IEEE P802.11
Wireless LANs

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| 11be D2.0 CR for 11.2.2 and 11.2.3 |
| Date: 2022-08-29 |
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Abstract

This submission proposes resolutions for the following CIDs:

10069, 10580, 10581, 10582, 10583, 10584, 11977, 13763, 13130, 13764

Revisions:

* Rev 0: Initial version of the document.

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 D2.0 Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGbe D2.0 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** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 10069 | Thomas Derham | 11.2.3.1 | 0.00 | Since (per 35.3.12.4) an AP MLD advertises TIM on all its links, and RNR provides critical update notification on each link pertaining to other links, a STA might not need to listen for every DTIM beacons on every link, but instead might only need to listen to DTIM beacons on one link of its choice (if it is in doze on the other links). This would avoid unnecessary power consumption. However, there are link-specific events such as GTK rekeying which might also need to be signaled as critical updates or some other method. | Clarify rules for MLD non-AP STA listening to DTIM beacons on each link. Add any necessary indications to enable STA to only listen to DTIM beacons on one link if it is in doze on other links. Add any needed support for signaling of link-specific events. | Rejected – We clarify the operations below.For DTIM, we have ReceiceDTIM variable defined in the baseline that controls reception of DTIM. MLD can reuse this variable in each link. See below and 6.3.2.2.2 Semantics of the service primitive*Non-DMG BSS: When true, this parameter causes the STA to awaken to receive all DTIM frames. When false, the STA is not required toawaken for every DTIM Beacon frame. DMG BSS: Not applicable*For GTK rekeying, it is possible to rekey in any link, and no switching link is required. See 12.7.7 Group key handshake.Critical update signaling is described in 35.3.10 BSS parameter critical update procedure.  |
| 10580 | Abhishek Patil | 11.2.3.1 | 304.03 | Should be "STA affiliated with" | Replace "of a non-AP MLD" with "affiliated with a non-AP MLD" | Revised – Agree in principle with the commenter. TGbe editor to make the changes shown in 11-22/1412r0 under all headings that include CID 10580 |
| 10581 | Abhishek Patil | 11.2.2 | 303.35 | There are several locations throughtout the spec (e.g., 35.3.7.1.2, 35.3.12.4, ) that state the TPC Request frame or a Link Measurement Request frame is not bufferable. However, Table 11-3 already stating this. Such duplication of text can cause spec inconsistency. Remove duplicate text and update all locations to point to Table 11-3 | As in comment | Revised – Agree in principle with the commenter. TGbe editor to make the changes shown in 11-22/1412r0 under all headings that include CID 10581 |
| 10582 | Abhishek Patil | 11.2.3.6 | 304.08 | In MLO, BUs are maintained at the MLD level. Therefore, item a) under 11.2.3.6 (baseline spec) doesn't apply to an AP that is affiliated with an AP MLD which has performed ML setup with a non-AP MLD that has an affiliated STA operating on the same link as the AP. | Update item a) and other sections of the baseline spec. Also provide a reference to 35.3.12.4 | Revised – We revise with “For non-MLO”. TGbe editor to make the changes shown in 11-22/1412r0 under all headings that include CID 10582 |
| 10583 | Abhishek Patil | 11.2.3.6 | 304.12 | The sentence is confusing. Simplified to say "If either the AP or the non-AP STA or both are non-MLO, then ...". Alternatively, reword the existing sentence as "When the (re)association between the AP and non-AP STA is not a multi-link (re)setup (see 35.3.5.1), an ..." | As in comment | Revised – We revise with “For non-MLO”. TGbe editor to make the changes shown in 11-22/1412r0 under all headings that include CID 10582 |
| 10584 | Abhishek Patil | 11.2.3.7 | 304.28 | Each STA affiliated with a non-AP MLD independently maintains its own power state and power-save mode. Therefore, item a) under 11.2.3.7 should be left unmodified by 11be - i.e., it should apply to each STA of a non-AP MLD as well. | As in comment | Revised – We revise with “For non-MLO”. TGbe editor to make the changes shown in 11-22/1412r0 under all headings that include CID 10584 |
| 11977 | Albert Petrick | 11.2.3.7 | 304.40 | The use of "deadline" is ambiguous. The note states"TBTT or TSBTT this is earlier than this deadline". The text is unclear what is meant by "this deadline". | Clarify text what is meant by the deadline and it's specific reference to. | Rejected – The commenter comments the text that is in the baseline. The commenter is encouraged to submit the comment to revme. |
| 13763 | Yuchen Guo | 11.2.3.6 | 304.12 | the AP operation is missing for the case when the (re)association is for Multi-Link setup | add the corresponding behavior | Revised – We add see 35.3.12.6 Operation for MLD listen interval for the operation of MLO as shown below.*The AP MLD may delete buffered BUs for the implementation dependent reasons (subject to 11.2.3.10 (APand AP MLD aging function)), including the use of an aging function and availability of buffers where theaging function is based on the listen interval indicated by the non-AP MLD in its (Re)Association Requestframe or the WNM sleep interval specified by the non-AP MLD in the WNM Sleep Mode Request frame.*TGbe editor to make the changes shown in 11-22/1412r0 under all headings that include CID 13763 |
| 13130 | Mark RISON | 11.2.3.7 | 304.28 | Adding "When a (re)association is not for a multi-link (re)setup" leads to the question: so then what if it is for ML setup, what is the required behaviour then? Ditto in the previous subclause | Add a description of the behaviour, or a xref to it | Revised – We add see 35.3.12.6 Operation for MLD listen interval for the operation of MLO as shown below.*When a (re)association is for an MLD association (see 11.3 (STA authenticationAuthentication and association)), the Listen Interval field is used to indicate to the AP MLD how often at least a STA affiliated with anon-AP MLD wakes to listen to Beacon frames if all STAs affiliated with the non-AP MLD are in powersave mode. This field is derived from the ListenInterval parameter when present as a parameter of anMLME primitive. The value is in units of the maximum value of beacon intervals corresponding to the linksthat the non-AP MLD intends to setup in the (Re)Association Request frame.*TGbe editor to make the changes shown in 11-22/1412r0 under all headings that include CID 13130 |
| 13764 | Yuchen Guo | 11.2.3.6 | 304.28 | the non-AP STA operation is missing for the case when the (re)association is for Multi-Link setup | add the corresponding behavior | Revised – We add see 35.3.12.6 Operation for MLD listen interval for the operation of MLO as shown below.*If all STAs affiliated with the non-AP MLD and operating on enabled links are in power save mode, at leastone of these STAs shall wake up to receive at least one Beacon frame scheduled for transmission within theinterval of duration equal to the listen interval indicated by the non-AP MLD in its (Re)Association Requestframe, starting from the last TBTT for which another STA or the same STA affiliated with the non-AP MLDwas awake.* TGbe editor to make the changes shown in 11-22/1412r0 under all headings that include CID 13130 |

