IEEE P802.11
Wireless LANs

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| Resolution for Miscellaneous CIDs related to Clause 35.3.18 (CC36) |
| Date: June 20, 2021 |
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 Abstract

This submission proposes resolutions for following comments received for TGbe CC36:

6177, 7826, 4078, 4079, 5065, 5066, 5107, 5701, 5702, 5703, 4247, 6965, 7622, 6971, 6972, 6967

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Editorial changes and wording changes according to the received comments.

***TGbe editor: Please note Baseline is 11ax D8.0, and 11be D1.3***

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** | **Clause**  | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 6177 | Michael Montemurro | 35.3.17 | 284.08 | Soft AP is not defined in 802.11 and it would be a complex task to update the base standard to define soft AP. However this looks to be requirements for a resource constrained AP MLD. | At the cited location, change "Change the title to "NSTR resource constrained AP MLD operation" | Revised.Agree with the commenter in principle. “NSTR Mobile AP MLD” has been accepted to replace “NSTR Soft AP MLD” in doc 11-21/1180r2 (https://mentor.ieee.org/802.11/dcn/21/11-21-1180-02-00be-cc36-cr-for-5386.docx) tagged as 5386.TGbe editor to make the changes shown in doc 21/1210r2. |
| 7826 | Yiqing Li | 35.3.17 | 284.06 | Please check the 35.3.17 for "an NSTR soft AP MLD" which should be "a NSTR soft AP MLD" | As commented. | Revised.Agree with the commenter in principle. “NSTR Mobile AP MLD” has been accepted to replace “NSTR Soft AP MLD” in doc 11-21/1180r2 (https://mentor.ieee.org/802.11/dcn/21/11-21-1180-02-00be-cc36-cr-for-5386.docx) tagged as 5386.TGbe editor to make the changes shown in doc 21/1210r2. |
| 4078 | Abhishek Patil | 35.3.17.1 | 284.24 | The spec needs to provide details on how a non-AP MLD identifies an AP MLD as an nSTR SoftAP. In addition, need details on how to identify a link as a nonprimary link. | As in comment | Revised.Agree with the commenter in principle.A subclasue ‘35.3.18.2 Discovery of an NSTR Mobile AP MLD’ is added.TGbe editor to make the changes shown in doc 21/1210r2. |
| 4079 | Abhishek Patil | 35.3.17.1 | 284.24 | The nSTR softAP MLD does not beacon on the nonprimary link and probing is not allowed on the nonprimary link. How does a non-AP MLD discover the nonprimary link? Furthermore, how does the non-AP MLD retrieve the (BSS parameter) updates for the nonprimary link. | Provide details the discovers mechanism and how critical updates work for the nonprimary link | RevisedAgree with the commenter in principle.A subclasue ‘35.3.18.2 Discovery of an NSTR Mobile AP MLD’ and a subclause ‘35.3.18.3 NSTR Mobile AP MLD BSS parameter critical update procedure’ are added.TGbe editor to make the changes shown in doc 21/1210r2. |
| 5065 | Gaurang Naik | 35.3.17.1 | 284.24 | Since an NSTR softAP MLD is not allowed to send a Beacon or Probe Response frames on the nonprimary link, the discovery procedure must ensure that legacy STAs do not discover the AP operating on the nonprimary link. The spec must provide a discovery mechanism that is different from the one used by APs affiliated with an AP MLD, and this is not discoverable by legacy STAs. | As in comment | RevisedAgree with the commenter in principle.A subclasue ‘35.3.18.2 Discovery of an NSTR Mobile AP MLD’ is added.TGbe editor to make the changes shown in doc 21/1210r2. |
| 5107 | Geonjung Ko | 35.3.17.1 | 284.25 | Need to specify how to determine which link is the primary link at non-AP MLD side. | As in comment | RevisedAgree with the commenter in principle.A subclasue ‘35.3.18.2 Discovery of an NSTR Mobile AP MLD’ is added. The non-primary link can be determined through neighbor AP Information field in RNR element.TGbe editor to make the changes shown in doc 21/1210r2. |
| 5701 | Kaiying Lu | 35.3.17.1 | 284.6 | Mechanism to discover the NSTR soft AP MLD needs to be defined. | As in comment | RevisedAgree with the commenter in principle.A subclasue ‘35.3.18.2 Discovery of an NSTR Mobile AP MLD’ is added.TGbe editor to make the changes shown in doc 21/1210r2. |
| 5703 | Kaiying Lu | 35.3.17.1 | 284.6 | Mechanism to identify an AP operating on the non-primary link of an NSTR link pair through RNR needs to be defined. | As in comment | RevisedAgree with the commenter in principle.A subclasue ‘35.3.18.2 Discovery of an NSTR Mobile AP MLD’ is added.TGbe editor to make the changes shown in doc 21/1210r2. |
| 4247 | Alfred Asterjadhi | 35.3.2.2 | 247.40 | Does this apply to an NSTR Soft AP as well? If yes then how does the STA learn the full information of the other link (since no beacons are sent in the other link)? | As in comment. | RevisedAgree with the commenter in principle.A subclasue ‘35.3.18.2 Discovery of an NSTR Mobile AP MLD’ is added.TGbe editor to make the changes shown in doc 21/1210r2. |
