IEEE P802.11
Wireless LANs

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| Comment resolutions for group addressed MPDUs delivery |
| Date: 2019-06-01 |
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Abstract

This submission proposes resolutions for multiple comments related to TGax D4.0 with the following CIDs (3 CIDs):

* 21295, 20120, 20123

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Revised version that contains suggestions received during the presentation at the ad-hoc. Changes in green.
* Rev 2: Upload this revision which contain minor editorial suggestion received from Mark. Also fixed the normative behaviour to allow the use of TXVECTOR parameters that are expanded if the group addressed frame is addressed to associated STAs, except for when at least one STA is not in the awake state in which case bandwidth is limited to 20 MHz. Changes in this color.

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** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 21295 | Robert Stacey | 424.20 | The HE Operation element contains the current opreating parameters for the BSS and these can change over time. Rewrite the requirement so that it references the current BSS operating paramters and not just those in effect when the BSS is started. The Basic HE-MCS And NSS Set field is always present so there is no need for a fallback to a mandatory HE-MCS. Beacon frames are always broadcast and hence "group addressed frames". DCM is not part of the basic set and should not be used. | Rewrite as "An AP that transmits a group addressed frame in an HE SU PPDU shall use an <HE-MCS, 1> tuple that is supported by all STA's in the BSS as indicated in the Basic HE-MCS And NSS set field in the last transmitted HE Operation element. An AP shall not transmit a group addressed frame in an HE SU PPDU with the TXVECTOR parameter DCM set to 1." | Revised –Agree in principle with the comment and the general description of the proposed changes. The proposed resolution accounts for these suggested changes, however, with the following additional changes:1. The comment is targeting text in the ER beacon and group addressed frames subclase. Proposed resolution is applying modifications to this subclause and also to that of HE SU beacons and group addressed frames.
2. Due to comment resolutions that lead to D4.1 the requirements of this paragraph are identical and refer to that of generating these frames using a mandatory HE MCS and NSS of 1. Proposed resolution is to simplify the paragraph and simply state that the AP will use a mandatory MCS and NSS of 1 when sending HE ER SU PPDUs or HE SU PPDUs containing group addressed frames.
3. There is no need to specify that the AP shall not set the DCM to 1 because there is already a requirement in D4.2 that says the AP shall set DCM to 0 (see the subclause where the comment is being made). Hence this is already accounted for in the latest draft.

TGax editor to make the changes shown in 11-19/0961r2 under all headings that include CID 21295. |
| 20120 | Alfred Asterjadhi | 374.14 | Need to add exception in baseline (11.2.smth) that the AP may schedule these DL BU deliveris not immediately following the DTIM beacon. Also subclause 10.13.4 (A-MPDU aggregation of group addressed Data frames) need to be updated for the 11ax case. | As in comment. | Revised – Agree in principle with the comment. Proposed resolution adds several references to baseline subclauses for the additional rules that apply to the 11ax case. In particular it adds exemptions and references to subclauses 10.6.5.3 (related to rate selection rules for HE ER SU and HE SU PPDU carrying group addressed frames), 10.13.4 (related to A-MPDU aggregation of group addressed frames, fixing some bugs found in baseline spec and using similar language throughout the items of the paragraph of interest, and adding respective rules for the 6 GHz band), and 11.2.3.6 (AP operation) related to group addressed frame delayed delivery during broadcast TWT SPs. The proposed resolution also clearly states what type of group addressed frames can be aggregated in both subclauses 26.15.5 (related to HE ER SU PPDU) and 26.15.6 (related to HE SU PPDU).TGax editor to make the changes shown in 11-19/0961r2 under all headings that include CID 20120. |
| 20123 | Alfred Asterjadhi | 386.47 | It is not clear how the AP delivers group addressed DL BUs in the 6 GHz band using the HE PPDU format. | As in comment. | Revised –Agree in principle with the comment. Baseline rules still apply. In addition, we need to add rules for the case of including the group addressed frames in an A-MPDU when carried in an HE PPDU. Hence adding these clarifications in clause 10.13.4, and in the additional rules for HE SU beacons and group addressed frames. Proposed resolution is to add these clarifications. TGax editor to make the changes shown in 11-19/0961r2 under all headings that include CID 20123. |

**Discussion:** *None.*

**10.6.5.3 Rate selection for other group addressed Data and Management frames**

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 20120):***

This subclause describes the rate selection rules for group addressed Data and Management frames, excluding the following:

* Non-STBC Beacon, ER Beacon, HE SU Beacon, and non-STBC PSMP frames
* STBC group addressed Data and Management frames
* Data frames located in an FMS stream (see 11.22.8 (FMS multicast rate processing))
* Group addressed frames transmitted to the GCR concealment address (see 11.22.16.3.5 (Concealment of GCR transmissions))
* Group addressed Data and Management frames transmitted in an HE ER SU PPDU (see 26.15.5 (Additional rules for ER beacons and group addressed frames)
* Group addressed Data and Management frames transmitted in an HE SU PPDU (see 26.15.6 (Additional rules for HE SU beacons and group addressed frames)*(#20120)*

…

**10.13.4 A-MPDU aggregation of group addressed Data frames**

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 20120):***

A STA that is neither an AP nor a mesh STA shall not transmit an A-MPDU containing an MPDU with a group addressed RA.

