IEEE P802.11
Wireless LANs

|  |
| --- |
| CC36 Resolution for CIDs related to Multi-Link Advertisement – Part 3 |
| Date: February 8, 2022 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Abhishek Patil | Qualcomm Inc |  |  | appatil@qti.qualcomm.com |
| Gaurang Naik |  |  |  |
| George Cherian |  |  |  |
| Alfred Asterjadhi |  |  |  |
| Duncan Ho |  |  |  |
| Yanjun Sun |  |  |  |
| Abdel Karim |  |  |  |

 Abstract

This submission proposes resolutions for following 27 CIDs received for TGbe CC36:

5179 6541 6988 6989 6520 6542 4722 5915 5273 4715 5517 6213 4101 4264 4265 5515 5516 5828 6620 8059 5170 6725 5906 4036 4919 6876 8032

**Revisions:**

* Rev 0: Initial version of the document.
* Rev 1: Updated the reference to doc 1840 to r4
* Rev 2:
	+ Updated resolution for CID 6988 (based on feedback received via emails on the 11be reflector)
	+ Updated resolution for CID 6725
	+ Included resolution for CID 5915
* Rev 3: Updated resolution for CIDs 4101 5828 4264 4265 5515 6620 8059 5516
* Rev 4: Live updated when the document was discussed on TGbe MAC call 3/16/22
	+ CIDs 4722, 5915, 6725, 4036, 4919 and 6878 are deferred
* Rev 5:
	+ Updates based on offline discussion with Yongho and Kumail:
		- Revised resolution for CID 5915
			* Added CIDs 5273 and 4715 – same resolution as 5915
		- Resolution for CID 4722 remains unchanged
	+ Updates based on discussion on TGbe reflector on the ‘Same SSID’ topic:
		- Updated resolution for CIDs 4036 and 6878
		- CIDs 6725 and 4919 remain deferred
	+ The modified / added CIDs are highlighted
* Rev 6: updated resolution for CID 5915 based on offline feedback from various members