**Discussion: None**

***TGbe editor: Change 11be specification as follows (track change on):***

**11.2.2 Bufferable MMPDUs**

***Change*** [***Table 11-3 (Bufferable/nonbufferable classification of MMPDUs)***](#bookmark0) ***as follows:***

**Table 11-3—Bufferable/nonbufferable classification of MMPDUs**

|  |  |
| --- | --- |
| **Description** | **Classification** |
| For non-MLO, a~~An~~ MMPDU that is carried in one or more Action (except for Fine Timing Measurement frame and Fine Timing Measurement Request frame), Disassociation, or Deauthentication frame.For MLO, an MMPDU that is carried in one or more Action (except for TPC Request frame, Link Measurement Request frame, Fine Timing Measurement frame and Fine Timing Measurement Request frame), Disassociation, or Deauthentication frame. | Bufferable |
| An individually addressed MMPDU that is carried in one or more Probe Response frames and that is sent in an IBSS in response to an individually addressed Probe Request frame. | Bufferable |
| All other MMPDUs. | Nonbufferable |

**11.2.3 Power management in a non-DMG infrastructure network**

**11.2.3.1 General**

***Change the tenth paragraph as follows:***

WNM sleep mode enables an extended power save mode ~~for non-AP STAs~~ in which a non-AP STA need not listen for every DTIM Beacon frame, and need not perform GTK/IGTK/BIGTK updates. A STAs in WNM

sleep mode can wake up as infrequently as once every WNM sleep interval to check whether ~~the~~its corresponding TIM bit is set or group addressed traffic is pending. The WNM sleep interval advertised by a non-AP STA affiliated with (#10580) a non-AP MLD is applied at the MLD level and the WNM procedures described in this subclause and in [11.2.3.16 (WNM sleep mode](#bookmark2)) are performed at the MLD level and apply to all the STAs affiliated with the MLD.

**11.2.3.6 AP operation**

***Change item k) in the second paragraph as follows:***

k)For non-MLO(#10582), an ~~An~~ AP may delete buffered BUs for implementation dependent reasons (subject to [11.2.3.10 (AP](#bookmark1) [and AP MLD aging function)](#bookmark1)), including the use of an aging function and availability of buffers. The AP may base the aging function on the listen interval indicated by the STA in its (Re)Association Request frame or the WNM sleep interval specified by the non-AP STA in the WNM Sleep Mode Request frame. In addition, the S1G AP may base the aging function on the listen interval indicated by the AP in the (Re)Association Response frame.

