IEEE P802.11
Wireless LANs

|  |
| --- |
| LB266 Comment Resolution Miscellaneous CIDs – Part 2 |
| Date: 2022-11-18 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Minyoung Park | Intel Corporation |  |  | Minyoung.park@intel.com |
|  |  |  |  |  |
|  |  |  |  |  |

Abstract

This submission proposes comment resolution(s) for the following 6 CID(s) received in LB266 on TGbe D2.0 related to multi-link traffic indication, EMLSR, misc.:

CIDs:

12886, 13400, 13674, 13703, 12412, 12810, 11227, 12811

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: added CIDs 11227 and 12811 (from Abhi)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Clause Number** | **Page.****Line** | **Comment** | **Proposed Change** | **Resolution** |
| 12886 | Ilya Levitsky | 35.3.12.4 | 442.42 | Please provide concrete examples of specific unicast frames and braodcast frames that an AP can use to recommend a non-AP MLD to use one or more enabled links to retrieve individually addressed buffered BU(s) | As in comment | Revised.In D2.2, the following text has been added “An AP MLD may (#12808)use Multi-Link Traffic Indication element and TIM element carried in a Beaconframe to recommend a non-AP MLD to use one or more enabled links to retrieve individually addressed buffered BU(s). An AP MLD may also use Multi-Link Traffic Indication element and AID Bitmap elementin a Link Recommendation frame to recommend a non-AP MLD to use one or more enabled links for all exchanges both for DL and UL. The AP’s indication may be carried in a broadcast or a unicast frame.”TGbe editor to make the changes with the CID tag (#12808) in doc 22/1026r10.No change needed. |
| 13400 | Liwen Chu | 35.3.16.8.1 | 459.34 | This is not complete. An eMLSR MLD may include complete radio and low cost radio where when the complete radio is doing frame receptions in one link the low-cost radio can do CCA in another link. | fix the medium access synchronization as mentioned in the comment. With this fixing an AP MLD can use such operation to optimize the medium usage (avoiding the starting of MediumSyncDelay timer by first soliciting the UL tranmission of then transmitting the DL Data/management frames in a TXOP). | Rejected.In D2.0, the following text specifies that the medium sync is lost when CCA cannot be performed on the other EMLSR link, so if CCA can be performed, the medium sync is not lost:“When a non-AP MLD is operating in the EMLSR mode, a STA affiliated with a non-AP MLD that is operating on one of the EMLSR links is considered to have lost medium synchronization if it is not able toperform CCA during frame exchanges that includes the link switch delays between an AP affiliated with an AP MLD and one of the other STAs operating on the other EMLSR links, which are affiliated with the samenon-AP MLD.” |
| 13674 | Albert Petrick | 35.3.16.8.1 | 459.43 | The aMediumSync Threshold is 72 microseconds. In NOTE 2: link switch delays should have a value total in microseconds for switching between listening operation to frame exchanges and frame exchanges back to listening operation. | Add link switch delays in microseconds | Revised.Added a reference to 35.3.17 (Enhanced multi-link single radio operation), which defines the link switch delay.TGbe editor to make the changes with the CID tag (#13674) in doc.: IEEE 802.11-22/2045r1[https://mentor.ieee.org/802.11/dcn/22/11-22-2045-01-00be-lb266-cr-misc-part2.docx] |
| 13703 | Yunbo Li | 35.3.16.8.1 | 459.40 | When a EMLSR MLD do frame exchange in one link, the other link will lose medium sync at least larger than SIFS+CTS (at 6Mbps, 44us)+SIFS, which is larger than aMediumSyncThreshold. So the condition "if the duration of the loss of medium synchronization is longer than aMediumSyncThreshold" will always meet. | The condition "if the duration of the loss of medium synchronization is longer than aMediumSyncThreshold" is redundant, please remove it. | Rejected.Since there is no technical issue with the condition, it is better to keep the condition, which clarifies the behavior for a non-AP MLD in EMLSR mode and removes any ambiguity.  |

