IEEE P802.11
Wireless LANs

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| LB266: CR for Clause 9 |
| Date: December 16, 2022 |
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 Abstract

This submission proposes resolutions for following 17 CIDs received for TGbe LB266:

13100, 12936, 12162, 10560, 11392, 13475, 13753, 13476, 14113, 11518, 11515, 10558, 11516, 12739, 12740, 12058, 12933

**Revisions:**

* Rev 0: Initial version of the document.
* Rev 1: Live changes during the call on 12/19. CIDs highlighted in yellow are deferred.
* Rev 2: Revised resolutions for CID 13100, 12936, 10560, 11392, 13475, and 11516. Resolutions highlighted in cyan.

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGbe Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGbe Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGbe Editor: Editing instructions preceded by “TGbe Editor” are instructions to the TGbe editor to modify existing material in the TGbe draft. As a result of adopting the changes, the TGbe editor will execute the instructions rather than copy them to the TGbe Draft.***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Section** | **Pg.Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 13100 | Chittabrata Ghosh | 9.4.2.312.2 | 281.17 | The eMLMR/MLSR definitions in Multi-Link element cannot model (do not allow) a valid realization of an MLD in the form of a shared baseband/radio for different sets of links and dedicated baseband/radios for others. For example, a 3-STA MLD with one radio used for 2.4/5 and another for 6GHz (or one for 2.4/5 and another for 6). This is unfortunate and fixable because problem seems to be purely with modeling (element fields and definnitions); operation for such devices is adequately covered by current text. Generally text and concepts around eMLSR and eMLMR operation in current draft stay valid or slightly modified, but the relationship and operation should be viewed as link-level instead of device level. | Develop text along the following lines,- Consider renaming eMLSR to enhanced multi-link shared radio (many single-radio instances chnaged to shared radio)- Shared radio is a realtionship between two links (it is roughly NSTT + NSRR if borrowing from STR/NSTR acronyms)- eMLSR/eMLMR operatiuon definitions unchanged- changes to capabilities (MLD, EML) and similar definitions | **Rejected**The comment fails to identify a technical issue that needs to be resolved.   |
| 12936 | Payam Torab Jahromi | 9.4.2.312.2 | 281.17 | The eMLMR/MLSR definitions in Multi-Link element cannot model (do not allow) a valid realization of an MLD in the form of a shared baseband/radio for different sets of links and dedicated baseband/radios for others. For example, a 3-STA MLD with one radio used for 2.4/5 and another for 6GHz (or one for 2.4/5 and another for 6). This is unfortunate and fixable because problem seems to be purely with modeling (element fields and definnitions); operation for such devices is adequately covered by current text. Generally text and concepts around eMLSR and eMLMR operation in current draft stay valid or slightly modified, but the relationship and operation should be viewed as link-level instead of device level. | Develop text along the following lines,- Consider renaming eMLSR to enhanced multi-link shared radio (many single-radio instances chnaged to shared radio)- Shared radio is a realtionship between two links (it is roughly NSTT + NSRR if borrowing from STR/NSTR acronyms)- eMLSR/eMLMR operatiuon definitions unchanged- changes to capabilities (MLD, EML) and similar definitions | **Rejected**The comment fails to identify a technical issue that needs to be resolved.   |
| 12162 | SAI SHANKAR NANDAGOPALAN | 9.4.2.312.2.1 | 0.00 | EMLSR need to distinguish between main radio and scan radio. This would help to not use padding delay and transition delay when AP is communicating with main radio in DL. Only when the AP knows that it is communicating with scan radio then it can use those as they reduce MAC efficiency. It has its purpose but need to optimize it | Need to use reserved bits in multi-link element to do this change. | **Rejected**The comment fails to identify a technical issue that needs to be resolved. Specification of EMLSR does not rely on or need any of such terms as identified by the commenter. Hence, no changes are needed.  |