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** | **Clause** | **Pg/Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 5179 | Guogang Huang | 9.4.2.295b.2 | 133.56 | Add a Status Code Present subfield in the STA Control field and a corresponding Status Code subfield in the STA Info field | As in comment. | **Rejected**Per clause 35.3.5.4 in D1.4 (P360L51), the (Re)Association Response frame carries complete profile in Basic ML IE and the complete profile will include the Status Code field as defined in Table 9-63 and Table 9-65. |
| 6541 | Pascal VIGER | 35.3 | 246.17 | multi-link operation in adhoc mode is not speciified. There is no reason for that. | Please define MLO operation for stations in adhoc mode (no infrastructure AP) | **Rejected**Supporting MLO in IBSS mode will require many changes throughout the 11be spec. For example, IBSS association involves 4-way handshake with each participating STA to establish a security key and exchange group key. Additional considerations would be required when IBSS involves a mix of MLO and non-MLO devices. Given the short timeline to complete R1 features, the commenter has agreed to have discussions, related to supporting multi-link in IBSS mode, done later. |
| 6988 | Sanghyun Kim | 35.3.2.3 | 249.28 | 11ax spec says "A STA 6 G shall not transmit HT/VHT Capabilities/Operation element". Need to allow 6 GHz reporting STA to transmit HT/VHT elements for reported STA (of the same MLD). | As in comment | **Revised**Agree with the commenter. A STA 6G that is affiliated with an MLD can transmit a frame (e.g., Association Req/Resp or Probe Req/Resp) that carries the complete profile of another STA affiliated with the same MLD and depending on the capabilities of the reported STA, HT/VHT Capabilities/Operation element may be present in the per-STA profile. The cited statement is amended to capture this. **TGbe editor: Please implement the changes shown in document 11-22/308r4 tagged as 6988.** |
| 6989 | Sanghyun Kim | 35.3.2.3 | 249.28 | Per-STA profiles corresponding to the 2.4/5 GHz reported STAs are unable to inherit HT/VHT related elements from the elements of the reporting STA, if the reporting STA is 6 GHz STA. It is because a 6 GHz STA have no HT/VHT elements.If a specific element is not present for the reporting STA, the same element(same element ID and same values) may be included in every Per-STA profiles.It is recommended to provide additional inheritance mechanism make possible a per-STA profile inherits elements from the other per-STA profile. | As in the comment | **Rejected**The (non)inheritance mechanism specified in the TGbe spec (D1.4) is sufficient and the spec doesn’t need to provide additional mechanisms. When a 6 GHz AP includes per-STA profile for a 2.4 or 5 GHz AP in ML IE, the profile will carry elements specific to the reported AP and the non-inherence element will identify the elements that are not applicable to (i.e., not inherited by) the reported AP. The rest of the elements are inherited by the reported profile. Similar rules apply when a 2.4 or 5 GHz AP includes a profile for a 6 GHz AP in ML IE. |
| 6520 | Pascal VIGER | 35.3 | 246.17 | TDLS procedure in multi-link STAs is not defined. Extension of TDLS over several links has to be defined, once an initial single link TDLS is established. | as in comment. | **Rejected**TGbe has discussed this topic in the past and decided to add support for multi-link TDLS in R2 timeframe.  |
| 6542 | Pascal VIGER | 35.3.2.2 | 247.11 | TDLS procedure in multi-link STAs is not defined.There is a need of an AP-assisted TDLS, such that an AP can advertize link information for TDLS. | as in comment | **Rejected**TGbe has discussed this topic in the past and decided to add support for multi-link TDLS in R2 timeframe. |
| 4722 | Chittabrata Ghosh | 9.4.2.295b.2 | 133.37 | A STA affiliated to either a non-AP MLD or an AP MLD should advertise about restricted TWT support in Basic variant MLE in case the reporting STA does not support restricted TWT operation | Please define restricted TWT support subfield in Per-STA Profile subelement of Basic variant MLE | **Rejected**Beacons/Probe Response frames do not carry STA profile unless conditions in 35.3.10 are met. Even then, the per-STA profile is partial. This is designed to limit the size of these frames and prevent frame bloating. A non-AP MLD is expected to either perform passive/active scanning on each link that is interested in or perform ML probing to gather information of all the links. ML probe response with complete profile carries the EHT Capabilities element and (Re)Association Response frame always carries the EHT Capabilities element in the per-STA profile corresponding to other affiliated STAs. Therefore, r-TWT capabilities of other STAs of the MLD can be determined via active/passive scanning on the respective link, ML probing or during (re)association. |
| 5915 | Li-Hsiang Sun | 35.3.4.3 | 253.62 | Beacon only has common info for a reported link, so beacon on link 1 would not advertise rTWT element of link2. However, the draft requires the EHT STA supporting rTWT to end TXOP at the start of a rTWT. This requires a EHT STA to receive beacon on a link before it can perform access on the link | Specify a mechanism of advertising other links' rTWT starting time on a reporting link | **Revised**Agree with the comment that the spec needs to provide a mechanism for non-AP MLDs to determine the rTWT SPs on all the links before and after association.The Beacons/Probe Response frames do not carry STA profile unless conditions in 35.3.10 are met, in which case it carries a partial profile. This is designed to limit the size of these frames and prevent frame bloating. However, a non-AP MLD is expected to either perform passive/active scanning on each link that is of interest to it or perform ML probing to gather information of all the links. Also, during ML setup the Assoc/Reassoc frames carry complete profile of the other links. At present, the Probe Response, (Re)Assoc Resp frames do not carry rTWT element. In addition, once associated, if there is a new rTWT parameter set inserted to an existing b-TWT IE the non-AP MLD needs to be told via the critical update mechanism. These items are addressed by the proposed changes.The proposed resolution adds conditions to tables in 9.3.3 for Probe Response frame, (Re)Association Response frame to include (r)TWT element. This will help unassociated non-AP MLDs determine the rTWT conditions on the other link(s) of the AP MLD (via ML probing or during association).Furthermore, the proposed resolution updates the condition in clause 11.2.3.15 to consider insertion of an rTWT parameter set as a criteria for critical update.**TGbe editor:** 1. **Please add the following condition under the ‘Notes’ column in the corresponding tables in clause 9.3.3 for Association Resp frame and Reassociation Response for the row matching TWT (before ‘Otherwise, the TWT element is not present’):**