| 7622 | Tomoko Adachi | 35.3.17.1 | 284.24 | How the non-AP MLDs know that the device transmitting the Beacon and Probe Response frames is a soft AP MLD needs to be described. By the info on the NSTR link pair?Is the nonprimary link just different from the primary link in the sense that Beacon and Probe Response frames are not transmitted? Can the BSS consisted at the nonprimary link have different settings from those in the primary link? Does the soft AP MLD accept Association Request frames in the nonprimary link? These should be also described. | As in comment | RevisedAgree with the commenter in principle.A subclasue ‘35.3.18.2 Discovery of an NSTR Mobile AP MLD’ and a subclause ‘35.3.18.3 NSTR Mobile AP MLD BSS parameter critical update procedure’ are added.TGbe editor to make the changes shown in doc 21/1210r2. |
| 5066 | Gaurang Naik | 35.3.17.1 | 284.24 | It is unclear as to how an AP affiliated with a softAP MLD operating on the primary link signals the critical updates for the nonprimary link. | Clarify how an AP affiliated with a softAP MLD operating on the primary link signals the critical updates for the nonprimary link. | RevisedAgree with the commenter in principle.A subclause ‘35.3.18.3 NSTR Mobile AP MLD BSS parameter critical update procedure’ are added.TGbe editor to make the changes shown in doc 21/1210r2. |
| 5702 | Kaiying Lu | 35.3.17.1 | 284.6 | An NSTR soft AP MLD shall only transmit Beacon frames and Probe Response frames on the primary link. BSS parameters and BSS parameters updates for the non-primary link shall be carried on the primary link. Please clarify it. | As in comment | RevisedAgree with the commenter in principle.A ‘35.3.18.3 NSTR Mobile AP MLD BSS parameter critical update procedure’ are added.TGbe editor to make the changes shown in doc 21/1210r2. |
| 6965 | Sanghyun Kim | 35.3.17.1 | 284.25 | Need to specify how Beacon frame related information for the nonprimary link(AP) is signaled1. Beacon interval subfield in the Per-STA profile subelement(in the primary link's management frame) corresponding to the nonprimary AP2. DTIM Info subfield in the Per-STA profile subelement(in the primary link's management frame) corresponding to the nonprimary APAlternatively, even if the Per-STA is a complete Per-STA profile, it may be allowed that the Beacon frame related information for the non-primary link AP is not included in the Per-STA profile subelement. | Clarify it | Revised.Agree with the commenter in principle.Beacon Interval and DTIM subfield for non-primary link is clarified in “9.4.2.295b.2 Basic variant Multi-Link element”TGbe editor to make the changes shown in doc 21/1210r2. |
| 6971 | Sanghyun Kim | 9.4.1.6 | 110.13 | The NSTR soft AP MLD does not transmit beacon frames on the nonprimary link. So, a non-AP MLD shall indicate the Listen interval in units of beacon interval of primary link when the non-AP MLD transmits (Re)Association Request frame to the NSTR soft AP MLD. | Clarify it. | Revised.Agree with the commenter in principle.Beacon Interval and DTIM subfield will not be present in the per-STA profile subelement corresponding to the non-primary link, so that only primary link beacon interval will be used as the unit of listen interval. Beacon Interval and DTIM subfield for non-primary link is clarified in “9.4.2.295b.2 Basic variant Multi-Link element” TGbe editor to make the changes shown in doc 21/1210r2. |
| 6972 | Sanghyun Kim | 9.4.2.295b.2 | 134.1 | Need to specify whether the Beacon Interval/DTIM Info Present subfields of a Per-STA Profile subelement corresponding to a nonprimary AP(of an NSTR soft AP MLD) are need to set to 1 or not.(NSTR Soft AP MLD has no beacon frame related information for the nonprimary link. ) | Clarify it. | Revised.Agree with the commenter in principle.Beacon Interval and DTIM subfield will not be present in the per-STA profile subelement corresponding to the non-primary link, so that only primary link beacon interval will be used as the unit of listen interval. Beacon Interval and DTIM subfield for non-primary link is clarified in “9.4.2.295b.2 Basic variant Multi-Link element” TGbe editor to make the changes shown in doc 21/1210r2. |
| 6967 | Sanghyun Kim | 35.3.17.1 | 284.25 | STAs of a BSS set their local TSF timer using timestamp in the received Beacon frame from the AP.In the case of nonprimary link, there is no Beacon frame to set TSF timer. So, STAs in the nonprimary BSS should set their TSF timer in different way to primary BSS STAS. | Clarify AP/STA operation in nonprimary link regarding the TSF. | RevisedAgree with the commenter in principle.STAs in the non-primary BSS shall set their TSF timer using timestamp in the received Beacon frame in the primary link.TGbe editor to make the changes shown in doc 21/1210r2. |