NOTE 1—An HT AP and an HT mesh STA can transmit an A-MPDU containing MPDUs with a group addressed RA.

NOTE 2—As a VHT STA and an HE STA is an HT STA, NOTE 1 also applies to VHT APs, VHT mesh STAs, HE APs and HE mesh STAs. *(#20120)*

NOTE 3—An AP providing GCR service can transmit an A-MPDU containing MPDUs with a group addressed RA.

NOTE 4—An S1G AP can transmit an A-MPDU containing MPDUs with a group addressed RA.

A STA that is an AP or a mesh STA shall not transmit an A-MPDU containing group addressed MPDUs if the HT Protection field is equal to non-HT mixed mode.

A DMG STA may transmit an A-MPDU containing MPDUs with a group addressed RA.

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 20120, 20123):***

When a STA transmits a PPDU containing at least one A-MPDU that contains MPDUs with a group addressed RA, the following shall apply:

* If the PPDU is an HT PPDU, the maximum A-MPDU length exponent value is the minimum value in the Maximum A-MPDU Length Exponent subfield of the A-MPDU Parameters field of the HT Capabilities elements across all HT STAs associated with the transmitting AP or across all peer HT mesh STAs.*(#20120)*
* *(#20120)*If the PPDU is a VHT PPDU, the maximum A-MPDU length exponent value is the minimum value in the Maximum A-MPDU Length Exponent subfield of the VHT Capabilities elements across all VHT STAs associated with the transmitting AP or across all peer VHT mesh STAs.
* If the PPDU is an HE PPDU sent in the 2.4 GHz or 5 GHz band, the maximum A-MPDU length exponent value is the minimum value in the Maximum A-MPDU Length Exponent subfield of the VHT Capabilities elements across all HE STAs associated with the transmitting AP or across all peer HE mesh STAs.*(#20120)*
* If the PPDU is an HE PPDU sent in the 6 GHz band, the maximum A-MPDU length exponent value is the minimum value in the Maximum A-MPDU Length Exponent subfield of the HE 6 GHz Band Capabilities elements across all HE STAs associated with the transmitting AP or across all peer HE mesh STAs.*(#20123)*
* If the PPDU is a VHT PPDU, the minimum MPDU start spacing value is the maximum value in the Minimum MPDU Start Spacing subfield of the A-MPDU Parameters fields of the HT Capabilities elements across all VHT STAs associated with the transmitting AP or across all peer VHT mesh STAs.*(#20120)*
* If the PPDU is an HT PPDU, the minimum MPDU start spacing valueis the maximum value in the Minimum MPDU Start Spacing subfield of the A-MPDU Parameters field of the HT Capabilities element across all HT STAs associated with the transmitting AP or across all peer HT mesh STAs.
* *(#20120)*If the PPDU is an HE PPDU sent in the 2.4 GHz or 5 GHz band, the minimum MPDU start spacing value is the maximum value in the Minimum MPDU Start Spacing subfield of the A-MPDU Parameters field of the HT Capabilities element across all HE STAs associated with the transmitting AP or across all peer HE mesh STAs.*(#20120)*
* If the PPDU is an HE PPDU sent in the 6 GHz band, the minimum MPDU start spacing value is the maximum value in the Minimum MPDU Start Spacing subfield of the HE 6 GHz Band Capabilities elements across all HE STAs associated with the transmitting AP or across all peer HE mesh STAs.*(#20123)*
* If the PPDU is a DMG PPDU, the maximum A-MPDU length exponent value that applies is the minimum value in the Maximum A-MPDU Length Exponent subfield of the A-MPDU Parameters field of the DMG Capabilities element of all DMG STAs associated with the AP or PCP.
* If the PPDU is a DMG PPDU, the minimum MPDU start spacing value that applies is the maximum value in the Minimum MPDU Start Spacing subfield of the A-MPDU Parameters field of the DMG Capabilities element of all DMG STAs associated with the AP or PCP.
* If the PPDU is an S1G PPDU, the maximum A-MPDU length exponent value that applies is the minimum value in the Maximum A-MPDU Length Exponent subfields of the S1G Capabilities Information field of the S1G Capabilities elements across all S1G STAs associated with the transmitting AP.
* If the PPDU is an S1G PPDU, the minimum MPDU start spacing value that applies is the maximum value in the Minimum MPDU Start Spacing subfields of the S1G Capabilities Information field of the S1G Capabilities elements across all S1G STAs associated with the transmitting AP.

