IEEE P802.11
Wireless LANs

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| CC36 Resolution for CIDs related to Multiple BSSID (Part 2) |
| Date: February 8, 2022 |
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 Abstract

This submission proposes resolutions for following 11 CIDs received for TGbe CC36:

5329 5330 6329 7881 4068 4103 6859 6860 6861 6862 6863

***TGbe editor: The baseline for this document is 11be D1.5.***

**Revisions:**

* Rev 0: Initial version of the document.
* Rev 1:
	+ Updated baseline to D1.5
	+ Bugfix in clause 35.3.10
	+ Includes CID 4068
* Rev 2:
	+ Added part B to resolve 6 CIDs related to obtaining and verifying security parameters
		- Resolution text crafted based on discussion with Duncan, Po-Kai and Mike M.
* Rev 3: Fixes two more bugs identified in D1.5
* Rev 4: Fixed a few more instances (found in 35.3.2.2 & 35.3.19.2) of ML probe req/resp frame as a resolution to CID 4103
* Rev 5: Live updates when the doc was discussed on TGbe MAC call on 3/31/22

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.***

**PART A:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Clause** | **Pg/Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 5329 | Jarkko Kneckt | 9.4.2.240 | 126.36 | It is not clear what does it mean that element is present in the Management frame. | Please clarify in which part of the management frame, or the element type that can be signaled as non-inherited by the non-inherited element. | **Revised**The cited sentence was updated to clarify that the elements that are not inherited (and hence listed in the Non-Inheritance element) are carried in the frame outside the Basic Multi-Link element.**TGbe editor, please make changes as shown in 11-21/1185r5 tagged 5329** |
| 5330 | Jarkko Kneckt | 9.4.2.240 | 126.36 | Different bands (2.4, 5 amd 6 GHz) have different capability elements (HT, VHT, HE) and operations elements. It does not make sense to always list the capabilities not supported by the band as non-inherited elements. For instance, a BSS in the 6 GHz band is not allowed totransmit HT or VHT capabilities or operations elements and signaling these elements with the non-inherit element adds signaling overheads. | Please define band specific presence rules for the HT and VHT capability and operations elements and avoid their listing in the non-inherited elements of the ML elements. | **Rejected**The Non-Inheritance element is specifically defined to address such use cases. The standard does not need to provide additional mechanisms to solve the same problem. |
| 6329 | Ming Gan | 35.3.18.2 | 284.55 | which part of Basic variant Multi-Link element is carried? | as in the comment | **Revised**A new sentence is added to the cited paragraph to clarify the contents of the Basic Multi-Link element when carried in the nontransmitted BSSID profile of Multiple BSSID element.**TGbe editor, please make changes as shown in 11-21/1185r5 tagged 6329** |
| 7881 | Yongho Seok | 35.3.2.2 | 247.24 | How about is other elements (e.g., Multiple BSSID-Index element, Multiple BSSID Configuration element)? Those IEs can't be included in the Per-STA Profile subelement of the Multi-Link element for a reported AP. | Please list all IEs that can't be included in the Per-STA Profile subelement of the Multi-Link element for a reported AP. | **Revised**Agree with the comment. The two IEs cited in the comment are included in the list of IEs that are not permitted to be carried in a Basic ML IE (per-STA profile). The two paragraphs in clause 35.3.2.1 which list the elements that are not permitted in Basic ML IE are moved to a separate subclause to make it easy to call out the exceptions from other parts of the spec. TIM element is added to the list of elements that are not carried in the per-STA profile.**TGbe editor, please make changes as shown in 11-21/1185r6 tagged 7881** |
| 4068 | Abhishek Patil | 35.3.10.4 | 267.10 | The AID space 1 to 2^n - 1 is reserved for nontransmitted multiple BSSIDs in a multiple BSSID set. Therefore, the AP MLD must not assign AID value that falls in this space for any link | Add a sentence as follows: "The AID value assigned to a non-AP MLD shall be greater than or equal to 2^N where N is the maximum of MaxBSSID Indicator (n) for each link where the corresponding AP belongs to a multiple BSSID set." | **Revised**Agree with the comment. In a multiple BSSID set, the first 2^n bits of the TIM element are set aside to indicate group address traffic for BSSIDs in the set. Therefore, these AIDs can’t assigned to a non-AP MLD. Since we can have multiple BSSID set on more than one link, the AID assignment should be based on maximum of the BSSID in all the sets. Normative behaviors in baseline reflect this intention. Therefore, the proposed resolution adds a note in clause 35.3.5.1.**TGbe editor, please add the following NOTE in clause 35.3.5.1 after the paragraph starting “An AP MLD shall assign a single AID…”**“NOTE – In a multiple BSSID set, the first 2^n bits of the partial virtual bitmap of TIM element are reserved for the indication of group addressed frame for the BSSIDs in the set (see 11.1.3.8.5 (Traffic advertisement in a multiple BSSID set)). As a result, an AP affiliated with an AP MLD does not assign, to a non-AP MLD, an AID value that is less than 2^N where N is the maximum of the value carried in the MaxBSSID Indicator (n) field of the Multiple BSSID element corresponding to each link that is accepted as part of the multi-link (re)setup where the AP affiliated with the AP MLD belongs to a multiple BSSID set.” |

