IEEE P802.11
Wireless LANs

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| LB266 CR for subclause 35.3.12.6 |
| Date: 2022-07-11 |
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Abstract

This submission proposes resolutions of comments received from TGbe comment collection LB266 based on TGbe D2.0.

* 10650 10878 10879 10880 10913 12072 10729 12644 13797 13798 13860

Revisions:

* Rev 0: Initial version of the document.
1. **Introduction**

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. The introduction and the explanation of the proposed changes are 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 802.11be 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** | **Clause** | **Page** | **Comment** | **Proposed Change** | **Resolution** |
| 10650 | 35.3.12.6 | 445.33 | In the figure, show the time duration (a line) between DL BUs being queued and those being discarded as 300 ms (consistent with max BI). Same comment for the next figure. | As in comment | Revised-Agree with comment, and update the figure.TGbe editor to make the changes shown in 22/1045r0 under all headings that include CID 10650. |
| 10878 | 35.3.12.6 | 446.53 | If the non-AP MLD only requires two links to be setup (link 2 between AP 2 and non-AP STA 2, and link 3 between AP 3 and non-AP STA 3), can it still set the value of Listen Interval field according to link 1? | as in comment | Rejected-The commenter just asked a question. There is no corresponding text change. To answer the commenter’s question, it is no. The value of Listen Interval field is in units of the maximum value of beacon intervals corresponding to the requested links indicated in the Association Request frame. |
| 10879 | 35.3.12.6 | 446.02 | What does it mean by "set the value of Listen Interval field carried in the Association Request frame to 1"? Listen Interval field is of 2 octets and has two subfields. Please clarify. | as in comment | Rejected-The commenter just asked a question. There is no corresponding text change. To answer the commenter’s question, the Listen Interval field of 2 octets can indicate the value of 1, but also can indicate other value that is less than 2^16. |
| 10880 | 35.3.12.6 | 446.60 | What does it mean by "set the value of Listen Interval field carried in the Association Request frame to 1"? Listen Interval field is of 2 octets and has two subfields. Please clarify. | as in comment | Rejected-The commenter just asked a question. There is no corresponding text change. To answer the commenter, the Listen Interval field of 2 octets can indicate the value of 1, but also can indicate other value that is less than 2^16. |
| 10913 | 35.3.12.6 | 447.10 | In case latency sensitive traffic arrives at an AP MLD right after a STA affiliated with a non-AP MLD in PS mode enters a doze state, the traffic may not be delivered to the non-AP MLD in a timely manner. Not knowing each STA power state, the AP MLD may schedule for the non-AP MLD a trigger-enbaled TWT SP. If the STA is in doze state, the scheduled resources may be wasted. STAs affiliated with the non-AP MLD may need to listen for Beacon frames at each TBTT on any enabled link for a certain time duration right after receiving DL BUs. | As in the comment. | Rejectd-The commenter failed to identify the technical issue for MLD. If there is a TWT agreement between two MLDs, they will follow TWT operation to exchange frames. |
| 12072 | 35.3.12.6 | 445.02 | Even if the AP affiliated with AP MLD, has the maximum beacon interval going to delete status, is the MLD listen interval sustained? We need some texts to cover this Delete case. | As the comment | RevisedThe value of Listen Interval field is in units of the maximum value of beacon intervals corresponding to the requested links indicated in the Association Request frame. This unit is just used to calculate the value of Listen Interval field at the AP side, but the requested value of the Listen Interval field is determined by the demand of power save at the non-AP STA side and will not be changed after ML setup even if one AP is removed later. A note is added to clarify this. TGbe editor to make the changes shown in 22/1045r0 under all headings that include CID 12072. |
| 10729 | 35.3.12.6 | 445.01 | We should describe the operation in terms of Listen Interval when an AP with maximum Beacon Interval is removed | As in the comment | RevisedThe value of Listen Interval field is in units of the maximum value of beacon intervals corresponding to the requested links indicated in the Association Request frame. This unit is just used to calculate the value of Listen Interval field at the AP side, but the requested value of the Listen Interval field is determined by the demand of power save at the non-AP STA side and will not be changed after ML setup even if one AP is removed later. A note is added to clarify this. TGbe editor to make the changes shown in 22/1045r0 under all headings that include CID 12072. |
| 12644 | 35.3.12.6 | 445.20 | Replace the term "was awake" with "was in awake state" in the following sentence: "If all STAs affiliated with the non-AP MLD and operating on enabled links are in power save mode, at least one of these STAs shall wake up to receive at least one Beacon frame scheduled for transmission within the interval of duration equal to the listen interval indicated by the non-AP MLD in its (Re)Association Request frame, starting from the last TBTT for which another STA or the same STA affiliated with the non-AP MLD was awake." | Revise the sentence as follows: "If all STAs affiliated with the non-AP MLD and operating on enabled links are in power save mode, at least one of these STAs shall wake up to receive at least one Beacon frame scheduled for transmission within the interval of duration equal to the listen interval indicated by the non-AP MLD in its (Re)Association Request frame, starting from the last TBTT for which another STA or the same STA affiliated with the non-AP MLD was in awake state to receive Beacon frames." | Revised-Agree with the comment, proposed resolution addresses this change.TGbe editor to make the changes shown in 22/1045r0 under all headings that include CID 12644. |
| 13797 | 35.3.12.6 | 446.13 | Typo: non-STA 1 should be non-AP STA1 | Change "non-STA 1" to "non-AP STA 1" | Accepted- |
| 13798 | 35.3.12.6 | 446.57 | non-AP STA1 should be non-AP STA2 because it's non-AP STA2 that sends the Association Request frame | As in the comment | Revised-Agree with the comment, proposed resolution addresses this issue.TGbe editor to make the changes shown in 22/1045r0 under all headings that include CID 13798. |
| 13860 | 35.3.12.6 | 445.60 | It would be better to reduce the beacon interval of the Link1 for the examples. This is because the TBTT offset of Link1 from the Beacon transmitted on the Link3 is too large.(Note that the TBTT offset between the APs affiliated with the same MLD shall be less than or equal to 254 TUs.) | As in comment. | Rejected-The TBTT offset shown in this example is less than 254 TUs. |

