IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Resolution for Miscellaneous CIDs related to Clause 9 and Clause 11 (CC34) | | | | |
| Date: Feb 9, 2021 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Gaurang Naik | Qualcomm Inc. |  |  | gnaik@qti.qualcomm.com |
| Abhishek Patil | Qualcomm Inc. |  |  | appatil@qti.qualcomm.com |
| Alfred Asterjadhi | Qualcomm Inc. |  |  | aasterja@qti.qualcomm.com |
| George Cherian | Qualcomm Inc. |  |  | gcherian@qti.qualcomm.com |
| Duncan Ho | Qualcomm Inc. |  |  | dho@qti.qualcomm.com |
| Yanjun Sun | Qualcomm Inc. |  |  | yanjuns@qti.qualcomm.com |

Abstract

This submission proposes resolutions for following 8 CIDs received for TGbe CC34:

1010, 1128, 1011, 1024, 1014, 1020, 1130, 1023

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Updated based on offline feedback from members listed below. Thanks!
  + Laurent Cariou (Intel)
  + Po-Kai Huang (Intel)
  + Tomo Adachi (Toshiba)
  + Jarkko Kneckt (Apple)
  + Mark Rison (Samsung)
  + Srinivas Kandala (Samsung)
  + Chunyu Hu (Facebook)
  + Payam Torab (Facebook)
  + Morteza Mehrnoush (Facebook)
  + Muhammad Kumail Haider (Facebook)
  + Ryuichi Hirata (Sony)
  + Insun Jang (LGE)
  + Namyeong Kim (LGE)
  + Pascal Viger (Canon)
  + Gaurav Patwardhan (HPE)
  + Huizhao Wang (Quantenna)

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** | **Pg/Ln** | **Section** | **Comment** | **Proposed Change** | **Resolution** |
| 1010 | Abhishek Patil | 68/52 | 9.4.2.36 | 9.4.2.36 Provide an indication if the reported AP is affiliated with an AP MLD. Also update the subelement list to include EHT Op and EHT Cap IE | As in comment | **Revised**  The Extremely High Throughput subfield was added to the BSSID Information field of the Neighbor Report element. A note was added in to indicate that if the Extremely High Throughput subfield is set to 1, the reported AP is affiliated with an AP MLD and supports multi-link operation.  Entries for the Multi-link element, EHT Capabilities and EHT Operation elements were added in Table 9-173.  Normative text was added in Clause 35.3.4 to cover the behavior at the non-AP MLD side when receiving the Neighbor Report element.  **Tgbe editor please implement changes as shown in doc 11-21/0252r1 tagged as 1010.** |
| 1128 | Alfred Asterjadhi | 166/01 | 9.4.2.26 | Any updates to te Neighbor Report element for 11be? Add EHT elements for example. (references relative to TGax D8.0) | As in comment. | **Revised**  The Extremely High Throughput subfield was added to the BSSID Information field of the Neighbor Report element. A note was added in to indicate that if the Extremely High Throughput subfield is set to 1, the reported AP is affiliated with an AP MLD and support multi-link operation.  Entries for the Multi-link element, EHT Capabilities and EHT Operation elements were added in Table 9-173.  Normative text was added in Clause 35.3.4 to cover the behavior at the non-AP MLD side when receiving the Neighbor Report element.  **Tgbe editor please implement changes as shown in doc 11-21/0252r1 tagged as 1128.** |
| 1011 | Abhishek Patil | 68/52 | 9.4.2.45 | 9.4.2.45: Add EHT Op and EHT Cap to the list of IEs that are same for all the BSSID in the set | As in comment | **Revised**  The text in clause 9.4.2.45 was revised to include the EHT Operation and EHT Capabilities element.  **Tgbe editor please implement changes as shown in doc 11-21/0252r1 tagged as 1011.** |
| 1024 | Abhishek Patil | 87/24 | 11.2.3.15 | Update clause 11.2.3.15 to include EHT Operation element to the list | As in comment | **Revised**  Modification of EHT Operation element and Basic variant Multi-link element were added to the list of events that shall classify as a critical update. A separate list was created to indicate events that cause the Check Beacon field to be incremented but do not cause the Change Sequence Number to be incremented.  **Tgbe editor please implement changes as shown in doc 11-21/0252r1 tagged as 1024.** |
| 1014 | Abhishek Patil | 68/52 | 9.4.2.177 | Table 9-288 needs to be updated to indicate request for EHT PHY | As in comment | **Revised**  An entry was inserted in Table 9-288 to indicate request for EHT PHY.  **Tgbe editor please implement changes as shown in doc 11-21/0252r1 tagged as 1014.** |
| 1130 | Alfred Asterjadhi | 183/31 | 9.4.2.177 | Any updates to FILS Request Parameters element for 11be? Add that STA is EHT Capable for example?(references relative to TGax D8.0) | As in comment. | **Revised**  An entry was inserted in Table 9-288 to indicate request for EHT PHY.  **Tgbe editor please implement changes as shown in doc 11-21/0252r1 tagged as 1130.** |
| 1023 | Abhishek Patil | 87/04 | 11.1.4.3.4 | In 11.1.4.3.4, update the 3rd paragraph to add a bullet to cover PHY not support case when FILS Request Parameter IE requests for EHT PHY | Add a bullet to the 3rd paragraph as follows: "If the FILS Criteria field is present in the FILS Requests Parameters element and the PHY Support Criterion of the FILS Criteria field of the FILS Request Parameters element is <TBD> and the responding STA is not EHT capable." | **Revised**  The identified paragraph was updated to insert a bullet for the EHT PHY case.    **Tgbe editor please implement changes as shown in doc 11-21/0252r1 tagged as 1023.** |
| 1020 | Abhishek Patil | 76/42 | 9.6 | Clause 9.6.7.36 (FILS Discovery frame) needs to be updated as follows: 1. Provide indication that the advertising AP is affiliated with an AP MLD, 2. Update Table 9-384 to indicate BW > 160 MHz, 3. Update Tables 9-385, Table 9.386 and 9-387 to signal EHT PHY capabilities | As in comment | **Revised**  An explicit indication for the advertising AP being part of an AP MLD was not added. This indication is implied by the PHY Index subfield (if set to 5) of the FD Capability subfield of the FILS Discovery Information  Tables 9-384, 9-386 and 9-387 were updated to signal EHT PHY capabilities. Table 9-385 was not updated because although the use of 16 SS is approved. However, it is not an R1 feature.  Normative text was added in Clause 35.3.4 to cover the behavior at the non-AP MLD side when receiving the FILS Discovery frame.  **Tgbe editor please implement changes as shown in doc 11-21/0252r1 tagged as 1020.** |