**9.4.2.240 Non-Inheritance element**

***TGbe editor: Please update the contents of the following paragraph in this subclause as shown below:***

When present in the Per-STA Profile subelement of a Basic Multi-Link element, the Non-Inheritance element identifies one or more elements that are not inherited by the STA corresponding to the per-STA profile. The identified elements are present in the Management frame transmitted by the STA that includes the Basic Multi-Link element, and are not contained within the Per-STA Profile subelement that carried the Non-Inheritance element[5329].

* + - 1. **General**

***TGbe editor: Please update the contents of the following paragraph in this subclause as shown below:***

An AP corresponding to the transmitted BSSID shall not include a Basic Multi-Link element in the Nontransmitted BSSID Profile subelement of a Multiple BSSID element unless the corresponding nontransmitted BSSID is affiliated with an AP MLD. When carried in a Nontransmitted BSSID Profile subelement of a Multiple BSSID element included in a Beacon or Probe Response frame that is not an ML probe response, the Basic Multi-Link element shall not include the Per-STA Profile subelement corresponding to reported AP affiliated with the same AP MLD unless conditions defined in 35.3.11 (Multi-link procedures for channel switching, extended channel switching, and channel quieting) are satisfied for the reported AP.[6329]

**35.3.2.2 Advertisement of complete or partial per-link information**

***TGbe editor: Please update the contents of the following paragraph in this subclause as shown below:***

Each Per-STA Profile subelement of the Basic Multi-Link element that is included in a Management frame transmitted by a STA affiliated with an MLD and that carries a complete profile shall consist of the STA Control field to identify the link on which the reported STA operates on and to carry the presence indicators for the subfield(s) within the STA Info field, the STA Info field, and the STA Profile field containing fields and elements based on the following rules:

* If the reporting STA is an AP, the STA Profile field corresponding to the reported AP:
	+ - * + carries fields and elements in the same order and subject to the conditions as in:

Table 9-67 (Probe Response frame body) if the frame is an ML probe response.

Table 9-63 (Association Response frame body) if the frame is an Association Response frame.

Table 9-65 (Reassociation Response frame body) if the frame is a Reassociation Response frame.

* + - * + is subject to inheritance rules defined in 35.3.2.3.1 (Inheritance in the per-STA profile of Basic Multi-Link element) and exceptions specified in [7881]35.3.2.x (Elements not carried in a per-STA profile).
				+ does not include the Timestamp field, Beacon Interval field, AID field, SSID element, [7881]and BSS Max Idle Period element.
* If the reporting STA is a non-AP STA, the STA Profile field corresponding to the reported non-AP STA:
	+ carries fields and elements in the same order and subject to conditions as in:
		- Table 9-62 (Association Request frame body) if the frame is an Association Request frame.
		- Table 9-64 (Reassociation Request frame body) if the frame is an Reassociation Request frame.
	+ is subject to inheritance rules defined in 35.3.2.3.1 (Inheritance in the per-STA profile of Basic Multi-Link element) and exceptions specified in [7881]35.3.2.x ( Elements not carried in a per-STA profile).
	+ does not include the Listen Interval field and Current AP Address field.
	+ Optionally, a Non-Inheritance element appears as the last element in the STA Profile field and carries a list of elements that are not inherited by the reported STA from the reporting STA (see 35.3.2.3.1 (Inheritance in the per-STA profile of Basic Multi-Link element)).

