IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CC36 Comment Resolution: Multi-Link Traffic Indication | | | | |
| Date: 2022-1-24 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Minyoung Park | Intel Corporation |  |  | Minyoung.park@intel.com |
|  |  |  |  |  |
|  |  |  |  |  |

Abstract

This submission proposes comment resolution(s) for the following 45 CID(s) received in CC36 on TGbe D1.0 related to subclause 35.3.10.4 (Multi-Link Traffic Indication):

CIDs:

6499, 4069, 4392, 5990, 5147, 4390, 4391, 4710, 6246, 6253,

4748, 5381, 6372, 8238, 5761, 6251, 6249, 4397, 4071, 4393,

6734, 4113, 5041, 4070, 5194, 7726, 5219, 8037, 4469, 5148,

6733, 4118, 5725, 4394, 4395, 4396, 6250, 7821, 8180, 4929,

4930, 8181, 6894, 4398, 8239

Revisions:

* Rev 0: Initial version of the document.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Clause Number** | **Page.**  **Line** | **Comment** | **Proposed Change** | **Resolution** |
| 6499 | Pascal VIGER | 35.3.10.4 | 266.10 | The first sentence is a specification that shall be placed in multi-link setup section (An AP MLD shall assign a single AID to a non-AP MLD upon successful multi-link setup... same AID...). Instead, make a reference to this section or a note in order to recall that AID is identical for all STAs of the non-AP MLD. | as in comment | Revised.  Agree with the commenter. The paragraph related to the AID assignment during multi-link setup is moved to Clause 35.3.5.1 (Multi-link (re)setup procedure)  TGbe editor to make the changes with the CID tag (#6499) in doc.: IEEE 802.11-22/196r0  [https://mentor.ieee.org/802.11/dcn/22/11-22-0196-00-00be-cc36-cr-ML-Traffic-Indication.docx] |
| 4069 | Abhishek Patil | 35.3.10.4 | 267.10 | An AP MLD assigns AID during ML setup. The description related to AID assignment must be covered in the clause on ML setup (35.3.5) | Move this sentence to clause 35.3.5.1 which discusses ML (Re)Setup procedure. | Revised.  Agree with the commenter. The paragraph related to the AID assignment during multi-link setup is moved to Clause 35.3.5.1 (Multi-link (re)setup procedure)  TGbe editor to make the changes with the CID tag (#4069) in doc.: IEEE 802.11-22/196r0  [https://mentor.ieee.org/802.11/dcn/22/11-22-0196-00-00be-cc36-cr-ML-Traffic-Indication.docx] |
| 4392 | Arik Klein | 35.3.10.4 | 267.10 | Avoid duplication of same requirement: The requirement to assign an AID to the non-AP MLd by the AP MLD is already stated in P266L33 - need to specify all the related requirements in one place rather than repating it in several places along the sepcification. | Please unify the requirement in the sentence " An AP MLD shall assign a single AID to a non-AP MLD upon successful multi-link setup. All the STAs of the non-AP MLD shall have the same AID as the one assigned to the non-AP MLD during multi-link setup" with the similar requirement cited in P266L33 (if there are differences - please point them out). | Revised.  Agree with the commenter. The paragraph related to the AID assignment during multi-link setup is moved to Clause 35.3.5.1 (Multi-link (re)setup procedure)  TGbe editor to make the changes with the CID tag (#4392) in doc.: IEEE 802.11-22/196r0  [https://mentor.ieee.org/802.11/dcn/22/11-22-0196-00-00be-cc36-cr-ML-Traffic-Indication.docx] |
| 5990 | Liwen Chu | 35.3.10.4 | 267.10 | The AID allocation rule is duplicate with basic operation subclause. | Delete one of the shall statement. | Revised.  Agree with the commenter. The paragraph related to the AID assignment during multi-link setup is moved to Clause 35.3.5.1 (Multi-link (re)setup procedure)  TGbe editor to make the changes with the CID tag (#5990) in doc.: IEEE 802.11-22/196r0  [https://mentor.ieee.org/802.11/dcn/22/11-22-0196-00-00be-cc36-cr-ML-Traffic-Indication.docx] |
| 5147 | Geonjung Ko | 35.3.10.4 | 267.11 | It is unclear if the AID assigned to an MLD operating on a link set can be assigned to a different STA or MLD operating on a different non-overlapping link set. | Clarify it. | Rejected.  The following spec text defines an AID and a non-AP MLD is one-to-one mapping:  “An AP MLD shall assign a single AID to a non-AP MLD upon successful multi-link setup.” |

**35.3.5 Multi-link (re)setup  
35.3.5.1 Multi-link (re)setup procedure**

**TGbe Editor to make the following changes in Subclause 35.3.5.1 (Multi-link (re)setup procedure):**

…

(#1656)An MLD that requests or accepts multi-link (re)setup for any two links ensures that each link is located on different nonoverlapping channels.

(#6499, 4069, 4392, 5990)

After successful multi-link (re)setup between a non-AP MLD and an AP MLD, the non-AP MLD and the AP MLD set up(#6452) links for multi-link operation (#1783)(see 35.3 (Multi-link operation) and the rest of the subclause 35.3 (Multi-link operation)), and the non-AP MLD is (re)associated with the AP MLD (i.e., in State 3 or State 4, see 11.3.2 (State variables))(#5298).

…

**TGbe Editor to make the following changes in Subclause 35.3.12.2 (Basic BSS operation):**

**35.3.12.2 Basic BSS operation**

(#1167)(#4467)A non-AP MLD shall be able to perform basic operations (such as receiving a traffic indication, time synchronization, receiving BSS parameter updates) by monitoring Beacon frames on one or more enabled links. This is in addition to mechanisms such as individual TWT agreement(#2601). (#7415)(#7416)With these mechanisms, a non-AP MLD can receive basic information about the AP MLD and all the APs affiliated with the AP MLD on a single link while the other STA(s) affiliated with the nonAP MLD are in doze state.  
  