***TGbe editor: Please modify following sentence in subclause 35.3.16.8.1 General in D2.3,*** P514L18:

NOTE 2—The link switch delays include the delay switching from the listening operation to the frame exchanges and
the delay switching from the frame exchanges to the listening operation (#13674)(see 35.3.17 (Enhanced multi-link single radio operation)).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Clause Number** | **Page.****Line** | **Comment** | **Proposed Change** | **Resolution** |
| 12412 | Juseong Moon | 35.3.12.4 | 443.60 | It is not clear how STAs can transmit PS-Poll over multiple links with NAVSyncDelay. When STAs of a non-AP STA MLD wakes up from the doze state, the STAs can not transmit PS-Poll during NAVSyncDelay timer before successful reception of frames. A STA received TIM can immediately transmit PS-Poll but other STAs of the same non-AP STA MLD may not transmit PS-Poll due to NAVSyncDelay which delays BU transmission over indicated multiple links. Even though APs of the AP MLD can transmit TF to solicit PS-Poll transmission, it is difficult to estimate exact STAs' wakeup time and STAs' wakeup status. If the STA received TIM can transmit PS-Poll with other links' wakeup status, APs may transmit TF or BU directly. | Please define a method to indicate other links' wakeup status. | RevisedAgree in principle. Added a signaling method to indicate power management mode of other links.TGbe editor to make the changes with the CID tag (#12412) in doc.: IEEE 802.11-22/2045r1[https://mentor.ieee.org/802.11/dcn/22/11-22-2045-01-00be-lb266-cr-misc-part2.docx] |
| 12810 | Laurent Cariou | 35.3.12.1 | 440.54 | To have efficient multi-link operation, it is important to define a mechanism in order to be able to change the Power Management Mode and the Power State of a STA of a non-AP MLD through another link (by a transmission from a STA affiliated with the same non-AP MLD as the STA), For instance, an eMLSR non-AP MLD will want to wake both links at the same time and to have both links go to doze at the same time, especially if this non-AP MLD is actually a single radio device. For dual radio non-AP MLD, it is also important to transition quickly between a full doze state where all STAs are in doze state to a full awake mode where all STAs are awake and ready to receive. | Define the cross link power save mode change and/or cross link power state change. | RevisedAgree in principle. Added a signaling method to indicate power management mode of other links.TGbe editor to make the changes with the CID tag (#12810) in doc.: IEEE 802.11-22/2045r1[https://mentor.ieee.org/802.11/dcn/22/11-22-2045-01-00be-lb266-cr-misc-part2.docx] |
| 11227 | Yong Liu | 35.3.12.1 | 440.54 | The multi-link power management relies on per-link PM signaling. This does not take fully advantage of the MLO capabilities. A cross-link PM signaling should be added to the standard to allow a non-AP MLD to signal its power state of one link (STA) via a different link (STA). | A cross-link PM signaling should be added to the standard to allow a non-AP MLD to signal its power state of one link (STA) via a different link (STA). | RevisedAgree in principle. Added a signaling method to indicate power management mode of other links.TGbe editor to make the changes with the CID tag (#12810) in doc.: IEEE 802.11-22/2045r1[https://mentor.ieee.org/802.11/dcn/22/11-22-2045-01-00be-lb266-cr-misc-part2.docx] |
| 12811 | Laurent Cariou | 35.3.12 | 440.50 | In the current draft D2.0, for a non-AP MLD, each STA's power management mode can be switched by transmitting a frame with the PM bit set to 0/1 by the STA. This is very inefficient to control PM mode of the STAs affiliated with the non-AP MLD since each STA on a link has to successfully transmit a frame on that link, especially when the number of enabled links is larger than the number  STR links. | Define a cross-link power save mode in which a STA affiliated with a non-AP MLD can transmit a frame that includes PM modes of the other STAs affiliated with the same non-AP MLD and switch the other STAs' PM mode. | RevisedAgree in principle. Added a signaling method to indicate power management mode of other links.TGbe editor to make the changes with the CID tag (#12810) in doc.: IEEE 802.11-22/2045r1[https://mentor.ieee.org/802.11/dcn/22/11-22-2045-01-00be-lb266-cr-misc-part2.docx] |

