IEEE P802.11
Wireless LANs

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| CC36 Resolution for CIDs related to MLO Power-save – Part 2 |
| Date: February 8, 2022 |
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 Abstract

This submission proposes resolutions for following 10 CIDs received for TGbe CC36: 5261 5353 6303 8036 7414 6159 7501 8297 7876 8362

**Revisions:**

* Rev 0: Initial version of the document.
* Rev 1: Added CIDs 7876 and 8362
* Rev 2: Updated baseline to include approved doc 11-22/196r1
	+ As a result, there were editorial updates to the resolutions for CIDs 8036 and 4068
* Rev 3: Updates based on offline feedback
	+ Resolution for CID 8036 was updated
	+ Add resolution for CID 7414
	+ CID 4068 is removed from this doc
	+ Updates to the bugfix section
* Rev 4: Live edits when the doc was presented on TGbe MAC call 3/17

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** | **Pg/Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 5261 | Insun Jang | 35.3.10.2 | 266.29 | Need to change "a non-AP MLD" to "a STA affilaited with a non-AP MLD" to be consistent with "the other STA(s)" although it is on a single link | As in the comment | **Revised**The reference to non-AP MLD is correct in the text cited by the comment. For example, the non-AP MLD needs to keep track of critical updates to a particular link or monitor traffic indication and track time (TSF) for each link. In order to provide further clarification, the text is updated to state that the non-AP MLD monitors Beacon frames on each link via its affiliated STA. The NOTE on critical updates is moved under the first paragraph in this subclause since the second paragraph is focused on traffic indication.**TGbe editor, please make changes as shown in 11-22-0292r4 tagged 5261** |
| 5353 | Jarkko Kneckt | 35.3.10.2 | 266.28 | The sentence is very hard to understand:"This is in addition to mechanisms such as individual TWT agreement." | Please clarify or delete the sentence. Individual TWT is optional mechanism for non-AP STA and it is not clear why its maintenance is considered here. | **Revised**The cited sentence is updated to clarify that each STA of a non-AP MLD can employ different mechanisms for performing additional power-save on their respective link.**TGbe editor, please make changes as shown in 11-22-0292r4 tagged 5353** |
| 6303 | Ming Gan | 35.3.10.2 | 266.28 | Not sure why "Not every non-STA affiliated with the non-AP MLD is required to receive Beacon frame" is removed, please add it back as in D0.3 | as in the comment | **Rejected**The cited sentence was deleted since the first sentence of this subclause says the same – i.e., a non-AP MLD can monitor Beacon frames (via its affiliated STA) on one or more links. |
| 8036 | Yuchen Guo | 35.3.10.2 | 266.35 | What does "shall be consistent" mean? Does it mean the TIM on all links shall be the same? What if one STA is in PS mode, the other STA in the same MLD is in acive mode? | Please clarify | **Revised**The sentence was updated to clarify what is meant by ‘consistent’ – i.e., the bit position in the PVB of TIM element for a particular non-AP MLD is the same in all the Beacon frames transmitted by the APs affiliated with the AP MLD with which the non-AP MLD has performed multi-link setup. The sentence was moved to clause 35.3.12.4 since it is a better fit there.**TGbe editor, please make changes as shown in 11-22-0292r4 tagged 8036** |
| 7414 | SunHee Baek | 35.3.10 | 265.50 | When an MLD requests a single individual TWT for multiple links, a STA affiliated with another MLD received the request needs to respond by considering TWT Setup command. For exmaple, if STA MLD sends a TWT request that includes two TWT elements; one TWT element is for Link 1 and Link 2 that have same parameter, and the other TWT element is for Link 3, AP MLD can respond different TWT Setup Command about Link 1 and Link 2 (e,g, accept and reject) | Add new sentences for clarify as in comment | **Revised**Clause 35.7.2 (Individual TWT agreements) already allows a STA of an MLD to setup individual TWT for the link it is operating on and (optionally) for any other link that the MLD is operating on by including more than one TWT element (one per STA/link) in a TWT Request / Response frames. The negotiation is on a per-link basis with each TWT element (carried in the req/resp frame) pointing to a particular link (which is identified via the Link ID bitmap). And each of these TWT elements contain their own TWT Setup Command. Hence no further changes are needed.**TGbe editor: No further changes are required for addressing this CID** |
| 6159 | Michael Montemurro | 4.3.19.2 | 45.30 | If you define the BSS MAX Idle period feature to work for MLO there is no association between affiliated STAs. | Change "When association is not for a multi-link setup, BSS max idle period management enables an AP to indicate a time period during which the AP does not disassociate a STA due to nonreceipt of frames from the STA (also see 4.3.19.23a (MLD max idle period management) for the case when the association is for a multi-link setup)(#2561). This supports improved STA power saving and AP resource management." to "BSS max idle period management enables an AP to indicate a time period during which the AP does not disassociate a STA due to nonreceipt of frames from the STA. For MLO, MLD MAX Idle period is described in 4.3.19.23a (MLD max idle period management) for the case when multi-link setup establishes a connection between two MLDs." | **Rejected**The text in the cited sentence was updated as a resolution to CID 8222. The resolution to CID 8222 differentiates between a legacy association and an MLO association. Therefore, no further changes are needed. |
| 7501 | Tomoko Adachi | 4.3.19.23a | 45.58 | Why does MLD max idle period management need to be described in different subclause other than 4.3.19.2? The description is repeated except that the AP becomes AP MLD and STA becomes non-AP MLD. Change 4.3.19.2 subclause title to also cover the MLD max idle period and combine the description therein. It may be enough to say that, for MLD association, MLD max idle period management service is used instead of the BSS max idle period management service and applied among all setup links. | As in comment. | **Rejected**There is very little duplication of text between the two subclauses and the actions are applicable to different subjects. In 4.3.21.2, the subjects are AP and non-AP STA while that in 4.3.21.24 it is the respective MLDs. In addition, with MLO, we have the concept of ‘setup links’ and the frame exchange needs to occur on one of the setup link for the AP MLD to not disassociate a non-AP MLD for exceeding the specified Max idle period. |
| 8297 | Zhiqiang Han | 9.6.13.20 | 158.13 | The link doesn't belong to any STA. the STA can transmits frames on the link. In the draft, there are many places to express the meaning of Link ID. It's better to keep the definition same. | as in comment. | **Rejected**The comment fails to identify an issue at the cited location. The usage of Link ID field is consistent across the spec text. |
| 7876 | Yongho Kim | 3.2 | 41.35 | Duplicated sentence. Delete from "An extended power save mode...." in L40. | As in the comment | **Accepted** |
| 8362 | Zhiqiang Han | C.3 | 591.11 | Add dot11MldMaxIdlePeriod | as in comment. | **Revised**There is only one instance of this in the spec which is not necessary. During ML (re)setup, the BSS Max Idle Period element carries in the (Re)Association Response frame provides the MLD Max Idle Period value and the same MIB variable dot11BssMaxIdlePeriod would govern the presence of this element. TGbe doesn’t need to define a separate MIB variable.**TGbe editor, please delete “or dot11MldMaxIdlePeriod is nonzero” from the TGbe draft (reference in D1.4 P277L1)** |