(#1695)(#3031)(#1168)(#2252)(#3032)(#4392)) The traffic indication for a non-AP MLD shall be consistent across the Beacon frames transmitted by APs affiliated with an AP MLD, that are operating on the links that are part of the multi-link setup.

**TGbe Editor to make the following changes in Subclause 35.3.11.4 (Traffic indication):**

**35.3.12.4 Traffic indication**

(#6499, 4069, 4392, 5990)

(#6254)An AP affiliated with an AP MLD where the AP is not in a multiple BSSID set shall indicate pending buffered traffic for a non-AP MLD associated with that AP MLD using the partial virtual bitmap of the TIM element as described in 9.4.2.5 (TIM element) and by following the rules described in this subclause.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Clause Number** | **Page.**  **Line** | **Comment** | **Proposed Change** | **Resolution** |
| 4390 | Arik Klein | 35.3.10.4 | 267.09 | If the AID is assigned per non-AP MLD as a mandatory - it shall be reflected in the corresponding text of section 9.4.1.8 (AID field). Currently it is not included in the 802.11 TGbe D1.0 | Add the "AP MLD" / "non-AP MLD" terms to the relevant sentences in 9.4.1.8 | Revised.  Agree with the commenter.  TGbe editor to make the changes with the CID tag (#4390) in doc.: IEEE 802.11-22/196r0  [https://mentor.ieee.org/802.11/dcn/22/11-22-0196-00-00be-cc36-cr-ML-Traffic-Indication.docx] |
| 4391 | Arik Klein | 35.3.10.4 | 267.09 | If the AID is assigned per non-AP MLD as a mandatory - it shall be reflected in the corresponding text of section 9.4.2.163 (AID element). Currently it is not included in the 802.11 TGbe D1.0 | Add the "AP MLD" / "non-AP MLD" terms to the relevant sentences in 9.4.2.163 | Revised.  The text was updated in P167L1 in TGbe D1.31.  TGbe editor: No changes are needed. |

**TGbe Editor to make the following changes in Subclause 9.4.1.8 (AID field):**

**9.4.1.8 AID field**(#4390)In infrastructure BSS operation, the AID field contains a value assigned by an AP, PCP or an AP MLD during association. The field represents the 16-bit ID of a STA when assigned by an AP or PCP. The field represents the 16-bit ID of a non-AP MLD when assigned by an AP MLD. In mesh BSS operation, the AID field is a value that represents the 16-bit ID of a neighbor peer mesh STA, assigned during mesh peering. The length of the AID field is 2 octets. The AID field is shown in Figure 9-138 (AID field format).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Clause Number** | **Page.**  **Line** | **Comment** | **Proposed Change** | **Resolution** |
| 4710 | Chien-Fang Hsu | 35.3.10.4 | 267.13 | The pending buffered traffic is MLD level or per link level is not clear. | specify where the pending buffer traffic locates and how the AP MLD identifies there is pending buffer traffic or not. | Rejected.  In TGbe D1.31, P364L39, the following paragraph defines that a BU is buffered at an AP MLD: “(#2302)An AP MLD shall buffer a BU with a TID at the AP MLD if the TID is not mapped to any link on which the corresponding STA of a non-AP MLD is in active mode, and it shall set the bit in the partial virtual bitmap of the TIM element that corresponds to the AID of the non-AP MLD to 1.” |
| 6246 | Ming Gan | 35.3.10.4 | 267.13 | This sentence is broken, how does an AP MLD recommend a non-AP MLD to use one or more links to retrieve individual addressed buffered Bus? By using Multi-Link Traffic element? | as in the comment | Rejected.  The following sentence seems to be correct and describes that an AP MLD indicates that there is buffered traffic for a non-AP MLD using TIM element:  “An AP MLD shall indicate pending buffered traffic for non-AP MLDs using partial virtual bitmap of TIM element in a Beacon frame as described in 9.4.2.5 (TIM element).”  The procedures defined in the paragraphs that follows the commented paragraph explains how buffered BU(s) is indicated when a non-AP MLD is using TID-to-link mapping. |
| 6253 | Ming Gan | 35.3.10.4 | 267.13 | This sentence is broken, please add other frames which carries TIM element, like TIM frame | as in the comment | Rejected.  The following sentence seems to be correct and describes that an AP MLD indicates that there is buffered traffic for a non-AP MLD using TIM element:  “An AP MLD shall indicate pending buffered traffic for non-AP MLDs using partial virtual bitmap of TIM element in a Beacon frame as described in 9.4.2.5 (TIM element).”  The procedures defined in the paragraphs that follows the commented paragraph explains how buffered BU(s) is indicated when a non-AP MLD is using TID-to-link mapping. |
| 4748 | Chunyu Hu | 35.3.10.4 | 267.21 | Change "if the TID is not mapped to any link on which the corresponding STA of a non-AP MLD is in active mode" to "if none of the links that the TID is mapped to is in active mode". | As commented | Accepted. |

