IEEE P802.11
Wireless LANs

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| CC36 Comment Resolution Clause 9  |
| Date: 2022-1-24 |
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Abstract

This submission proposes comment resolution(s) for the following 24 CID(s) received in CC36 on TGbe D1.0 related to Clause 9:

Subclauses:

* 9.3.3.2 Beacon frame format
* 9.4.2.1 General
* 9.4.2.295b.2 Basic variant Multi-Link element
* 9.4.2.295e Multi-Link Traffic element
* 9.6.34.3 EML Operating Mode Notification frame format

CIDs:

* 8264, 4000, 5822
* 8274, 4009
* 6706, 5052
* 4107, 7352, 5136, 4350, 5137, 6373, 8176, 8174, 8175, 6370, 8056, 6708
* 5358, 6652

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: updated resolutions in cyan for the deferred CIDs (8264, 4000, 5822)

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| **CID** | **Commenter** | **Clause Number** | **Page.****Line** | **Comment** | **Proposed Change** | **Resolution** |
| 8264 | Zhiqiang Han | 9.3.3.2 | 105.14 | Multi-Link Traffic element shall be included in beacon frame. | Please add Multi-Link Traffic element into Beacon frame. | Revised.Agree with the commenter. Multi-link Traffic element is added to the beacon frame.TGbe editor to make the changes with the CID tag (#8264) in doc.: IEEE 802.11-22/193r1[https://mentor.ieee.org/802.11/dcn/22/11-22-193-01-00be-cc36-cr-clause9.docx] |
| 4000 | Abhishek Patil | 9.3.3.2 | 105.15 | Multi-Link Traffic element is optionally included in the Beacon frame if AP MLD supports TID mapping and at least one non-AP MLD has negotiated TID-to-link mapping with the AP MLD. | Add entry for Multi-Link Traffic element to Table 9-32 with appropriate description of the condition when the element is included in the Beacon frame | Revised.Agree with the commenter. Multi-link Traffic element is added to the beacon frame.TGbe editor to make the changes with the CID tag (#4000) in doc.: IEEE 802.11-22/193r1[https://mentor.ieee.org/802.11/dcn/22/11-22-193-01-00be-cc36-cr-clause9.docx] |
| 5822 | Lei Huang | 9.3.3.2 | 105.18 | Multi-Link Traffic element is missing in the Beacon frame. It is better to place the Multi-Link Traffic element immediately after the TIM element in the Beacon frame, which may be beneficial for STA's power save since the STA may stop parsing remaining elements in the Beacon frame in case of no buffered BUs for the STA. | as in the comment | Revised.Agree with the commenter. Multi-link Traffic element is added to the beacon frame.TGbe editor to make the changes with the CID tag (#5822) in doc.: IEEE 802.11-22/193r1[https://mentor.ieee.org/802.11/dcn/22/11-22-193-01-00be-cc36-cr-clause9.docx] |
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**TGbe Editor to make the following changes in Subclause 9.3.3.2 (Beacon frame format):**

**9.3.3.2 Beacon frame format**

***Update existing order 12 and insert four new rows to*** [***Table 9-60 (Beacon frame***](#bookmark55) ***[body(#1004)(#2246)(#3352)](#bookmark55)* [(#8264, 4000, 5822)](#bookmark55)*[)](#bookmark55):***.

**Table 9-60—Beacon frame body(#1004)(#2246)(#3352)(#8264, 4000, 5822)**

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| **Order** | **Information** | **Notes** |
| 12 | Quiet | The Quiet element is optionally present if dot11SpectrumManage- mentRequired is true or dot11RadioMeasurementActivated is true or dot11RestrictedTWTOptionImplemented is true(#2215). |
| <Last assigned + 1> | Multi-Link | (#3016)(#1005)(#1896)(#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> | Multi-Link Traffic | The Multi-Link Traffic element is present if dot11MultiLinkTIMActivated is true; otherwise it is not present. |

**35.3.12.4 Traffic indication**

**…**

**TGbe Editor to insert the following paragraph in Subclause 35.3.12.4 (Traffic Indication) in TGbe D1.4:**

(#8264, 4000, 5822)An AP MLD shall set dot11MultiLinkTIMActivated to true if dot11TIDtoLinkMappingActivated is true and if any of the following conditions is met and otherwise shall set to false:

- At least one of the associated non-AP MLD(s) 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 not all TIDs are mapped to all the enabled links and the AP MLD has buffered BU(s) for that non-AP MLD

- The AP MLD intends to provide link recommendations to at least one of the associated non-AP MLD(s) that has successfully negotiated a TID-to-link mapping with the AP MLD and all TIDs are mapped to all the enabled links and the AP MLD has buffered BU(s) for that non-AP MLD

- The AP MLD intends to provide link recommendations to at least one of the associated non-AP MLD(s) that is in the default mapping mode (35.3.7.1.2 (Default mapping mode)) and the AP MLD has buffered BU(s) for that non-AP MLD.

