IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| AP Link Disablement Advertisement | | | | |
| Date: Jul 2022 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Pooya Monajemi | Cisco |  |  | pmonajem@cisco.com |
| Brian Hart | Cisco |  | brianh@cisco.com |
| Laurent Cariou | Intel |  |  | laurent.cariou@intel.com |
| Arik Klein | Huawei |  |  | arik.klein@huawei.com |
| Ming Gan | Huawei |  |  | ming.gan@huawei.com |
| Yong Liu | Apple |  |  | yongliu@apple.com |
| Jarkko Kneckt | Apple |  |  | jkneckt@apple.com |
| Abhishek Patil | Qualcomm |  |  | appatil@qti.qualcomm.com |
| George Cherian | Qualcomm |  |  | gcherian@qti.qualcomm.com |
| Eldad Perahia | HPE |  |  | eldad.perahia@hpe.com |
| Gaurav Patwardhan | HPE |  |  | gaurav.patwardhan@hpe.com |
| Matthew Fischer | Broadcom |  |  | matthew.fischer@broadcom.com |
| Liuming Lu | Oppo |  |  | luliuming@oppo.com |
| Lei Huang | Oppo |  |  | huang.lei1@oppo.com |
| James Yee | Mediatek |  |  | james.yee@mediatek.com |
| Yongho Seok | Mediatek |  |  | yongho.seok@mediatek.com |
| Kaiying Lu | Mediatek |  |  | Kaiying.Lu@mediatek.com |
| Sunhee Baek | LG |  |  | sunhee.baek@lge.com |
| Insun Jang | LG |  |  | insun.jang@lge.com |

Abstract

Proposed draft text for enhancements to TID mapping.

The submission proposes text changes to resolve CID 11107 from LB266. All proposed changes are based on 802.11be Draft 2.0.

Please see discussion notes below for a review of introduced changes.

# Revision History

|  |  |  |
| --- | --- | --- |
| **Date** | **Revision** | **Changes** |
| 2022-09-06 | 0 | Initial draft |
| 2022-09-09 | 1 | Restrictions for advertised mapping modes, added normative text for MU-EDCA mapping operation, editorials and clarifications, added authors |

# LB266 Comments and discussion [against Draft 2.0]

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **P.L** | **Clause** | **Comment** | **Proposed Change** | **Proposed Resolution** |
| 11107 | 220.12 | 9.4.2.312.2.2 | Capability 2 is onerous for implementations, and capability 1 is a very limited form of T2LM. | Introduce a capability 1.5 whereby the MLD supports at least one link (e.g. N-1 links) with all TIDs mapped, and supports another link that has some TIDs mapped. Then renumber the capabilities: 0->0, 1->1, 1.5->2, 2->3. | Resolution: Revised, please implement the changes as shown in document 22/1510r[motioned revision] marked #11107. |

**Discussion:**

### **9.4.2.312.2.2** Common Info field of the Basic Multi-Link element

TGbe editor: Modify one row in Table 9-401i in section 9.4.2.312.2.2 as shown below (#11107):

**Table 9-401i— Subfields of the MLD Capabilities and Operations field *(continued)***

|  |  |  |
| --- | --- | --- |
| **Subfield** | **Definition** | **Encoding** |
| TID-To-Link Map- ping Negotiation Sup- port | Indicates support for TID-to-link mapping negotiation. | Set to 0 if dot11TIDtoLinkMappingActivated is false and TID-to-link mapping is not supported by the MLD.  Set to 1 if dot11TIDtoLinkMappingActivated is true and the MLD only supports the mapping of all TIDs to the same link set, both for the DL and UL, in unrestricted mode  Set to 2 if dot11TIDtoLinkMappingActivated is true and the MLD only supports the mapping, for both UL and DL, of all TIDs to all or a subset of links in unrestricted mode, except optionally in one link mapping some TIDs in MU EDCA mode. TIDs mapped to the same AC are mapped similarly.  Set to 3 if dot11TIDtoLinkMappingActivated is true and the MLD supports the mapping of each TID to the same or different link set either in unrestricted mode or in MU-EDCA mode.  See NOTE 1  (See 35.3.7.1.3 (Negotiation of TID-to-link mapping)) |
| NOTE 1—Indicating support for TID-to-link mapping negotiation using any value also indicates support for negotiations applicable to all smaller values. | | |