**TGbe Editor to make the following changes in Subclause 35.3.12.4 (Traffic indication) in P375L37 in TGbe D1.4:**

**35.3.12.4 Traffic indication**

**…**

(#2302)An AP MLD shall buffer a BU with a TID at the AP MLD if (#4748)none of the links that the TID is mapped to is in active mode, and it shall set the bit in the partial virtual bitmap of the TIM element that corresponds to the AID of the non-AP MLD to 1.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Clause Number** | **Page.**  **Line** | **Comment** | **Proposed Change** | **Resolution** |
| 5381 | Jay Yang | 35.3.10.4 | 267.26 | Measurement MMPDUs delivery among multiple links is missing,11be shall define a mechanism to allow measurement MMPDUs delivered on any links without waking up the PS STA affiliated non-AP MLD. | as the comments | Rejected.  Measurement MMPDUs include link specific information that is measured on that specific link at the time of transmission so Measurement MMPDUs cannot be delivered on any link. |
| 6372 | Morteza Mehrnoush | 35.3.10.4 | 267.26 | Is the Measurement MMPDU different from the buffarable MMPDU? The buffarable MMPDU is part of the BU per the definition of the "buffarable unit (BU)", so the buffrable MMPDU case doesn't need to be seperatly mentioned as buffereing a BU is already covered on in page267-line21.  Please remove this paragraph. | as in comment | Rejected.  As defined in the following sentence, the Measurement MMPDUs include TPC Request and Link measurement Request frames that has to be transmitted on a link that information is measured and therefore cannot be buffered and transmitted later on a different link: “TPC Request and Link Measurement Request frames are Measurement MMPDUs.” |
| 8238 | Yuxin LU | 35.3.10.4 Traffic indication | 267.29 | "An AP MLD buffers an MMPDU...", suggest to add a normative verb "shall", in alignment with line 21, which says "An AP MLD shall buffer a BU..." | Change "An AP MLD buffers an MMPDU..." to "An AP MLD shall buffer an MMPDU..." | Accepted. |
| 5761 | Laurent Cariou | 35.3.10.4 | 267.32 | clarify that for measurement MMPDUs, the bit in the partial virtual bitmap of the TIM element that corresponds to the AID of the non-AP MLD is not set to 1. | as in comment | Revised.  Added a sentence that the Measurement MMPDUs are not buffered.  TGbe editor to make the changes with the CID tag (#5761) in doc.: IEEE 802.11-22/196r0  [https://mentor.ieee.org/802.11/dcn/22/11-22-0196-00-00be-cc36-cr-ML-Traffic-Indication.docx] |
| 6251 | Ming Gan | 35.3.10.4 | 267.32 | Add "the Multi-Link Traffic element is not present in a Beacon frame" | as in the comment | Rejected.  Invalid comment. The commenter failed to identify an issue. |