**Discussion:** None.

***TGbe editor: Please modify the subclause 9.4.2.199 TWT element as follows***

**35.3.12.6 Operation for MLD listen interval**

During multi-link (re)setup, the value carried in Listen Interval field in the (Re)Association Request frame sent by a non-AP STA affiliated with a non-AP MLD to an AP affiliated with an AP MLD is requested at the MLD level. The value of the Listen Interval field shall be in units of the maximum value of beacon intervals corresponding to the links that the non-AP MLD intends to setup in the (Re)Association Request frame (see 9.4.1.6 (Listen Interval field)).

NOTE- The value of the Listen Interval field is not changed after successful multi-link (re)setup. (CID # 12072 and 10729)

The AP affiliated with the AP MLD may reject the multi-link (re)setup because the listen interval requested by the non-AP MLD is too large. After successful multi-link (re)setup, the AP MLD shall use the listen interval in determining the lifetime of frames that it buffers for the non-AP MLD.The AP MLD may delete buffered BUs for the implementation dependent reasons (subject to 11.2.3.10 (AP and AP MLD aging function)), including the use of an aging function and availability of buffers where the aging function is based on the listen interval indicated by the non-AP MLD in its (Re)Association Request frame or the WNM sleep interval specified by the non-AP MLD in the WNM Sleep Mode Request frame.

If all STAs affiliated with the non-AP MLD and operating on enabled links are in power save mode, at least one of these STAs shall wake up to receive at least one Beacon frame scheduled for transmission within the interval of duration equal to the listen interval indicated by the non-AP MLD in its (Re)Association Request frame, starting from the last TBTT for which another STA or the same STA affiliated with the non-AP MLD was in awake state (CID #12644).

An example of operation for MLD listen interval is shown in Figure 35-17 (Example of operation for MLD listen interval).



