as in doc 17/0403r0 |

**Discussion:**

Change the text according to the comment.

“If 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 HE non-AP STA(s), an HE AP ~~can~~may initiate a cascading sequence of MU PPDUs in a TXOP…”

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| 8560 | 175 | 33 | 27.5.3 | In the sentence "An HE MU PPDU transmitted by the AP..." if the HE MU PPDU refers to the one that starts an MU Cascading sequence, please specify as such. | Qualify the HE MU PPDU to which the A-MPDU contents applies as the one that starts an MU cascading sequence. | RevisedMake changes as in doc 17/0403r0 |

**Discussion:**

If the HE MU PPDU is the one that starts an MU cascading sequence, it still have the contents as described. However, the difference between HE MU PPDU in MU cascading and common HE MU PPDU in DL MU transmission is that the former PPDU triggers at least one STA to send at least one MPDU but ACK/BA in its HE trigger-based PPDU immediately after it.

We can make changes to the last bullet as follows:

“— At most one Ack, BlockAck or Multi-STA BlockAck frame for the preceding HE trigger-based PPDU and,

— Zero or more MPDUs and,

— One or more Trigger frames or UL MU Response Scheduling A-Control fields to allocate the resource for at least one STA to send back at least one MPDU but Ack or BlockAck in its HE trigger-based PPDU, if this HE MU PPDU is not the last PPDU of the MU cascading sequence.”

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| 9716 | 174 | 36 | 27.5.3 | What does "a cascading sequence of MU PPDUs in a TXOP" mean?In my understanding, a cascading sequence of MU PPDU is as the following:An HE MU PPDU transmitted by the AP a SIFS after an HE trigger-based PPDU has the following A-MPDU contents:-- One or more Ack, BlockAck or Multi-STA BlockAck frames for the preceding HE trigger-based PPDU and,-- Zero or more MPDUs and,-- One or more Trigger frames or UL MU Response Scheduling A-Control fieldsPlease clarify a cascading sequence of MU PPDUs in a TXOP. | As per comment. | RevisedMake changes as in doc 17/0403r0 |

**Discussion:**

“A cascading sequence of MU PPDUs in a TXOP” means “alternating HE MU PPDUs and HE trigger-based PPDUs starting with an HE MU PPDU in the same TXOP”.

The invoked text in the comment refers to the first HE MU PPDU of the “cascading sequence of MU PPDU”.

The resolution is as follows:

“an HE AP ~~can~~may initiate an MU cascading sequence ~~of MU PPDUs~~ in a TXOP, allowing alternating HE MU PPDUs and HE trigger-based PPDUs starting with an HE MU PPDU in the same TXOP…”

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| 9717 | 175 | 57 | 27.5.3 | "The cascading sequence may have different UL transmitters within each HE trigger-based PPDU. The cascading sequence may have a different set of transmitters in HE trigger-based PPDUs as compared to the HE MU PPDU that immediately follows the HE trigger-based PPDUs within the same TXOP."Is this paragraph an unique feature of the cascading sequence?In my understanding, this paragraph is comonly applied to an UL MU sequence.If this paragraph is needed, please move it to 27.5.2.1 (General). | As per comment. | RevisedMake changes as in doc 17/0403r0 |

**Discussion:**

Agree with the commenter that “different UL transmitters within each HE trigger-based PPDU” is not only in MU cascading, but also in the continuous transmission of multiple UL MU.

Since MU cascading allows AP to trigger ACK/BA for the previous HE MU PPDU and other MPDUs simultaneously, the following part is unique.

“The cascading sequence may have a different set of transmitters in HE trigger-based PPDUs as compared to the HE MU PPDU that immediately follows the HE trigger-based PPDUs within the same TXOP.”

Make changes as follows:

“~~The cascading sequence may have different UL transmitters within each HE trigger-based PPDU.~~ The cascading sequence may have a different set of transmitters in HE trigger-based PPDUs as compared to the HE MU PPDU that immediately follows the HE trigger-based PPDUs within the same TXOP.”