“The TWT element is present if dot11RestrictedTWTOptionImplemented is true, the soliciting Request frame is received from an EHT STA that has Restricted TWT Support subfield in transmitted EHT Capabilities elements set to 1, and the AP has at least one r-TWT schedule as described in 35.9.3 (r-TWT service periods announcement).”1. **Please add the following conditions under the ‘Notes’ column in Table 9-67 (Probe Response frame body) for the row matching TWT:**

“The TWT element is present if the dot11RestrictedTWTOptionImplemented is true and the AP has at least one r-TWT schedule as described in 35.9.3 (r-TWT service periods announcement). Otherwise, the TWT element is not present”1. **Please add a new bullet after bullet ‘m’ in 11.2.3.15 as follows:** “m1) Insertion of a Broadcast TWT Parameter Set field in an existing Broadcast TWT element”
 |
| 5273 | Insun Jang | 35.3.6.2 | 298.22 | What about missing case, i.e., EHT STAs that supports rTWT may miss the scheduled information of rTWT from Beacon which is very important one. Need to handle it. | As in the comment | **Revised**Agree with the comment. Same resolution as CID 5915 |
| 4715 | Chittabrata Ghosh | 35.6.4 | 298.42 | Restricted TWT SP schedule in all link should be shared among all STAs affiliated with an MLD | Please add specific behavior to satisy the issue pointed out in the comment | **Revised**Agree with the comment. A same resolution as CID 5915 |
| 5517 | Jinsoo Choi | 9.4.2.295c.2 | 136.43 | Many EHT MAC features have been introduced and amended in the spec (e.g. multi-link operation, STR/NSTR channel access, discovery, r-TWT etc.) but we haven't specified enough MAC capabilities information yet. We need to have it upon the agreements in the next version of draft. | As in comment | **Rejected**Draft 1.4 provides signaling of all defined capabilities. For example, the Basic Multi-Link element indicates support for MLD-level capabilities, e.g., EMLSR and EMLMR, SRS Support, TID-To-Link Mapping, etc. Additionally, the NSTR Link Bitmap indicates the pair-wise STR/NSTR capabilities of the non-AP MLD. The EHT Capabilities further indicates support for link level capabilities, e.g., restricted TWT, EPCS, TXS, etc. |
| 6213 | Michael Montemurro | 35.3.10.3 | 266.61 | After reading this sub-clause and 35.3.5.3, I'm not clear on disassociation procedures. Does the disassocation occur between affiliated STA links or does it occur between MLDs? How are the frames differentiated? | If there are changes required, the commenter is willing to collaborate to provide a contribution to address this comment. | **Rejected**The text in Clause 35.3.4.3 in D1.4 provides sufficient details on the disassociation procedure for MLDs. It is clarified that after the teardown procedure, all non-AP STAs affiliated with the non-AP MLD and the non-AP MLD are in the unassociated state. |
| 4101 | Abhishek Patil | 9.4.2.295b.2 | 129.36 | Per Figure 9-788el, the size of EML Capabilities subfield is 3 octets | Update the size of EML Capabilities subfield in Figure 9-788ei to "0 or 3" | **Revised**Approved document 11-21/1840r4 has modified the contents of EML Capabilities subfield and the updated size of this field is 2 octets. **TGbe editor: No further changes are required for addressing this CID** |
| 5828 | Lei Wang | 9.4.2.295b.2 | 129.36 | The sizes of "EML Capabilities" subfield are on consistent in Figure 9-788ei (0 or 2 Octets) and Figure 9-788el (24 bits, i.e., 3 octets). | In Figure 9-788ei, change the size of "EML Capabilities" subfield to "0 or 3". | **Revised**Approved document 11-21/1840r4 has modified the contents of EML Capabilities subfield and the updated size of this field is 2 octets. **TGbe editor: No further changes are required for addressing this CID** |
| 4264 | Alfred Asterjadhi | 9.4.2.295b.2 | 129.32 | Call it out as Link ID Information rather than Info. And yes, EML Caps are 3 octets rather than 2. | As in comment. | **Revised**Approved document 11-21/1840r4 has modified the contents of EML Capabilities subfield and the updated size of this field is 2 octets. The name change for Link ID field is being addressed in contribution 11-22/0024 (Gaurang) as a resolution for CIDs 8058, 5377 and 6704. The discussion is currently on-going.**TGbe editor: No further changes are required for addressing this CID** |
