IEEE P802.11
Wireless LANs

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| CR for Multiple BSSID Index Adjustment |
| Date: Oct 2022 |
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Abstract

Proposed draft text for enhancements to TID mapping.

The submission proposes text changes to resolve CID 14067 from LB266. All proposed changes are based on 802.11be Draft 2.2.

Please see discussion notes below for a review of introduced changes.

# Revision History

|  |  |  |
| --- | --- | --- |
| **Date** | **Revision** | **Changes** |
| 2022-10-28 | 0 | Initial draft |

# LB266 Comments and discussion [against Draft 2.0]

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| --- | --- | --- | --- | --- | --- |
| **CID** | **P.L** | **Clause** | **Comment** | **Proposed Change** | **Proposed Resolution** |
| 14067 | 426.01 | 35.3.6.2.2 | Procedure for removing an AP corresponding to the transmitted BSSID of a Multi-BSSID set is unclear, if the APs corresponding to the non-transmitted BSSID's are not meant to be removed. | Define procedures for non-transmitted BSSIDs if the removed AP corresponds to the transmitted BSSID | Resolution: Revised, please implement the changes as shown in document 22/XXXXr[motioned revision] marked #14067. |

**Discussion:**

TGbe has defined procedures for

* Removing an AP from AP MLD (permanently)
* Disabling an AP affiliated with an AP MLD (Temporarily)

Both of the procedures above will result in a halt in transmission of Beacon frames as well as any other frames from the AP that is removed.

It may be the case that the AP that is removed or disabled is the TX BSSID in an MBSSID set, and we do not desire to remove or disable any of the other APs belonging to the same MSSID set (ie. Non-TX BSSIDs).

In order to continue operating the non-Tx BSSIDs we need to define a mechanism that selects one of the non-TX BSSIDs as the TX BSSID after the removal operation. This document defines a procedure similar to CSA in order to achieve this.

9.4.2.45 Multiple BSSID element

TGbe editor: Change the second last item of the seventh paragraph as follows: (#14067):

- 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, and 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, ~~and~~ Spatial Reuse Parameter Set, EHT Capabilities, EHT Operation, and Multiple BSSID Configuration 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.

* Multiple BSSID Configuration element(11ax)

TGbe editor: Modify section 9.4.2.260 as shown below (#14067):

The Multiple BSSID Configuration element is used to provide configuration information for a multiple BBSID set.

The format of the Multiple BSSID Configuration element is shown in Figure 9-899 (Multiple BSSID Configuration element format(11ax)).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |
|  | Element ID | Length | Element ID Extension | BSSID Count | Full Set Rx Periodicity | Index Adjustment Factor | Index Adjustment TBTT Count |
| Octets: | 1 | 1 | 1 | 1 | 1 | 0 or 1 | 0 or 1 |
| Multiple BSSID Configuration element format(11ax) |

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1 (General).

The BSSID Count field carries the total number of active BSSIDs in the multiple BSSID set.

Full Set Rx Periodicity field indicates the least number of Beacon frames or DMG Beacon frames a STA needs to receive in order to discover all the active nontransmitted BSSIDs in the set.

The Index Adjustment Factor field may be present and is set to the value by which the BSSID Index of each BSSID in a multiple BSSID set will be adjusted according to procedures defined in 11.1.3.8.6 (11.1.3.8.6 Multiple BSSID Index Adjustment Procedure).

The Index Adjustment TBTT Count field is present when the Index Adjustment Factor field is present and is set to the number of TBTTs until a BSSID Index adjustment occurs. The value 1 indicates that the switch occurs at the next TBTT (the ensuing Beacon frame is created assuming the new BSSID Index values), and the value 0 indicates that the switch occurs at any time after the frame containing the element is transmitted.

* + - * 1. Multiple BSSID Index Adjustment Procedure

TGbe editor: Add a new section 11.1.3.8.6 as shown below (#14067):

This subclause describes the procedure to adjust multiple BSSID index values, including the switching of the transmitted BSSID.

An AP corresponding to a transmitted BSSID in a multiple BSSID set shall inform STAs associated with APs belonging to the multiple BSSID set that a multiple BSSID index adjustment is imminent by advertising the adjustment using the Multiple BSSID Configuration element (see 9.4.2.260 Multiple BSSID Configuration element) in Beacon frames and Probe Response frames until the intended adjustment time. The multiple BSSID index adjustment should be scheduled so that all STAs in the BSSs corresponding to the BSSIDs in the multiple BSSID set, including STAs in power save mode, have the opportunity to receive at least one Multiple BSSID Configuration element before the adjustment.