| 10560 | Abhishek Patil | 9.4.2.312.2.2 | 219.44 | The meaning of SRS Support field is different for an AP MLD and a non-AP MLD. On the AP side it is the ability to generate the frame. Hence the term reception is incorrect. Also take into account the usage of this field for nSTR Mobile AP MLD. | As in comment | **Revised**Agree with the commenter in principle. The description text is revised. **TGbe editor: Please implement the changes shown in document [**<https://mentor.ieee.org/802.11/dcn/22/11-22-1480-02-00be-lb266-cr-for-clause-9.docx>] **tagged as 10560**  |
| 11392 | Gaurang Naik | 9.4.2.312.2.2 | 219.44 | The definition of SRS Support is incomplete/incorrect. Currently, it only describes what SRS Support means for an AP MLD. Need to revise the definition such that it captures AP's support as well as non-AP's support. | As in comment | **Revised**Agree with the commenter in principle. The description text is revised. **TGbe editor: Please implement the changes shown in document [**<https://mentor.ieee.org/802.11/dcn/22/11-22-1480-02-00be-lb266-cr-for-clause-9.docx>] **tagged as 10560**  |
| 13475 | Liwen Chu | 9.4.2.312.2.2 | 219.44 | It seems that a non-AP MLD as the transmitter side doesn't need to announce whether it supports SRS support or not. | As in comment | **Revised**Agree with the commenter principle. The description text is revised. **TGbe editor: Please implement the changes shown in document [**<https://mentor.ieee.org/802.11/dcn/22/11-22-1480-02-00be-lb266-cr-for-clause-9.docx>] **tagged as 10560**  |
| 13753 | Yuchen Guo | 9.4.2.312.2.2 | 216.36 | It seems that the dot11MSDOFDMEDthreshold will never be less than -72dBm, what's the reason for that? suggest to change the calculation method such that dot11MSDOFDMEDthreshold can be set to a wider range of value | As in the comment | **Rejected**The comment fails to identify a technical issue that needs to be resolved and is asking a question.During discussions on a suitable range for dot11MSDOFDMEDthreshold, concerns were raised that selecting a threshold less than -72 dBm can create unfairness for 11be STAs since this threshold is also used to detect non-802.11 transmissions. The value of -72 dBm was selected to maintain a good balance between being conservative towards potentially ongoing 802.11 transmissions and unfairness towards 11be STAs in the presence of non-802.11 transmissions.Also see related discussions in [https://mentor.ieee.org/802.11/dcn/21/11-21-1825-03-00be-remaining-cr-for-35-3-15-8-1.docx] |
| 13476 | Liwen Chu | 9.4.2.312.2.3 | 221.50 | add the following text at the end of the paragraph: An AP affiliated with an NSTR mobile AP MLD and that is operating on the nonprimary link set this subfield to 0. | As in comment | **Revised**Agree with the commenter in principle. However, the AP operating on nonprimary link does not send Beacon/Probe Response frames. Hence, a statement is added to say that the AP operating on the primary link sets the subfield to 0 in the Per-STA Profile corresponding to the AP operating on the nonprimary link. Similar text is added for other subfields in the Basic Multi-Link element that do not apply to NSTR mobile AP MLDs.**TGbe editor: Please implement the changes shown in document [**[https://mentor.ieee.org/802.11/dcn/22/11-22-1480-01-00be-lb266-cr-for-clause-9.docx](https://mentor.ieee.org/802.11/dcn/22/11-22-1480-00-00be-lb266-cr-for-clause-9.docx)] **tagged as 13476** |
| 14113 | Li-Hsiang Sun | 9.4.2.312.2.3 | 221.52 | TSF Offset Present should always be set to 0 for a NSTR mobile AP MLD | As in comment | **Revised**Agree with the commenter in principle. A statement is added to say that the AP operating on the primary link sets the subfield to 0 in the Per-STA Profile corresponding to the AP operating on the nonprimary link. Similar text is added for other subfields in the Basic Multi-Link element that do not apply to NSTR mobile AP MLDs.**TGbe editor: Please implement the changes shown in document [**[https://mentor.ieee.org/802.11/dcn/22/11-22-1480-01-00be-lb266-cr-for-clause-9.docx](https://mentor.ieee.org/802.11/dcn/22/11-22-1480-00-00be-lb266-cr-for-clause-9.docx)] **tagged as 13476** |
| 11518 | Xiaofei Wang | 9.4.2.312.2.2 | 222.05 | Is "complete profile subfield = 0 and NSTR Link pair present subfield = 1" a valid combination? If not, that needs to be specified. Otherwise, please remove the condition "Complete profile subfield is equal to 1" | as in comment | **Revised**Agree with the issue pointed by the commenter. A statement is added to say that the cited condition is invalid. **TGbe editor: Please implement the changes shown in document [**[https://mentor.ieee.org/802.11/dcn/22/11-22-1480-01-00be-lb266-cr-for-clause-9.docx](https://mentor.ieee.org/802.11/dcn/22/11-22-1480-00-00be-lb266-cr-for-clause-9.docx)] **tagged as 11518** |