TGbe editor: Modify section 9.4.2.314 as shown below (#11107):

### **9.4.2.314 TID-To-Link Mapping element**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Element ID | Length | Element ID Extension | TID-To-Link Mapping Control | Mapping Switch Time | Expected Duration |

Octets: 1 1 1 1 or 2 0 or 2 0 or 3

|  |  |  |  |
| --- | --- | --- | --- |
| Link Mapping Of TID 0  (Optional) | … | Link Mapping Of TID 7  (Optional) | MU EDCA Mappping  (Optional) |

Octets: 0 or 2 0 or 2 0 or 2

**Figure 9-1002am—TID-To-Link Mapping element format**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 B1 | B2 | B3 | B4 | B5 B6 | B7 | B8 |  | B15 |
| Direction | Default Link Mapping | Mapping Switch Time Present | Expected Duration Present | Reserved | MU EDCA Present | Link Mapping Presence Indicator (Optional) | | |
| Bits: | 2 | 1 | 1 | 1 | 3 | 1 |  | 0 or 8 |  |

**Figure 9-1002an—TID-To-Link Control field format**

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 Mapping Switch Time Present subfield is set to 1 if the Mapping Switch Time field is present and 0 otherwise.

The Expected Duration Present subfield is set to 1 if the Expected Duration field is present and 0 otherwise.

The MU EDCA Present subfield is set to 1 if the MU EDCA Mapping field is present and 0 otherwise.

The Link Mapping Presence Indicator subfield indicates whether the Link Mapping Of TID n field is present

in the TID-To-Link Mapping element (i.e., it identifies the TID(s) for which the mapping is provided in the

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 not present.

The Mapping Switch Time field is present when the TID-To-Link Mapping element is transmitted by an AP affiliated with an AP MLD in a Beacon or Probe Response frame and the indicated TID-to-Link mapping is not yet established; otherwise it is not present. The absence of Mapping Switch Time field in the TID-To-Link Mapping element in a Beacon or Probe Response frame transmitted by an AP affiliated with an AP MLD indicates that the indicated TID-to-Link mapping is already established. The 2 octet Mapping Switch Time field has units of TUs and is set to the time at which the the new mapping is established using as a timebase the value of the TSF corresponding to the BSS identified by the BSSID of the frame containing the TID-To-Link Mapping element: i.e., bits 10 to 25 of the TSF or rem(floor(TSF / 1024), 65536)) of that time.

The Expected Duration field indicates the duration for which the proposed TID-to-link Mapping is expected to be effective in units of TUs when the Mapping Switch Time field is present, and the remaining duration for which the proposed TID-to-link Mapping is expected to be effective in units of TUs when the Mapping Switch Time field is not present. The Expected Duration field is present if the TID-To-Link Mapping element is carried in a Beacon or a Probe Response frame transmitted by an AP affiliated with an AP MLD, and is not present otherwise.

The Link Mapping Of TID n field (where n= 0, 1… 7 ) indicates the link(s) on which frames belonging to the TID n are allowed to be sent (i.e., carries a bitmap of the links to which the TID n is mapped to). A value of 1 in bit position i (where i = 0, 1…14 ) of the Link Mapping Of TID n field indicates that TID n is mapped to the link associated with the link ID i for the direction as specified in the Direc- tion subfield. A value of 0 in bit position i indicates that the TID n is not mapped to the link associated with the link ID i. When the Default Link Mapping subfield is set to 1, this field is not present.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| MU EDCA Indicator | Link ID for MU EDCA | Reserved |
| Bits: | 0 or 8 | 0 or 4 | 0 or 4 |

**Figure 9-xx1—MU EDCA Mapping field format**

The MU EDCA Mapping field, defined in Figure 9-xx1(MU EDCA Mapping field format), may be present when the TID-To-Link Mapping element is transmitted by an AP affiliated with an AP MLD.

The MU EDCA Indicator subfield indicates which TIDs are requested to be mapped in MU EDCA mode. Bit position n in the MU EDCA Indicator subfield is set to 1 to indicate that TID n is requested to be mapped in MU EDCA mode, and otherwise is set to 0.

The Link ID for MU EDCA subfield indicates the link ID in which the indicated TIDs are requested to be mapped in MU EDCA mode.

Except as indicated by the MU EDCA Indicator and the Link ID for MU EDCA subfields, all other TID-to-link mappings indicated in the TID-To-Link Mapping element are requested to be mapped in unrestricted mode.