**TGbe Editor to make the following changes in Subclause 35.3.12.4 (Traffic indication) in P375L49 in TGbe D1.4:**

**35.3.12.4 Traffic indication**

**…**

(#2302)An AP MLD (#8283)shall buffer an MMPDU that is not a Measurement MMPDU and intended for receipt by a STA affiliated with a non-AP MLD in the AP MLD when all STAs affiliated with the non-AP MLD are in power save mode. In this case, the bit in the partial virtual bitmap of the TIM element that corresponds to the AID of the non-AP MLD shall be set to 1. (#5761)An AP MLD shall not buffer a Measurement MMPDU.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Clause Number** | **Page.**  **Line** | **Comment** | **Proposed Change** | **Resolution** |
| 6249 | Ming Gan | 35.3.10.4 | 267.01 | Please add more description, The figure was simplified to show the order of AID assignment. In real deployment, the AID assignment for Pre-HE STAs or non-AP MLDs in the default mode and in non-default mode is not in the order, and this belongs to implementation specific. | as in the comment | Revised.  Added a description explaining that the figure is an example when AID assignments are done in a specific order: STAs, non-AP MLDs with default mapping, and non-AP MLDs with TID-to-link mapping.  TGbe editor to make the changes with the CID tag (#6249) in doc.: IEEE 802.11-22/196r0  [https://mentor.ieee.org/802.11/dcn/22/11-22-0196-00-00be-cc36-cr-ML-Traffic-Indication.docx] |
| 4397 | Arik Klein | 35.3.10.4 | 268.06 | Figure 35-8 shows that there is different ranges of AIDs that are assigned for non-AP MLD with defualt mapping and for non-AP MLD with non-defualt mapping. It seems to incorrect since AID is assigned as one-time value once the non-AP MLD has became associated with the AP MLD (till this association is torn-down) while having defualt mapping or non-defualt mapping may be changed frequently during the association period | Please clarify if the AID re-assigment is required each time the non-AP MLD is in transition from default mapping to non-default mapping (or vice versa)? If not - please correct the captions in the figure. | Revised.  Added a description explaining that the figure is an example when AID assignments are done in a specific order: STAs, non-AP MLDs with default mapping, and non-AP MLDs with TID-to-link mapping.  TGbe editor to make the changes with the CID tag (#4397) in doc.: IEEE 802.11-22/196r0  [https://mentor.ieee.org/802.11/dcn/22/11-22-0196-00-00be-cc36-cr-ML-Traffic-Indication.docx] |
| 4071 | Abhishek Patil | 35.3.10.4 | 267.40 | The presence and order in which the link bitmap for a non-AP MLD that is listed in Multi-Link Traffic element is based on the bit indication in the partial virtual bitmap of TIM element. A pre-11be non-AP STA will not decode the Multi-Link Traffic element and a STA that doesn't support TID-to-link mapping negotiations will ignore it as well. If AIDs are assigned at first come first basis, it will lead to many entries of link bitmap in Multi-Link traffic which are wasteful (since they correspond to legacy STA or non-AP MLDs that are not capable of TID-mapping negotiation). To prevent bloating of the Multi-Link Traffic element (and consequently bloating of the Beacon frame), an AP MLD must assign AIDs to legacy non-AP STAs and non-AP MLD in a certain order. For example, assign AID value in lower range to legacy STAs and non-AP MLDs that do not support TID-to-link mapping negotiations. And assign AID value higher than a certain offset (k) to non-AP MLDs that support TID-to-link mapping negotiation. | The spec must provide rules for AID assignment for an AP MLD such that legacy STAs and non-AP MLDs that do not support TID-mapping feature are assigned AIDs in the lower end followed by non-AP MLDs that support TID-to-link mapping. | Revised.  Added a recommendation that the AID assignment should be done in the following order: pre-EHT STAs, non-AP MLDs in the default mapping mode, and non-AP MLDs that successfully negotiated a TID-to-link mapping with an AP MLD with a nondefault mapping.  TGbe editor to make the changes with the CID tag (#4071) in doc.: IEEE 802.11-22/196r0  [https://mentor.ieee.org/802.11/dcn/22/11-22-0196-00-00be-cc36-cr-ML-Traffic-Indication.docx] |
| 4393 | Arik Klein | 35.3.10.4 | 267.42 | In addition to AID offset field setting, need to add a requirement for the AP MLD to assign consecutive range of AIDs (starting from 0) for non-MLD STAs and a different consecutive range of AIDs (not starting from 0) for the non-AP MLDs. Otherwise - the entire proposed indication machnaism in the Multi-link Traffic element will not work. | Add a requirement for the AP MLD to assign consecutive ranges of AID value for: (1) non-MLD STAs (starting from AID0 onwards). (2) MLD STAs (not starting from AID 0). | Revised.  Added a recommendation that the AID assignment should be done in the following order: pre-EHT STAs, non-AP MLDs in the default mapping mode, and non-AP MLDs that successfully negotiated a TID-to-link mapping with an AP MLD with a nondefault mapping.  TGbe editor to make the changes with the CID tag (#4393) in doc.: IEEE 802.11-22/196r0  [https://mentor.ieee.org/802.11/dcn/22/11-22-0196-00-00be-cc36-cr-ML-Traffic-Indication.docx] |
| 6734 | Rojan Chitrakar | 35.3.10.4 | 268.05 | As shown in Figure 35-8, an AP MLD should maintain separate AID spaces used to allocate AIDs for associated STAs that do not require additional ML Traffic Indication Bitmap (e.g., pre-EHT STAs or Non-AP MLDs with default TID-to-Link mapping) and a separate AID space used to allocate AIDs for associated STAs that require additional ML Traffic Indication Bitmap (e.g., EHT STAs or Non-AP MLDs with non-default TID-to-Link mapping), else the ML traffic element will carry unnecessary ML Traffic Indication Bitmap even for STAs that do not require them. | Add normative sentences stating that an AP MLD should maintain separate AID space used to allocate AIDs for associated STAs that do not require additional ML Traffic Indication Bitmap (e.g., pre-EHT STAs or Non-AP MLDs with default TID-to-Link mapping) and a separate AID space used to allocate AIDs for associated STAs that require additional ML Traffic Indication Bitmap (e.g., EHT STAs or Non-AP MLDs with non-default TID-to-Link mapping). | Revised.  Added a recommendation that the AID assignment should be done in the following order: pre-EHT STAs, non-AP MLDs in the default mapping mode, and non-AP MLDs that successfully negotiated a TID-to-link mapping with an AP MLD with a nondefault mapping.  TGbe editor to make the changes with the CID tag (#6734) in doc.: IEEE 802.11-22/196r0  [https://mentor.ieee.org/802.11/dcn/22/11-22-0196-00-00be-cc36-cr-ML-Traffic-Indication.docx] |
| 4113 | Abhishek Patil | 35.3.10.4 | 267.07 | This subclause applies for the case when AP MLD support TID-to-link mapping and at least one non-AP MLD has negotiated TID-mapping. The title needs to reflect this. | Update the title to "Traffic Indication with TID-to-Link mapping" | Accepted. |
