IEEE P802.11
Wireless LANs

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| Resolution for CIDs related to Multi-Link element (CC 34) – Part 1 |
| Date: Feb 9, 2021 |
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 Abstract

This submission proposes resolutions for following 28 CIDs received for TGbe CC34:

2093, 2094, 1006, 2095, 1774, 1897, 1007, 1898, 2861, 1155, 1414, 2581, 3367, 3359, 2583, 3360, 2859, 2295, 1154, 2850, 2450, 3366, 3152, 1716, 2898, 1494, 1744, 3221

Revisions:

* Rev 0: Initial version of the document.

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.***

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| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Pg/Ln** | **Section** | **Comment** | **Proposed Change** | **Resolution** |
| 2093 | kaiying Lu | 58/29 | 9.3.3.6 | Only when the soliciting association Request frame initiating a multi-link setup is received from a STA affiliated with a non-AP MLD, the Basic Variant multi-link element is present in the association Response frame. | change to "...the soliciting Association Request frame initiating a multi-link setup is received from a STA affiliated with a non-AP MLD" | **Revised**Agree in principle. A non-AP MLD that is interested in multi-link setup would include Multi-Link element in its Association Request frame. An AP of an AP MLD would optionally include Multi-Link element when responding to such a request if the AP MLD accepts the association request and wants to establish multi-link setup with the non-AP MLD.**TGbe editor please implement changes as shown in doc 11-21/0242r0 tagged as 2093.** |
| 2094 | kaiying Lu | 58/63 | 9.3.3.8 | Only when the soliciting Reassociation Request frame initiating a multi-link setup is received from a STA affiliated with a non-AP MLD, the Basic Variant multi-link element is present in the Reassociation Response frame. | change to "...the soliciting Reassociation Request frame initiating a multi-link setup is received from a STA affiliated with a non-AP MLD" | **Revised**Agree in principle. A non-AP MLD that is interested in multi-link setup would include Multi-Link element in its Reassociation Request frame. An AP of an AP MLD would optionally include Multi-Link element when responding to such a request if the AP MLD accepts the association request and wants to establish multi-link setup with the non-AP MLD.**TGbe editor please implement changes as shown in doc 11-21/0242r0 tagged as 2094.** |
| 1006 | Abhishek Patil | 59/10 | 9.3.3.9 | Fix the TBD - the ML IE is present if the frame is an ML Probe Request frame. Non-ML Probe Request does not include ML IE (see 35.3.4.3). Update the variant to be ML Probe Request variant | As in comment | **Revised**The TBD was fixed. The condition for the presence of the Multi-Link element was updated.**TGbe editor please implement changes as shown in doc 11-21/0242r0 tagged as 1006.** |
| 2095 | kaiying Lu | 59/12 | 9.3.3.10 | it is not consistent with "35.3.4.3" by "The Basic variant Multi-Link element is TBD present if the STA is affiliated with a non-AP MLD and the frame is a non-ML or ML Probe Request frame." | please clarify it | **Revised**The Basic variant Multi-Link element was changed to Probe Request variant Multi-Link element. This makes it consistent with 35.3.4.3.**TGbe editor please implement changes as shown in doc 11-21/0242r0 tagged as 2095.** |
| 1774 | Insun Jang | 59/12 | 9.3.3.9 | For Table 9-38, in case of ML Probe Request frame, it includes Probe Request variant ML IE not Basic variant ML IE, which needs to be described in Notes | We need to add descriptions regarding Probe Request variant ML IE in Notes of Table 9-38 | **Revised**The Basic variant Multi-Link element was changed to Probe Request variant Multi-Link element.**TGbe editor please implement changes as shown in doc 11-21/0242r0 tagged as 1774.** |
| 1897 | Jeongki Kim | 58/12 | 9.3.3.9 | The Basic variant Multi-Link element should be present in the Probe Request frame if the STA is affiliated with a non-AP MLD and the frame is a non-ML or ML Probe Request frame. So remve the TBD in the related text. If there is the case that does not include ML element, change TBD to optionally. | Either Remove the TBD or change TBD to optionally | **Revised**The Basic variant Multi-Link element was changed to Probe Request variant Multi-Link element. The TBD was fixed.**TGbe editor please implement changes as shown in doc 11-21/0242r0 tagged as 1898.** |
| 1007 | Abhishek Patil | 59/29 | 9.3.3.10 | Fix the TBD - the Basic variant of ML IE is optionally present in the non-ML Probe Response frame (for example when the AP support SAE authentication) | As in comment | **Revised**The TBD was fixed. The condition for the presence of the Multi-Link element was updated.**TGbe editor please implement changes as shown in doc 11-21/0242r0 tagged as 1007.** |