| 11515 | Xiaofei Wang | 9.4.2.312.2.2 | 220.28 | does "not an NSTR mobile AP MLD" mean "a regular non-mobile AP MLD" or "a STR mobile AP MLD" or "an AP MLD that is a regular STR AP MLD"? Please clarify | maybe change to "set to 1 to indicate AP MLD is an NSTR mobile AP MLD; otherwise, set to 0" | **Revised**The text is revised. The subfield is set to 1 if the AP MLD is an NSTR mobile AP MLD. Otherwise, the subfield is set to 0.**TGbe editor: Please implement the changes shown in document [**[https://mentor.ieee.org/802.11/dcn/22/11-22-1480-01-00be-lb266-cr-for-clause-9.docx](https://mentor.ieee.org/802.11/dcn/22/11-22-1480-00-00be-lb266-cr-for-clause-9.docx)] **tagged as 11515** |
| 10558 | Abhishek Patil | 9.4.2.312.1 | 213.34 | Move the Link ID Info and BPCC subfields out of the Common Info field and add them to a separate field between Multi-Link Control and Common Info field. Name the new field 'Transmitting Link Info'. | As in comment | **Rejected**The group could not reach consensus on a proposed change that would resolve this comment. Members had different opinions on an appropriate name for the new subfield and how to restructure the ML element. |
| 11516 | Xiaofei Wang | 9.4.2.312.2.2 | 221.28 | is the Link ID subfield the same as defined in figuire 9-1002i? If so, it doesn't need to be specified again and a reference should be made to the previous definition. | as in comment | **Revised**Agree with the commenter in principle. The field Link ID has been defined at several places in the spec. Propose to define a new ‘Link ID Info’ field in Clause 9.4.1 and refer to it throughout the draft.**TGbe editor: Please implement the changes shown in document [**<https://mentor.ieee.org/802.11/dcn/22/11-22-1480-02-00be-lb266-cr-for-clause-9.docx>] **tagged as 11516** |
| 12739 | Liuming Lu | 9.4.2.312.2.2 Common Info field of the Basic Multi-Link element | 220.18 | The name of "AP MLD Type Indication" seems to be inappropriate as it is a subfileld of the MLD Capabilities and Operations field, which refers to the Capabilities and Operations and doesn't mean the device type. | Suggest to modify "AP MLD Type Indication subfied" as "NSTR Mobile AP MLD Operation Support subfield" | **Rejected**NSTR Mobile AP MLD is a specific category of an AP MLD. It would not be appropriate for an AP MLD that is not an NSTR mobile AP MLD to provide an indication whether ‘it supports NSTR Mobile AP MLD Operation’. The name of the subfield as defined in D2.0/D2.3 seems more appropriate for the intention. |
| 12740 | Liuming Lu | 9.4.2.312.2.2 Common Info field of the Basic Multi-Link element | 220.18 | There is no indication on whether the non-AP MLD supports to operate with an NSTR mobile AP MLD. | Suggest to add an indication on whether the non-AP MLD supports to operate with NSTR mobile AP MLD. | **Rejected**It is the non-AP MLD’s choice to select how many links to request during association when associating with an NSTR mobile AP MLD.  |
| 12058 | Massinissa Lalam | 9.4.2.312.1 | 213.33 | It is a bit confiusing to have link specific information (Link ID Info and BSS Parameters Change subfield) in the Common Info subfield. Since those Link ID Info and BSS Parameters Change are one byte each and only present in the Basic ML ELement, maybe they should be in the Link Info subfield before (or after) the Per-STA Profile subelements. Otherwise, what is the rationale to have specific element in a common info subfield? | As in comment | **Rejected**The group could not reach consensus on a proposed change that would resolve this comment. Members had different opinions on an appropriate name for the new subfield and how to restructure the ML element. |
| 12933 | Payam Torab Jahromi | 9.4.2.312.1 | 213.33 | "The Common Info field carries information that is common to all the links except for Link ID Info subfield and BSS Parameters Change Count subfield that are for the link on which the Multi-Link element is sent."Information in Common Info is common to the links included in the Multi-Link element, and not necessarily all the links; also editorial improvements as sugggested. | Change to "The Common Info field carries information that are common to all the links carried in the Link Info field, except for Link ID Info and BSS Parameters Change Count subfields, which apply to the link on which the Multi-Link element is sent." | **Revised**Agree in principle with the commenter. The cited statement is revised.**TGbe editor: Please implement the changes shown in document [**[https://mentor.ieee.org/802.11/dcn/22/11-22-1480-01-00be-lb266-cr-for-clause-9.docx](https://mentor.ieee.org/802.11/dcn/22/11-22-1480-00-00be-lb266-cr-for-clause-9.docx)] **tagged as 12933** |