***TGbe editor: Please modify the following subclause 9.2.4.6.4 HE variant in D2.3*** P130L55 **(#12412, 12810**):

**9.2.4.6.4 HE variant
*Change Table 9-25 (Control ID subfield values) as follows:***

**Table 9-25—Control ID subfield values**

|  |  |  |  |
| --- | --- | --- | --- |
| **ControlID value**  | **Meaning** | **Length of theControlInformationsubfield (bits)** | **Content of the Control Informationsubfield** |
| **…** |  |  |  |
| 10 | Multi-link power save (MLPS) | 20 | See 9.2.4.7.12 (MLPS Control) |
| 11–14~~7–14~~ | Reserved |  |  |
| 15  | Ones need expansion surely (ONES)  | 26  | Set to all 1s |

***TGbe editor: Please add the following subclause 9.2.4.7.12 MLPS Control after 9.2.4.7.11 ELA Control in D2.3* (#12412, 12810**):

**9.2.4.7.12 MLPS Control(#12412, 12810)**

The Control Information subfield in an MLPS Control subfield contains the power management mode of non-AP STA(s) affiliated with a non-AP MLD.

The format of this subfield is shown in Figure 9-abc (Control Information subfield format in an MLPS Control subfield(#11832)).

|  |  |  |  |
| --- | --- | --- | --- |
|  |  B0 | B1 B16 | B17 B19 |
|  | MLPM | MLPS Link Bitmap | Reserved |
| Bits: | 1 | 16 | 3 |

**Figure 9-abc—Control Information subfield format in an MLPS Control subfield**

The MLPM subfield indicates the power management mode of non-AP STA(s) affiliated with a non-AP MLD that are indicated in the MLPS Link Bitmap subfield. The MLPM subfield is set to 0 to indicate that the non-AP STA(s) affiliated with the non-AP MLD are in active mode and is set to 1 to indicate that the non-AP STA(s) affiliated with the non-AP MLD are in power save mode.

The MLPS Link Bitmap subfield indicates the link(s) on which non-AP STA(s) affiliated with a non-AP MLD operate that adopt the power management mode indicated in the MLPM subfield. The bit position *i* of the MLPS Link Bitmap subfield corresponds to a link with link ID equal to *i* and set to 1 to indicate that the power management mode indicated in the MLPM subfield is adopted by the non-AP STA affiliated with the non-AP MLD that operates on that link. Otherwise, set to 0.

***TGbe editor: Please modify the following subclause 35.3.12.1 General in TGbe D2.3***:

**35.3.12 Multi-link power management
35.3.12.1 General**

…

***TGbe editor: Please add the following paragraph and figure at the end of subclause 35.3.12.1 General in TGbe D2.3***:

(#12412, 12810)A non-AP STA affiliated with a non-AP MLD may transmit a frame with the MLPS Control subfield to change the power management mode of the other non-AP STA(s) affiliated with the same non-AP MLD. The MLPM subfield in the MLPS Control subfield of the frame sent by the non-AP STA affiliated with the non-AP MLD indicates the power management mode that the other non-AP STA(s) affiliated with the same non-AP MLD, which are indicated in the MLPS Link Bitmap subfield in the MLPS Control subfield of the frame, shall adopt upon successful transmission of the frame. Figure 35-19a illustrates an example where STA 1 transmitting a frame with the PM bit set to 0, the MLPM subfield set to 0, and the bit position 1 of the MLPS Link Bitmap subfield is set to 1 and the rest bit positions are set to 0. After the successful transmission of the frame, both STA1 and STA 2 affiliated with the non-AP MLD enters active mode. Once frame exchanges are complete, STA 2 transmits a frame with the PM bit set to 1, the MLPM subfield set to 1, and the bit position 0 of the MLPS Link Bitmap subfield set 1 and the rest of the bit positions set to 0. After the successful transmission of the frame, both STA 1 and STA 2 affiliated with the non-AP MLD enters power save mode.



**Figure 35-19a— Power management mode of one STA affiliated with a nono-AP MLD is changed by a frame transmitted by the other STA affiliated with the same non-AP MLD (#12412, 12810):**