NOTE - see 35.3.12.6 (Operation for MLD listen interval) for the related operation for MLO.(#13763)

**11.2.3.7 Receive operation for STAs in PS mode**

***Change item a) in the second paragraph as follows:***

The following rules describe operation of a STA in PS mode:

a) For non-MLO(#10584), the ~~The~~ STA with dot11NonTIMModeActivated equal to false shall wake up early enough to be able to receive the first Beacon frame scheduled for transmission at the time corresponding to the last TBTT or TSBTT for which the STA was awake plus the time interval indicated by the ListenInterval parameter of the MLME-ASSOCIATE.request or MLME REASSOCIATE.request primitive. The STA with dot11NonTIMModeActivated equal to true is not required to wake up to receive a Beacon frame and shall transmit at least one PS-Poll or trigger frame that is individually addressed to the associated AP every listen interval starting from the last known transition of the S1G STA in non-TIM mode in doze state unless it follows the TWT or NDP Paging procedure.

NOTE—The STA might wake for a TBTT or TSBTT that is earlier than this deadline. In that case the previous requirement is reset based on a new “last TBTT or TSBTT”.

NOTE - see 35.3.12.6 (Operation for MLD listen interval) for the related operation for MLO.(#13130)

**35.3.7.1.1 General**

(…existing texts…)

A non-AP MLD may retrieve buffered BUs that are MMPDUs buffered at the AP MLD on any enabled link.
An AP MLD may use any enabled links to transmit individually addressed bufferable management frames (see Table 11-3)(#10581), subject to the power state of the
non-AP STA on each of the links.

(…existing texts…)

**35.3.7.1.6 Use of More Data subfield by an MLD**

An AP affiliated with an AP MLD uses the More Data subfield as defined in 9.2.4.1.8 (More Data subfield) to indicate to a non-AP STA in PS mode affiliated with the non-AP MLD that more individually addressed BUs are buffered for that non-AP MLD. The indicated buffered BUs (not including the BU currently being transmitted) are buffered at the AP MLD for the non-AP MLD and correspond to Data frames with TIDs that are mapped to this link by the most recent DL TID-to-link mapping (negotiated TID-to-link mapping or default mode mapping, see [35.3.7.1 (TID-to-link mapping)](#bookmark35)) or Management frames (see Table 11-3 and [35.3.12.4 (Traffic indication)](#bookmark53))(#10581).

NOTE—In the case of default mapping, all TIDs are mapped to all links, so that individually addressed buffered BUs refer to all individually addressed Data frames and individually addressed bufferable Management frames (see Table 11-3)(#10581).

(…existing texts…)

**35.3.12.4 Traffic indication**

(…existing texts…)

An AP MLD shall buffer an MMPDU (see Table 11-3)(#10581) and intended for receipt by a STA affiliated with a non-AP MLD in the AP MLD when all STAs affiliated with the non-AP MLD are in power save mode. In this case, the bit in the partial virtual bitmap of the TIM element that corresponds to the AID of the non-AP MLD shall be set to 1.

(…existing texts…)

If a buffered BU is an MMPDU that is intended for one STA affiliated with a non-AP MLD (see Table 11-3)(#10581), and if it is transmitted on a link where another STA (other than the intended STA) affiliated with the same non-AP MLD is operating on, following the procedure above, the MMPDU shall carry information to determine the intended destination STA affiliated with the non-AP MLD (see 35.3.14.2 (Identification of the Intended STA)).

(…existing texts…)

**9.2.4.1.8 More Data subfield**

**9.2.4.1.8 More Data subfield**

***Change the second paragraph as follows:***

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 Man- agement 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 (see 11.2.3.6 (AP operation)).

For a non-AP MLD, an AP affiliated with an AP MLD uses the More Data subfield to indicate to a non-AP STA in PS mode affiliated with the non-AP MLD that more BUs, corresponding to Data frames with TIDs that are mapped to this link by the most recent DL TID-to-link mapping (negotiated TID-to-link mapping or default link mapping, see 35.3.7.1 (TID-to-link mapping)) or bufferable Management frames (see Table 11-3 and 35.3.12.4 (Traffic indication))(#10581) are buffered for the non-AP MLD at the AP MLD (see 35.3.7.1.6 (Use of More Data subfield by an MLD)). The More Data sub- field is valid in individually addressed Data or Management frames transmitted by an AP affiliated with an AP MLD to a STA affiliated with a non-AP MLD that is in PS mode and in certain control frames as defined below.

***Change the fourth paragraph as follows:***

The AP can set the More Data subfield to 1 to indicate that it has a pending transmission for the STA or, if the AP is affiliated with an AP MLD, to indicate that the AP MLD has additional buffered BUs correspond- ing to frames with TIDs that are mapped to the link on which the AP operates by the most recent DL TID-to- link mapping (negotiated TID-to-link mapping or default mode mapping, see 35.3.7.1 (TID-to-link map- ping)) or bufferable Management frames (see Table 11-3 and 35.3.12.4 (Traffic indication))(#10581) if it has received a frame that contains a QoS Info field in which the More Data Ack subfield is equal to 1 from the STA and one of the following conditions is true:

* The STA is in PS mode and has one or more ACs that are delivery enabled (see 11.2.2.6 (AP opera- tion during the CP)).
* The STA is in PS mode and is a TWT requester or a TWT scheduled STA (see 26.8 (TWT opera- tion))