Figure 35-17—Example of operation for MLD listen interval

In this example, AP MLD has three affiliated APs: AP 1 operates on link 1, AP 2 operates on link 2, and AP 3 operates on link 3. The beacon intervals of link 1, link 2, and link 3 are 300 ms, 200 ms, and 70 ms, respectively. Non-AP STA 1 affiliated with the non-AP MLD sends an Association Request frame to AP 1 affiliated with the AP MLD. The non-AP STA 1 requests three links to be setup (link 1 between AP 1 and non-AP STA 1, link 2 between AP 2 and non-AP STA 2, and link 3 between AP 3 and non-AP STA 3) and set the value of Listen Interval field carried in the Association Request frame to 1 and the value of Listen Interval field in units of 300 ms. Therefore, the listen interval requested by the non-AP MLD is 300 ms. AP 1 affiliated with the AP MLD accepts the three links for this multi-link setup (link 1 between AP 1 and non-AP STA 1, link 2 between AP 2 and non-AP STA 2, and link 3 between AP 3 and non-AP STA 3) by sending an Association Response frame to non-AP STA 1 affiliated with the non-AP MLD. After the successful multi-link setup, non-AP STA 2 and non-AP STA 3 enter in power save mode. A little later, non-AP STA 1 enters power save mode (i.e., signals PM = 1). In this case, the AP MLD shall buffer the DL BUs to the non-AP MLD at least for 300 ms. At T1, the non-AP STA 1 receives a Beacon frame on link 1, then a non-AP STA affiliated with the non-AP MLD is required to wake up to receive at least one Beacon frame before T2 where T2 = T1 + 300 ms, for example, the non-AP STA 1 (CID # 13797) receives the second Beacon frame on link 1 (at T1 + 300 ms), or the non-AP STA 2 receives the second Beacon frame on link 2 (at T1 + 200 ms), or the non-AP STA 3 receives the fourth Beacon frame on link 3 (at T1 + 280 ms). The figure was simplified to show the first Beacon frames on all links as aligned. In real deployment, the first TBTTs on all links may not be aligned.

Another example of operation for MLD listen interval is shown in Figure 35-18 (Another example of operation for MLD listen interval).



Figure 35-18—Another example of operation for MLD listen interval

In this example, AP MLD has three affiliated APs: AP 1 operates on link 1, AP 2 operates on link 2, and AP 3 operates on link 3. The beacon intervals of link 1, link 2, and link 3 are 300 ms, 200 ms, and 70 ms, respectively. Non-AP STA 2 affiliated with the non-AP MLD sends an Association Request frame to AP 2 affiliated with the AP MLD. The non-AP STA2 (CID #13798) requests three links to be setup (link 1 between AP 1 and non-AP STA 1, link 2 between AP 2 and non-AP STA 2, and link 3 between AP 3 and non-AP STA 3) and sets the value of Listen Interval field carried in the Association Request frame to 1 and the value of Listen Interval field in units of 300 ms. AP 2 affiliated with the AP MLD accepts the two links for this multi-link setup (link 2 between AP 2 and non-AP STA 2, and link 3 between AP 3 and non-AP STA 3) by sending an Association Response frame to non-AP STA 2 affiliated with the non-AP MLD, the listen interval requested by the non-AP MLD is still 300 ms and it is not changed along with the accepted links in the multi-link setup procedure. After the successful multi-link setup, non-AP STA 3 enters in power save mode. A little later, non-AP STA 2 enters power save mode (i.e., signal PM = 1). In this case, the AP MLD shall buffer the DL BUs to the non-AP MLD at least for 300 ms. At T1, the non-AP STA 2 receives a Beacon frame on link 2, then either non-AP STA 2 or non-AP STA 3 is required to wake up to receive at least one Beacon frame before T2 where T2 = T1 + 300 ms, for example, the non-AP STA 2 receives the second Beacon frame on link 2 (which occurs at T1 + 200 ms in this example) or the non-AP STA 3 receives the fourth Beacon frame on link 3 (which occurs at T1 + 280 ms). The figure was simplified to show the first Beacon frames on all links as aligned. In real deployment, the first TBTTs on all links may not be aligned.