**35.3.2.1 General**

***TGbe editor: Please moved the following paragraphs from this subclause to 35.3.2.3 (Element not carried in a Per-STA profile):***

[7881]

[7881]

[7881]***TGbe editor: Please add a new subclause after 35.3.2.2 as shown below:***

[7881]***TGbe editor: Please increment the subclause numbers for existing subclauses that follow 35.3.2.2 subclause after incorporating the new subclause show:***

**35.3.2.x Elements not carried in a per-STA profile**[7881]

***TGbe editor: Please moved the following paragraphs from 35.3.2.1 (General) to this subclause and make the updates as shown:***

, TIM ele ment, Multiple BSSID-Index element, Multiple BSSID Configuration element

**PART B:**

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| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Clause** | **Pg/Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 4103 | Abhishek Patil | 12.7.2 | 225.47 | ML probe response is not a new frame type. It is a Probe Response frame with an "ML" qualifier when certain conditions defined in 35.3.4.2 are satisfied. This needs to be fixed at multiple locations. | As in comment | **Revised**Agree with the comment. Beacon and Probe Response frame transmitted by an AP of an AP MLD does not carry complete profile of another AP affiliated with the same AP MLD. Therefore, the existing text, suggesting that a non-AP (supplicant) can determine the security parameters of all APs via a Beacon or Probe Response frame is incorrect. The text throughout the clause 12 is simplified and a NOTE is added to relevant sections to clarify that a non-AP MLD can determine the security related parameter for an AP of an AP MLD by receiving the Beacon or Probe Response frame from that AP or by receiving an ML probe response carrying complete profile for that AP. Some missing text and errors were fixed along the way. In addition, incorrect references to ML probe request/response frame in clause 35.3.2 and 35.3.19 were also fixed.**TGbe editor: Please implement changes as shown in doc 11-22/1185r5 tagged as 4103** |
| 6859 | Rubayet Shafin | 12.7.2 | 225.47 | ML Probe Response frame (and its format) is not defined | Needs to define the format of ML Probe Response frame | **Revised**Agree with the comment. Same resolution as CID 4103.**TGbe editor: Please implement changes as shown in doc 11-22/1185r5 tagged as 4103** |
| 6860 | Rubayet Shafin | 12.7.2 | 225.54 | ML Probe Response frame (and its format) is not defined | Needs to define the format of ML Probe Response frame | **Revised**Agree with the comment. Same resolution as CID 4103.**TGbe editor: Please implement changes as shown in doc 11-22/1185r5 tagged as 4103** |
| 6861 | Rubayet Shafin | 12.7.6.1 | 229.40 | ML Probe Response frame (and its format) is not defined | Needs to define the format of ML Probe Response frame | **Revised**Agree with the comment. Same resolution as CID 4103.**TGbe editor: Please implement changes as shown in doc 11-22/1185r5 tagged as 4103** |
| 6862 | Rubayet Shafin | 12.7.6.4 | 233.56 | ML Probe Response frame (and its format) is not defined | Needs to define the format of ML Probe Response frame | **Revised**Agree with the comment. Same resolution as CID 4103.**TGbe editor: Please implement changes as shown in doc 11-22/1185r5 tagged as 4103** |
| 6863 | Rubayet Shafin | 12.7.6.4 | 234.15 | ML Probe Response frame (and its format) is not defined | Needs to define the format of ML Probe Response frame | **Revised**Agree with the comment. Same resolution as CID 4103.**TGbe editor: Please implement changes as shown in doc 11-22/1185r5 tagged as 4103** |

**12.7.2 EAPOL-Key frames**[4103]

***TGbe editor: Please update the content of the following bullet in this subclause as shown below:***

* **4-way handshake message 3** is an EAPOL-Key frame with the Key Type subfield equal to 1. The Key Data field shall contain one or two RSNEs, and may contain an RSNXE. If a group cipher has been negotiated, this field shall also include a GTK. This field shall be encrypted if a GTK is included. For MLO, the Key Data field shall include the MAC Address KDE set to the MLD MAC address of the Authenticator. When the Authenticator is an AP MLD and the Supplicant is a non-AP MLD, this field shall include one MLO GTK for each setup link (see 35.3.5 (Multi-link (re)setup)).