***TGbe editor: Please note that the baseline for this document is 11be D2.3***

**9.4.2.312.1 General**

***TGbe editor: Please update the following paragraph as shown below: [CID 12933]***

The Common Info field carries information that is common to all the links, except for Link ID Info and BSS Parameters Change Count subfields, which apply to the link on which the Multi-Link element is sent. (#12933)

**9.4.2.312.2.3 Link Info field of the Basic Multi-Link element**

***TGbe editor: Please update the following paragraph as shown below: [CID 13476]***

The TSF Offset Present subfield indicates the presence of the TSF Offset subfield in the STA Info field and is set to 1 if the TSF Offset subfield is present in the STA Info field; otherwise set to 0. A non-AP STA sets the TSF Offset Present subfield to 0 in the transmitted Basic Multi-Link element. An AP affiliated with an AP MLD that is not an NSTR mobile AP MLD sets this subfield to 1 when the element carries complete profile. The AP affiliated with an NSTR mobile AP MLD operating on the primary link sets this subfield to 0 in the Per-STA Profile subelement corresponding to the AP affiliated with the same NSTR mobile AP MLD that is operating on the nonprimary link (#13476).

***TGbe editor: Please update the following paragraph as shown below: [CID 11518]***

If the Complete Profile subfield is equal to 1 and the NSTR Link Pair Present subfield is equal to 1 in the STA Control field, then the STA Info field contains an NSTR Indication Bitmap subfield whose size is indicated in the NSTR Bitmap Size subfield; otherwise, the NSTR Indication Bitmap subfield is not present in the STA Info field. The NSTR Bitmap Size subfield in a STA Control field is set to 1 if the length of the corresponding NSTR Indication Bitmap subfield is equal to 2 octets and is set to 0 if the length of the corresponding NSTR Indication Bitmap subfield is equal to 1 octet. The NSTR Bitmap Size subfield in the STA Control field is reserved if the NSTR Link Pair Present subfield in that field is 0. The NSTR Link Pair Present subfield is set to 0 if the Complete Profile subfield is equal to 0. (#11518)

***TGbe editor: Please update the following paragraph as shown below: [CID 13476]***

The condition for the presence of the EML Capabilities subfield in the Common Info field is defined in 35.3.17 (Enhanced multi-link single radio operation) and 35.3.18 (Enhanced multi-link multi-radio operation). The subfield is not included in frames transmitted by an AP affiliated with an NSTR mobile AP MLD (#13476).