| 1898 | Jeongki Kim | 58/29 | 9.3.3.10 | The Basic variant Multi-Link element should be present if the AP is affiliated with an AP MLD and the frame is a non-ML Probe Response frame to carry some ML related capabilities to the AP | Either Remove the TBD | **Revised**The TBD was fixed. The condition for the presence of the Multi-Link element was updated.**TGbe editor please implement changes as shown in doc 11-21/0242r0 tagged as 1898.** |
| 2861 | Stephen McCann | 59/29 | 9.3.3.9 | The sentences do not make sense logically, as they state that the ML element is present for both a non-ML and ML probe. | Change all the sentences in the table to "The Basic variant Multi-Link element is present if the frame is a MLD probe response frame" | **Revised**The sentence was revised to clarify the conditions when Multi-Link element is carried in the Probe Request frame. **TGbe editor please implement changes as shown in doc 11-21/0242r0 tagged as 2861.** |
| 1155 | Alfred Asterjadhi | 126/11 | 35.3.2.1 | What are non-ML Probe Response frames? Please clarify. Also in the next paragraph it specifies that the AP follows some rules defined in a subclause that deals with probe requests. Please note that AP does not send probe requests. Overall there is a lot of duplicate text in this subclause (generally it is simply saying that rules are defined elsewhere). Evaluate if it can be compressed. | As in comment. | **Revised**Clause 35.3.4.2 is updated to differentiate between ML probe response and non-ML Probe response. Further, spec references to ML probe req/resp (including the cited reference) are updated to remove the term non-ML probe. Clause 35.3.4.3 was updated to clarify that an ML probe request includes Probe Request variant of Multi-link element. Since the container is Multi-Link element, a sentence indicating TBD container is deleted (resolves a TBD). Furthermore, the clause title is updated to ML probing to remove the ambiguity pointed by the commenter (‘an AP doesn’t send a probe request’).**Tgbe editor please implement changes as shown in doc 11-21/0242r0 tagged as 1155.** |
| 1414 | Chien-Fang Hsu | 126/12 | 35.3.2.1 | "non-ML probe response frame" meaning is not clear since there is no ML probe response frame. | Provide definition | **Revised**Clause 35.3.4.2 is updated to differentiate between ML probe response and non-ML Probe response. Further, spec references to ML probe req/resp (including the cited reference) are updated to remove the term non-ML probe. Clause 35.3.4.3 was updated to clarify that an ML probe request includes Probe Request variant of Multi-link element. Since the container is Multi-Link element, a sentence indicating TBD container is deleted (resolves a TBD).**Tgbe editor please implement changes as shown in doc 11-21/0242r0 tagged as 1414.** |
| 2581 | Rojan Chitrakar | 126/12 | 35.3.2.1 | What is a non-ML Probe Response frame? Is it supposed to be the regular Probe Response frame? | Provide the definition of non-ML Probe Resonse frame. | **Revised**Clause 35.3.4.2 is updated to differentiate between ML probe response and non-ML Probe response. Further, spec references to ML probe req/resp (including the cited reference) are updated to remove the term non-ML probe. Clause 35.3.4.3 was updated to clarify that an ML probe request includes Probe Request variant of Multi-link element. Since the container is Multi-Link element, a sentence indicating TBD container is deleted (resolves a TBD).**Tgbe editor please implement changes as shown in doc 11-21/0242r0 tagged as 2581.** |
| 3367 | Zhiqiang Han | 126/12 | 35.3.2.1 | What is non-ML Probe Response? define it | as the comment | **Revised**Clause 35.3.4.2 is updated to differentiate between ML probe response and non-ML Probe response. Further, spec references to ML probe req/resp (including the cited reference) are updated to remove the term non-ML probe. Clause 35.3.4.3 was updated to clarify that an ML probe request includes Probe Request variant of Multi-link element. Since the container is Multi-Link element, a sentence indicating TBD container is deleted (resolves a TBD).**Tgbe editor please implement changes as shown in doc 11-21/0242r0 tagged as 3367.** |