An Authenticator’s SME shall insert the RSNE it sent in its Beacon or Probe Response frame, and shall insert the RSNXE it sent in its Beacon or Probe Response frame if the RSNXE is present in the Beacon or Probe Response frame it sent. When this message 3 is part of a fast BSS transition initial mobility domain association or an association started through the FT protocol, the PMKR1Name is added in the PMKID List field of the RSNE. For MLO, for each affiliated AP, the Authenticator’s SME shall insert a MLO Link KDE that includes the LinkID field, affiliated AP MAC address, RSNE, and RSNXE (if it was present). The Supplicant’s SME shall validate the selected security configuration against the RSNE received in message 3, and shall validate the RSNXE included in message 3 against the RSNXE received in the Beacon or Probe Response frame from the Authenticator. For MLO, the Supplicant’s SME shall validate the security configuration for each LinkID field, affiliated AP MAC address, RSNE, and RSNXE (if present) for each affiliated AP included in message 3 against the affiliated AP MAC address, RSNE, and RSNXE (if present) received for each affiliated AP. If the second optional RSNE is present, the STA shall either use that cipher suite with its pairwise key or deauthenticate. In any of these cases, if the values do not match, then the receiver shall consider the RSNE or the RSNXE modified and shall use the MLME-DEAUTHENTICATE.request primitive to break the association. A security error should be logged at this time.

NOTE – A non-AP MLD obtains the Link ID, AP MAC address, RSNE, and RSNXE (if present) for an AP affiliated with the AP MLD when it receives a Beacon or Probe Response frame from that AP or when it receives an ML probe response transmitted by another AP affiliated with the same AP MLD carrying a Basic Multi-Link element containing a complete profile of that AP (see 35.3.4 (Discovery of an AP MLD)).

* + - 1. **General**[4103]

***TGbe editor: Please update the content of the following bullet in this subclause as shown below:***

* An MLO Link KDE is included for each affiliated STA of an MLD. When included in message 2, an MLO Link KDE is included for each link and contains the LinkId field and corresponding affiliated STA MAC address received in the Basic Multi-Link element by the AP MLD in the (Re)Association Request frame. When included in message 3, an MLO Link KDE is included for each affiliated AP and contains the LinkId field, corresponding affiliated AP MAC address, RSNE, and RSNXE (if present) for each affiliated AP that was sent by the Authenticator.

NOTE – A non-AP MLD obtains the Link ID, AP MAC address, RSNE, and RSNXE (if present) for an AP affiliated with the AP MLD when it receives a Beacon or Probe Response frame from that AP or when it receives an ML probe response transmitted by another AP affiliated with the same AP MLD carrying a Basic Multi-Link element containing a complete profile of that AP (see 35.3.4 (Discovery of an AP MLD)).

* + - 1. **4-way handshake message 3**[4103]

***TGbe editor: Please update the content of the following bullet in this subclause as shown below:***

* For MLO, a MLO Link KDE containing the LinkID field, the affiliated AP MAC address, RSNE, and RSNXE (if present) for each affiliated AP that was sent by the Authenticator.

NOTE – A non-AP MLD obtains the Link ID, AP MAC address, RSNE, and RSNXE (if present) for an AP affiliated with the AP MLD when it receives a Beacon or Probe Response frame from that AP or when it receives an ML probe response transmitted by another AP affiliated with the same AP MLD carrying a Basic Multi-Link element containing a complete profile of that AP (see 35.3.4 (Discovery of an AP MLD)).

***TGbe editor: Please update the content of the following bullet in this subclause as shown below:***

* + - * 1. For MLO, verifies the following:
* The affiliated AP MAC address and all fields in the RSNE, and the RSNXE (if present), for each requested link are identical to those received for the corresponding affiliated APs of the AP MLD.
* The affiliated AP MAC address and all fields in the RSNE and the RSNXE (if present), of other discovered links, if information is available are identical to those as received for the affiliated APs of the AP MLD.

NOTE – A non-AP MLD obtains the Link ID, AP MAC address, RSNE, and RSNXE (if present) for an AP affiliated with the AP MLD when it receives a Beacon or Probe Response frame from that AP or when it receives an ML probe response transmitted by another AP affiliated with the same AP MLD carrying a Basic Multi-Link element containing a complete profile of that AP (see 35.3.4 (Discovery of an AP MLD)).