### 35.3.7.1 TID-to-link mapping

### 35.3.7.1.1 General

TGbe editor: Modify section 35.3.7.1.1 as shown below (#11107):

The TID-to-link mapping mechanism allows an AP MLD and a non-AP MLD that performed or are performing multi-link setup to determine how UL and DL Qos traffic corresponding to TID values between 0 and 7 will be assigned to the setup links for the non-AP MLD.

An AP 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 sets the TID-To-Link Mapping Negotiation Supported subfield of the MLD Capabilities field of the Basic Multi-Link element to a nonzero value shall support TID-to-link mapping negotiation with the TID-To-Link Mapping Negotiation Supported subfield of the MLD Capabilities field of the Basic Multi-Link element it transmits to at least 1. An MLD with dot11EHTBaseLineFeaturesImplementedOnly equal to true shall not set the TID-To-Link Mapping Negotiation Supported subfield of MLD Capabilities field of the Basic Multi-Link element to 3.By default, all TIDs shall be mapped to all setup links for both DL and UL (see 35.3.7.1.2 (Default mapping mode)). When a negotiated aTID-to-link mapping is in effect according to the procedures defined in 35.3.7.1.3 (Negotiation of TID-to-link mapping), 35.3.7.1.7 (Advertised TID-to-link mapping in Beacon and Probe Response frames), and 35.3.7.1.8 (Association Procedures for TID-to-link mapping) then a TID can be mapped to a link set, which is a subset of setup links, spanning from only one setup link to all the setup links.

A setup link is defined as enabled for a non-AP MLD if at least one TID is mapped to that link either in DL or in UL and is defined as disabled if no TIDs are mapped to that link both in DL and UL. At any point in time, a TID shall always be mapped to at least one setup link both in DL and UL, which means that a TID-to-link mapping change is only valid and successful if it will not result in having any TID for which the link set for DL or UL is made of zero setup links. By default, all setup links shall be enabled (see 35.3.7.1.2 (Default mapping mode)).

* If a link is enabled for a non-AP MLD, then:

may be used for individually addressed frame exchange, subject to the power state of the non-AP STA operating on that link and only MSDUs or A- MSDUs with TIDs mapped to that link may be transmitted on that link between the corresponding STA and AP of the non-AP MLD and AP MLD in the direction (DL/UL) corresponding to the TID-to-link mapping.

* MSDUs or AMSDUs as defined in 10.23.2 with TIDs mapped to that link may be transmitted on that link between the corresponding STA and AP affiliated with the non-AP MLD and AP MLD, respectively, in the direction (DL/UL) corresponding to the TID-to-link mapping.
* Individually addressed Management frames and Control frames may be sent on any enabled links between the corresponding STA affiliated with the non-AP MLD and AP affiliated with the associated AP MLD both in DL and UL.

If a link is disabled for a non-AP MLD, it shall not be used for individually addressed frame exchange between the corresponding STA affiliated with the non-AP MLD and AP affiliated with the associated AP MLD, including Management frames.

A STA affiliated with an MLD that operates on a disabled link shall suspend all wireless functionalities on that link until the link is enabled.

NOTE 1— Suspension of wireless functionalities refers to functionalities such as frame generation, schedules, scoreboard maintenances, etc., while still preserving previously negotiated parameters with the peer EHT STA(s).NOTE 2—Group addressed frames delivery procedure is defined in 35.3.15 (Multi-link group addressed frame delivery and reception).

If a TID is mapped in UL to a set of enabled links for a non-AP MLD, then the non-AP MLD may use any link within this set of enabled links to transmit individually addressed MSDUs or A-MSDUs corresponding to that TID.

A TID may be mapped to a link in either the MU-EDCA mode or the unrestricted mode, as indicated by the MU EDCA Mapping field of the TID-To-Link Mapping element. If no mapping mode is indicated for a TID’s mapping to a link, that mapping is assumed to be in the unrestricted mode.

If a TID is mapped in MU-EDCA mode to a link, when a non-AP STA affiliated with a non-AP MLD performs EDCA contention to transmit MSDU’s corresponding to that TID on that link:

* If the TID is negotiated as an r-TWT UL TID, during the corresponding r-TWT SP, the non-AP STA shall ignore the MU-EDCA mapping mode
* Otherwise, the non-AP STA shall use the latest MU-EDCA parameter set announced by the AP affiliated with the AP MLD that operates on the link If the MU-EDCA parameters announced by the AP operating on the link indicate AIFSN=0, then the value of the AIFSN is assumed to be 15.