Starting from the TBTT indicated by the Index Adjustment TBTT Count field of the Multiple BSSID Configuration element used to advertise a multiple BSSID index adjustment, the index for each BSSID belonging to the multiple BSSID set is updated as follows:

New Index = (Old Index + Index Adjustment Factor) mod 2n

Where n is the value of the MaxBSSID Indicator field of the Multiple BSSID element advertised by the AP, and the Index Adjustment Factor is indicated in the Multiple BSSID Configuration element.

Following the adjustment, the BSSID whose new index value is 0 is the transmitted BSSID, and new Beacon frames shall be transmitted using this BSSID.

The Index Adjustment Factor shall be selected such that an index belonging to an active non-transmitted BSSID is updated to the value 0.

Note 1—During the multiple BSSID index adjustment procedure no change is made to the BSSIDs, only their index within the multiple BSSID set is rotated such that a former nontransmitted BSSID becomes the new transmitted BSSID with the updated index value of 0.

Note 2—Indication of buffered group addressed frames for each BSSID belonging to the multiple BSSID set as described in 9.4.2.5 (TIM element) will follow the newly assigned multiple BSSID index values updated according to this subclause.

NOTE 3—For example, if we start with n = 3, transmitted BSSID = 8c-fd-0f-7f-1e-f5, and two nontransmitted BSSIDs BSSID(2) = 8c-fd-0f-7f-1e-f7 and BSSID(5) = 8c-fd-0f-7f-1e-f2, then an Index Adjustment Factor of 6 will convert the BSSID 8c-fd-0f-7f-1e-f7 to index (2+6) mod 23=0 as the transmitted BSSID, and the other BSSID index values are updated as BSSID((5+6) mod 23=3) = 8c-fd-0f-7f-1e-f2 and BSSID((0+6) mod 23=6) = 8c-fd-0f-7f-1e-f5 where the latter BSSID is converted into a nontransmitted BSSID.

* + - 1. **TIM Broadcast**

TGbe editor: Add an additional item in section 11.2.3.15 as shown below (#14067):

The AP shall increase the value (modulo 256) of the Check Beacon field in the next transmitted TIM frame(s) when a critical update occurs to any of the elements inside the Beacon frame.

The following events about the operational parameters of the AP shall classify as a critical update:

a) Inclusion of a Channel Switch Announcement element

b) Inclusion of an Extended Channel Switch Announcement element

c) Modification of the EDCA parameters element

d) Inclusion of a Quiet element

e) Modification of the DSSS Parameter Set

f) Modification of the HT Operation element

g) Inclusion of a Wide Bandwidth Channel Switch element

h) Inclusion of a Channel Switch Wrapper element

i) Inclusion of an Operating Mode Notification element

j) Inclusion of a Quiet Channel element

k) Modification of the VHT Operation element

l) Modification of the HE Operation element

m) Insertion of a Broadcast TWT element

m1) Insertion of a Broadcast TWT Parameter Set field in an existing Broadcast TWT element

n) Inclusion of the BSS Color Change Announcement element

o) Modification of the MU EDCA Parameter Set element

p) Modification of the Spatial Reuse Parameter Set element

q) Modification of the UORA Parameter Set element

r) Modification of the EHT Operation element

s) Insertion of the Index Adjustment Factor in the Multiple BSSID Configuration element

TGbe editor: Rename and modify subclause 35.3.11 as shown below (#14067):

* + 1. **Multi-link procedures for channel switching, extended channel switching, channel quieting, and Multiple BSSID Index Adjustment**

(#11744)In this subclause, the term affected AP is used to identify an AP that is subject to channel switching, extended channel switching, and channel quieting among all the APs that are affiliated with an AP MLD.