**26.15.5 Additional rules for ER beacons and group addressed frames**

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 21295):***

An AP that transmits a Beacon frame or group addressed frames in an HE ER SU PPDU shall transmit the HE ER SU PPDU with an <HE-MCS, NSS> tuple where the HE-MCS is a mandatory HE-MCS and NSS = 1.*(#21295)*

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 20120):***

A Beacon frame or a group addressed frame transmitted in an HE ER SU PPDU shall be sent as an S-MPDU (see Table 9-532 (A-MPDU contents in the S-MPDU context)), except for group addressed Data frames, which may also be sent as an A-MPDU subject to the rules in 10.13.4 (A-MPDU aggregation of group addressed Data frames).*(#20120)*

**…**

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 21295, 20123):***

**26.15.6 Additional rules for HE SU Beacons and group addressed frames**

An AP that transmits a Beacon frame or group addressed frames in an HE SU PPDU shall transmit the HE SU PPDU with an <HE-MCS, NSS> tuple where the HE-MCS is a mandatory HE-MCS and NSS = 1.*(#21295)*

NOTE–An AP might send a Beacon frame in an HE SU PPDU only when operating in the 6 GHz band (see 26.17.2.2 (HE beacons in the 6 GHz band)).*(#20123)*

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 20120, 20123):***

A Beacon frame or a group addressed frame transmitted in an HE SU PPDU shall be sent as an S-MPDU (see Table 9-532 (A-MPDU contents in the S-MPDU context)), except for group addressed Data frames, which may also be sent as an A-MPDU subject to the rules in 10.13.4 (A-MPDU aggregation of group addressed Data frames).*(#20120, 20123)*

If the HE SU PPDU contains a group addressed frame intended for at least one STA that is not associated to the AP then the HE AP shall set the TXVECTOR parameters for the HE PPDU as follows:

* CH\_BANDWIDTH to CBW20.
* HE\_LTF\_TYPE to 2xHE-LTF and GI\_TYPE to 0u8s\_GI or 1u6s\_GI, or HE\_LTF\_TYPE to 4xHE-LTF and GI\_TYPE to 3u2s\_GI
* FEC\_CODING to BCC\_CODING
* STBC to 0
* DCM to 0
* DOPPLER to 0
* BEAMFORMED to 0
* NUM\_STS to 1
* NOMINAL\_PACKET\_PADDING to 16 μs
* NO\_SIG\_EXTN to false in the 2.4 GHz band and true otherwise *(#20120, 20123)*
* BEAM\_CHANGE as defined in 26.11.3 (BEAM\_CHANGE)

Otherwise, if the HE SU PPDU contains group addressed frames intended only for associated STAs then the AP shall set the TXVECTOR parameters to values that are indicated as supported by all the intended STAs, except that the CH\_BANDWIDTH shall be set to CBW20 if at least one of the intended STAs is currently not in the awake state.

**11.2.3.6 AP operation**

**TGax Editor: *Change item f) below of this subclause as follows (#CID 20120):***

The following rules describe the operation(M53):

…

f) When dot11FMSActivated is false, the AP shall transmit all buffered non-GCR-SP (11ak)non-SYNRA group addressed BUs immediately after every DTIM or during broadcast TWT SPs within that beacon interval as defined in 26.8.3.2 (Rules for TWT scheduling AP).*(#20120)*

When dot11FMSActivated is true and the AP has established an FMS delivery interval for a multicast stream, the AP shall transmit all non-GCR-SP (11ak)non-SYNRA group addressed BUs belonging to particular FMS stream immediately after the DTIM that has the Current Count field value of the FMS Counter field set to 0 for that particular FMS stream or during broadcast TWT SPs within that beacon interval as defined in 26.8.3.2 (Rules for TWT scheduling AP).*(#20120)*

…

* A-MPDU operation in an HE PPDU
* General

**TGax Editor: *Change the paragraphs below of this subclause as follows (#CID 20120):***

A-MPDU operation for an HE PPDU follows the procedures defined in 10.13 (A-MPDU operation) and, additionally, the procedures defined in this subclause.