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

— The non-AP MLD may retrieve individually addressed buffered Bus buffered at the AP MLD that are MSDUs or A-MSDUs corresponding to that TID on any link within this set of enabled links.— The AP MLD may use any link within this set of enabled links to transmit individually addressed MSDUs or A-MSDUs corresponding to that TID, subject to the power state of the non-AP STA on each of these links.

NOTE 2—If the default mode is used, the non-AP MLD can retrieve Bus buffered by the AP MLD on any setup link but the AP MLD can recommend a link as defined in 35.3.12.4 (Traffic indication).

A non-AP MLD may retrieve buffered Bus that are MMPDUs buffered at the AP MLD on any enabled link. An AP MLD may use any enabled links to transmit individually addressed bufferable management frames that are not that are not a TPC Request frame or a Link Measurement Request frame, subject to the power state of the non-AP STA on each of the links.

If a STA affiliated with a non-AP MLD is in active mode on a link with a set of TIDs mapped for DL transmission, its associated AP affiliated with the AP MLD shall transmit to the STA:

— MSDUs/A-MSDUs corresponding to that set of negotiated TIDs for the non-AP MLD, and

— MMPDUs that are not a TPC Request frame or a Link Measurement Request frame for the non-AP

MLD or its affiliated STAs,

unless it is transmitted to another STA affiliated with the same non-AP MLD and in active mode.

NOTE 3—Operation with STAs affiliated with a non-AP MLD in power save mode are defined in 35.3.12.4 (Traffic indication).

### 35.3.7.1.2 Default mapping mode

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 associated with an AP MLD shall operate under this mode if a TID-to-link mapping is not advertised by the AP MLD (see 35.3.7.1.7(Advertised TID-to-link mapping in Beacon and Probe Response frames)), and a TID-to-link mapping negotiation for a different mapping did not occur, was unsuccessful or was torn down.

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

Tgbe editor: Modify section 35.3.7.1.3 as shown below (#11107):

An MLD that supports TID-to-link mapping

negotiation has dot11TIDtoLinkMappingActivated equal to true and shall set to a nonzero value the TID-tolink Mapping Negotiation Supported subfield in the MLD Capabilities and Operations field of the Basic

Multi-Link element that it transmits. An MLD that does not support TID-to-link mapping negotiation has

dot11TIDtoLinkMappingActivated equal to false and 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 1, the MLD that initiates a TID-to-link mapping negotiation to the peer MLD shall

send only the TID-to-link Mapping element where all TIDs are mapped to the same link set. If the TID-tolink Mapping Negotiation Supported subfield value received from a peer MLD is equal to 3, the MLD that

initiates a TID-to-link mapping negotiation to the peer MLD shall send the TID-to-link Mapping element

where each TID is mapped to the same or different link set.

After the multi-link (re)setup is successful and 4-way handshake is complete (if RSNA is required), to negotiate a new TID-to-link mapping, an initiating non-AP 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.

An AP MLD with dot11TIDtoLinkMappingActivated equal to true that initiates a TID-to-link mapping negotiation may perform one of the following:

- Send an individually addressed TID-to-link Mapping Request frame to a non-AP MLD

- Advertise a TID-to-link Mapping by including a TID-To-Link Mapping element in Beacon and Probe Response frames as defined in 35.3.7.1.7 (Advertised TID-to-link mapping in Beacon and Probe Response frames).

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 133 (DENIED\_TID\_TO\_LINK\_MAPPING) or

134 (PREFERRED\_TID\_TO\_LINK\_MAPPING\_SUGGESTED) the Status Code in the TID-to-link

Mapping Response frame. When the Status Code in the TID-to-link Mapping Response frame is

134 (PREFERRED\_TID\_TO\_LINK\_MAPPING\_SUGGESTED), the responding MLD is

suggesting a preferred mapping as indicated in the TID-to-link Mapping element included in the

frame

An MLD may suggest a preferred TID-to-link mapping to a peer MLD by sending an unsolicited TID-tolink Mapping Response frame with the Dialog Token field set to 0 that includes the TID-to-link Mapping element and sets the Status Code to

134 (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 either 0 (SUCCESS) or 133 (DENIED\_TID\_TO\_LINK\_MAPPING).