***TGbe editor: Please update the Table 9-401i as shown below: [CID 12368, 11515]***

**Table 9-401i – Subfields of the MLD Capabilities and Operations field**

|  |  |  |
| --- | --- | --- |
| **Subfield** | **Definition** | **Encoding** |
| SRS Support | Indicates support for the reception of a frame that carries an SRS Control subfield | For an AP MLD or an NSTR mobile AP MLD:Set to 1 to indicate that the AP MLD, with which the AP is affiliated, is capable of receiving a frame with an SRS Control subfield. Set to 0 otherwise.For a non-AP MLD:If the non-AP MLD is associated with an NSTR mobile AP MLD, set to 1 to indicate that the non-AP MLD, with which the non-AP STA is affiliated, is capable of receiving a frame with an SRS Control subfield. Set to 0 otherwise. (#12368)See 35.3.16.5 (PPDU end time alignment). |
| Frequency Separation For STR/AP MLDType Indication | Frequency Separation For STR: Indicates the minimum freq uency gap between any two links that is recommended by the non-AP MLD for STR operation. The frequency gap is specified as the difference between the nearest frequency edges of the two links.AP MLD Type Indication:Indicates the type of an AP MLD. | Frequency Separation For STR:For a non-AP MLD:Set to 0 to indicate that no frequency separation information is provided.Set to a nonzero value *n* to indicate that the STR frequency gap is (*n* – 1) ´ 80 MHz.AP MLD Type Indication:For an AP MLD:Set B7 to 1 to indicate that the AP MLD is an NSTR mobile AP MLD; set to 0 otherwise. (#11515)B8–B11 are reserved.See 35.3.16.2 (Multi-link device capability and operation signaling). |

***TGbe editor: Please add the following subclause (after 9.4.1.74) and update the subclauses and paragraphs as shown below: [CID 11516]***

**9.4.1.74a Link ID Info field**

The Link ID Info field is defined in Figure 9-144xyz (Link ID Info field).

B0 B3 B4 B7

Reserved

Link ID

Bits: 4 4

**Figure 9-144xyz—Link ID Info field format**

The Link ID subfield of the Link ID Info field indicates the identifier of the link, which is described in the element carrying the Link ID Info field (see 35.3.3.2 (Link ID)).

**9.4.2.312.2.3 Common Info field of the Basic Multi-Link element**

…

The format of the Link ID Info subfield is defined in 9.4.1.74a (Link ID Info field). The Link ID subfield of the Link ID Info field indicates the link identifier of the AP that is affiliated with the AP MLD which is described in the Basic Multi-Link element and satisfies one of the following:

* It is the AP that transmitted the Basic Multi-Link element.
* It is the AP that corresponds to a nontransmitted BSSID that is a member of the same multiple BSSID set as the AP that transmitted the Multiple BSSID element containing the profile for the nontransmitted BSSID which includes the Basic Multi-Link element.

**9.4.2.312.2.4 Link Info field of the Basic Multi-Link element**

…

The Link ID subfield is as defined in 9.4.1.74a (Link ID Info field) and specifies a value that uniquely identifies the link where the reported STA is operating on (see 35.3.3.2 (Link ID)).

**9.4.2.312.3 Probe Request Multi-Link element**

…

The Link ID subfield is as defined in 9.4.1.74a (Link ID Info field) and specifies a value that uniquely identifies the AP whose information is requested.

**9.4.2.312.4 Reconfiguration Multi-Link element**

…

The Link ID subfield is as defined in 9.4.1.74a (Link ID Info field) and specifies a value that uniquely identifies the link that the reported AP is operating on.

**9.4.2.312.4 Priority Access Multi-Link element**

…

The Link ID subfield is as defined in 9.4.1.74a (Link ID Info field) and specifies a value that uniquely identifies the link that the AP affiliated with the AP MLD is operating on.

**9.4.2.47 Fast BSS Transition element (FTE)**

The MLO GTK subelement contains the GTK for a link, which is encrypted (see procedures in 13.8.5 (FT authentication sequence: contents of fourth message)) and is defined in Figure 9-425a (MLO GTK subele[ment format)](#bookmark114).