35. Extremely High Throughput (EHT) MAC specification

35.3 Multi-Link Operation

35.3.18 NSTR Mobile AP MLD Operation (#6177)(#7826)

***TGbe editor: Please modify the following subclause 35.3.18.1 as follows:***

**35.3.18.1 General**

**…**

An NSTR Mobile AP MLD shall designate one link of an NSTR link pair as the primary link to transmit Beacon and Probe Response frames. The other link of the NSTR link pair is the non-primary link.

(# 6967)TSF timers of all APs affiliated with an NSTR Mobile AP MLD shall be the same.

***TGbe editor: Please insert the following subclause 35.3.18.2 as follows:***

**35.3.18.2 Discovery of an NSTR Mobile AP MLD (#4078)(#4079)(#5065)(#5107)(#5701)(#5703)(#7622)(#4247)**------------------------------------------------------------------------------------------------------

**Discussion on discovery of an NSTR Mobile AP MLD and the non-primary link:**

An NSTR Mobile AP MLD can be discovered by identifying an AP affiliated with the AP MLD and that is operating on a non-primary link in the Reduced Neighbor Report element carried in a Beacon/Probe Response frame transmitted on the primary link. A non-primary link can be identified by using TBTT Information field of a Neighbor AP Information field in the RNR element.

There are two options to identify the neighbor AP on a non-primary link.

Option 1: setting the TBTT Information Field Type subfield to 1.

Option 2: setting the TBTT Information Field Type subfield to 0 and the TBTT Information Length subfield to 3.

Both options are legacy STA compatible. Legacy STAs will ignore the neighbor AP with either the unrecognized TBTT Information Field Type (set to 1 in this case) or unrecognized TBTT Information Length (set to 3 in this case).

Option 1 using a new TBTT Information Field Type allows flexible future extension with TBTT Information Length subfield having all other values reserved, except value 3. It allows MLD Parameters subfield of mobile AP on the non-primary link to carry different information than those of regular neighbor APs. Eg. MLD ID in the MLD parameters subfield is not needed for mobile AP on the non-primary link. It also allows different TBTT Information Length subfield corresponding to the mobile AP on the non-primary link than that of regular neighbor APs. Option 2 uses the same TBTT Information Field Type as a regular AP with a specific TBTT Information Length value 3 which is the only possible value for mobile AP operating on the non-primary link with no future extension allowed.

**Option 1 is preferred.**

**Discussion part is over.**

**-----------------------------------------------------------------------------------------------------------**

The discovery procedure for an NSTR Mobile AP MLD is the same as the procedure described in 35.3.4 (Discovery of an AP MLD) with the following exceptions:

* An AP affiliated with an NSTR Mobile AP MLD and that is operating on the primary link of an NSTR link pair shall include a TBTT Information field in a Reduced Neighbor Report element with the TBTT Information Field Type subfield set to 1 corresponding to a reported AP affiliated with the NSTR Mobile AP MLD and that is operating on the non-primary link of the NSTR link pair in a Beacon and Probe Response frames that it transmits. The TBTT Information Field Type subfield set to 1 identifies, together with the TBTT Information Length subfield, the format of the TBTT Information field for the reported AP operating on the non-primary link.
* (#6965) (#6971) (#6972) An AP affiliated with an NSTR Mobile AP MLD and that is operating on the primary link shall set the Beacon Interval Present subfield to 0 and shall set the DTIM Info Present subfield to 0 in the STA Control field of the Per-STA profile subelement corresponding to the AP affiliated with the NSTR Mobile AP MLD and that is operating on the non-primary link.
* To request a complete profile of the AP affiliated with an NSTR Mobile AP MLD and that is operating on the non-primary link, a non-AP STA affiliated with a non-AP MLD may send an ML probe request frame to an AP affiliated with the NSTR Mobile AP MLD and that is operating on the primary link.
* A non-AP STA affiliated with a non-AP MLD and that is operating on the same link as the non-primary link shall not transmit a Probe Request frame to the AP affiliated with the NSTR Mobile AP MLD and that is operating on the non-primary link of the NSTR link pair.

