IEEE P802.11
Wireless LANs

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| D3.0 CR for 6GHz Post Association |
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Abstract

This submission proposes resolutions for the following comments on 6GHz post association of TGax D3.0:

* 15178, 16444

Revisions:

* Rev 0: Initial version of the document. Use D3.2 as baseline spec text.
* Rev 1: Updated based on offline discussion. Since revision 0 was not presented, we didn’t highlight changes.
* Rev 2: Updated discussion based on latest proposal.
* Rev 3: Editorial change (section number in note for editor), adding Enhanced MU EDCA Operation bit in RNR (as a part of BSS Parameters subfield format proposed in 11-18/1227r12)

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** | **Clause Number** | **Page** | **Comment** | **Proposed Change** | **Resolution** |
| 16444 | 28.3.22.2 | 5797 | Given that a new protocol might be defined for the 5.940 band, it would be good to have some wayto disable EDCA access by Tgax devices in this band to allow most efficient use of this new spectrum. | Add a signaling mechanism that allows future devices to disable EDCA in Tgax devices operating in channels referenced to 5.940 GHz | **Revised.***TGax Editor: TGax editor to make changes as shown in 11-18/1828r3* |
| 15178 | 27.2 | 253 | A STA that operates in the 6 GHz band cannot do EDCA whenever it wants. Ensure that the STA can do EDCA only if it is explicitly allowed by the AP. | Will submit a proposal. | **Revised.***TGax Editor: TGax editor to make changes as shown in 11-18/1828r3* |

**Discussion:**

Discussion can be found in 11-18/1827r1, “6 GHz operation for 11ax follow up”

In summary, we agree that limiting EDCA access (for both active scanning and normal data transmission) may bring higher network throughput and it may ensure implementation of fairness in overall BSS performance by central entity. However, complete scheduling based scheme has problem at non-AP STA. To solve this problem, we propose an “Enhanced MU EDCA Operation”

* Optional Enhanced MU EDCA Operation
* Count down of MUEDCATimer
	+ Starts/continues after sending BSR only when STA has data to send
	+ Resets after sending QoS data
	+ This gives AP time to prepare schedule for STA
* Smaller max MUEDCATimer
	+ To minimize initial UL latency
* Exceptions: we want to transmit following frames immediately
	+ QoS Null frame containing BSR, PM=1, OM Control subfield

In 11-16/0657r0, “In-device Multi-radio Coexistence and UL MU operation, authors proposed following two.

* The simplest mitigation technique is to disable UL MU while the device has coex issues
	+ The device would then fall back to SU operation with the full range of existing remedies available
* Another approach is to signal a change in transmit operating mode
	+ For example, signal a change in the number of transmit antennas and/or Tx power
	+ This would constrain what Tx parameters appear in a Trigger frame
	+ It may also help the AP select an MCS for the STA

Among these two, disable UL MU is accepted. Now, to solve the problem mentioned in 11-18/1827r1, we want to disallow disable UL MU while solving the problem mentioned in 11-16/0657r0 by second approach it proposed, i.e. sending QoS Null with OMI/OMN using EDCA.

In order to find out whether the 6GHz AP is operating in Enhanced MU EDCA Operation or not, we further propose to have a bit in RNR.

**Proposed Changes:**

***TGax Editor: Modify text in 9.4.2.238(HE Operation element):***

***…***

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0       B2 | B3 | B4      B13 | B14 | B15 | B16 | B17 | B18     B23 |
|  | Default PE Duration | TWT Required | TXOP Duration RTS Threshold | VHT Operation Information Present | Co-Located BSS | ER SU Disable | Enhanced MU EDCA Operation | Reserved |
| Bits: | 3 | 1 | 10 | 1 | 1 | 1 | 1 | 6 |
| * HE Operation Parameters field format
 |  |

The Default PE Duration subfield indicates the PE field(#16005) duration in units of 4 μs for an HE TB PPDU that is solicited with a TRS Control subfield and its use is defined in 27.5.3.3 (Non-AP STA(#16562) behavior for UL MU operation). Values 5-7 of the Default PE Duration subfield are reserved.