Octets: 1 1 2 1 1 8 24–40

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Subelement ID | Length | Key Info | Link ID Info | Key Length | RSC | Wrapped Key |

**Figure 9-425a—MLO GTK subelement format**

The Link ID Info field of the MLO GTK subelement is as defined in 9.4.1.74a (Link ID Info field).

Bits:

The definitions of Key Info, Key Length, RSC, and Wrapped Key fields are the same as in the GTK subelement.

The MLO IGTK subelement contains the IGTK for a link, used for protecting robust Management frames. The MLO IGTK subelement format is shown in Figure 9.425c (MLO IGTK subelement format).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Subelement ID | Length | Key ID | IPN | Link ID Info | Key Length | Wrapped Key |

Octets: 1 1 2 6 1 1 24–40

**Figure 9-425c—MLO IGTK subelement format**

The definitions of Key ID, IPN, Key Length, and Wrapped Key fields are the same as in the IGTK subelement.

The definition of Link ID Info field is the same as the MLO GTK subelement described above.

The MLO BIGTK subelement contains the BIGTK for a link, used for protecting Beacon frames. The MLO BIGTK subelement format is shown in Figure 9-425d (MLO BIGTK subelement format).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Subelement ID | Length | Key ID | BIPN | Link ID Info | Key Length | Wrapped Key |

Octets: 1 1 2 6 1 1 24–40

**Figure 9-425d—MLO BIGTK subelement format**

The definitions of Key ID, BIPN, Key Length, and Wrapped Key fields are the same as in the BIGTK sub- element.

The definition of Link ID Info field is the same as the MLO GTK subelement described above.

**9.6.13.20 WNM Sleep Mode Response frame format**

…

The MLO GTK subelement contains the GTK for the AP operating on the link identified by the Link ID subfield carried in the subelement. The format of the MLO GTK subelement is shown in [Figure 9-1162a (WNM](#bookmark235) [Sleep Mode MLO GTK subelement format)](#bookmark235).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Subelement ID | Length | Link ID Info | Key Info | Key Length | RSC | Key |

Octets: 1 1 1 2 1 8 5 to 32

**Figure 9-1162a—WNM Sleep Mode MLO GTK subelement format**

The Length field is defined in 9.4.3 (Subelements).

The format of the Link ID Info field is as defined in 9.4.1.74a (Link ID Info field).

The Key Info, Key Length, and RSC fields are as defined for GTK subelement.

The Key field is the GTK being distributed for the AP operating on the link identified by the Link ID sub- field.

The MLO IGTK subelement contains the IGTK for the AP operating on the link identified by the Link ID subfield carried in the subelement. The format of the MLO IGTK subelement is shown in [Figure 9-1162c](#bookmark237) [(WNM Sleep Mode MLO IGTK subelement format)](#bookmark237).

Octets: 1 1 1 2 6 16

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Subelement ID | Length | Link ID Info | Key ID | PN | Key |

**Figure 9-1162c—WNM Sleep Mode MLO IGTK subelement format**

The Length field is defined in 9.4.3 (Subelements).

The format of the Link ID Info field is as defined in 9.4.1.74a (Link ID Info field).

The Key ID and PN fields as defined for IGTK subelement.

The Key field is the IGTK being distributed for the AP operating on the link identified by the Link ID subfield.

The MLO BIGTK subelement contains the BIGTK for the AP operating on the link identified by the Link ID subfield carried in the subelement. The format of the MLO BIGTK subelement is shown in Figure 9- 1162d (WNM Sleep Mode MLO BIGTK subelement format).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Subelement ID | Length | Link ID Info | Key ID | BIPN | Key |

Octets: 1 1 1 2 6 16 or 32

**Figure 9-1162d—WNM Sleep Mode MLO BIGTK subelement format**

The Length field is defined in 9.4.3 (Subelements).

The format of the Link ID Info field is as defined in 9.4.1.74a (Link ID Info field).

The Key ID and BIPN fields are as defined for the BIGTK subelement.

The Key field is the BIGTK being distributed for the AP operating on the link identified by the Link ID subfield.