IEEE P802.11
Wireless LANs

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| **Comment resolution for Enterprise-Grade TID Mapping** |
| **Date: 2021-11-06** |
| **Author(s):** |
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Abstract

Proposed draft text for enhancements to TID mapping. Introduced are a set of .

The submission proposes text changes to resolve CID 6636 from CC36. All proposed changes are based on 802.11be Draft 1.2.

# Revision History

|  |  |  |
| --- | --- | --- |
| **Date** | **Revision** | **Changes** |
| 2021-11-6 | 0 | Initial draft |

# CC36 Comments and discussion [against Draft 1.0]

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **P.L** | **Clause** | **Comment** | **Proposed Change** | **Proposed Resolution** |
| 6643 | 258.8 | 35.3.6.1.1 | TID to link negotiation can be mandatory in certain cases, however not in all. AP needs to be able to signal that a negotiation is required. | Add signaling in operation element indicating the need to perform negotiation. | Resolution: Revised, please implement the changes as shown in Document IEEE 802.11-21/1793r0. |

**Discussion:**

Please refer to contribution 802.11-21/1611 for discussion on this topic. This proposed draft text in this document performs the following:

* Make All-TID-to-link-subset support mandatory for EHT non-AP STAs
* Introduce an advertisement of TID to link mapping scheme for the AP
* Introduce a priority value in the TID negotiation frames

### 9.3.3.2 Beacon frame format

TGbe editor: Add one row to table 9-32 as follows:

**Table 9-32—Beacon frame body(#1004)(#2246)(#3352) *(continued)***

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| <Last assigned + 2> | EHT Capabilities | The EHT Capabilities element is present if dot11EHTOptionIm- plemented is true; otherwise it is not present. |
| <Last assigned + 3> | EHT Operation | The EHT Operation element is present if dot11EHTOptionImple- mented is true; otherwise it is not present. |
| <Last assigned + 4> | TID-To-Link Map- ping | The TID-To-Link Map ping element is optionally present if dot11EHTOptionIm plemented is true; otherwise it is not present. |

### 9.3.3.10 Probe Response frame format

TGbe editor: Add one row to table 9-39 as follows:

### Table 9-39—Probe Response frame body(#1004)(#2246)(#3359)

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| 11 | Quiet | The Quiet element is optionally present if dot11SpectrumManage- mentRequired is true or if dot11RadioMeasurementActivated is true or dot11RestrictedTWTOptionImplemented is true(#2215). |
| <Last assigned + 1> | Multi-Link | (#3016)(#1005)(#1896)(#1007)(#2861)(#1898)(#2860)(#1155)(# 1414)(#2581)(#3367)(#3359)(#2859)(#6700)The Basic Multi-Link element is present if the AP is affiliated with an AP MLD. Otherwise it is not present. |
| <Last assigned + 2> | EHT Capabilities | The EHT Capabilities element is present if dot11EHTOptionIm- plemented is true; otherwise it is not present. |
| <Last assigned + 3> | EHT Operation | The EHT Operation element is present if dot11EHTOptionImple- mented is true; otherwise it is not present. |
| <Last assigned + 4> | TID-To-Link Map- ping | The TID-To-Link Map ping element is optionally present if dot11EHTOptionIm plemented is true; otherwise it is not present. |

### **9.4.2.295d TID-To-Link Mapping element**

TGbe editor: Modify Figure 9-788eae as follows:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 B1 | B2 | B3  | B4 | B5 B7 | B8 |  | B15 |
| Direction | Default Link Mapping | Priority | Reserved |  | Link Mapping Presence Indicator |
| Bits: | 2 | 1 | 2 | 3 |  | 8 |  |

**Figure 9-788eae—TID-To-Link Control field format**

TGbe editor: Modify section 9.4.2.295d as shown below:

The Default Link Mapping subfield is set to 1 if the TID-To-Link Mapping element represents the default TID-to-link mapping. Otherwise, it is set to 0.

The Priority subfield indicates the priority level for the proposed Link Mapping according to table 9-xxx.