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| **CID** | **Commenter** | **Clause Number** | **Page.****Line** | **Comment** | **Proposed Change** | **Resolution** |
| 8274 | Zhiqiang Han | 9.4.2.1 | 119.10 | There is no Multi-Link Trafftic element. | Please add the Multi-Link Traffic element into the table. | Revised.Agree with the commenter. The Multi-Link Traffic element was added in TGbe D1.1. However, the entries for the ‘Extensible’ and ‘Fragmentable’ are missing.TGbe editor to make the changes with the CID tag (#8274) in doc.: IEEE 802.11-22/193r1[https://mentor.ieee.org/802.11/dcn/22/11-22-193-01-00be-cc36-cr-clause9.docx]  |
| 4009 | Abhishek Patil | 9.4.2.1 | 119.11 | Entry for Multi-Link Traffic element is missing in Table 9-92 | Add a row for Multi-Link Traffic element in Table 9-92 - Extensible:Yes, Fragmentable:Yes | Revised.Agree with the commenter. The Multi-Link Traffic element was added in TGbe D1.1. However, the entries for the ‘Extensible’ and ‘Fragmentable’ are missing.TGbe editor to make the changes with the CID tag (#8274) in doc.: IEEE 802.11-22/193r1[https://mentor.ieee.org/802.11/dcn/22/11-22-193-01-00be-cc36-cr-clause9.docx]  |
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**TGbe Editor to make the following changes in Subclause 9.4.1.1 (General):**

* + 1. **Elements**
			1. **General**

***Insert a new row to*** [***Table 9-128 (Element IDs(#1009)(#1121))***](#bookmark86)***:***

**Table 9-128—Element IDs(#1009)(#1121)(#8274, 4009)**

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| --- | --- | --- | --- | --- |
| **Element** | **Element ID** | **Element ID Extension** | **Extensible** | **Fragmentable** |
| EHT Operation (see [9.4.2.311 (EHT](#bookmark113) [Operation element)](#bookmark113)) | 255 | 106 | Yes | No |
| Multi-Link (see [9.4.2.312 (Multi-Link](#bookmark116) [element)](#bookmark116)) | 255 | 107 | Yes | Yes |
| EHT Capabilities (see [9.4.2.313 (EHT](#bookmark142) [Capabilities element(#4819))](#bookmark142)) | 255 | 108 | Yes | No |
| TID-To-Link Mapping (see [9.4.2.314](#bookmark159) [(TID-To-Link Mapping element)](#bookmark159)) | 255 | 109 | Yes | Yes |
| Multi-Link Traffic (see [9.4.2.315 (Multi-](#bookmark162) [Link Traffic element(#2341))](#bookmark162)) | 255 | 110 | Yes | Yes |
| (#4918)QoS Characteristics (see [9.4.2.316](#bookmark167) [(QoS Characteristics element(#4918))](#bookmark167) | 255 | <ANA> | Yes | Yes |

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| **CID** | **Commenter** | **Clause Number** | **Page.****Line** | **Comment** | **Proposed Change** | **Resolution** |
| 6706 | Rojan Chitrakar | 9.4.2.295b.2 | 131.06 | It appears (from clause 35) that the EML Capabilities subfield is always present in the MLE; if so it is very wasteful to include a 3 octets field when both EMLSR and EMLMR are not supported, just to signal the two Support bits (both set to 0). | Consider more efficient method of signaling the EMLSR/EMLMR Support bits. One solution may be to rearrange this field such that bits B5 -B7 are reserved and the EMLMR Delay field is shifted right; if both EMLSR and EMLMR are not supported, then this capability field can be reduced to 1 octet. | Rejected.Based on 11be D1.31, the EML Capabilities subfield is not always present. Please see the following in P380L44: “(#6741)An MLD with dot11EHTEMLSROptionImplemented equal to false and dot11EHTEMLMROptionImplemented equal to false shall set the EML Capabilities Present subfield to 0.”  |
| 5052 | Gaurang Naik | 9.4.2.295b.2 | 131.17 | There is discrepancy in the size of EML capabilities subfield | Specify if the size of the EML Capabilities subfield is 2 octets or 3 octets | Revised.Agree with the commenter. The EML Capabilities subfield is 3 octets.TGbe editor to make the changes with the CID tag (#5052) in doc.: IEEE 802.11-22/193r1[https://mentor.ieee.org/802.11/dcn/22/11-22-193-01-00be-cc36-cr-clause9.docx]  |