| 4265 | Alfred Asterjadhi | 9.4.2.295b.2 | 131.54 | Encoding is missing, please add NSS + 1 in both this and next sentence. | As in comment. | **Revised**Approved document 11-21/1840r4 has removed this field.**TGbe editor: No further changes are required for addressing this CID** |
| 5515 | Jinsoo Choi | 9.4.2.295b.2 | 131.54 | The EMLMR Rx NSS subfield needs to address how the maximum receive Nss that is supported by the non-AP MLD is set, otherwise it's hard to interprete what could be the maximum values that are described by 4 bits. Need to specify it. | As in comment | **Revised**Approved document 11-21/1840r4 has removed this field.**TGbe editor: No further changes are required for addressing this CID** |
| 6620 | Po-Kai Huang | 9.4.2.295b.2 | 131.54 | For the EMLMR Rx NSS and EMLMR Tx NSS, if the indicated value is larger than the NSS capability of a specific link, then it seems that there are problems for sounding because sounding is per link and is based on the NSS capabilty of each link. | Specify that the EMLMR Rx NSS and EMLMR Tx NSS can not be larger than the per link maximum NSS capability. | **Revised**Approved document 11-21/1840r4 has removed this field.**TGbe editor: No further changes are required for addressing this CID** |
| 8059 | Yuchen Guo | 9.4.2.295b.2 | 131.54 | The maximum receive Nss is supported by the non-AP STA, not the non-AP MLD. Same comment for the maximum transmit Nss. | Change "supported by the non-AP MLD in the EMLMR mode" to "supported by the non-AP STA affiliated with the non-AP MLD in the EMLMR mode, which receives the initial frame" | **Revised**Approved document 11-21/1840r4 has removed this field.**TGbe editor: No further changes are required for addressing this CID** |
| 5516 | Jinsoo Choi | 9.4.2.295b.2 | 131.58 | The EMLMR Tx NSS subfield needs to address how the maximum receive Nss that is supported by the non-AP MLD is set, otherwise it's hard to interprete what could be the maximum values that are described by 4 bits. Need to specify it. | As in comment | **Revised**Approved document 11-21/1840r4 has removed this field.**TGbe editor: No further changes are required for addressing this CID** |
| 5170 | Guogang Huang | 3.2 | 0.00 | The current Spec. text is not concise enough. Add the definitions of reporting link and reported link. And update the corresponding text | Reporting link: A link on which the frames are transmittedReported link: A link that is described in an element, such as a Neighbor Report element or a Reduced Neighbor Report element or Basic variant Multi-Link element. | **Revised**The definition of reporting AP/STA and reported AP/STA already exist in the spec (D1.4). The issue highlighted by the commenter can be addressed by revising all instances of reporting/reported link by reporting/reported AP. There are only 3 instances of ‘reporting link/reported link’.**TGbe editor: Please revise all instances of ‘reporting link’ to ‘reporting AP’ and all instances of ‘reported link’ to ‘reported AP’ and all instances of ‘affected link’ to ‘affected AP’ throughout the TGbe draft (including figure(s)).** |
| 6725 | Rojan Chitrakar | 35.3.2.2 | 248.26 | Why disallow SSID element to be included in the STA Profile field? If the different APs of the MLD use different SSIDs, the SSID element should be included in the STA Profile. | Delete SSID element from the list. | **Rejected**Per baseline, the relationship of SSID-ESS-DS are as follows: a) APs that are members of the same ESS advertise the same SSID and b) APs that are members of the same ESS are connected to the same DS. Therefore, all APs affiliated with an AP MLD need to be members of the same ESS and are connected to the same DSS. As a result, all APs affiliated with the same AP MLD must have the same SSID. For reference, please see definition of SSID, DS and ESS from baseline spec (REVme D1.0): **SSID**: A string used to identify the infrastructure basic service sets (BSSs) that comprise an extended service set (ESS), or to identify a non-infrastructure BSS**DS**: A system used to interconnect a set of basic service sets (BSSs) and integrated local area networks (LANs) to create an extended service set (ESS).**ESS**: A set of one or more basic service sets (BSSs) that are interconnected by a single distribution system (DS); an ESS appears as a single IEEE Std 802™ access domain to the logical link control (LLC) sublayer.Also see explanation provided in 11-21/537 (Duncan) and 11-21/209 (Mike). |