(#7622)Note1: The AP affiliated with an NSTR Mobile AP MLD and that is operating on the non-primary link does not send a Beacon frame or respond to Probe Request frame. The BSS Parameter Change Count for the AP operating on non-primary link is only advertised on the primary link in the MLD Parameters subfield in the TBTT Information field of the Reduced Neighbor Report element corresponding to that AP.

***TGbe editor: Please insert the following subclause 35.3.18.3 as follows:***

**35.3.18.3 NSTR Mobile AP MLD BSS parameter critical update procedure (#4079) (#5066) (#5702) (#7622)**

The BSS parameter critical update procedure for an AP affiliated with an NSTR Mobile AP MLD shall follow the BSS parameter critical update procedure defined in 35.3.8 (BSS parameter critical update procedure) with the following exception:

* A non-AP STA affiliated with a non-AP MLD and that is operating on the non-primary link shall not transmit a Probe Request frame to request updated BSS parameters

Note: The AP affiliated with an NSTR Mobile AP MLD and that is operating on the non-primary link does not send a Beacon frame or respond to Probe Request frame. The BSS Parameter Change Count for the AP operating on non-primary link is only advertised on the primary link in the MLD Parameters subfield in the TBTT Information field of the Reduced Neighbor Report element corresponding to that AP.

***TGbe editor: Please update the following subclause 9.4.2.170.2 as follows:***

**9.4.2.170.2 Neighbor AP Information field**

…

The TBTT Information Length subfield is 1 octet in length and indicates the length of each TBTT Information field included in the TBTT Information Set field of the Neighbor AP Information field. If the TBTT Information Field Type subfield is 0, the TBTT Information Length subfield:

—contains the length in octets of each TBTT Information field that is included in the TBTT Informa­tion Set field of the Neighbor AP Information field

— is set to 1, 2, 4, 5, 6, 7, 8, 9, 11, or 12, 13, or 16; other values of the length field are reserved;

(#4078) (#4079) (#5065) (#5107) (#5701) (#5703) (#7622) If the TBTT Information Field Type subfield is 1, the TBTT Information Length subfield:

—is set to 3; other values are reserved;

The TBTT Information Length subfield indicates the TBTT Information field contents as shown in Table 9-281 (TBTT Information field con­tents).

**Table 9-281—TBTT Information field contents**

|  |  |  |  |
| --- | --- | --- | --- |
|

|  |
| --- |
| **TBTT Information Length subfield value** |

 |

|  |
| --- |
| **TBTT Information field contents** |

 |
|  … |  |
| 3 |

|  |  |
| --- | --- |
| The MLD Parame­ters subfield  |  |

 |
| 0, ~~3, 4, 10~~, 14,15 |  Reserved |
|

|  |  |  |  |
| --- | --- | --- | --- |
|

|  |  |
| --- | --- |
| …  |  |

 |  |

  |  |

**…**

**Figure 9-709—TBTT Information field for­mat when the TBTT Information Length subfield is not equal to 3**

***TGbe editor: Please*** ***insert Figure 9-709x (TBTT Information field for­mat when the TBTT Information Length is equal to 3) as follows:***

|  |  |
| --- | --- |
|

|  |
| --- |
| MLD Parame­ters |

 |

 **Octets: 3**

**Figure 9-709x—TBTT Information field for­mat when the TBTT Information Length is equal to 3**

…

The format of the MLD Parameters subfield is defined in Figure 9-632b (MLD Parameters subfield for­mat)

 B0 B7 B8 B11 B12 B19 B20 B23

|  |  |  |  |
| --- | --- | --- | --- |
| MLD ID/ Reserved  | Link ID | BSS Parameters Change Count | Reserved |