**Table 9-xxx —TID-To-Link Mapping Priority Levels**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Priority Subfield** | **Request by AP MLD** | **Request by non-AP MLD** | **Response by AP MLD** | **Response by non-AP MLD** |
| 0 | Inquiry Only | Inquiry Only | Reserved | Reserved |
| 1 | Request a change | Request a change | Amenable to change | Amenable to change |
| 2 | Mandatory – Except Existing | Reserved | Prefer not to change | Prefer not to change |
| 3 | Mandatory – Override Existing  | Reserved | Cannot accept change | Strong objection to change |

The Link Mapping Presence Indicator subfield indicates whether the Link Mapping Of TID *n* field is present in the TID-To-Link Mapping element. A value of 1 in bit position *n* of the Link Mapping Presence Indicator subfield indicates that the Link Mapping Of TID *n* field is present in the TID-To-Link Mapping element. Otherwise, the Link Mapping Of TID *n* field is not present in the TID-To-Link Mapping element. When the Default Link Mapping subfield is set to 1, this subfield is reserved.

TGbe editor: Modify section 35.3.6.1 as shown below:

## 35.3.6.1 TID-to-link mapping

### 35.3.6.1.1 General

The TID-to-link mapping mechanism allows an AP MLD and a non-AP MLD that performed multi-link setup to determine how TIDs are mapped to the setup links in DL and in UL.

By default, all TIDs shall be mapped to all setup links for (#2068)both DL and UL (see 35.3.6.1.2 (Default mapping mode)). When a mandatory mapping is implicitly negotiated by an announcement by the AP MLD in its transmitted Beacons and Probe Responses, or both MLDs have explicitly negotiated a TID-to-link mapping by following the procedure defined in 35.3.6.1.3 (Negotiation of TID-to-link mapping), each TID can be mapped to the same or different link set(#2908).

A setup link is defined as enabled if at least one TID is mapped to that link and is defined as disabled if no TIDs are mapped to that link. At any point in time, a TID shall always be mapped to at least one setup link, unless admission control is used. By default, as TIDs are mapped to all setup links, all setup links shall be enabled (see 35.3.6.1.2 (Default mapping mode)).

(#1496)If a link is enabled, it may be used for frame exchange, subject to the power state of the non-AP STA operating on that link. Only MSDUs or A-MSDUs with TIDs mapped to an enabled link may be transmitted on that link. Management frames and Control frames may be sent only on enabled links.

If a link is disabled between MLDs in a BSS, it shall not be used for frame exchange between the MLDs, including Management frames both for DL and UL. If an AP MLD link advertises a link to be disabled, the link shall not be used for transmitting management frames by an unassociated non-AP MLD to the AP MLD.

If a TID is mapped in UL to a set of enabled links for a non-AP MLD, then the non-AP MLD can use any link within this set of enabled links to transmit frames carrying MSDUs or A-MSDUs with that TID.

If a TID is mapped in DL to a set of enabled links for a non-AP MLD, then:

—(#1226)The non-AP MLD can retrieve buffered BUs corresponding to that TID on any link within this set of enabled links.

—The AP MLD can use any link within this set of enabled links to transmit frames carrying MSDUs or A-MSDUs with that TID, subject to existing restrictions for transmissions of frames that apply to those enabled links.

NOTE 1—An example of restriction is if the STA is in doze state.

(#1788)(#1680)NOTE 2—If the default mode is used, all TIDs are mapped to all setup links and all setup links are therefore enabled. The non-AP MLD can have the corresponding non-AP STA wake up on any link to receive BUs buffered by the AP MLD.

### 35.3.6.1.2 Default mapping mode

(#1790)(#2427)(#2907)(#3377)(#3027)(#2908)Under this mode, all TIDs are mapped to all setup links for DL and UL, and all setup links are enabled. A non-AP MLD and an AP MLD that performed multi-link setup shall operate under this mode if a TID-to-link mapping negotiation for a different mapping did not occur or was unsuccessful or torn down.