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

A multi-radio 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 a negotiated TID-to-link mapping if the current TID-to-link mapping was established by an advertisement of TID-to-link mapping. After teardown, if a mapping scheme is advertised by the AP MLD as described in 35.3.7.1.7 (Advertised TID-to-link mapping in Beacon and Probe Response frames)), the MLDs shall operate in the established mode as described in 35.3.7.1.7 (Advertised TID-to-link mapping in Beacon and Probe Response frames), otherwise they shall operate in the default mapping mode (see 35.3.7.1.2 (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 uplink and/or downlink TID-to-link mapping information according to the negotiated TID-to-link mapping. In case a TID-to-link mapping of a specific TID is missing in the negotiation, the most recent TID-to-link mapping of this TID remains unchanged and valid. If an MLD has failed to negotiate the TID-to-link mapping with a peer MLD, the most recent TID-to-link mapping of all TID remains unchanged and valid.

NOTE2—If there is no successfully negotiated TID-to-link mapping for a TID then the TID is mapped to all setup links for DL and UL.

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

in the (Re)Association Request frame, TID-To-Link Mapping Request frame, Beacon frame, or Probe Response frame is set to 0, the TID n shall not be mapped to the link associated with the link ID i in the uplink and/or downlink based on the Direction subfield in the TID-To-Link Mapping element.

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 in the (Re)Association Request frame, TID-To-Link Mapping Request frame, Beacon frame, or Probe Response frame is set to 1, the TID n shall be mapped to the link associated with the link ID i in the uplink and/or downlink basd on the Direction subfield in the TID-To-Link Mapping element

### 35.3.7.1.7 Advertised TID-to-link mapping in Beacon and Probe Response frames

tGbe editor: Add a new section 35.3.7.1.7 as shown below and renumber sections accordingly (#11107):

An AP MLD may advertise a mandatory TID-to-link mapping by including a TID-To-Link Mapping element in the Beacon and Probe Response frames that the aPs affiliated with the AP MLD transmit.

An AP that advertises a TID-to-link mapping shall include the Mapping Switch Time field and set it to the time, in units of tUs, of a DTIM Beacon of one of the aPs affiliated with the AP MLD. Beginning at the indicated time, the indicated TID-to-link mapping is established and the Mapping Switch Time field is no longer included.

An TID-to-link mapping that is advertised by an AP MLD shall comply to one of the following:

* All TIDs are mapped to the same link set, both for DL and UL, in unrestricted mode
* All TIDs are mapped to the same link set, both for DL and UL. All mappings are in unrestricted mode except for one link, where a subset of TIDs are mapped in MU-EDCA mode. TIDs mapped to the same AC are mapped similarly. TIDs corresponding to AC\_VI and AC\_VO are not mapped in MU-EDCA mode.

The Direction field of an advertised TID-To-Link Mapping element shall be set to 2.

NOTE 1— An advertised TID-to-link mapping will include a mapping for all TIDs

NOTE 2— Since the Link IDs can be different for MLDs affiliated with each BSSID in a multiple BSSID set, inheritance will not apply to advertised TID-To-Link mapping for APs that are part of a multiple BSSID set, and therefore the TID-To-Link Mapping element needs to be carried in each Nontransmitted BSSID Profile to which an advertised mapping applies.

An AP MLD shall include two TID-To-Link Mapping elements in the Beacon and Probe Response frames that the APs affiliated with the AP MLD transmit, if there is already an established advertised TID-to-link mapping and a new non-default advertised TID-to-link mapping will replace it. In this case, the AP MLD shall not include the Mapping Switch Time field in the currently established advertised TID-To-Link Mapping element, and shall include the Mapping Switch Time field in the new TID-To-Link Mapping element, in order to indicate an advertised TID-to-link mapping that will be established in the future. The value of the Expected Duration field of the existing TID-To-Link Mapping element shall indicate a remaining duration that ends at the same time as indicated by the Mapping Switch Time field of the new TID-To-Link Mapping element.

NOTE 3— If the newly advertised TID-to-link mapping is the default mapping, the AP MLD sets the Expected Duration field of the currently advertised TID-to-link mapping to the remaining time until the default mapping is established as described in 9.4.2.314 (TID-To-Link Mapping element) and does not include the TID-To-Link Mapping element for the newly advertised TID-to-link mapping in the Beacon and Probe Response frames. After the establishment of the default mapping, no TID-To-Link Mapping elements are included in the Beacon or Probe Response frames transmitted by the APs affiliated with the AP MLD.