| 3359 | Zhiqiang Han | 59/31 | 9.3.3.10 | What is non-ML Probe Response? define it | as the comment | **Revised**Clause 35.3.4.2 is updated to differentiate between ML probe response and non-ML Probe response. Further, spec references to ML probe req/resp (including the cited reference) are updated to remove the term non-ML probe. Clause 35.3.4.3 was updated to clarify that an ML probe request includes Probe Request variant of Multi-link element. Since the container is Multi-Link element, a sentence indicating TBD container is deleted (resolves a TBD).**TGbe editor please implement changes as shown in doc 11-21/0242r0 tagged as 3359.** |
| 2583 | Rojan Chitrakar | 126/57 | 35.3.2.2 | ML Probe Response frame is called MLD probe response in 35.3.4.2; which is correct? | Use consistent name for MLD probe response. | **Revised**Agree with the comment. The standard must use consistent terms throughout the spec.The name is revised to ML probe req/resp. MLD probing gives the impression that the information requested or provided is that of the MLD. However, the mechanism is designed to provide information for one or more requested link (not necessarily that of the MLD) – e.g., during critical updates. Therefore, the term multi-link (ML) probe is more appropriate.**TGbe editor please change all occurrences of the term ‘MLD probe request’ to ‘ML probe request’ and ‘MLD probe response’ to ‘ML probe response’ throughout the draft.****TGbe editor, please note, the changes are not shown in doc 11-21/0242r0.** |
| 3360 | Zhiqiang Han | 59/33 | 9.3.3.10 | Change ML Probe Response frame to MLD Probe Response frame as defined in 35.3.4.2 Use of MLD probe request | as the comment | **Revised**The name is revised to ML probe req/resp (instead of MLD probe req/resp). MLD probing gives the impression that the information requested or provided is that of the MLD. However, the mechanism is designed to provide information for one or more requested link (not necessarily that of the MLD) – e.g., during critical updates. Therefore, the term multi-link (ML) probe is more appropriate.**TGbe editor please change all occurrences of the term ‘MLD probe request’ to ‘ML probe request’ and ‘MLD probe response’ to ‘ML probe response’ throughout the draft.****TGbe editor, please note, the changes are not shown in doc 11-21/0242r0.** |
| 2859 | Stephen McCann | 59/12 | 9.3.3.9 | What is a non-ML probe request? I think this is a "probe request"? In addition, an "ML probe" should be "MLD probe". | Delete all occurances of "non-ML" in the draft. | **Revised**Clause 35.3.4.2 is updated to differentiate between ML probe response and non-ML Probe response. Further, spec references to ML probe req/resp (including the cited reference) are updated to remove the term non-ML probe. Clause 35.3.4.3 was updated to clarify that an ML probe request includes Probe Request variant of Multi-link element. The name is revised to ML probe req/resp (instead of MLD probe req/resp). MLD probing gives the impression that the information requested or provided is that of the MLD. However, the mechanism is designed to provide information for one or more requested link (not necessarily that of the MLD) – e.g., during critical updates. Therefore, the term multi-link (ML) probe is more appropriate.**TGbe editor please implement changes as shown in doc 11-21/0242r0 tagged as 2859.****TGbe editor, please note, the changes related to name change are not shown in doc 11-21/0242r0.** |
| 2295 | Michael Montemurro | 126.06 | 35.3.2.1 | A STA of an MLD is really a STA affiliated with an MLD. | Change "STA of an MLD" to "STA affiliated with an MLD" at 126.6, 126.32, 126.44,Change "STA of a non-AP MLD" to "STA affiliated with a non-AP MLD" at 126.24, 126.27, 139.9, 139.42, 140.3, 140.5Change "STA of an MLD" to "MLD" at 126.44, 127.25Change "STA of a non-AP MLD" to "non-AP MLD" at 1Change "STA of the MLD it is affiliated" to "STAs affiliated with the MLD" at 125.6Change "AP of an AP MLD" to "AP affiiated with an MLD" at 126.10, 126.15, 126.19, 126.37, 129.31, 138.51, 139.60, 139.61, 146.24, 387.60 .Change "AP of the AP MLD" to "AP affiiated with the MLD" at 138.39, 139.61Change "AP of an AP MLD" to "AP MLD" at 126.56, 126.60Change "affiliated AP of the AP MLD" to "AP affiliated with the AP MLD" at 108.8, 138.55, 138.60 | **Accept****TGbe editor, please note, the changes are not shown in doc 11-21/0242r0.** |
| 1154 | Alfred Asterjadhi | 126/06 | 35.3.2.1 | Not precise enough "certain". I think it should be fine to not mention it at all here as long as Clause 6 is complete for this with the addition of the presence of ML element in the tables of clause 9. Otherwise just list all possible MGMT frames that can carry the element (AP MLD side and non-AP MLD side). | As in comment | **Revised**Since the subsequent paragraphs in 35.3.2.1 lists the frames in which the Multi-Link element is included, the sentence was deleted.**TGbe editor please implement changes as shown in doc 11-21/0242r0 tagged as 1154.** |
