IEEE P802.11
Wireless LANs

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| CR for Power Save of NSTR Mobile AP MLD |
| Date: January 30, 2022 |
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 Abstract

This submission proposes resolutions for following CIDs received for TGbe (CC36):

5064, 6929

***TGbe Editor: Please note, the baseline for this document is REVme D1.0 and TGbe D1.4***

Revisions:

* Rev 0: Initial version
* Rev 1: Editorial modifications.

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** | **Section** | **Pg/Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 5064 | Gaurang Naik | 35.3.17.1 | 284.24 | An NSTR softAP is a mobile device and may have considerations similar to a non-AP MLD such as power save. The spec currently does not have a mechanism to signal the unavailability of the non-primary link for a soft AP MLD. | Define a mechanism by which an NSTR softAP MLD can signal the unavailability of the nonprimary link | **Revised****Agree with the commenter in principle. Considering the following facts, a trigger-based wakeup mechanism is proposed. Specifically, in order to save power, the AP which operates on the non-primary link normally operates in the doze state and can be waked up by the associated non-AP MLD for improving the throughput.*** **Since there may exist legacy STAs associated with the affiliated AP which operates on the primary link, the power save is only for the affiliated AP which operates on the non-primary link.**
* **When the AP MLD is in a very low power-level and doesn’t want the affiliated AP which operates on the non-primary link to be waked up anymore, then it can remove the non-primary link.**

**TGbe editor, please make changes as shown in doc 11-21/0356r1 tagged 5064** |
| 6929 | Ryuichi Hirata | 35.3.17.1 | 284.20 | Soft AP MLD is typically battery powered, therefore power save mechanism for soft AP MLD should be defined. | Define power save mechanism for soft AP MLD. | **Revised****TGbe editor, please make changes as shown in doc 11-21/0356r1 tagged 5064** |

*TGbe editor: Change the following subclause as follows: (#5064)*

**9.4.2.170 Reduced Neighbor Report element**

**9.4.2.170.2 Neighbor AP Information field**

The format of the MLD Parameters subfield is defined in Figure 9-709b (MLD Parameters subfield for- mat(#1068)((#1901)(#1902)(#1016)(#1017)(#1903)).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | B0 B7 | B8 B11 | B12 B19 | B20 | B21 B23 |
|  | MLD ID | Link ID | BSS Parameters Change Count | Doze | Reserved |
| Bits: | 8 | 8 | 4 | 1 | 3 |
| **Figure 9-709b—MLD Parameters subfield for- mat(#1068)((#1901)(#1902)(#1016)(#1017)(#1903)** |

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 2n – 1 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).

(#3014)(#6233)NOTE 1—The MLD ID is used to identify the list of reported APs affiliated with the same AP MLD, especially when APs from multiple AP MLDs are reported, and (#4099)is assigned such that it is unique to an AP MLD only in the frames which carries the Reduced Neighbor Report element describing reported APs affiliated with the AP MLD. Following the rules to set the MLD ID field, another AP may use a different MLD ID for the same AP MLD.

(#5122)NOTE 2—An MLD ID subfield set to 255 does not mean that the reported AP has BSSID index set to 255.

(#1019)(#1775)(#2157)(#2568)(#2974)(#3015)(#3259)(#3362)(#2976)The Link ID subfield indicates the

link identifier of the reported AP within the AP MLD (#6233)with which the reported AP is affiliated. The Link ID subfield is set to 15 if the reported AP is not part of an AP MLD, or if the reporting AP does not have that information.

NOTE 3—The link identifier is unique to an AP within an AP MLD.

(#1068)The BSS Parameters Change Count subfield is an unsigned integer, initialized to 0, that increments when a critical update to the Beacon frame 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.

The Doze subfield is used to indicate the state of the corresponding reported AP affiliated with the same AP MLD as the reporting AP. The Doze subfield is set to 1 if the corresponding reported AP is operating in the doze state and set to 0 otherwise.

*TGbe editor: Add the following subclause as follows: (#5064)*

**9.6.34.x EHT Wakeup Request frame format(#5064)**

The EHT Wakeup Request frame is used for requesting to wake up the specified link.

The Action field of the EHT Wakeup Request frame contains the information shown in Table 9-xxx (EHT Wakeup Request frame Action field format)

**Table 9-xxx—EHT Wakeup Request frame Action field format**

|  |  |
| --- | --- |
| **Value** | **Meaning** |
| 1 | Category |
| 2 | EHT Action |
| 3 | Dialog Token |
| 4 | Link Bitmap |

The Category field is defined in Table 9-79 (Category values).