***TGbe editor: Please note Baseline is REVmd D5.0, 11ax D8.0, and 11be D0.3***

**9.4.2.36 Neighbor Report element**

TGbe editor: Please update Figure 9-337 (BSSID Information field format) as shown below [CID 1010, 1128]:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 B1 | B2 | B3 | B4 B9 | B10 | B11 | B12 | B13 |
|  | AP Reachability | Security | Key Scope | Capabilities | Mobility  Domain | High Throughput | Very High Throughput | FTM |
| Bits: | 2 | 1 | 1 | 6 | 1 | 1 | 1 | 1 |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B14 | | B15 | B16 | B17 | B18 | B19 | B20 | B21 | B22        B31 |
|  | High Efficiency | | ER BSS | Co-Located AP | Unsolicited Probe Responses Active | Member Of ESS With 2.4/5 GHz Co-Located AP | OCT Supported With Reporting AP | Co-Located With 6 GHz AP | Extremely High Throughput | Reserved |
| Bits: | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 |
|  | | * BSSID Information field format | | | | | | | | |

TGbe editor: Please insert the following after the paragraph starting with “The Co-Located With 6 GHz AP subfield …” as shown below [CID 1010, 1128]:The Extremely High Throughput subfield is set to 1 to indicate that the AP represented by this BSSID is an EHT AP and that the EHT Capabilities element (or EHT Operation element), if included as a subelement in the report, is identical in content to the EHT Capabilities element (or EHT Operation element) included in the neighboring AP’s Beacon frame. Otherwise, the Extremely High Throughput subfield is set to 0.NOTE – The Extremely High Throughput subfield set to 1 implies that the AP represented by this BSSID is affiliated with an AP MLD and supports Multi-link operation as defined in 35.3 (Multi-link operation).

TGbe editor: Please insert the following row in Table 9-173 (Optional subelement IDs for Neighbor Report) [CID 1010, 1128]:

|  |  |  |
| --- | --- | --- |
| **Subelement ID** | **Name** | **Extensible** |
| <ANA> | EHT Capabilities | Yes |
| <ANA> | EHT Operation | Yes |
| <ANA> | Basic variant Multi-Link | Yes |

***TGbe editor: Please insert the following after the paragraph beginning with “The SSID subelement has the same format”[CID 1010, 1128]:***

The EHT Capabilities subelement is the same as the EHT Capabilities element defined in 9.4.2.295c (EHT Capabilities element).

The EHT Operation subelement is the same as the EHT Operation element defined in 9.4.2.295a (EHT Operation element).

The Basic variant Multi-Link subelement is the same as the Basic variant Multi-Link element defined in 9.4.2.295b.2 (Basic variant Multi-Link element).