| 5041 | Gaurang Naik | 35.3.10.4 | 267.07 | If the negotiated TID-to-link mapping between an AP MLD and a non-AP MLD is non-default, the spec is missing a mechanism on how to notify the links on which BUs are buffered for those non-AP MLDs that only monitor the TIM frames. | For non-AP MLDs that only monitor the TIM frames, specify a mechanism on how such non-AP MLDs are notified about buffered BUs. | Revised.  A non-AP MLD that has successfully negotiated a TID-to-link mapping with an AP MLD with a nondefault mapping shall receive and interpret a Multi-Link Traffic element together with TIM to determine which AP has buffered BU(s) or MMPDU(s). Added a sentence to clarify this similar to the baseline spec.  TGbe editor to make the changes with the CID tag (#5041) in doc.: IEEE 802.11-22/196r0  [https://mentor.ieee.org/802.11/dcn/22/11-22-0196-00-00be-cc36-cr-ML-Traffic-Indication.docx] |
| 4070 | Abhishek Patil | 35.3.10.4 | 267.35 | Clarify that if the AP MLD does not support TID-to-Link mapping feature, it shall not (never) include the Multi-Link Traffic element in the Beacon frame that it transmits. | As in comment | Revised.  An AP MLD that does not support TID-to-link mapping can also use the Multi-Link Traffic element to provide link recommendation to the associated non-AP MLDs. This is added to the paragraph.  TGbe editor to make the changes with the CID tag (#4070) in doc.: IEEE 802.11-22/196r0  [https://mentor.ieee.org/802.11/dcn/22/11-22-0196-00-00be-cc36-cr-ML-Traffic-Indication.docx] |
| 5194 | Guogang Huang | 35.3.10.4 | 267.35 | Considering the Measurement MMPDU is only allowed to transmit on the intended link, even when no associated non-AP MLD negotiates a TID-to-link mapping, the AP MLD also shall include the Multi-link Traffic element in a Beacon frame it transmits. Please add text to clarify the condition of including the Multi-link Traffic element in a Beacon frame | As in comment. | Rejected.  The condition for including the Multi-Link Traffic element is already defined in TGbe draft as follows:  “An AP affiliated with an AP MLD shall include the Multi-Link Traffic element (see 9.4.2.295e (Multi-Link Traffic element(#2341))) in a Beacon frame it transmits if at least one of the associated non-AP MLD has successfully negotiated a TID-to-link mapping (see 35.3.6.1.3 (Negotiation of TID-to-link mapping)) with the AP MLD and the AP MLD has buffered BU(s) for the non-AP MLD.” |
| 7726 | Xiaofei Wang | 35.3.10.4 | 267.35 | If a non-AP MLD successfully negotiated TID-to-Link mapping, does that include the case in which the default mapping was indicated in a TID-To-Mapping negotiation? In that case, please clarify whether the AP MLD shall include the Multi-link traffic element. | as in comment | Revised.  Clarified the text that the AP MLD shall include the Multi-link traffic element when the TID-to-Link mapping is successful with nondefault mapping.  TGbe editor to make the changes with the CID tag (#7726) in doc.: IEEE 802.11-22/196r0  [https://mentor.ieee.org/802.11/dcn/22/11-22-0196-00-00be-cc36-cr-ML-Traffic-Indication.docx] |
| 5219 | Huizhao Wang | 35.3.10.4 | 267.36 | It is entirely unnecessary to have Multi-Link Traffic IE: if any negotiated TID-to-link mapping exist, then the AP in the AP MLD corresponding to the link which the TID's BUs are buffered, then it will update its TIM element for the AID corresponding to the STA, and other APs in the same AP MLD won't update their TIM element. | Remove Multi-Link Traffic IE from the spec. | Rejected.  The Multi-Link Traffic element is needed to indicate which AP has buffered BUs when a non-AP MLD successfully negotiated TID-to-link mapping with an AP MLD. The suggested method by the commenter cannot tell whether there is buffered BU on the other link but only tell the state of the current link on which a TIM element is received. |
| 8037 | Yuchen Guo | 35.3.10.4 | 267.37 | The multi-link Traffic element only indicates DL traffic, but the 3rd line of this paragraph fails to say that the successfully negotiated TID-to-link mapping is for DL or bidirection. Same for Line 47 of this page. | add "for DL or bidirectional traffic" after "TID-to-link mapping", or other suitable wording. | Accepted. |
| 4469 | Arik Klein | 35.3.10.4 | 267.40 | Rephrase the following sentence for better clarity/ understanding:" The Multi-Link Traffic element includes Per-Link Traffic Indication Bitmap subfield(s) that corresponds to the AID(s) of the non-AP MLD(s), starting from the bit number k of the traffic indication virtual bitmap, in the Per-Link Traffic Indication Bitmap List field." | Consider the following revised text:" The Per-Link Traffic Indication Bitmap List field of the Multi-Link Traffic element includes Per-Link Traffic Indication Bitmap subfield(s), each corresponds to the AID of the non-AP MLD(s), starting from the AID indicated in bit number k of the traffic indication virtual bitmap." | Revised.  The sentence has been rephrased for better clarity.  TGbe editor to make the changes with the CID tag (#4469) in doc.: IEEE 802.11-22/196r0  [https://mentor.ieee.org/802.11/dcn/22/11-22-0196-00-00be-cc36-cr-ML-Traffic-Indication.docx] |
| 5148 | Geonjung Ko | 35.3.10.4 | 267.40 | Non-AP MLDs does not have knowledge of which AIDs correspond to MLDs. Therefore, the Multi-Link Traffic element should include Per-Link Traffic Indication Bitmap subfields that correspond to AIDs of a STA not affiliated with an MLD as well, if corresponding bits in the Partial Virtual Bitmap subfield are 1. | As in comment | Revised.  Agree with the commenter. Per-Link Traffic Indication Bitmap subfield could corresponds to the AID of a STA.  TGbe editor to make the changes with the CID tag (#5148) in doc.: IEEE 802.11-22/196r0  [https://mentor.ieee.org/802.11/dcn/22/11-22-0196-00-00be-cc36-cr-ML-Traffic-Indication.docx] |
| 6733 | Rojan Chitrakar | 35.3.10.4 | 267.40 | "The Multi-Link Traffic element includes Per-Link Traffic Indication Bitmap subfield(s) that corresponds to the AID(s) of the non-AP MLD(s), starting from the bit number k of the traffic indication virtual bitmap, in the Per-Link Traffic Indication Bitmap List field." It should be clarified that a Per-Link Traffic Indication Bitmap subfield only exist for bit set to 1 in the traffic indication virtual bitmap. Also, it cannot be guaranteed that the bits after bit k corresponds to AIDs of non-AP MLDs (e.g., it may also be non-MLDs) if AID spaces are not properly allocated. | Revise the sentence to clarify that a Per-Link Traffic Indication Bitmap subfield only exist for bits set to 1 in the traffic indication virtual bitmap. Also, change "non-AP MLD(s)" to "non-AP MLD(s) or non-AP STA(s)". | Revised.  In D1.31, P203L5 (clause 9), the spec defines the Per-Link Traffic Indication List field as follows, which clarifies that the bitmap exists only when the corresponding bit in the partial virtual bitmap in TIM is set to 1: “The Per-Link Traffic Indication List field contains *l* Per-Link Traffic Indication Bitmap subfields, where *l* is the number of the bits that correspond to the AIDs of the non-AP MLDs set to 1, counting from the bit numbered *k* of the traffic indication virtual bitmap, in the Partial Virtual Bitmap subfield of the TIM element that is included in a Beacon frame with the Multi-Link Traffic element.”  Agree with the second part of the comment and added STA(s) after non-AP MLD(s).  TGbe editor to make the changes with the CID tag (#6733) in doc.: IEEE 802.11-22/196r0  [https://mentor.ieee.org/802.11/dcn/22/11-22-0196-00-00be-cc36-cr-ML-Traffic-Indication.docx] |