The EHT Action field is defined in Table 9-623a (EHT Action field values).

The Dialog Token field is set by a non-AP MLD to a nonzero value chosen by the non-AP MLD and is set by an AP MLD to the value copied from the corresponding received EHT Wakeup Request frame.

The link Bitmap field indicates the subset of links that is requested to wake up.

*TGbe editor: Add the following subclause as follows: (#5064)*

**9.6.34.x EHT Wakeup Response frame format(#5064)**

The EHT Wakeup Response frame is used for responding to the wakeup request for the specified link.

The Action field of the EHT Wakeup Response frame contains the information shown in Table 9-xxx (EHT Wakeup Response frame Action field format)

**Table 9-xxx—EHT Wakeup Response frame Action field format**

|  |  |
| --- | --- |
| **Value** | **Meaning** |
| 1 | Category |
| 2 | EHT Action |
| 3 | Dialog Token |
| 4 | Link Bitmap |

The Category field is defined in Table 9-79 (Category values).

The EHT Action field is defined in Table 9-623a (EHT Action field values).

The Dialog Token field is set by a non-AP MLD to a nonzero value chosen by the non-AP MLD and is set by an AP MLD to the value copied from the corresponding received EHT Wakeup Request frame.

The link Bitmap field indicates the subset of the non-primary links that has been accepted to wake up.

*TGbe editor: Add the following subclause as follows: (#5064)*

**35.3.19.2 Power save for the non-primary link(#5064)**

Each AP affiliated with an NSTR mobile AP MLD and operating on the primary link shall advertise the power state of the AP affiliated with the same NSTR mobile AP MLD and operating on the non-primary link using the corresponding Doze subfield of the MLD Parameters field of the TBTT Information field corresponding to this affiliated AP in the Reduced Neighbor Report element.

An AP affiliated with a NSTR mobile AP MLD and operating on the non-primary link may enter the doze state by setting the Doze subfield of the MLD Parameters field to 1 in the TBTT Information field corresponding to this affiliated AP in the Reduced Neighbor Report element carried in the Beacon and Probe response frames transmitted on the primary link. When the affiliated AP which is operating on the non-primary link is in the doze state, this non-primary link shall not be used for any frame exchange.

When an AP affiliated with a NSTR mobile AP MLD and operateing on the non-primary link is in the awake state, the Doze subfield of the MLD Parameters field of the TBTT Information field corresponding to this affiliated AP in the Reduced Neighbor Report element is set to 0.

When a non-AP MLD wants to use a non-primary link on which the corresponding affiliated AP is in the doze state for transmissions, the non-AP MLD shall send an EHT Wakeup Request frame to the associated NSTR mobile AP MLD to wake up it through an affiliated STA and corresponding affiliated AP, respectively.

An AP affiliated with the associated NSTR mobile AP MLD shall respond to an EHT Wakeup Request frame with an EHT Wakeup Response frame after the AP that operates on the non-primary link has been successfully waked up and its power state has been turned into the awake state. The AP that operates on the non-primary link shall stay awake at least until a MPDU with the More Data subfield in the Frame Control field being equal to 0 from the non-AP MLD which successfully wake up it has been received.

*TGbe editor: Change the following subclause as follows: (#5064)*

* More Data subfield

The More Data subfield is used differently by a DMG, an S1G STA, and a non-DMG non-S1G STA(#464).

A non-DMG and non-S1G STA uses the More Data subfield to indicate to a STA in PS mode that more BUs are buffered for that STA at the AP. The More Data subfield is valid in individually addressed Data or Management frames transmitted by an AP to a STA in PS mode. The More Data subfield is set to 1 to indicate that at least one additional buffered BU is present for the same STA.

A STA affiliated with a non-AP MLD uses the More Data subfield to indicate to an AP affiliated with an NSTR mobile AP MLD on the non-primary link that more BUs are buffered for that AP at that STA. The More Data subfield is valid only in individually addressed Data or Management frames transmitted by a STA affiliated with a non-AP MLD to an AP affiliated with the associated NSTR mobile AP and operating on the non-primary link. The More Data subfield is set to 1 to indicate that at least one additional buffered BU is present for the AP affiliated with the associated NSTR mobile AP and operating on the non-primary link.

(11ax)An AP optionally sets the More Data subfield to 1 in Ack frames sent to a non-DMG non-S1G non-HE STA and in Ack, BlockAck, and Multi-STA BlockAck frames sent to an HE STA. An HE AP indicates that it supports setting the More Data subfield to 1 in these control response frames by setting the More Data Ack subfield to 1 in the QoS Info field of elements it includes in frames transmitted to the STA.

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