The TWT Required subfield is set to 1 to indicate that the AP requires its associated non-AP HE STAs that have declared support for TWT (by setting any one of TWT Requester Support or TWT Responder Support or Broadcast TWT Support subfield in HE Capabilities element that it transmits to 1) to operate in the role of either TWT requesting STA, as described 27.7.2 (Individual TWT agreements), or TWT scheduled STA, as described in 27.7.3 (Broadcast TWT operation) and set to 0 otherwise.

The TXOP Duration RTS Threshold subfield enables an HE AP to manage RTS/CTS usage by non-AP HE STAs that are associated with it (see 27.2.1 (TXOP duration-based RTS/CTS)). The TXOP Duration RTS Threshold subfield contains the TXOP duration RTS threshold in units of 32 s, which enables the use of RTS/CTS except for the value 1023. The value 1023 indicates that TXOP duration-based RTS is disabled.

The VHT Operation Information Present subfield is set to 1 to indicate that the VHT Operation Information field is present in the HE Operation element and set to 0 otherwise. The VHT Operation Information Present subfield is set as defined in 27.16 (HE BSS operation).(#17090)

The Co-Located BSS subfield is set to 1 to indicate that the AP transmitting this element shares the same operating class, channel and antenna connectors with at least one other BSS and is set to 0 otherwise. A TDLS STA, IBSS STA or mesh STA transmitting this element sets the subfield to 0.

The ER SU Disable subfield indicates whether 242-tone HE ER SU PPDU reception is disabled or enabled by the AP. The ER SU Disable subfield is set to 1 to indicate that 242-tone HE ER SU PPDU reception is disabled and set to 0 to indicate that 242-tone HE ER SU PPDU reception is enabled.

The Enhanced MU EDCA Operation subfield indicates whether enhanced MU EDCA access of associated STAs is enabled in the 6 GHz band. The Enhanced MU EDCA Operation subfield is set to 1 to indicate that enhanced MU EDCA access is required and set to 0 otherwise. An HE AP sets the Enhanced MU EDCA Operation subfield to 0 in HE Operation elements it transmits in the 2.4 or 5 GHz band.

***TGax Editor: Insert a new paragraph in 27.16.1a (HE BSS functionality in 6 GHz band):***

A 6 GHz HE AP may set the Enhanced MU EDCA Operation subfield to 1 in HE Operation elements it transmits only if it is co-located with at least one other HE AP that operates in the 5 GHz or 6 GHz band that has set the Enhanced MU EDCA Operation subfield to 0 in the HE Operation element it transmits.

A 6 GHz non-AP HE STA that is associated with an HE AP that has set Enhanced MU EDCA Operation subfield to 1 in the HE Operation element it transmits:

* Shall set the UL MU Disable and the UL MU Data Disable field to 0 in OMI Control fields it transmits to the AP if the MUEDCATimer[AC] for all ACs is less than or equal to 200TU.
* May contend using EDCA to transmit QoS Null frames contained in a non-A-MPDU format and are carried in a 20 MHz PPDU even if MUEDCATimer[AC] has not reached 0.

***TGax Editor: Modify text in 27.2.7 (EDCA operation using MU EDCA parameters) as follows:***

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.

A 6 GHz HE AP that has set the Enhanced MU EDCA Operation subfield to 1 in HE Operation elements it transmits, shall 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.

…

In a non-AP HE STA, each MUEDCATimer[AC] shall uniformly count down without suspension to 0 when its value is nonzero except when the STA is a non-AP HE STA associated with an HE AP that has set Enhanced MU EDCA Operation subfield to 1 in the HE Operation element it transmits, in which case the non-AP STA shall not start counting down the MUEDCATimer[AC] until the non-AP STA successfully sends a buffer status report (see 27.5.3.6) to the AP. Once the STA has transmitted all the BUs it has reported in the most recently transmitted BSR, the STA shall stop counting down MUEDCATimer[AC].

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 27.5.5 (UL OFDMA-based random access (UORA)).

***11ax Editor: Modify 9.4.2.170 Neighbor AP information field element as follows:***

* Neighbor AP Information field

…

(#1533)The TBTT Information Count subfield is 4 bits in length and contains the number of TBTT Information fields included in the TBTT Information Set field of the Neighbor AP Information field, minus one. For example, a value of 0 indicates that one TBTT Information field is included.