***TGbe editor: The baseline for this document is 11be D1.4 and approved doc 11-22/196r1***

* + - 1. **Basic BSS operation**

***TGbe editor: Please update the contents of this subclause as shown below:***

A non-AP MLD shall be able to perform basic operations (such as receiving a traffic indication, time synchronization, receiving BSS parameter updates) by monitoring Beacon frames[5261] via one or more of its affiliated STAs on their respective enabled links. [5353]This is accomplished in addition to other power-save mechanisms (such as individual TWT agreement or U-APSD), if setup, between the STA affiliated with the non-AP MLD and the corresponding AP affiliated with the AP MLD with which the non-AP MLD has performed association. With these mechanisms, a non-AP MLD can receive basic information about the AP MLD and all the APs affiliated with the AP MLD on a single link while the other STA(s) affiliated with the non-AP MLD are in doze state.

[5261]

[8036]

[5261]

**35.3.12.4 Traffic indication**

An AP MLD shall buffer a BU with a TID at the AP MLD if the TID is not mapped to any link on which the corresponding STA of a non-AP MLD is in active mode, and it shall set the bit in the partial virtual bitmap of the TIM element that corresponds to the AID of the non-AP MLD to 1. [8036] (i.e., the bit in the partial virtual bitmap of the TIM element that matches the AID of the non-AP MLD is set to a value that reflects the status of the BUs at the AP MLD for that non-AP MLD)

**Discussion: Bug in figure 35-10 and related text (issue pointed out by Morteza (Meta)) – No CID.**

Per baseline spec, a STA remains in its current power management mode until it informs the AP of a power management mode change via a frame exchange that includes an acknowledgment from the AP (see 11.2.3.1 & 11.2.3.2).

Figure 35-10 is missing a ACK frame after the frame indicating PM=1 is sent on Link 1 and the text in the 2nd paragraph needs to state that it was a successful frame exchange.

**35.3.12.1 General**

***TGbe editor: Please update the text in the 2nd paragraph and Figure 35-10 as shown below:***

[Figure 35-10 (Each STA affiliated with a non-AP MLD maintains its own power](#bookmark34) [state)](#bookmark34) illustrates the power save operation for each STA affiliated with a non- AP MLD during multi-link operation. As depicted in the figure, during the initial portion of the illustration, both STAs affiliated with the non-AP MLD are in active mode and are involved in frame exchange with the respective APs on the links. Each AP affiliated with the non-AP MLD indicates that it is in active mode by setting to 0 the Power Management subfield (namely PM bit in the figure) in the Frame Control field of a transmitted frame. At some point in time, STA 2 affiliated with the non-AP MLD operating on Link 2 indicates to AP 2 that it is entering power save mode (i.e., sets PM bit to 1) and transitions to doze state after the successful frame exchange. STA 2 remains in doze state for the rest of the illustration. After a period of time, STA 1 enters power save mode (i.e., sets PM bit to 1) after the successful frame exchange. While operating in power save mode, STA 1 wakes up to receive the Beacon frame transmitted by AP 1 and determines that AP MLD has BUs belonging to TID(s) mapped to Link 1. Based on this determination, STA 1 indicates to AP 1 that it has transitioned to awake state by transmitting a PS-Poll or U-APSD trigger frame on Link 1. STA 1 participates in frame exchange with AP 1 while in awake state.



**Figure 35-10—Each STA affiliated with a non-AP MLD maintains its own power state**