**TGbe Editor to make the following changes in Subclause 9.4.2.312.2.1 (Multi-Link Control field of the Basic Multi-Link element):**

**Multi-Link Control field of the Basic Multi-Link element(#7567)**

The format of the Common Info field of the (#6700)Basic Multi-Link element is defined in [Figure 9-1002e](#bookmark123) [(Common Info field of the Basic Multi-Link element for-](#bookmark123) [mat(#6700)(#5043)(#1068)(#2139)(#2159)(#2161)(#3018)(#1773)(#2603)(#3017))](#bookmark123).

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| --- | --- | --- | --- | --- | --- | --- |
| Common Info Length | MLD MACAddress | Link ID Info | BSSParameters Change Count | Medium Synchronization Delay Information | EMLCapabilities | MLDCapabilities |

 Octets: 1 6 0 or 1 0 or 1 0 or 2 0 or 3 0 or 2

**Figure 9-1002e—Common Info field of the Basic Multi-Link element for- mat(#6700)(#5043)(#1068)(#2139)(#2159)(#2161)(#3018)(#1773)(#2603)(#3017)(#5052)**

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| **CID** | **Commenter** | **Clause Number** | **Page.****Line** | **Comment** | **Proposed Change** | **Resolution** |
| 4107 | Abhishek Patil | 9.4.2.295e | 153.22 | The name "Multi-Link Traffic" doesn't convey the intended meaning of this element. The element is providing traffic indication for the case when TID mapping is negotiated between the MLDs. | Suggest changing the name to Multi-Link Traffic 'Indication' element. | Revised.TGbe editor to replace ‘Multi-Link Traffic element’ to ‘Multi-Link Traffic Indication element’ throughout the TGbe draft.Also change the name of the Multi-Link Traffic Control subfield to ‘Multi-Link Traffic Indication Control’ subfield throughout the TGbe draft.  |
| 7352 | Stephen McCann | 9.4.2.295e | 153.28 | It is not immediately clear how the length of the Per-Link Traffic Indication List in Figure 9-788ead is determined. The length is "m+1"\*"l" (padded to the next octet), but it appears that only "m+1" can be determined by the receiver. I don't see how "l" can be determined. | Make one of the following changes. Either:1) Add a length sub-field for the Per-Link Traffic Indication List sub-field2) Clarify how the value of "l" is determined by the receiver. | Rejected.The value ‘*l*’ is determined based on the following text in P205L5 in D1.31:“The Per-Link Traffic Indication List field contains *l* Per-Link Traffic IndicationBitmap subfields, where *l* is the number of the bits that correspond to the AIDs of the non-AP MLDs set to1, 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.” |
| 5136 | Geonjung Ko | 9.4.2.295e | 153.62 | Non-AP MLDs does not have knowledge of which AIDs correspond to MLDs. | The Per-Link Traffic Indication List field should contain Per-Link Traffic Indication Bitmap subfields that correspond to STAs not affiliated with an MLD as well, if corresponding bits in the Partial Virtual Bitmap subfield are 1. | Revised.Agree with the commenter. The Per-Link Traffic Indication List field may include Per-Link Traffic Indication Bitmap subfields that corresponds to AIDs assigned to STAs.TGbe editor to make the changes with the CID tag (#5136) in doc.: IEEE 802.11-22/193r1[https://mentor.ieee.org/802.11/dcn/22/11-22-193-01-00be-cc36-cr-clause9.docx] |
| 4350 | Arik Klein | 9.4.2.295e | 153.65 | Rephrase the following sentence for clarity: "where l is the number of the bits that correspond to the AIDs of the non-AP MLDs set to 1" | Consider the following text:"where l is the number of the bits that \*are set to 1 and\*correspond to the AIDs of the non-AP MLDs" | Revised.For clarity, added ‘and’ in front of ‘set to 1’.TGbe editor to make the changes with the CID tag (#4350) in doc.: IEEE 802.11-22/193r1[https://mentor.ieee.org/802.11/dcn/22/11-22-193-01-00be-cc36-cr-clause9.docx] |
| 5137 | Geonjung Ko | 9.4.2.295e | 153.65 | Non-AP MLDs does not have knowledge of which AIDs correspond to MLDs. | The number l should count the number of bits that correspond to STAs not affiliated with an MLD as well, if corresponding bits in the Partial Virtual Bitmap subfield are 1. | Revised.Agree with the commenter. The Per-Link Traffic Indication List field may include Per-Link Traffic Indication Bitmap subfields that corresponds to AIDs assigned to STAs.TGbe editor to make the changes with the CID tag (#5137) in doc.: IEEE 802.11-22/193r1[https://mentor.ieee.org/802.11/dcn/22/11-22-193-01-00be-cc36-cr-clause9.docx] |