All APs affiliated with an AP MLD that advertises a TID-to-link mapping shall include the same mapping in all Beacon and Probe Response frames from the time at which the TID-to-link mapping is first advertised until the time at which the TID-to-link mapping is no longer advertised, and shall include the Expected Duration field in all TID-to-link mapping elements in Beacons. From when a new TID-to-link mapping is advertised in a Beacon frame until the advertised TID-to-link mapping is established, the Mapping Switch Time field shall be included in the TID-To-Link Mapping element and set to the time, in units of TUs, at which the TID-to-link mapping will be established, then not included thereafter. The time indicated by the Mapping Switch Time field shall be the TBTT of the DTIM Beacon of one of the APs affiliated with the AP MLD. The Mapping Switch Time field should initially be set to a sufficiently large value. After an advertised TID-to-link mapping is established, the duration indicated by Expected Duration field shall indicate the time when the advertised TID-to-link mapping is expected to end. During the advertisement of the TID-to-link mapping the time indicated may be updated to indicate an earlier time than initially indicated, but shall not be updated to indicate a later time than initially indicated. The duration indicated by Expected Duration field shall be exact when the duration is smaller than two DTIM periods of the AP transmitting the frame carrying the field.

At the time indicated by the Mapping Switch Time field of a TID-To-Link Mapping element in a Beacon or a Probe Response frame received by a STA affiliated with a non-AP MLD from an AP affiliated with its associated AP MLD, the non-AP MLD shall update its TID-to-link mapping according to the rules that establish a TID-to-link mapping in this subclause and with the consequences of the updated mapping defined in 35.3.7.1.1 (General).

The TID-to-link mapping that is established in a non-AP MLD beginning at the time indicated by the Mapping Switch Time field in a newly changed TID-To-Link Mapping element received by a non-AP MLD in a Beacon or a Probe Response frame from its associated AP MLD is derived as follows:

- If the advertised mapping does not include any mappings in MU-EDCA mode for the links included in the non-AP MLD’s multi-link setup, the set of mapped links for each TID and direction for a non-AP MLD are the set of links that are included in the non-AP MLD multi-link setup with the associated AP MLD and have been mapped to that TID for that direction in the advertised TID-to-link mapping.

- If the advertised mapping includes mappings in MU-EDCA mode for a link included in the non-AP MLD’s multi-link setup and the non-AP MLD sets the TID-To-Link Mapping Negotiation Supported subfield of MLD Capabilities field of the Basic Multi-Link element to 2 or 3, the set of mapped links for each TID and direction for a non-AP MLD are the set of links that are included in the non-AP MLD multi-link setup with the associated AP MLD and have been mapped to that TID for that direction in the advertised TID-to-link mapping. For each mapping, the mapping mode follows the mode signaled by the advertised mapping for the corresponding TID and link.

- If the advertised mapping includes mappings in MU-EDCA mode for a link included in the non-AP MLD’s multi-link setup and the non-AP MLD sets the TID-To-Link Mapping Negotiation Supported subfield of MLD Capabilities field of the Basic Multi-Link element to 0 or 1, the set of mapped links for each TID and direction for a non-AP MLD are the set of links that are included in the non-AP MLD multi-link setup with the associated AP MLD and have been mapped to that TID for that direction in the unrestricted mode in the advertised TID-to-link mapping.

NOTE 4—An individually negotiated TID-to-link mapping whose negotiation was completed prior to the establishment of an advertised TID-to-link mapping is discarded at the time of the establishment of the advertised TID-to-link mapping.

NOTE 5—A non-AP MLD ignores links that are included in the link mappings of an advertised TID-to-link mapping that are not part of the non-AP MLD multi-link setup procedure. For example, if the AP MLD operates on links 1,2, and 3, and it advertises that link 3 is disabled and all TIDs are mapped to links 1 and 2, then for a non-AP MLD that is associated with the AP MLD using links 1 and 2 the default mapping will apply. In this case, for a non-AP MLD that is associated with the AP MLD using links 1 and 3, link 3 will be disabled.

NOTE 6—In absence of an advertised mapping by the AP a default TID-to-link mapping is assumed unless an individual TID-to-link mapping is successfully negotiated.