| 2850 | stephane baron | 126/06 | 35.3.2.1 | the sentence "A STA of an MLD shall advertise multi-link capabilities and information of other STA of the MLD it is affiliated with by including a Basic variant Multi-Link element in certain Management frames that it transmits." looks strange to me because of the usage of the words "certain Management frames". How can we mandate an action in "certain" frames without indicating those frames, or giving additional constraints ? I think we should list those frames to clarify this mandatory behaviour, or relaxe the constraint by replacing the shall by a may. | As in comment | **Revised**Since the subsequent paragraphs in 35.3.2.1 lists the frames in which the Multi-Link element is included, the sentence was deleted.**TGbe editor please implement changes as shown in doc 11-21/0242r0 tagged as 2850.** |
| 2450 | Patrice Nezou | 126/07 | 35.3.2.1 | The word "certain" does not define any management frames. The management frames supporting the Basic variant Multi-Link element have to be specified. Otherwise remove the sentence. | Define the management frames that supports the Multi link IE. | **Revised**Since the subsequent paragraphs in 35.3.2.1 lists the frames in which the Multi-Link element is included, the sentence was deleted.**TGbe editor please implement changes as shown in doc 11-21/0242r0 tagged as 2450.** |
| 3366 | Zhiqiang Han | 126/07 | 35.3.2.1 | Certain management frames are unclear, please clarify it | Clarify which management frame can carry the Basic variant Multi-Link element. | **Revised**Since the subsequent paragraphs in 35.3.2.1 lists the frames in which the Multi-Link element is included, the sentence was deleted.**TGbe editor please implement changes as shown in doc 11-21/0242r0 tagged as 3366.** |
| 3152 | Yongho Seok | 126/07 | 35.3.2.1 | "A STA of an MLD shall advertise multi-link capabilities and information of other STA of the MLD it is affiliated with by including a Basic variant Multi-Link element in certain Management frames that it transmits."Since this is "shall" statement, it is necessary to specify which management frames correspond to certain Management frames. Otherwise, remove "shall". | As in comment. | **Revised**Since the subsequent paragraphs in 35.3.2.1 lists the frames in which the Multi-Link element is included, the sentence was deleted.**TGbe editor please implement changes as shown in doc 11-21/0242r0 tagged as 3152.** |
| 1716 | Hanqing Lou | 126/06 | 35.3.2.1 | It is not clear if a STA of an MLD has one active link should include the Basic variant ML element in certain Management frames. | Need clearifications | **Revised**The cited text was deleted as resolution for other comments (CIDs 1154, 2850, 2450, 3366, 3152). **TGbe editor please implement changes as shown in doc 11-21/0242r0 tagged as 1716.** |
| 2898 | Stephen McCann | 126/06 | 35.3.2.1 | Some of the MLD terminology is overly complex and can be simplified. | Change the cited sentence to read "An MLD shall advertise multi-link capabilities and information of all affiliated STAs by including a Basic variant Multi-Link element in certain Management frames that it transmits." | **Revised**The cited text was deleted as resolution for other comments (CIDs 1154, 2850, 2450, 3366, 3152). **TGbe editor please implement changes as shown in doc 11-21/0242r0 tagged as 2898.** |
| 1494 | Dibakar Das | 28.28 | 35.3.2 | Both sentences after L27 is pointing to same section. | Change to "A STA of a non-AP MLD shall follow the rules in 35.3.5.4 (Usage and rules of Basic variant Multi-linkelement in the context of multi-link setup) for including a Basic variant Multi-Link element in the(Re-)Association Request and Authentication frame that it transmits" | **Accept****TGbe editor, please note, the changes are shown in doc 11-21/0242r0 tagged as CID 1494.** |
| 1744 | Hanseul Hong | 126/44 | 35.3.2.1 | Neighbor Report element is not needed to be included in Basic variant Multi-Link element | Add the "Neighbor Report element" in the sentence | **Revised**The Neighbor Report element was added in the sentence. In addition, a duplicate paragraph in clause 35.3.4.2 was deleted (also resolves a TBD).**TGbe editor please implement changes as shown in doc 11-21/0242r0 tagged as 1744.** |
| 3221 | Young Hoon Kwon | 132/57 | 35.3.5.4 | What if the size of the ML element is greater than 256Byte? | As shown in the comment. | **Revised**The Multi-Link element is fragmentable (see Table 9-92 in D0.3). A clarification NOTE was added at the end of clause 35.3.2.1.**TGbe editor please implement changes as shown in doc 11-21/0242r0 tagged as 3221.** |