### 35.3.6.1.3 Negotiation of TID-to-link mapping

An MLD may support TID-to-link mapping negotiation. A non-AP MLD that performs multi-link (re)setup on at least two links with an AP MLD that has set to a nonzero value the TID-To-Link Mapping Negotiation Supported subfield of MLD Capabilities field of the Multi-Link element shall support TID-to-link mapping negotiation. An MLD that supports TID-to-link mapping negotiation has dot11TIDtoLinkMappingActivated equal to true and shall set to a nonzero value the TID-to-link Mapping Negotiation Supported subfield in the MLD Capabilities field of the Basic variant Multi-Link element that it transmits. Otherwise it shall set the TID-to-link Mapping Negotiation Supported subfield to 0. If the TID-to-link Mapping Negotiation Supported subfield value received from a peer MLD is equal to 2, the MLD shall send to the peer MLD only the TID-to-link Mapping element where all TIDs are mapped to the same link set.

An AP MLD may set the Priority subfield of the TID-To-Link Control field to 2 or 3 to indicate that, for TID n, a link is not permitted if the link is not marked as allowable in the Link Mapping of TID n field (where n=0, 1, … ,7). Starting at the end of the next DTIM Beacon after receiving a TID-to-link Mapping Request frame containing a TID-to-Link mapping from its associated AP MLD with the Priority subfield of the TID-To-Link Control field equal to 2 or 3, a non-AP MLD shall not map frames associated with a TID to a link unless that the mapping is allowed for that link by the TID-To-Link Mapping.

NOTE 1— The AP MLD might disassociate the non-AP MLD if the outcome of the negotiation is that an unallowed link for a TID is included in the final TID-to-link mapping.

An AP MLD may include the TID-To-Link Mapping element in the Beacon and Probe Response frames that the AP MLD transmits to advertise a recommended or required TID-to-link mapping. An AP with dot11EHTBaseLineFeaturesImplementedOnly equal to true shall not advertise a TID-to-link mapping with the Priority subfield of the TID-To-Link Control field equal to 2 or 3 that does not map all TIDs to the same link set.

Starting at the end of the next DTIM Beacon after receiving a Beacon or a Probe Response frame containing a TID-to-Link mapping element from its associated AP MLD with the Priority subfield of the TID-To-Link Control field equal to 1, a non-AP MLD that does not have an established non-default TID-To-Link mapping should not map frames associated with a TID to a link unless that the mapping is allowed for that link by the TID-To-Link Mapping.

Starting at the end of the next DTIM Beacon after receiving a Beacon or a Probe Response frame containing a TID-to-Link mapping element from its associated AP MLD with the Priority subfield of the TID-To-Link Control field equal to 2, a non-AP MLD that does not have an established non-default TID-To-Link mapping shall not map frames associated with a TID to a link unless that the mapping is allowed for that link by the TID-To-Link Mapping.

Starting at the end of the next DTIM Beacon after receiving a Beacon or a Probe Response frame containing a TID-to-Link mapping element from its associated AP MLD with the Priority subfield of the TID-To-Link Control field equal to 3, a non-AP MLD shall not map frames associated with a TID to a link unless that the mapping is allowed for that link by the TID-To-Link Mapping.

In a multi-link (re)setup procedure, a non-AP MLD may initiate a TID-to-link mapping negotiation by including the TID-to-link Mapping element in the (Re)Association Request frame if an AP MLD has indicated a support of TID-to-link mapping negotiation.

After receiving the (Re)Association Request frame containing the TID-To-Link Mapping element, the AP MLD shall reply to the (Re)Association Request frame according to 11.3.5.3 (AP, AP MLD, or PCP association receipt procedures), 11.3.5.5 (AP, AP MLD, or PCP reassociation receipt procedures), and 35.3.5 (Multi-link (re)setup), with the following additional rules:

—The AP MLD can accept the requested TID-to-link mapping in the TID-to-link Mapping element in the received (Re)Association Request frame only if it accepts the multi-link (re)setup for all links on which at least one TID is requested to be mapped. In this case, it shall not include in the (Re)Association Response frame the TID-to-link Mapping element.

—Otherwise, it shall indicate rejection of the proposed TID-to-link mapping by including in the (Re)Association Response frame the TID-to-link Mapping element that suggests a preferred TID-to-link mapping.