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| 9921 | 174 | 37 | 27.5.3 | Definition of a cascading sequence of MU PPDUs in a TXOP is not clear. It says "allowing alternating HE MU PPDUs and HE trigger-based PPDUs starting with an HE MU PPDU in the same TXOP". If this defines the cascaded sequence, DL MU transmission that solicits immediate response is also a cascading sequence as it has the sequence of DL MU PPDU followed by UL trigger based PPDU. If this is the case, DL MU transmission that solicits immediate response is allowed only if MU Cascading Support field in the HE Capabilities element is set to 1, which does not make sense. Further clarification is needed. | As in the comment. | RevisedMake changes as in doc 17/0403r0 |

**Discussion:**

Agree with the commenter. The current definition is not enough.

The resolution is the same as the resolution to CID 8560.

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| 9922 | 175 | 32 | 27.5.3 | In P174L37, it says "alternating HE MU PPDUs and HE trigger-based PPDUs starting with an HE MU PPDU in the same TXOP". It implies that cascading sequence starts from DL MU PPDU. However, in P175L33, it says "An HE MU PPDU transmitted by the AP a SIFS after an HE trigger-based PPDU has the following AMPDU contents", which implies that DL MU PPDU follows UL trigger-based PPDU. These two sentences are not clearly in line with each other. Further clarification is needed. | As in the comment. | RevisedMake changes as in doc 17/0403r0 |

**Discussion:**

Agree with the commenter. Both of them conflict.

The resolution is the same as the resolution to CID 5726.

***TGax editor: Modify the Paragraphs on section 27.5.3 as the following:***

**27.5.3 HE MU cascading operation**

~~A TXOP can include both DL MU and UL MU transmissions.~~ (#6009, 6721)

If 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 HE non-AP STA(s), an HE AP ~~can~~may(#6722) initiate an MU(#4807) cascading sequence ~~of MU PPDUs~~(#4807, 9716) in a TXOP, allowing alternating HE MU PPDUs and HE trigger-based PPDUs starting with an HE MU PPDU in the same TXOP, as illustrated in Figure 27-2 (An example of MU(#4807) cascading sequence ~~of MU PPDUs~~(#4807)).

***TGax Editor: Please change the title of Figure 27-2 into “***An example of MU(#4807) cascading sequence ~~of MU PPDUs~~(#4807)***”***

~~An HE MU PPDU transmitted by the AP a SIFS after an HE trigger-based PPDU has the following A-MPDU contents:~~

 The presence of an HE MU PPDU with the following A-MPDU contents starts an MU cascading sequence within that TXOP:( #5726, 9922)

—At most one Ack, BlockAck or Multi-STA BlockAck frame for each of(#5725) the preceding HE trigger-based PPDU and,

— Zero or more MPDUs and,

—One or more Trigger frames or UL MU Response Scheduling A-Control fields to allocate the resource for at least one STA to send back at least one MPDU but Ack or BlockAck in its HE trigger-based PPDU, if this HE MU PPDU(#8560, 9921) is not the last PPDU of the MU cascading sequence.

~~The presence of an HE MU PPDU with that A-MPDU contents starts an MU cascading sequence within that TXOP.~~ ( #5726, 9922)

An HE trigger-based 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(#6146)

If 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(#4807) cascading sequence ~~of MU PPDUs~~(#4807) in its TXOP(s).

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

~~The cascading sequence may have different UL transmitters within each HE trigger-based PPDU.~~ ( #9717) The MU(#4807) cascading sequence may have a different set of receivers in the DL HE MU PPDU as compared to the set of transmitters of(#5727) the HE trigger-based PPDUs that immediately follows the DL HE MU PPDU within the same TXOP. The MU(#4807) cascading sequence may have a different set of receivers in the DL HE MU PPDU as compared to the set of transmitters of(#5727) the HE trigger-based PPDUs that immediately follows the DL HE MU PPDU within the same TXOP.

When an AP does not receive an immediate response with at least one MPDU from at least one STA solicited by a Trigger frame or UL MU Response Scheduling A-Control field in the previous HE MU PPDU, i.e., transmission failure, the backoff procedure described in 9.22.2.2 (EDCA backoff procedure) may apply. (#6147, 6148, 9535)