***TGbe editor: Please note Baseline is REVmd D5.0, 11ax D8.0, 11be D0.3and doc 11-21/0290r0***

**9.3.3.6 Association Response frame format**

***TGbe editor: Please update the third column of Table 9-35 (Association Response frame body) as shown below:***

### Table 9-35—Association Response frame body

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| <ANA> | Multi-Link | The Basic variant Multi-Link element is present if the AP is affiliated with an AP MLD and the soliciting Association Request frame includes Basic variant Multi-Link element. Otherwise it is not present.[CID 2093] |

**9.3.3.9 Reassociation Response frame format**

***TGbe editor: Please update the third column of Table 9-37 (Reassociation Response frame body) as shown below:***

### Table 9-37—Reassociation Response frame body

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| <ANA> | Multi-Link | The Basic variant Multi-Link element is present if the AP is affiliated with an AP MLD and the soliciting Reassociation Request frame includes Basic variant Multi-Link element. Otherwise it is not present.[CID 2094] |

**9.3.3.9 Probe Request frame format**

***TGbe editor: Please update the third column of Table 9-38 (Probe Request frame body) as shown below:***

### Table 9-38—Probe Request frame body

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| <ANA> | Multi-Link | The Probe Request variant Multi-Link element is present if the STA is affiliated with a non-AP MLD and the Probe Request is an ML probe request (see 35.3.4.2). Otherwise it is not present.[CID 1006, 2095, 1774, 1897, 1155, 1414, 2581, 3367, 3359, 2859] |

**9.3.3.10 Probe Response frame format**

***TGbe editor: Please update the third column of Table 9-39 (Probe Response frame body) as shown below:***

### Table 9-39—Probe Response frame body

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| <ANA> | Multi-Link | The Basic variant Multi-Link element is optionally present if the AP is affiliated with an AP MLD and the soliciting Probe Request frame is not an ML probe request (see 35.3.4.3). The Basic variant Multi-Link element is present if the soliciting Probe Request frame is an ML probe request (see 35.3.4.2). Otherwise it is not present.[CID 1007, 2861, 1898, 1155, 1414, 2581, 3367, 3359, 2859] |