| 6373 | Morteza Mehrnoush | 9.4.2.295e | 154.05 | In figure "Figure 9-788eaf", there is a indexing for 1 to n for the Per-Link Traffic Indication Bitmap (1 to n); Please define "n" in the text. | as in comment | Revised.Agree with the commenter. ‘n’ is replaced with ‘*l*’ which is the variable that indicates the number of Per-Link Traffic Indication Bitmap subfields.TGbe editor to make the changes with the CID tag (#6373) in doc.: IEEE 802.11-22/193r1[https://mentor.ieee.org/802.11/dcn/22/11-22-193-01-00be-cc36-cr-clause9.docx] |
| 8176 | Yunbo Li | 9.4.2.295e | 154.13 | A Per-Link Traffic Indication Bitmap subfield may corresponding to a legacy STA, current text doesn't include the description about legacy STA. | Please add the descripton about legacy STA. E.g. if a Per-Link Traffic Indication Bitmap subfield corresponsding to a legacy STA. the bits are reserved. | Revised.Agree with the commenter. Added a sentence for a legacy STA.TGbe editor to make the changes with the CID tag (#8176) in doc.: IEEE 802.11-22/193r1[https://mentor.ieee.org/802.11/dcn/22/11-22-193-01-00be-cc36-cr-clause9.docx]  |
| 8174 | Yunbo Li | 9.4.2.295e | 154.15 | TID-Link mapping --> TID-To-Link mapping, search the whole spec and do the according modifications. | as in comment | Revised.Replaced TID-Link mapping to TID-to-link mapping.TGbe editor to make the changes with the CID tag (#8174) in doc.: IEEE 802.11-22/193r1[https://mentor.ieee.org/802.11/dcn/22/11-22-193-01-00be-cc36-cr-clause9.docx] |
| 8175 | Yunbo Li | 9.4.2.295e | 154.29 | "on which a STA affiliated with a non-AP MLD is operating" the STA MLD may not operating on some of the links base on ML association. Please delete or modify this sentence. | as in comment | Revised.Agree with the commenter. Moved the quoted phrase to the later part of the paragraph.TGbe editor to make the changes with the CID tag (#8175) in doc.: IEEE 802.11-22/193r1[https://mentor.ieee.org/802.11/dcn/22/11-22-193-01-00be-cc36-cr-clause9.docx] |
| 6370 | Morteza Mehrnoush | 9.4.2.295e | 154.34 | Per the definition of buffarble unit (BU), bufferable MMPDU is part of the BU, so we don't need to mention MMPDU again at the end of the sentense. So, remove "or MMPDU(s)" and "nor MMPDU(s)" in below text:"there is buffered BU(s) with TID(s) mapped to the link with the link ID equal to i or MMPDU(s); a value of 0 in a bit position in the bitmap indicates that there is no buffered BU(s) with TID(s) mapped to the corresponding link nor MMPDU(s).""bufferable unit (BU): A medium access control (MAC) service data unit (MSDU), aggregate MAC service data unit (A-MSDU) [high-throughput (HT) stations (STAs) and directional multi-gigabit (DMG) STAs only], or bufferable MAC management protocol data unit (MMPDU)." | as in comment | Rejected.The MMPDU in the sentence is needed because MMPDU is not mapped to a TID and without MMPDU in the sentence the bitmap only indicates buffered data frames.  |
| 8056 | Yuchen Guo | 9.4.2.295e | 154.34 | If all the buffered BU(s) correspond to delivery-enabled ACs, and not all ACs are delivery enabled, will the bit still be set to 1? | Please clarify | Rejected.Based on 11-13/230r5 (comment resolution tutorial document), this is an invalid comment. The commenter is asking a question. It is not proposing a change that can in any sense be interpreted as “specific wording”.The bit is set to 1 to indicate that there is buffered BU(s) with TID(s) mapped to the corresponding link. |
| 6708 | Rojan Chitrakar | 9.4.2.295e | 154.37 | It is not clear whether more than one bit can be set as 1 in the same Per-Link Traffic Indication Bitmap. | Please state whether more than one bit can be set as 1 in the same Per-Link Traffic Indication Bitmap, and if yes for what scenario? If it is not allowed, the bitmap can potentially be reduced by 1 bit by not including the bit corresponding to the link in which the element is transmitted since the link can be implicitly signaled.by setting all bits of the bitmap to 0. | Rejected.In P365L46 in D1.31, the following paragraph states that there could be more than one link used to retrieve data:“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.” |