| 4118 | Akira Kishida | 35.3.10.4 | 267.46 | D1.0 defines that a bit position of Per-Link Traffic Indication Bitmap subfield shall be set to 1 if the AP MLD has buffered BU(s) with TID(s) that are mapped to that link. If there are multiple mapped links for the TID(s), it is unclear whether this indication should be set for all the mapped links or partial of the mapped links. It should be clarifid that the "all links" should be set to 1 because AP should not limit the links to be used to get Buffered BU(s). | If a non-AP MLD has successfully negotiated a TID-to-link mapping with an AP MLD with a nondefault mapping, "all" the bit position i of the Per-Link Traffic Indication Bitmap subfield that corresponds to the link with the link ID equals to i on which a STA of the non-AP MLD is operating shall be set to 1 if the AP MLD has buffered BU(s) with TID(s) that are mapped to that link or MMPDU(s) for that non-AP MLD, otherwise the bit shall be set to 0. | Rejected.  Draft D1.31 defines as follows and this defines that all the bits that correspond to the links that are mapped to a TID are set to 1 if there is a BU with TID at the AP MLD.  “If a non-AP MLD has successfully negotiated a TID-to-link mapping with an AP MLD with a nondefault mapping, the bit position *i* of the Per-Link Traffic Indication Bitmap subfield that corresponds to the link with the link ID equals to *i* on which a STA of the non-AP MLD is operating shall be set to 1 if the AP MLD has buffered BU(s) with TID(s) that are mapped to that link or MMPDU(s) for that non-AP MLD, otherwise the bit shall be set to 0. |
| 5725 | KENGO NAGATA | 35.3.10.4 | 267.46 | D1.0 defines that a bit position of Per-Link Traffic Indication Bitmap subfield shall be set to 1 if the AP MLD has buffered BU(s) with TID(s) that are mapped to that link. If there are multiple mapped links for the TID(s), it is unclear whether this indication should be set for all the mapped links or partial of the mapped links. It should be clarified that the "all links" should be set to 1 because AP should not limit the links to be used to get Buffered BU(s). | If a non-AP MLD has successfully negotiated a TID-to-link mapping with an AP MLD with a nondefault mapping, all the bit position i of the Per-Link Traffic Indication Bitmap subfield that corresponds to the link with the link ID equals to i on which a STA of the non-AP MLD is operating shall be set to 1 if the AP MLD has buffered BU(s) with TID(s) that are mapped to that link or MMPDU(s) for that non-AP MLD, otherwise the bit shall be set to 0. | Rejected.  Draft D1.31 defines as follows and this defines that all the bits that correspond to the links that are mapped to a TID are set to 1 if there is a BU with TID at the AP MLD.  “If a non-AP MLD has successfully negotiated a TID-to-link mapping with an AP MLD with a nondefault mapping, the bit position *i* of the Per-Link Traffic Indication Bitmap subfield that corresponds to the link with the link ID equals to *i* on which a STA of the non-AP MLD is operating shall be set to 1 if the AP MLD has buffered BU(s) with TID(s) that are mapped to that link or MMPDU(s) for that non-AP MLD, otherwise the bit shall be set to 0. |
| 4394 | Arik Klein | 35.3.10.4 | 267.49 | Need to add further condition for setting the bit position i of the Per-Link Traffic Indication Bitmap subfield to 1 for Qos Data BUs | Please revise the sentence as follows: "If a non-AP MLD has successfully negotiated a TID-to-link mapping with an AP MLD with a nondefault mapping, the bit position i of the Per-Link Traffic Indication Bitmap subfield that corresponds to the link with the link ID equals to i on which a STA of the non-AP MLD is operating shall be set to 1 if the AP MLD has buffered BU(s) with TID(s) that are mapped to that link \*and if the STAs affiliated with the non-AP MLD are in Power Save mode in all links that are mapped to this TID\*..." | Rejected.  The following sentence clarifies the condition that all STAs affiliated with a non-AP MLD operating on the links that are mapped to a TID have to be in PS mode for the bit that corresponds to the AID of the non-AP MLD in TIM to be set to 1, and the corresponding Per-Link Traffic Indication Bitmap exists when the bit is set to 1:  “(#2302)An AP MLD shall buffer a BU with a TID at the AP MLD if (#4748)none of the links that the TID is mapped to is in active mode, and it shall set the bit in the partial virtual bitmap of the TIM element that corresponds to the AID of the non-AP MLD to 1.” |
| 4395 | Arik Klein | 35.3.10.4 | 267.50 | Need to add further condition for setting the bit position i of the Per-Link Traffic Indication Bitmap subfield to 1 for MMPDU BUs | Please revise the sentence as follows: "If a non-AP MLD has successfully negotiated a TID-to-link mapping ...shall be set to 1 if the AP MLD .. Or if the AP MLD has buffered MMPDU(s) for that non-AP MLD when all STAs affiliated with the non-AP MLD are in Power Save mode. " | Rejected.  The following sentence already clarifies the condition:  “(#2302)An AP MLD buffers an MMPDU that is not a Measurement MMPDU and intended for receipt by a STA affiliated with a non-AP MLD in the AP MLD when all STAs affiliated with the non-AP MLD are in power save mode. In this case, the bit in the partial virtual bitmap of the TIM element that corresponds to the AID of the non-AP MLD shall be set to 1.” |
| 4396 | Arik Klein | 35.3.10.4 | 267.52 | Need to add further condition for setting the bit position i of the Per-Link Traffic Indication Bitmap subfield to 1 for BUs | Please revise the sentence as follows: "If a non-AP MLD is in the default mapping mode (see 35.3.6.1.2 (Default mapping mode)), the bit position i of the Per-Link Traffic Indication Bitmap subfield that corresponds to the link with the link ID equal to i on which a STA affiliated with the non-AP MLD is operating may be set to 1 to indicate to the non-AP MLD a link on which buffered BU(s) should be retrieved \*only if all the STAs affiliated with the non-AP MLD are in PS mode\*." | Rejected.  The following sentence clarifies the condition that all STAs affiliated with a non-AP MLD operating on the links that are mapped to a TID have to be in PS mode for the bit that corresponds to the AID of the non-AP MLD in TIM to be set to 1, and the corresponding Per-Link Traffic Indication Bitmap exists when the bit is set to 1:  “(#2302)An AP MLD shall buffer a BU with a TID at the AP MLD if (#4748)none of the links that the TID is mapped to is in active mode, and it shall set the bit in the partial virtual bitmap of the TIM element that corresponds to the AID of the non-AP MLD to 1.” |
| 6250 | Ming Gan | 35.3.10.4 | 267.54 | Change "may" to "is" since "should" is mentioned later | as in the comment | Rejected.  In the following sentence, the first ‘may’ defines a normative behavior of an AP MLD and the second ‘should’ defines a normative behavior of a non-AP MLD. Therefore the current text is correct.  “If a non-AP MLD is in the default mapping mode (see 35.3.6.1.2 (Default mapping mode)), the bit position *i* of the Per-Link Traffic Indication Bitmap subfield that corresponds to the link with the link ID equal to *i* on which a STA affiliated with the non-AP MLD is operating may be set to 1 to indicate to the non-AP MLD a link on which buffered BU(s) should be retrieved.” |
| 7821 | Yiqing Li | 35.3.10.4 | 267.54 | It should be "..with the link ID equals to I on which..." | As commented. | Revised.  Fixed typo ‘equal’ to ‘equals’. Lowercase ‘*i*’ is correct.  TGbe editor to make the changes with the CID tag (#7821) in doc.: IEEE 802.11-22/196r0  [https://mentor.ieee.org/802.11/dcn/22/11-22-0196-00-00be-cc36-cr-ML-Traffic-Indication.docx] |