If (#11568)an AP (affected AP) affiliated with an AP MLD includes any of the following (#11967)applicable elements (#10644)outside the Basic Multi-Link element in the Beacon frame, Probe Response frame or (Extended) Channel Switch Announcement frame it transmits:

* Channel Switch Announcement element
* Extended Channel Switch Announcement element
* Max Channel Switch Time element
* Quiet element corresponding to quiet intervals other than quiet intervals scheduled to protect (#11109)R-TWT SPs (see 35.8.4.2 (Quieting STAs during R-TWT SPs(#10893)(#11109)))
* Quiet Channel element
* Multiple BSSID Configuration element that includes the Index Adjustment Factor field

(#11260)(#10490)then one of the following shall apply if other APs are affiliated with the same AP MLD as the affected AP:

* Another AP (reporting AP) affiliated with the same AP MLD and not corresponding to a nontransmitted BSSID shall carry the corresponding element(s) in the STA Profile field of the Per- STA Profile subelement corresponding to the affected AP contained in the Basic Multi-Link element included in the Beacon frame and Probe Response frame that it transmits.
* An AP corresponding to the transmitted BSSID in the same multiple BSSID set as a nontransmitted BSSID (reporting AP) that is affiliated with the same AP MLD as the affected AP shall carry the corresponding element(s) in the STA Profile field of the Per-STA Profile subelement corresponding to the affected AP contained in the Basic Multi-Link element corresponding to the AP MLD in the nontransmitted BSSID profile corresponding to the reporting AP in the Multiple BSSID element included in the Beacon frame and Probe Response frame that it transmits.

and

* The timing fields in the Channel Switch Announcement element, the Extended Channel Switch Announcement element, the Quiet element, the Quiet Channel element, and the Multiple BSSID Configuration element shall be applied in reference to the most recent TBTT and (#10416)Beacon Interval indicated in the corresponding element(s) of the affected AP and not to the TBTT and Beacon Interval of the reporting AP.

NOTE 1—The affected AP can correspond to a transmitted BSSID in a multiple BSSID set or an AP with dot11MultiBSSIDImplemented equal to false. The case where the affected AP corresponds to nontransmitted BSSID in a multiple BSSID set is covered in the next paragraph.

(#10647)NOTE 2—The Switch Time field in the Max Channel Switch Time element carried in the per-STA profile of the reported AP is not tied to a TBTT on the affected link. Instead, it provides an estimated time when the first Beacon frame will be transmitted on the new channel of the affected link after the channel switch has occurred.

(#11967)NOTE 3—For the Beacon and Probe Response frames all five elements are applicable. For the (Extended) Channel Switch Announcement frame, the applicable elements include the Channel Switch Announcement, Extended Channel Switch Announcement, and Max Channel Switch Time elements.

If an AP corresponding to the transmitted BSSID in a multiple BSSID set includes any of the following elements (#13372)in the Beacon frame or Probe Response frame it transmits so that any of these elements is inherited for the affected AP in these frames:

* Channel Switch Announcement element
* Extended Channel Switch Announcement element
* Max Channel Switch Time element
* Quiet element corresponding to quiet intervals other than quiet intervals scheduled to protect (#11109)R-TWT SPs (see 35.8.4.2 (Quieting STAs during R-TWT SPs(#10893)(#11109)))
* Quiet Channel element
* Multiple BSSID Configuration element that includes the Index Adjustment Factor field

and if the affected AP corresponding to a nontransmitted BSSID in the same multiple BSSID set is affiliated with an AP MLD (#10490)with at least another AP, then one of the (#11260)following shall apply:

* Another AP (reporting AP) affiliated with the same AP MLD and not corresponding to a nontransmitted BSSID shall carry the corresponding element(s) in the STA Profile field of the Per- STA Profile subelement corresponding to the affected AP contained in the Basic Multi-Link element included in a Beacon frame and Probe Response frame that it transmits.
* An AP corresponding to the transmitted BSSID in the same multiple BSSID set as a nontransmitted BSSID (reporting AP) that is affiliated with the same AP MLD as the affected AP shall carry the corresponding element(s) in the STA Profile field of the Per-STA Profile subelement corresponding to the affected AP contained in the Basic Multi-Link element carried in the Nontransmitted BSSID Profile subelement in the Multiple BSSID element included in a Beacon frame and Probe Response frame that it transmits.

and

* The timing fields in the Channel Switch Announcement element, the Extended Channel Switch Announcement element, the Quiet element, the Quiet Channel element, and the Multiple BSSID Configuration element shall be applied in reference to the most recent TBTT and (#10416)Beacon Interval included in the corresponding element(s) of the affected AP and not with respect to the TBTT and Beacon Interval of the reporting AP.