An HE STA that sends a VHT Capabilities element, an HT Capabilities element, or an HE 6 GHz Band Capabilities element and an HE Capabilities element with Maximum A-MPDU Length Exponent Extension field of 0 shall support in reception an A-MPDU pre-EOF padding with maximum length defined in 10.13.2 (A-MPDU length limit rules).*(#20120)*

An HE STA that sends a VHT Capabilities element and an HE Capabilities element with Maximum A-MPDU Length Exponent Extension subfield greater than 0 shall support reception of an HE PPDU with an A-MPDU pre-EOF padding as defined in 10.13.2 (A-MPDU length limit rules) except that the maximum length for the A-MPDU pre-EOF padding shall be equal to . An HE STA that sets the Maximum A-MPDU Length Exponent Extension subfield of the HE Capabilities element to a value greater than 0 shall set the Maximum A-MPDU Length Exponent subfield of the VHT Capabilities element to 7.

NOTE—6 500 631 is defined in Table 9-25 (Maximum data unit sizes (in octets) and durations (in microseconds)) as the upper bound of A-MPDU size.

An HE STA that does not send a VHT Capabilities element but sends an HT Capabilities element and an HE Capabilities element with Maximum A-MPDU Length Exponent Extension subfield greater than 0 shall support in reception an A-MPDU pre-EOF padding in an HE PPDU as defined in 10.13.2 (A-MPDU length limit rules) except that the maximum length for the A-MPDU pre-EOF padding shall be equal to 2(16 + Maximum A-MPDU Length Exponent Extension) – 1. An HE STA that sets the Maximum A-MPDU Length Exponent Extension subfield of the HE Capabilities element to a value greater than 0 shall set the Maximum A-MPDU Length Exponent subfield of the HT Capabilities element to 3.

NOTE—An HE STA that is a VHT STA sends a VHT Capabilities element. An HE STA that is not a VHT STA does not send a VHT Capabilities element.

An HE STA that sends an HE 6 GHz Band Capabilities element and an HE Capabilities element with Maximum A-MPDU Length Exponent Extension subfield greater than 0 shall support in reception an A-MPDU pre-EOF padding in an HE PPDU as defined in 10.13.2 (A-MPDU length limit rules) except that the maximum length for the A-MPDU pre-EOF padding shall be equal to . An HE STA that sets the Maximum A-MPDU Length Exponent Extension field of the HE Capabilities element to a value greater than 0 shall set the Maximum A-MPDU Length Exponent subfield of the HE 6 GHz Band Capabilities element to 7.(*#20120)*

An HE STA shall not transmit an A-MPDU in an HE PPDU to a STA that exceeds the maximum A-MPDU length capability indicated in the HE Capabilities, VHT Capabilities, and HT Capabilities elements received from the recipient STA. If a VHT Capabilities element is received from the recipient STA, then the maximum A-MPDU length capability is derived from the Maximum A-MPDU Length Exponent Extension subfield in the HE Capabilities and the Maximum A-MPDU Length Exponent subfield in the VHT Capabilities element. Otherwise the maximum A-MPDU length capability is derived from the Maximum A-MPDU Length Exponent subfields in the HE Capabilities element and the Maximum A-MPDU Length Exponent subfield in the HT Capabilities element or in the HE 6 GHz Band Capabilities element.*(#20120)*

An HE STA may transmit an HE SU PPDU or HE MU PPDU that carries an A-MPDU with contents defined in Table 9-529 (A-MPDU contents in the data enabled no immediate response context) or Table 9-532a (A-MPDU contents in the HE non-ack-enabled single TID immediate response context).

An A-MPDU with any number of QoS Null frames with any TID and with the Ack Policy field set to No Ack and aggregated with or without other frames may be transmitted to a recipient STA in an HE PPDU that is not an HE TB PPDU regardless of the value of the Multi-TID Aggregation Rx/Tx Support subfield in the HE MAC Capabilities Information field in the HE Capabilities element received from the recipient STA.

An A-MPDU with any number of QoS Null frames with any TID and with Ack Policy field set to No Ack and aggregated with or without other frames in an A-MPDU may be transmitted in the HE TB PPDU regardless of the value of the TID Aggregation Limit subfield and the value of the Preferred AC subfield in the Basic Trigger frame, and the value of the Multi-TID Aggregation Rx Support of the AP that solicits the A-MPDU.

NOTE—A QoS Null frame with the Ack Policy field set to Normal Ack or Implicit Block Ack Request is not allowed to be sent in an A-MPDU (as defined in Table 9-532a (A-MPDU contents in the HE non-ack-enabled single TID immediate response context) in HE PPDU context), Table 9-532b (A-MPDU contents in the HE ack-enabled single TID immediate response context), Table 9-532c (A-MPDU contents in the HE non-ack-enabled multi-TID immediate response context), Table 9-532d (A-MPDU contents in the HE ack-enabled multi-TID immediate response context), Table 9-426 (A-MPDU contents in the data enabled no immediate response context) and Table 9-531 (A-MPDU contents MPDUs in the control response context)).