**TGbe Editor to make the following changes in Subclause 35.3.12.4 (Traffic indication) in P375L55 in TGbe D1.4:**

**35.3.12.4 Traffic indication**

**…**

(#1432)(#1697)(#2136)(#2153)(#2341)(#2342)(#3149)An AP affiliated with an AP MLD (#4070)that supports TID-to-link mapping negotiation shall include the Multi-Link Traffic element (see 9.4.2.295e (Multi-Link Traffic element(#2341))) in a Beacon frame it transmits if at least one of the associated non-AP MLD has successfully negotiated a TID-to-link mapping (see 35.3.6.1.3 (Negotiation of TID-to-link mapping)) with the AP MLD (#7726)with nondefault mapping (#8037)for DL or bidirectional traffic and the AP MLD has buffered BU(s) for the non-AP MLD. (#4070)An AP MLD may include the Multi-Link Traffic element in a Beacon frame it transmits if it intends to provide link recommendations to at least one of the associated non-AP MLDs and the AP MLD has buffered BU(s) for the non-AP MLD. The Multi-Link Traffic element includes Per-Link Traffic Indication Bitmap subfield(s) (#4469)in the Per-Link Traffic Indication Bitmap List field. The Per-Link Traffic Indication Bitmap subfield(s) corresponds to the AID(s) of the non-AP MLD(s) (#5148, 6733)or STA(s), starting from the bit number *k* of the traffic indication virtual bitmap(#4469). The AID Offset subfield of the Multi-Link Traffic Control field of the Multi-Link Traffic element contains the value *k*. The order of the Per-Link Traffic Indication Bitmap subfield(s) follows the order of the bits that are set to 1 in the Partial Virtual Bitmap subfield of the TIM element that corresponds to the AID(s) of the non-AP MLD(s) (#5148, 6733)or the STA(s). If a non-AP MLD has successfully negotiated a TID-to-link mapping with an AP MLD with a nondefault mapping, the bit position *i* of the Per-Link Traffic Indication Bitmap subfield that corresponds to the link with the link ID equals to *i* on which a STA of the non-AP MLD is operating shall be set to 1 if the AP MLD has buffered BU(s) with TID(s) that are mapped to that link or MMPDU(s) for that non-AP MLD, otherwise the bit shall be set to 0. If a non-AP MLD is in the default mapping mode (see 35.3.6.1.2 (Default mapping mode)), the bit position *i* of the Per-Link Traffic Indication Bitmap subfield that corresponds to the link with the link ID equals(#7821) to *i* on which a STA affiliated with the non-AP MLD is operating may be set to 1 to indicate to the non-AP MLD a link on which buffered BU(s) should be retrieved. (#4071, 4393, 6734)In order to reduce the overhead of the Multi-link Traffic element, an AP MLD should assign AIDs to pre-EHT STAs or non-AP MLDs in the following order: pre-EHT STAs, non-AP MLDs in the default mapping mode, and non-AP MLDs that successfully negotiated a TID-to-link mapping with an AP MLD with a nondefault mapping. An example of the construction of the Multi-Link Traffic element is shown in Figure 35-8 (Example of Multi-Link Traffic element construction) (#6249, 4397)for the case when AIDs are assigned in the following order: pre-EHT STAs, non-AP MLDs in the default mapping mode, and non-AP MLDs that successfully negotiated a TID-to-link mapping with an AP MLD with a nondefault mapping. (#5041)A non-AP MLD that successfully negotiated a TID-to-link mapping with an AP MLD with a nondefault mapping shall determine which AP has buffered BU(s) with TID(s) or MMPDU(s) by interpreting a Multi-Link Traffic element.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Clause Number** | **Page.**  **Line** | **Comment** | **Proposed Change** | **Resolution** |
| 8180 | Yunbo Li | 35.3.10.4 | 268.09 | in Figure 35-8, (N-1)\*8-1 should be N\*8-1, and N\*8-1 should be (N+1)\*8 -1. | as in comment | Accepted. |