| 5906 | Li-Hsiang Sun | 35.3.2.2 | 248.29 | "If the reporting STA is a non-AP STA, the Listen Interval field and Current AP Address field are not included in the STA Profile field."should also mention SSID element not included | as in comment | **Revised** Agree with the comment.**TGbe editor: Please add “, SSID element,” between ‘Listen Interval field’ and ‘and’ in the bullet on P349L8 of D1.4** |
| 4036 | Abhishek Patil | 35.3.2.2 | 248.25 | Clarify why certain fields or IEs are not included in the STA Profile field. | Add the follow two NOTEs after the last bullet as follows:"NOTE 1: Timestamp field and TIM element are specific to each link and the value for each can be obtained on the respective link. Beacon Interval field is an explicit subfield in STA Info field for the reported AP. AID field, BSS Max Idle Period element and SSID element have the same value for all links.NOTE 2: Listen Interval field and Current AP Address field apply at the MLD level and have the same value for all links." | **Revised** Agree with the comment. The proposed notes clarify the reason why each of the listed field and element (except SSID) are not part of the STA Profile field. CIDs related to SSID are under discussion and SSID element will be addressed as part of resolution for CID 6725 and 4919.**TGbe editor: Please add NOTE 1 and NOTE 2 after the last bullet [D1.5 P377L32] as suggested by the comment. NOTE 2 is unchanged. NOTE 1 is updated as follows:**“NOTE 1: Timestamp field and TIM element are specific to each link and the value for each can be obtained on the respective link. Beacon Interval field is an explicit subfield in STA Info field for the reported AP. AID field and BSS Max Idle Period element have the same value for all links.” |
| 4919 | Duncan Ho | 35.3.2.2 | 0.00 | SSID settings of the affiliated APs of an AP MLD is not clear | Add a note to clarify all affilicated APs of an AP MLD use the same SSID - adopt the latest revision of 21/537 | **Revised**Agree with the comment. See resolution for CID 4036.**TGbe editor: Same resolution as CID 4036** |
| 6876 | Rubayet Shafin | 35.3.2.2 | 248.25 | This third rule seems out of place. Why do need we need to mention this? Using rule 1 (Page 248, line 9), we already know what fields and elements shall be carried in STA Profile field and in what order. Adding this third rule creates confusion since it gives an impression that additional field(s) other than those mentioned in rule 1 and other than the optional (last) Non-Inheritance element may also be present in the STA Profile field (If this is the case, then the question becomes what will be the order in which they come?). | Please clarify this issue. | **Revised** The cited bullet identifies the fields and elements that will not be included in the STA Profile field if one of the following applies: a) the cited element or field is always inherited from the reporting STA (e.g., BSS Max Idle Period element) or b) the cited element can’t be advertised by a reporting STA (e.g., TIM element) or c) the cited field is present in another field of the Per-STA Profile subelement corresponding to the reported STA (e.g., Beacon Interval field). Resolution to CID 4036 adds two NOTEs which provides clarification for each of the element or field listed in this bullet.**TGbe editor: Same resolution as CID 4036** |
| 8032 | Yuchen Guo | 35.3.2.2 | 248.25 | why is "Timestamp" field not included? Without it, the synchronization of other links can not be maintained. | Make it included in the STA info field | **Rejected**The timestamp value is specific to a link and can be obtained by listening to the Beacon frame on that link. |

***TGbe editor: The baseline for this document is 11be D1.4 and REVme D1.1***

**26.17.2.1 General**

A STA 6G shall not transmit an HT Capabilities element, VHT Capabilities element, HT Operation element, VHT Operation element, or an HE Operation element that contains a VHT Operation Information field to provide capabilities and operational parameters of the STA 6 G.

NOTE – An EHT STA 6G that transmits a Basic Multi-Link element carrying a complete profile of a reported STA that operates on 2.4 GHz or 5 GHz band includes one or more of these elements (as applicable) to the reported STA in the STA Profile field of the Per-STA Profile subelement corresponding to the reported STA[6988].