NOTE 2— The AP MLD may include a TID-to-link Mapping element in the (Re)Association Response frame even if the non-AP MLD does not initiate a TID-to-link mapping negotiation. Status codes <ANA> (DENIED\_TID\_TO\_LINK\_MAPPING) or <ANA> (PREFERRED\_TID\_TO\_LINK\_MAPPING\_SUGGESTED) may be used.

After the multi-link (re)setup is successful, to negotiate a new TID-to-link mapping, an initiating MLD with dot11TIDtoLinkMappingActivated equal to true shall send an individually addressed TID-to-link Mapping Request frame to a responding MLD that has indicated support of TID-to-link mapping negotiation.

After receiving the individually addressed TID-to-link Mapping Request frame, the responding MLD shall send an individually addressed TID-to-link Mapping Response frame to the initiating MLD according to the following rules:

—If the responding MLD accepts the requested TID-to-link mapping in the TID-to-link Mapping element in the received TID-to-link Mapping Request frame, it shall set to 0 (SUCCESS) the Status Code in the TID-to-link Mapping Response frame.

—Otherwise, the responding MLD shall indicate rejection of the proposed TID-to-link mapping by setting to either <ANA> (DENIED\_TID\_TO\_LINK\_MAPPING) or <ANA> (PREFERRED\_TID\_TO\_LINK\_MAPPING\_SUGGESTED) the Status Code in the TID-to-link Mapping Response frame. The responding MLD may suggest a preferred TID-to-link mapping by setting <ANA> (PREFERRED\_TID\_TO\_LINK\_MAPPING\_SUGGESTED) the Status Code in the TID-to-link Mapping Response frame and including the TID-to-link Mapping element in the TID-to-link Mapping Response frame.

An MLD may suggest a preferred TID-to-link mapping to a peer MLD by sending an unsolicited TID-to-link Mapping Response frame that includes the TID-to-link Mapping element and sets the Status Code to <ANA> (PREFERRED\_TID\_TO\_LINK\_MAPPING\_SUGGESTED). An MLD shall not send an unsolicited TID-to-link Mapping Response frame that includes the TID-to-link Mapping element and sets the Status Code to 0 (SUCCESS).

If indicated by a peer MLD, an MLD should take into account the preferred TID-to-link mapping when it initiates a new TID-to-link mapping. In addition, an AP MLD should take into account the traffic flow(s) affiliated with the non-AP MLD and the capabilities and constraints (if any) of the non-AP MLD.

NOTE 3—A non-AP MLD can indicate its constraints (such as single radio) during multi-link setup.

A multi-link multi-radio (MLMR) non-AP MLD should accept a TID-to-link mapping initiated by its associated AP MLD.

When two MLDs have negotiated a TID-to-link mapping, either MLD may teardown the negotiated TID-to-link mapping by sending an individually addressed TID-to-link Mapping Teardown frame, except a non-AP MLD shall not tear down the negotiated a TID-to-link mapping if the current TID-to-link mapping was established by a negotiation in which the AP requested a mandatory TID-to-link mapping (but may initiate a new TID-to-link mapping negotiation instead). After teardown, the MLDs shall operate in default mapping mode (see 35.3.6.1.2 (Default mapping mode)).

If an MLD has successfully negotiated the TID-to-link mapping with a peer MLD, both the MLD and the peer MLD shall update an uplink and/or downlink TID-to-link mapping information according to the negotiated the TID-to-link mapping. In case that a TID-to-link mapping of specific TID is missing in the negotiation, the most recent TID-to-link mapping of this TID remains unchanged and valid.

NOTE 4—If there is no successfully negotiated TID-to-link mapping for missing TID, the default mapping is applied to this TID.

When an MLD has successfully negotiated with a peer MLD an uplink and/or downlink TID-to-link mapping in which the bit position i of the Link Mapping Of TID field in the TID-to-link Mapping element is set to 0, the TID n shall not be mapped to the link associated with the link ID i in an uplink and/or downlink.

When an MLD has successfully negotiated with a peer MLD an uplink and/or downlink TID-to-link mapping in which the bit position i of the Link Mapping Of TID n field in the TID-to-link Mapping element is set to 1, the TID n shall be mapped to the link associated with the link ID i in an uplink and/or downlink.