**TGbe Editor to make the following changes in the figure 35-11 in TGbe D1.4:**



**Figure 35-11—Example of Multi-Link Traffic element construction(#8180)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Clause Number** | **Page.**  **Line** | **Comment** | **Proposed Change** | **Resolution** |
| 4929 | Eldad Perahia | 35.3.10.4 | 268.31 | "When a non-AP MLD that is in the default mapping mode (see 35.3.6.1.2 (Default mapping mode)) detects that the bit corresponding to its AID is 1 in the TIM element, any STA affiliated with the non-AP MLD may issue a PS-Poll frame, or a U-APSD trigger frame if the STA is using U-APSD and all ACs are delivery enabled, to retrieve buffered BU(s) in the AP MLD." If the non-AP MLD is always operating on 2.4 GHz, is there a way for the AP to force it to receive traffic on 5 GHz? | as in comment | Rejected.  This is invalid comment. The comment is asking a question. It is not proposing a change that can in any sense be interpreted as “specific wording”.  The Multi-Link Traffic element can be used to indicate a recommended link to a non-AP MLD that has corresponding Per-Link Traffic Indication Bitmap. |
| 4930 | Eldad Perahia | 35.3.10.4 | 268.37 | "When a non-AP MLD that is in the default mapping mode (see 35.3.6.1.2 (Default mapping mode)) detects that the bit corresponding to its AID is 1 in the TIM element and the Multi-Link Traffic element is present in a Beacon frame, any STA affiliated with the non-AP MLD that operates on the link(s) indicated in the Multi-Link Traffic element should issue a PS-Poll frame, or a U-APSD trigger frame if the STA is using U-APSD and all ACs are delivery enabled, to retrieve buffered BU(s) in the AP MLD." Is there anyway for the AP to force the STA to pick a particular link/band? | as in comment | Rejected.  This is invalid comment. The comment is asking a question. It is not proposing a change that can in any sense be interpreted as “specific wording”.  The Multi-Link Traffic element can be used to indicate a recommended link to a non-AP MLD that has corresponding Per-Link Traffic Indication Bitmap. |
| 8181 | Yunbo Li | 35.3.10.4 | 268.40 | "the link(s) indicated in the Multi-Link Traffic element" it is not clear what indicated means, should be modified to indicated as "1" in the Multi-link Traffic element. | as in comment | Revised.  Agree with the commenter. The paragraph is revised.  TGbe editor to make the changes with the CID tag (#8181) in doc.: IEEE 802.11-22/196r0  [https://mentor.ieee.org/802.11/dcn/22/11-22-0196-00-00be-cc36-cr-ML-Traffic-Indication.docx] |
| 6894 | Rubayet Shafin | 35.3.10.4 | 268.41 | This comment is related to three rules defined in the first three paragraphs in this page. For the second rule, in line 41, "should" is used in "..should issue a PS-Poll frame...". However, for the first rule (line 32) and second rule (line 49), "may" is used in "...may issue a PS-Poll frame..." | Please clarify the rationale for using "should" in some places and "may" in other places. | Rejected.  This is invalid comment. It fails to locate and identify the issue. Fails to identify changes in sufficient detail so that the specific wording of the changes can be determined.  The ‘may’ and ‘should’ are used based on the following definitions:  “In this document, the word *shall* is used to indicate a mandatory requirement. The word *should* is used to indicate a recommendation. The word *may* is used to indicate a permissible action. The word *can* is used for statements of possibility and capability.” |
| 4398 | Arik Klein | 35.3.10.4 | 268.45 | Need to add a condition that PS-Poll / U-APSD can be issued only if STA affiliated with the non-AP MLD is in PS mode on the corresponding links. | Please revise the sentence as follows:" When a non-AP MLD that has successfully negotiated TID-to-link mapping (see 35.3.6.1.3 (Negotiation of TID-to-link mapping)) detects that the bit corresponding to its AID is equal to 1 in the TIM element and any bit of the Per-Link Traffic Indication Bitmap subfield that corresponds to a link on which a STA affiliated with the non-AP MLD is operating is equal to 1 in the Multi-Link Traffic element, the STA affiliated with the non-AP MLD that operates on that link \*and is in PS mode on any of these links\*, may issue a PS-Poll frame, or a U-APSD trigger frame if the STA is using U-APSD and all ACs are delivery enabled, to retrieve buffered BU(s) from the AP MLD." | Rejected.  The following sentence clarifies the condition that all STAs affiliated with a non-AP MLD operating on the links that are mapped to a TID have to be in PS mode for the bit that corresponds to the AID of the non-AP MLD in TIM to be set to 1, and the corresponding Per-Link Traffic Indication Bitmap exists when the bit is set to 1:  “(#2302)An AP MLD shall buffer a BU with a TID at the AP MLD if (#4748)none of the links that the TID is mapped to is in active mode, and it shall set the bit in the partial virtual bitmap of the TIM element that corresponds to the AID of the non-AP MLD to 1.” |
| 8239 | Yuxin LU | 35.3.10.4 Traffic indication | 268.51 | "to retrieve buffered BU(s) from the AP MLD", here "from" is used. However, "in the AP MLD" is used on lines 35 and 42. Suggest to unify the use of "in" and "from" | As in comment | Revised.  Agree with the commenter. The two ‘in’ are replaced with ‘from’.  TGbe editor to make the changes with the CID tag (#8239) in doc.: IEEE 802.11-22/196r0  [https://mentor.ieee.org/802.11/dcn/22/11-22-0196-00-00be-cc36-cr-ML-Traffic-Indication.docx] |

**TGbe Editor to make the following changes in Subclause 35.3.12.4 (Traffic indication) in P376L42, P376L55 in TGbe D1.4:**

**35.3.12.4 Traffic indication**

**…**

When a non-AP MLD that is in the default mapping mode (see 35.3.6.1.2 (Default mapping mode)) detects that the bit corresponding to its AID is 1 in the TIM element, any STA affiliated with the non-AP MLD may issue a PS-Poll frame, or a U-APSD trigger frame if the STA is using U-APSD and all ACs are delivery enabled, to retrieve buffered BU(s) from(#8239) the AP MLD.

(#8181)When a non-AP MLD that is in the default mapping mode (see 35.3.6.1.2 (Default mapping mode)) detects that the bit corresponding to its AID is 1 in the TIM element and the Multi-Link Traffic element is present in a Beacon frame and the Multi-Link Traffic element includes a Per-Link Traffic Indication Bitmap that corresponds to the non-AP MLD, any STA affiliated with the non-AP MLD that operates on the link(s) indicated as 1 in the Per-Link Traffic Indication Bitmap should issue a PS-Poll frame, or a U-APSD trigger frame if the STA is using U-APSD and all ACs are delivery enabled, to retrieve buffered BU(s) from(#8239) the AP MLD.

When a non-AP MLD that has successfully negotiated TID-to-link mapping (see 35.3.6.1.3 (Negotiation of TID-to-link mapping)) detects that the bit corresponding to its AID is equal to 1 in the TIM element and any bit of the Per-Link Traffic Indication Bitmap subfield that corresponds to a link on which a STA affiliated with the non-AP MLD is operating is equal to 1 in the Multi-Link Traffic element, the STA affiliated with the non-AP MLD that operates on that link may issue a PS-Poll frame, or a U-APSD trigger frame if the STA is using U-APSD and all ACs are delivery enabled, to retrieve buffered BU(s) from the AP MLD.