NOTE 7—No TID-To-Link Mapping Request nor TID-To-Link Mapping Response frames are transmitted by non-AP STAs affiliated with the associated non-AP MLDs in response to an advertised TID-to-link mapping.

A non-AP MLD that is associated with an AP MLD that advertises a TID-to-link mapping may initiate a negotiation for a TID-to-link mapping that is different from the TID-to-link mapping established from the advertisement as described in this section. Any MLD shall not initiate a negotiation for a TID-to-link mapping that maps a TID to a link if the requested TID is not already mapped to the link in the advertised TID-to-link mapping.

### 35.3.7.1.8 Association Procedures for TID-to-link mapping

TGbe editor: Add a new section 35.3.7.1.8 as shown below and renumber sections accordingly (#11107):

During 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, the AP

MLD shall reply to the (Re)Association Request frame according to 11.3.5.3 (Authentication—destination

STA or MLD), 11.3.5.5 (Deauthentication—destination STA or MLD), and 35.3.5 (Multi-link (re)setup),

and perform the following TID-to-link mapping negotiation procedure:

— Where the AP MLD advertises a TID-To-Link Mapping that is already established according to 35.3.7.1.7(Advertised TID-to-link mapping in Beacon and Probe Response frames), if the non-AP MLD does not include at least one TID-to-link Mapping Request element or requests a mapping that maps TIDs to a link in a direction that is not enabled in the advertised mapping, the AP shall include in the (Re)Association Response frame a TID-To-Link Mapping element with the Mapping Switch Time Present subfield equal to 0 and indicating the TID-to-link mapping that is advertised in Beacons for each of the links accepted in the association procedure. After the transmission of the (Re)Association Response frame the TID-to-link mapping included in that frame is established and shall be used during the association unless and until a new TID to link mapping is advertised or negotiated.

— Otherwise, if the AP MLD does not accept an individually requested TID-to-link mapping in an Association Request frame, the AP MLD 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, and the default TID-to-link mapping remains established until a new TID to link mapping is advertised or negotiated.

The AP MLD that rejects a (Re)Association Request may include a TID-to-link Mapping-related status code in the (Re)Association Response frame even if the non-AP MLD does not initiate a TID-to-link mapping negotiation. Status code 134 (PREFERRED\_TID\_TO\_LINK\_MAPPING\_SUGGESTED) may be used.

— Otherwise, 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. The AP MLD that accepts the requested TID-tolink mapping shall not include in the (Re)Association Response frame the TID-to-link Mapping element.

NOTE 1—Whether the multi-link (re)setup is successful or not is independent from whether the TID-to-link mapping negotiation that is done jointly with the multi-link setup is successful or not. A multi-link (re)setup can be successful even if the TID-to-link mapping negotiation is not successful.

TGbe editor: Add a new section 35.3.7.3 as shown below and renumber sections accordingly (#11107):

**35.3.7.3 Affiliated AP link disablement and enablement**

An AP MLD shall use the procedures described in 35.3.7.1.7 (Advertised TID-to-link mapping in Beacon and Probe Response frames) in order to disable or enable a link for all associated non-AP MLDs. Further rules pertaining to the disablement and enablement are described in the sections below 35.3.7.3.1 Affiliated AP link disablement and 35.3.7.3.2 Affiliated AP link enablement.

**35.3.7.3.1 Affiliated AP link disablement**

Upon receiving an MLME-BSS-LINK-DISABLE.request primitive, the affiliated AP shall advertise a TID-to-link mapping in Beacon and Probe Response frames that does not map any TIDs to the disabled link on which the AP is operating. The Mapping Switch Time field for the advertised TID-to-link mapping shall point to the same time as indicated in the DisableTimer parameter of the MLME-BSS-LINK-DISABLE.request primitive. The Expected Duration field of the advertised TID-to-link mapping shall indicate the same duration as the ExpectedDuration parameter of the MLME-BSS-LINK-DISABLE.request primitive.