(#1533)The TBTT Information Length subfield is 1 octet in length and indicates the length of each TBTT Information field included in the TBTT Information Set field of(#342) the Neighbor AP Information field. When the TBTT Information Field Type subfield is set to 0, the TBTT Information Length subfield:

* contains the length in octets of each TBTT Information field that is included in the TBTT Information Set field of(#342) the Neighbor AP Information field
* is set to 1, 5, 7, 8, 11, or 12; other values are reserved.(11ai)
* indicates the TBTT Information field contents as shown in Table 9-273 (TBTT Information field content(11ai)).

(#1533)A TVHT AP sets the TBTT Information Length subfield to 1.

(11ai)The TBTT Information Length subfield is interpreted as shown in Table 9-283 (TBTT Information field(11ai) contents(#1533)).

|  |
| --- |
| * TBTT Information field(11ai) contents(#1533)
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| TBTT Information Length subfield value | TBTT Information field contents |
| 1 | The Neighbor AP TBTT Offset subfield |
| 5 | The Neighbor AP TBTT Offset subfield and the Short-SSID subfield  |
| 7 | The Neighbor AP TBTT Offset subfield and the BSSID subfield |
| 8 | The Neighbor AP TBTT Offset subfield, the BSSID subfield, and the BSS Parameters subfield |
| 11 | The Neighbor AP TBTT Offset subfield, the BSSID subfield and the Short-SSID subfield |
| 12 | The Neighbor AP TBTT Offset subfield, the BSSID subfield, the Short-SSID subfield and the BSS Parameters subfield |
| 0, 2–4, 6, 9–10 | Reserved |
| 13–255 | The first 12 bytes of the field are the same as for TBTT Information Length subfield value equal to 12 and the remaining bytes are reserved |

The Operating Class field is 1 octet in length and indicates a channel starting frequency that, together with the Channel Number field, indicates the primary channel of the BSSs of the APs in this Neighbor AP Information field. Values of Operating Class are shown in Table E-4 (Global operating classes), of which operating classes that, together with the channel number, indicate the primary channel is valid (see 11.49 (Reduced neighbor report(#1533))).

NOTE—The Operating Class field and Channel Number tuple indicate the primary channel in order to assist with passive scanning.

The Channel Number field is 1 octet in length and indicates the last known primary channel of the APs in this Neighbor AP Information field. Channel Number is defined within an Operating Class as shown in Table E-4 (Global operating classes).

The TBTT Information Set field contains one or more TBTT Information fields. The TBTT Information field is defined in Figure 9-624 (TBTT Information field (11ai)format).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Neighbor AP TBTT Offset | BSSID (optional)(#15)(11ai) | Short-SSID (optional)(#15)(11ai) | BSS Parameters |
| Octets: | 1 | 0 or 6 | 0 or 4 | 0 or 1 |
| * TBTT Information field format
 |  |

 The Neighbor AP TBTT Offset subfield is 1 octet in length and indicates the offset in TUs, rounded down to nearest TU, to the next TBTT of an AP from the immediately prior TBTT of the AP that transmits this element. The value 254 indicates an offset of 254 TUs or higher. The value 255 indicates an unknown offset value.

The BSSID is defined in 9.2.4.3.4 (BSSID field).(11ai)

The Short-SSID subfield is calculated as given in 9.4.2.170.3 (Calculating the Short-SSID(11ai)).(11ai)

The format of BSS Parameters subfield is defined in Figure 9-xxx (BSS Parameters subfield format).

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 | B3 | B4 | B5 | B6 | B7 |
|  | OCT Recommended | Same SSID | Multiple BSSID | Transmitted BSSID | Member Of Co-located ESS  | 20 TU Probe Response Active | Enhanced MU EDCA Operation | Reserved |
| Bits | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
|  | Figure 9-xxx BSS Parameters subfield format |

The Enhanced MU EDCA Operation subfield is set to 1 to indicate enhanced MU EDCA access of associated STAs for the reported HE AP is enabled. It is set to 0 otherwise. The value of Enhanced MU EDCA Operation subfield shall be same as the value of Enahced MU EDCA Operation subfield in HE Operation elements the reported AP transmits.

**End of proposed changes.**