* + - 1. **Advertisement of complete or partial per-link information**[4103]

***TGbe editor: Please update the content of NOTE 3 and following paragraph in this subclause as shown below:***

NOTE 3—See 35.3.11 (Multi-link procedures for channel switching, extended channel switching, and channel quieting) for conditions when a Beacon or a Probe Response frame that is not an ML probe response transmitted by an AP affiliated with an AP MLD carries a partial profile of reported AP(s).

An AP affiliated with an AP MLD may include either the complete profile or the partial profile of a reported AP affiliated with the same AP MLD in an ML probe response that it transmits, as defined in 35.3.4.2 (Use of ML probe request and response).

* + - 1. **Discovery of an NSTR mobile AP MLD**[4103]

***TGbe editor: Please update the content of the following bullet in this subclause as shown below:***

* + - * + A non-AP STA affiliated with a non-AP MLD shall not transmit a Probe Request frame to the AP affiliated with the NSTR mobile AP MLD and that is operating on the nonprimary link of the NSTR link pair. To request a complete profile of the AP operating on the nonprimary link, a non-AP STA affiliated with a non-AP MLD may send an ML probe request to an AP affiliated with the NSTR mobile AP MLD and that is operating on the primary link (see 35.3.4.2 (Use of ML probe request and response)).

**Bugfixes – no CIDs**

1. In a multiple BSSID set, an AP corresponding to the nontransmitted BSSID responds to a (Re)Association Request frame. In such case the Multiple BSSID element is not carried in the (Re)Association Response frame. In addition, the Basic Multi-Link element carried in the frame provides information of the affiliated AP MLD and partner APs. The cited paragraph (see below) in clause 35.3.10 incorrectly states that the (Re)Association Response frame carries Multiple BSSID element.

**35.3.10 BSS parameter critical update procedure**

***TGbe editor: Please update the contents of the following paragraph in this subclause as shown below:***

An AP affiliated with an AP MLD corresponding to a nontransmitted BSSID in a multiple BSSID set shall include in the (Re)Association Response frame it transmits a BSS Parameters Change Count subfield for each of all APs affiliated with the AP MLD.

* The BSS Parameters Change Count subfield for each of the other AP(s) affiliated with the AP MLD shall be carried in the STA Info subfield in the Per-STA Profile subelement of Basic Multi-link element corresponding to that AP where each of the other AP(s) is identified by the Link ID subfield of the STA Control field of the Per-STA Profile subelement.
* The BSS Parameters Change Count subfield for the nontransmitted BSSID shall be carried in the Common Info field in the Basic Multi-Link element where the AP is identified by the Link ID subfield of the Common Info field in the Basic Multi-Link element

NOTE – In a multiple BSSID set, an AP corresponding to the nontransmitted BSSID responds to a (Re)Association Request frame by transmitting a (Re)Association Response frame which does not include the Multiple BSSID element. The Basic Multi-Link element carried in the (Re)Association Response frame transmitted by an AP affiliated with an AP MLD carried information of the AP MLD and complete profile of other AP(s) affiliated with the same MLD.

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1. The first sub-bullet of the first paragraph in clause 35.3.10 incorrect refers to (Re)Association frames (implying that the bullets apply to (Re)Association Request frames as well).

**35.3.10 BSS parameter critical update procedure**

***TGbe editor: Please update the contents of the following bullet in this subclause as shown below:***

If an AP affiliated with an AP MLD is not in a multiple BSSID set or corresponds to a transmitted BSSID in a multiple BSSID set, the AP shall

* + - * include in Beacon, Probe Response, and (Re)Association Response frames it transmits a BSS Parameters Change Count subfield for each of all APs affiliated with the same AP MLD as the AP.

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1. The cite sentence doesn’t cover the case of regular probe response frame carrying the Multi-Link element and including the Link ID and BPCC subfields. In addition, these subfields are not included by an AP is when the AP transmits an Authentication frame carrying Multi-Link element. Simplified the sentence to cover both aspects.

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

***TGbe editor: Please update the contents of the following paragraph in this subclause as shown below:***

The Link ID Info subfield and the BSS Parameters Change Count subfield are present in the Common Info field of the Basic Multi-Link element, when the element is carried in a Management frame transmitted by an AP, except for the Authentication frame.