 Bits 8 4 8 4

 **Figure 9-709b—MLD Parameters subfield for­mat**

The MLD ID subfield indicates the identifier of the AP MLD (#6233)with which the reported AP is affili-ated. If the reported AP is affiliated (#6233)with the same MLD as the reporting AP (#8275)sending the frame carrying this element, the MLD ID subfield is set to 0. If the reported AP is affiliated (#6233)with the same MLD as a nontransmitted BSSID that is in the same multiple BSSID set as the reporting AP (#8275)sending the frame carrying this element, the MLD ID subfield is set to the same value as in the BSSID Index field in the Multiple BSSID-Index element in the nontransmitted BSSID profile corresponding to the nontransmitted BSSID. If the reported AP is (#6233)affiliated with another AP MLD, the MLD ID subfield is set to a value (#8163)(#8276)that is unique for this AP MLD in frames sent by the reporting AP and that is higher than 0 and lower than 255 if no Multiple BSSID element is carried in the same frame or a value higher than and lower than 255 if a Multiple BSSID element is carried in the same frame, where n is the value contained in the MaxBSSID Indicator field in the Multiple BSSID ele-ment(#2972)(#3361)(#1041)(#1923)(#1973). The MLD ID subfield is set to 255 if the reported AP is not part of an AP MLD, or if the reporting AP does not have information of that MLD(#2156). The MLD ID subfield is reserved if the reported AP is affiliated with an NSTR mobile AP MLD and that is operating on the non-primary link. **(#4078)(#4079)(#5065)(#5107)(#5701)(#5703)(#7622)(#4247)**

…

The BSS Parameters Change Count subfield is an unsigned integer, initialized to 0, that increments when a critical update to the BSS Parameters (#4079)(#5066)(#5702)(#7622) of the reported AP occurs. The critical updates are defined in 11.2.3.15 (TIM Broadcast). The BSS Parameters Change Count subfield is set to 255(#2156) if the reported AP is not part of an AP MLD, or if the reporting AP does not have that information.

***TGbe editor: Please update the following subclause 9.4.2.295b0.2 as follows:***

**9.4.2.295b.2 Basic variant Multi-Link element**

 B0 B3 B4 B5 B6 B7 B8 B9 B10 B15

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Link ID | Complete Profile | MAC Address Present | Beacon Interval Present | DTIM Info Present | NSTR Link PairPresent | NSTR Bitmap Size | Reserved |

Bits: 4 1 1 1 1 1 1 6

 **Figure 9-788eo—STA Control field format**

The Beacon Interval Present subfield indicates the presence of the Beacon Interval subfield in the STA Info field and is set to 1 if the Beacon Interval subfield is present in the STA Info field; otherwise set to 0. A non-AP STA sets the Beacon Interval Present subfield to 0 in transmitted Basic variant Multi-Link element. An AP sets this subfield to 1 when the element carries complete profile, except for an AP affiliated with an NSTR Mobile AP MLD and that is operating on the non-primary link. (#6965)(#6971)The DTIM Info Present subfield indicates the presence of the DTIM Info subfield in the STA Info field and is set to 1 if the DTIM Info subfield is present in the STA Info field; otherwise set to 0. A non-AP STA sets the DTIM Info Present subfield to 0 in transmitted Basic variant Multi-Link element. An AP sets this sub­field to 1 when the element carries complete profile, except for an AP affiliated with an NSTR Mobile AP MLD and that is operating on the non-primary link. (#6965) (#6971)

***TGbe editor: Please update the following subclause 35.3.1 as follows:***

**35.3 Multi-link operation**

**35.3.1 General**

MLO enables a non-AP MLD to discover, authenticate, associate, and set up multiple links with an AP MLD. Each link enables channel access and frame exchanges between the non-AP MLD and the AP MLD based on the supported capabilities exchanged during association.

(#1057)(#2319)A STA, which is affiliated with an MLD, may select and manage its (#6601)capabilities and operating parameters independently from the other STA(s) affiliated with the same MLD, unless specified otherwise.

(#1057)(#2319)NOTE 1—For example, each AP, which is affiliated with an AP MLD, may select its BSS color corresponding to the BSS that the AP generates differently.

(#5606)NOTE 2—Examples of operating parameters that are selected at the MLD level (i.e., not independently selected by affiliated STAs) are the listen interval (see 35.3.11.6 (Operation for MLD listen interval)) and the WNM sleep interval (see 11.2.3.1 (General)).

(#6967)TSF timers of all APs affiliated with an AP MLD or an NSTR mobile AP MLD shall be synchronized to a common clock.

**1210r2**

**Straw Poll: Do you support to incorporate the proposed draft text in this document 11-21/1210r21210r2 to the next revision of TGbe Draft?**

**Result: Yes/No/Abstain**