NOTE – The AP follows the rules defined in 35.3.2 (Container for multi-link information) when it includes a Basic variant Multi-Link subelement in the Neighbor Report element.

**35.3.2 Container for multi-link information**

***TGbe editor: Please insert the following sentence as the last paragraph as shown below [CID 1010, 1128]:***

**35.3.2.1 General**

In order to prevent duplication of information, an AP of an AP MLD shall not include 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.

The Basic variant Multi-Link element when carried in the Neighbor Report element shall not include Link Info field.

**9.4.2.45 Multiple BSSID element**

***TGbe editor: Please update the following paragraph as shown below [CID 1011]:***

The Timestamp and Beacon Interval fields, TIM, DSSS Parameter Set, IBSS Parameter Set, Country, Channel Switch Announcement, Extended Channel Switch Announcement, Wide Bandwidth Channel Switch, Transmit Power Envelope, Supported Operating Classes, IBSS DFS, ERP Information, HT Capabilities, HT Operation, VHT Capabilities, VHT Operation, S1G Beacon Compatibility, Short Beacon Interval, S1G Capabilities, and S1G Operation, HE Capabilities, HE 6 GHz Band Capabilities, HE Operation, BSS Color Change Announcement, Spatial Reuse Parameter Set, EHT Capabilities, and EHT Operation elements are not included in the Nontransmitted BSSID Profile subelement; the values of these elements for each nontransmitted BSSID are always the same as the corresponding transmitted BSSID element values.

* + - 1. **TIM Broadcast**

***TGbe editor: Please update the subclause before the NOTE as shown below [CID 1024]:***

q) Modification of the Spatial Reuse Parameter Set element

r) Modification of the UORA Parameter Set element(#24019)

s) Modification of the EHT Operation element

t) Modification of the Basic variant Multi-Link element

**35.3.8 BSS parameter critical update procedure**

***TGbe editor: Please update the text as shown below [CID 1024]:***

An AP within an AP MLD shall increase the value (modulo TBD maximum value) of the Change Sequence field for the AP when a critical update occurs to any of the elements for the AP. An AP within an AP MLD shall increase the value (modulo TBD maximum value) of the Change Sequence field for another AP in the same AP MLD when a critical update occurs to any of the elements for that AP. An AP within an AP MLD that is transmitted BSSID shall increase the value (modulo TBD maximum value) of the Change Sequence field for a nontransmitted BSSID in the same multiple BSSID set when a critical update occurs to any of the elements for the nontrasnmitted BSSID. The name and format of the Change Sequence field are TBD. The critical updates that cause the Change Sequence field for an AP affiliated with an AP MLD to be incremented are defined as all events listed in 11.2.3.15 (TIM Broadcast) except the events listed below..

* Modification of the Basic variant Multi-Link element

NOTE – An update to the Common Info field of the Basic variant Multi-Link element is expected to be the same on all the links. Hence, a change in the Basic variant Multi-Link element does not qualify as a criterion to cause an increment of the Change Sequence field.

**9.4.2.177 FILS Request Parameters element**

***TGbe editor: Please insert the following row in Table 9-288 (PHY Support Criterion subfield) and update the Reserved row as appropriate [CID 1014, 1130]:***

|  |  |
| --- | --- |
| Table 9-288 PHY Support Criterion subfield | |
| Value | Explanation |
| 4 | Indicates that a responding FILS STA is EHT capable. |
| 5-7 | Reserved |

**11.1.4.3.4 Criteria for sending a response**

***TGbe editor: Please add the following after the bullet point “3a) If the FILS Criteria field is … is not HE capable.” [CID 1023]***

3b) If the FILS Criteria field is present in the FILS Request Parameters element and the PHY Support Criterion of the FILS Criteria field of the FILS Request Parameters element is 4 and the responding STA is not EHT capable.

**9.6.7.36** **FILS Discovery frame format**

TGbe editor: Please update and insert a new row in Table 9-384 (BSS Operating Channel Width) as follows and update the Reserved row as appropriate [CID 1020]:

Table 9-384 – BSS Operating Channel Width

|  |  |  |  |
| --- | --- | --- | --- |
| BSS Operating Channel Width field | HR/DSSS, OFDM, ERP, HT, VHT, or HE BSS operating channel width | EHT BSS operating channel width | TVHT BSS operating channel width |
| 0 | 20 MHz or 22 MHz | 20 MHz or 22 MHz | TVHT\_W |
| 1 | 40 MHz | 40 MHz | TVHT\_W+W |
| 2 | 80 MHz | 80 MHz | TVHT\_2W |
| 3 | 160 MHz or 80+80 MHz | 160 MHz | TVHT\_4W or TVHT\_2W+2W |
| 4 | Reserved | 320 MHz | Reserved |
| 5-7 | Reserved | Reserved | Reserved |