**35.3.2 Container for multi-link information**

**35.3.2.1 General**

***TGbe editor: Please modify this clause as shown below:***

[CID 1154, 2850, 2450, 3366, 3152, 1716, 2898]

[CID 1155, 1414, 2581, 3367, 3359, 2859]An AP of an AP MLD shall follow the rules defined in 35.3.4.3 (Multi-link element usage rules in the context of discovery) for including a Basic variant Multi-Link element in the Beacon frames and Probe Response frames, which are not ML probe response, that it transmits.

[CID 1155, 1414, 2581, 3367, 3359, 2859]An AP of an AP MLD shall follow the rules in 35.3.4.2 (Use of ML probing) for including a Basic variant Multi-Link element in a Probe Response frame, which is an ML probe response, that it transmits.

An AP of an AP MLD shall follow the rules in 35.3.5.4 (Usage and rules of Basic variant Multi-link element in the context of multi-link setup) for including a Basic variant Multi-Link element in the (Re-)Association Response frame that it transmits.

A STA of a non-AP MLD shall follow the rules in 35.3.4.2 (Use of [CID 1155]ML probing) for including a Probe Request variant Multi-Link element in the Probe Request frame that it transmits.

A STA of a non-AP MLD shall follow the rules in 35.3.5.4 (Usage and rules of Basic variant Multi-link element in the context of multi-link setup) for including a Basic variant Multi-Link element in the (Re-)Association Request frame [CID 1494]and Authentication frame that it transmits.

[CID 1494]In order to prevent duplication of information, an AP of an AP MLD shall not include a [CID 1744]Neighbor Report element, a Reduced Neighbor Report element or a Multiple BSSID element or another Basic variant Multi-Link element in the Per-STA Profile subelement of the Basic variant Multi-Link element for a reported AP.

[CID 3221]NOTE – Multi-link element is fragmented if the content exceeds 252 octets. When fragmented, the transmitting STA follows the rules defined in 10.28.11 (Element fragmentation) and the receiving STA follows the rules defined in 10.28.12 (Element defragmentation).

**35.3.4.2 Use of** [CID 1155]**ML probing**

***TGbe editor: Please delete the 3rd paragraph and add a new paragraph in this subclause as shown below***

[CID 1744]

[CID 1155, 1414, 2581, 3367, 3359, 2859]A Probe Response frame transmitted, by an AP affiliated with an AP MLD, in response to receiving an ML probe request is called an ML probe response; otherwise, the Probe Response frame is not a ML probe response. An ML probe response includes Basic variant Multi-Link element which may carry complete or partial per-STA profile(s) for the requested AP(s) of the AP MLD.

**35.3.4.3 Multi-link element usage rules in the context of discovery**[CID 1155, 1414, 2581, 3367, 3359, 2859]

***TGbe editor: Please update the subclause as shown below***

An AP within an AP MLD should include in the Beacon frame and Probe Response frame, that is not an ML probe request, only the MLD level/common information carried in the field(s) of the Multi-Link element as defined in 9.4.2.247b (Multi-Link element) that is common to all APs affiliated with the AP MLD. The MLD Level/Common Information field shall include the MLD MAC address of the AP MLD with which the AP is affiliated and other information (TBD).

NOTE—Whether the Basic variant Multi-Link element is always present in the Beacon frame and Probe Response frame, that is not an ML probe request, or is optionally present is TBD.

An AP that is part of an AP MLD that supports SAE authentication shall include the MLD MAC address of the AP MLD with which the AP is affiliated in the Beacon and Probe Response frames it transmits.

A Probe Request frame that is not a ML probe request shall not include a Multi-Link element.

A Probe Request frame that is an ML probe request shall not include a Basic variant Multi-Link element.

A Probe Request frame that is an ML probe request shall include a Probe Request variant Multi-Link element.