When an AP MLD advertises that a link is disabled for all associated non-AP MLDs, after the time indicated by the Mapping Switch Time field is reached:

* the Disabled Link Indication subfield shall be set to 1 in the MLD Parameters subfield corresponding to the AP affiliated with the AP MLD and operating on the link which is included in the Neighbor AP Information field in the Reduced Neighbor Report element carried in the Beacon or Probe Response frames transmitted by any of the APs affiliated with the AP MLD and any APs that set the Co-Located AP bit of the BSS Parameters subfield of the TBTT Information field of the Neighbor AP Information field to 1 for the disabled AP. If the Disabled AP Link Indication subfield corresponding to a reported AP is set to 1, then the Neighbor AP TBTT Offset subfield included in the same TBTT Information field of the Reduced Neighbor Report element shall be set to 255.
* an EHT STA affiliated with a non-AP MLD that is associated with the AP MLD shall not use the link to transmit individually addressed frames to the AP affiliated with the AP MLD which is operating on a link that is disabled
* an EHT STA affiliated with a non-AP MLD that is not associated with the AP MLD shall not transmit ML Probe Request, Authentication and (Re)association Request frames to the AP affiliated with the AP MLD while the link is disabled (as indicated in the Expected Duration field in the advertised TID-to-link Mapping element which does not include Mapping Switch time field, or as indicated in the Disabled Link Indication subfield in the RNR element).
* an EHT STA affiliated with a non-AP MLD that is not associated with the AP MLD should not use the link to transmit other individually addressed management frames to the AP affiliated with the AP MLD which is operating on a link that is disabled
* A non-AP STA affiliated with the non-AP MLD shall not delete the GTK/IGTK/BIGTK values for the disabled link

NOTE 1—When an AP MLD advertises that a link is disabled for all associated non-AP MLDs, a non-AP MLD remains associated with the AP MLD.

NOTE 2––The AP affiliated with an AP MLD which is operating on the link to become disabled may disassociate or use BTM in advance for non-AP STAs not affiliated an MLD.

NOTE 3–– The non-AP MLD uses the GTK/IGTK/BIGTK for the reception of protected broadcast/groupcast management frames when the link becomes enabled again.

An AP affiliated with an AP MLD that intends to turn its operating link into a disabled link should verify that it is not associated with any non-MLD non-AP STA on the link to become disabled.

**35.3.7.3.2 Affiliated AP link enablement**

Upon receiving the MLME-BSS-LINK-ENABLE.request primitive and after the time indicated by the EnableTimer parameter in the primitive, or after the expiry of the Expected Duration advertised in an existing TID-to-link mapping, an afiliated AP shall advertise a TID-to-link mapping in Beacon and Probe Response frames that maps at least one TID to the link on which the AP is operating or stop advertising the TID-to-link mapping which indicated no TIDs mapped to the enabled link. If a new non-default TID-to-link mapping is advertised to replace the existing one, in the frames advertising the new TID-to-link-mapping, the Mapping Switch Time field shall indicate the same time as the Expected Duration field of the currently advertised TID-to-link mapping.

When an AP MLD stops advertising that a link is disabled for all associated non-AP MLDs:

* the Disabled AP Link Indication subfield shall be set to 0 in the MLD Parameters subfield corresponding to the AP affiliated with the AP MLD and operating on the link which is included in the Neighbor AP Information field in the Reduced Neighbor Report element carried in the Beacon or Probe Response frames transmitted by any of the APs affiliated with the AP MLD
* the AP operating on this link shall retain unchanged GTK/IGTK/BIGTK keys as before this link was advertised as disabled for all associated non-AP MLDs
* the AP operating on this link shall transmit a TSF that is equivalent to the expected TSF if this link was never advertised as disabled
* frame exchange operation on this link between the affiliated AP and non-AP STAs affiliated with the associated non-AP MLDs that include the enabled link in their ML setup can be initiated by any member of the BSS that is affiliated with an MLD following CCA performance until a frame is detected by which it can set its NAV, or a period equal to NAVSyncDelay has transpired, whichever is earlier. The frame exchange is initiated using all the link parameters that were defined before the link has been defined as an unavailable link subject to power state (see 35.3.11) and enablement status (see 35.3.6.1) of the affiliated non-AP EHT STA.

NOTE 1—An equivalent TSF is desirable for maintaining TWT agreements. An equivalent TSF might be implemented at the AP MLD by determining the difference between the TSF of the disabled AP minus the TSF of another affiliated AP when the link is disabled and then initializing the TSF of the AP when later enabled to the TSF of the other affiliated AP plus the difference.

NOTE 2—After the enablement of an AP link is established, if there is no new TID-to-link mapping advertised, all associated non-AP STAs operate in the default mapping.