TGbe editor: Please insert a new row in Table 9-386 (PHY Index subfield) as follows and update the Reserved row as appropriate [CID 1020]:

|  |  |
| --- | --- |
| Table 9-386 PHY Index subfield | |
| PHY Index subfield | PHY |
| 5 | EHT (see Clause 36 (Extremely High Throughput (EHT) PHY specification)) |
| 6-7 | Reserved |

TGbe editor: Please insert a column in Table 9-387 (FILS Minimum Rate) as follows [CID 1020]:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Table 9-387 FILS Minimum Rate | | | | | | |
| FILS Minimum Rate subfield | PHY Index subfield is 0 (HR/DSSS) | PHY Index subfield is 1 (ERP-OFDM) | PHY Index subfield is 2 (HT) | PHY Index subfield is 3 (VHT or TVHT) | PHY Index subfield is 4 (HE) | PHY Index subfield is 5 (EHT) |
| 0 | 1 Mbps | 6 Mbps | MCS 0 | MCS 0 | HE-MCS 0 | EHT-MCS 0 |
| 1 | 2 Mbps | 9 Mbps | MCS 1 | MCS 1 | HE-MCS 1 | EHT-MCS 1 |
| 2 | 5.5 Mbps | 12 Mbps | MCS 2 | MCS 2 | HE-MCS 2 | EHT-MCS 2 |
| 3 | 11 Mbps | 18 Mbps | MCS 3 | MCS 3 | HE-MCS 3 | EHT-MCS 3 |
| 4 | Reserved | 24 Mbps | MCS 4 | MCS 4 | HE-MCS 4 | EHT-MCS 4 |
| 5-7 | Reserved | Reserved | Reserved | Reserved | Reserved | Reserved |

TGbe editor: Please update the following subclause as shown below [CID 1010, 1020, 1128]:

**35.3.4 Discovery of an AP MLD**

**35.3.4.3 Non-AP behavior**

A non-AP MLD shall be able to discover an AP MLD when it receives a Basic variant Multi-Link element carried in a Beacon frame or Probe Response frame, that is not an ML probe response, transmitted by an AP affiliated with the AP MLD or by the AP corresponding to the transmitted BSSID in the same multiple BSSID set as at least one of the APs affiliated with the AP MLD.

A non-AP MLD shall be able to discover an AP MLD and the capabilities and operational parameters of one or more APs affiliated with an AP MLD when it receives a Basic variant Multi-Link element that carries a complete profile of the reported AP carried in the ML Probe Response frame transmitted by an AP affiliated with the AP MLD or by the AP corresponding to the transmitted BSSID in the same multiple BSSID set as at least one of the APs affiliated with the AP MLD.

A non-AP MLD shall be able to discover an AP as an AP affiliated with an AP MLD when it receives the Reduced Neighbor Report element carried in a Beacon or Probe Response frame transmitted by the AP. A non-AP MLD shall be able to infer the relationship between the reported AP and the reporting AP by decoding the MLD ID subfield of the MLD Parameters subfield in the Reduced Neighbor Report element and following the rules described in 35.3.4.1 (AP behavior).

A non-AP MLD may use the information it gathers from a Reduced Neighbor Report element and a Basic variant Multi-Link element to decide whether to perform multi-link setup with an AP MLD.

A non-AP MLD shall be able to discover an AP MLD when it receives a Neighbor Report element carried in a Management frame. If the Extremely High Throughput subfield of the BSSID Information field is equal to 1, then the reported AP is an EHT AP and is affiliated with an AP MLD. If a Basic variant Multi-Link subelement is transmitted in the Neighbor Report element, then the non-AP MLD shall be able to obtain, based on the contents of the Common Info field, the MLD information for the AP MLD with which the reported AP is affiliated. A non-AP MLD may use the information it receives from a Neighbor Report element to make a decision on performing multi-link setup (see 35.3.5) or ML transition. A non-AP MLD shall be able to determine that two or more APs reported in different Neighbor Report elements are affiliated with the same AP MLD if the MLD MAC address of the reported APs are the same.

A non-AP MLD shall be able to discover an AP MLD through the FILS Discovery frame. If the PHY Index subfield of the FD Capability subfield of the FILS Discovery Information field is set to 5, then the AP transmitting the FILS Discovery frame is an EHT AP and is affiliated with an AP MLD. A non-AP MLD may use the information to make decisions such as listening for the next Beacon frame transmitted by an AP affiliated with an AP MLD or sending an ML Probe Request frame to an AP affiliated with an AP MLD.

***TGbe editor: Please update the title of the following subclause as shown below:***

**35.3.4.4 Multi-link element usage rules in the context of discovery**