**TGbe editor to replace the name ‘Multi-Link Traffic element’ to ‘Multi-Link Traffic Indication element’ and change the name ‘Multi-Link Traffic Control’ subfield to ‘Multi-Link Traffic Indication Control’ subfield throughout the TGbe draft.(#4107)**

**TGbe Editor to make the following changes in Subclause 9.4.2.315 (Multi-Link Traffic element):**

**9.4.2.315 Multi-Link Traffic element(#2341)**

The Per-Link Traffic Indication List field is defined in Figure 9-1002ad (Per-Link Traffic Indication List field format). The Per-Link Traffic Indication List field contains Per-Link Traffic Indication Bitmap subfields that correspond to the AIDs of the non-AP MLDs (#5136)and STAs starting from the bit numbered *k* of the traffic indication virtual bitmap. 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 (#5137)and STAs (#4350)and 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.

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| Per-Link Traffic Indication Bitmap 1 | … | Per-Link Traffic Indication Bitmap *l* | Padding |

 Bits: *m*+1 *m*+1 variable (0–7)

**Figure 9-1002ad—Per-Link Traffic Indication List field format(#6373)**

The Per-Link Traffic Indication Bitmap subfield is defined in Figure 9-788eag (Per-Link Traffic Indication Bitmap subfield format). Each Per-Link Traffic Indication Bitmap subfield indicates per-link traffic indications for a non-AP MLD that has negotiated a (#8174)TID-to-link mapping with an AP MLD (#8264, 4000, 5822)and not all TIDs are mapped to all the enabled links or link recommendation for a non-AP MLD (#8264, 4000, 5822) that has negotiated a TID-to-link mapping with an AP MLD and all TIDs are mapped to all the enabled links or link recommendation for a non-AP MLD that is in the default mapping mode. (#8176)When a Per-Link Traffic Indication Bitmap subfield corresponds to an AID of a STA that is not affiliated with a non-AP MLD, the Per-Link Traffic Indication Bitmap subfield is reserved.

(#8175)Each bit in the Per-Link Traffic Indication Bitmap subfield corresponds to a link and the bit position *i* of the bitmap, B*i*, corresponds to a link with link ID equal to *i*. When the Per-Link Traffic Indication Bitmap subfield corresponds to a non-AP MLD that has successfully negotiated TID-to-link mapping, a value of 1 in the bit position *i* in the bitmap that corresponds to a link on which a STA affiliated with a non-AP MLD is operating indicates that there is buffered BU(s) with TID(s) mapped to the link with the link ID equal to *i* or MMPDU(s); a value of 0 in a bit position in the bitmap indicates that there is no buffered BU(s) with TID(s) mapped to the corresponding link nor MMPDU(s). When the Per-Link Traffic Indication Bitmap subfield corresponds to a non-AP MLD that is in the default mapping mode, a value of 1 in the bit position *i* in the bitmap indicates that the link with the link ID equal to *i* is recommended for retrieving buffered BU(s).

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| **CID** | **Commenter** | **Clause Number** | **Page.****Line** | **Comment** | **Proposed Change** | **Resolution** |
| 5358 | Jarkko Kneckt | 9.6.3.34 | 160.12 | It is not described how a STA takes EMLSR mode into use or stops operating in this mode. A non-AP MLD should be able to transition to/from EMLSR mode fast. | The EMLSR mode shall be fast (few hundrets of microseconds) to take into use or to stop operating in the mode. If the operation in the EMLSR mode is stopped/started, it should be clarified whether both links are in awake state after transition. | Revised.The procedures to enable and disable EMLSR mode was added in Draft 1.31, P380L49/P381L50.No change is needed. |
| 6652 | Qi Wang | 9.6.34.3 | 160.30 | "EML Control" of the EML Operating Mode Notification frame contains "EMLSR" field. However, this notification frame doesn't seem to be used for EMLSR operation. Please clarify whether this notification frame is used for both EMLMR and EMLSR operations or only for the EMLMR operation. | As in comment. | Revised.The procedures to enable and disable EMLSR mode was added in Draft 1.31, P380L49/P381L50.No change is needed. |