IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 11be D3.0 CR for 3.2 and Some Clauses in 35 | | | | |
| Date: 2023-03-27 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Po-Kai Huang | Intel |  |  |  |

Abstract

This submission proposes resolutions for the following CIDs:

15288, 15289, 15346, 16715, 17951, 17974, 15003, 15140, 16747, 16751,

16752, 15543, 16527, 16821, 18164, 16831, 17295, 15279,

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Editorial revision
* Rev 2: Add green tag
* Rev 3: Revision based on the discussion during the teleconference call
* Rev 4: Revision based on the offline discussion for 15346 and 17974. Revise resolution for CID 16747.

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 D3.0 Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGbe D3.0 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.***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Clause** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 15288 | Bo Sun | 3.2 | 59.29 | The "one MAC data servcie" here is not a complete set of 802.11 MAC data services defined in sub-clause 5.2 | Change to "a subset of the MAC data services and a single MAC SAP..." or "a single instance of MAC service and a single MAC SAP..." | Rejected –  “MAC data service” is the right term used in the baseline. We do not need to say a subset of the MAC data servies.  *The MAC data service provides the transport of MSDUs between MAC peer entities as characterized in 5.1.1 (Data service).* |
| 15289 | Bo Sun | 3.2 | 59.53 | The term "link" is frequently used to explain MLD/MLO terms. But it's never explained. Though "link" is often used in communication system, it refers to different definition in various context. We have LLC layer link, MAC layer link, and low-MAC specific link in 802.11. What is the meaning of "link" in this context, especially it's used to explain the conception of "single radio" (which is typically a PHY term)? | Refine the definition by explicitly explaining the definition of "link" or "MLD/MLO link" and relation between "links" and "single radio". For example, if "MLO link" is explained as a low-MAC link, then single radio Non-AP MLD could be explained as "A non-AP MLD that has one single physical radio, and supports operation on more than one MLO links but receives or transmits frames only on one MLO link at a time." | Rejected –  Link is defined in 802.11 as follows. Terms like downlink or uplink has beend used in the baseline. MLO follows the baseline definition for link.  *link: In the context of an IEEE 802.11 medium access control (MAC) entity, a physical path consisting of exactly one traversal of the wireless medium (WM) that is usable to transfer MAC service data units (MSDUs) between two stations (STAs) (#1379)that have established a relationship.* |
| 15346 | John Wullert | 3.2 | 59.22 | The definition of mobile access point multi-link device makes reference to the mobility of the affiliated APs. This gives the impression that the APs may be individaully capable of motion and thus that the MLD can be (variably) geographically distributed | Revise defintion to "An access point (AP) multi-link device (MLD) that is capable of keeping its Basic Service Set(s) (BSS(es)) operational while its geolocation is changed." | Revised –  Agree in principle with the commenter. MLD is defined as logical entity, but mobile AP does start to mention geolocation. Further, mobile AP MLD is used in the spec exclusively for NSTR mobile AP MLD. If each AP can be in different geolocation, then there is really no NSTR operation since there is no interference.  We simply add “are colocated” to the definition.  TGbe editor to make the changes shown in 11-23/0547r4 under all headings that include CID 15346 |
| 16715 | Mark RISON | 35.1 | 473.16 | Doesn't an EHT STA also support, band-permitting, HE, VHT, HT, OFDM, ERP, CCK, DSSS, etc.? | Make the list complete | Rejected –  Before HE, all baseline MAC features are described in clause 10, 11, and 12. This is the same style used in clause 26. For PHY, there is another set of descriptions in 36.1.1.  *An EHT STA supports the MAC and MLME functions defined in Clause 35 (Extremely high throughput (EHT) MAC specification) in addition to the MAC functions defined in Clause 26 (High efficiency (HE) MAC specification) and Clause 10 (MAC sublayer functional description), the MLME functions defined in Clause 11 (MLME), and the security functions defined in Clause 12 (Security) except when the functions in Clause 35 (Extremely high throughput (EHT) MAC specification) supersede the functions in Clause 10 (MAC sublayer functional description), Clause 11 (MLME), Clause 12 (Security), or Clause 26 (High efficiency (HE) MAC specification).*  *Clause 36 (Extremely high throughput (EHT) PHY specification) specifies the PHY entity for an extremely high throughput (EHT) orthogonal frequency division multiplexing (OFDM) system. In addition to the requirements in Clause 36 (Extremely high throughput (EHT) PHY specification), an EHT STA shall be capable of transmitting and receiving PPDUs that are compliant with the mandatory requirements of Clause 27 (High Efficiency (HE) PHY specification), which specifies support of the mandatory requirements of Clause 17 (Orthogonal frequency division multiplexing (OFDM) PHY specification), Clause 19 (High Throughput (HT) PHY specification), and Clause 21 (Very High Throughput (VHT) PHY specification).* |
| 17951 | Yuchen Guo | 35.1 | 473.08 | the ML TDLS transmission scheme is missing | please add corresponding scheme | Rejected –  TDLS for multi-link is in 35.3.21, and is covered by the description “An EHT STA supports multi-link operation defined in 35.3 (Multi-link operation).”  *35.3.21TDLS procedure in multi-link operation* |
| 17974 | Xiaofei Wang | 35.1 | 473.22 | If the sentence "An EHT STA supports multi-link operation defined in 35.3 (Multi-link operation)." means that MLO is mandatory for an EHT STA, the spec should clearly say so. If not, please rephrase to remove ambiguity. | as in comment | Revised –  “Support” does not necessarily mean mandatory. In the baseline HE description, “support” is also used, then separate mandatory /optional description in 4.3.16 shown below. The commenter can also check 4.3.16a for mandatory and optional description.  To avoid confusion, we add a note.  TGbe editor to make the changes shown in 11-23/0547r4 under all headings that include CID 17974 |
| 15003 | Jay Yang | 35.3.2 | 480.48 | "if the individually addressed frame is a Data frame, the value of the Address 3 field and the Address 4 field (if present) in the MAC header of the Data frame shall be set based on Table 9-58" need some clarification on SA,DA in A3,A4 of MLD, e.g. SA,DA shall be set to MLD MAC of MLD. If so, need update the note in table 9-58. | in Table 9-58, e.g. in Note1, A1 is equal to DA when the STA is not afflicated with MLD, in note2, A2 is equal to SA when the STA is not afflicated with MLD. SA,DA shall be set to the MLD MAC address. | Revised –  Agree that we need update the note in 9-58 so that A1 may not equal to DA and A2 may not qual to SA under MLO cases.  TGbe editor to make the changes shown in 11-23/0547r3 under all headings that include CID 15003 |
| 15140 | Po-Kai Huang | 35.3.2 | 480.12 | There has been discussions about what is the SA or DA in EAPOL key frame. | If needed, clarify with the following. For MLO, - EAPOL key data frame from AP MLD to non-AP MLD with To DS 0 and From DS 1 with SA field, then the value of the SA field is the AP MLD MAC address. - EAPOL key data frame from non-AP MLD to AP MLD with To DS 1 and From DS 0 with DA field, then the value of the DA field is the AP MLD MAC address. | Revised –  Agree in principle with the commenter.  TGbe editor to make the changes shown in 11-23/0547r4 under all headings that include CID 15140 |
| 16747 | Mark RISON | 35.3.2 | 480.15 | "singly identifies" -- it is not clear what "singly" means here | Delete "singly" | Rejected –  “singly” has been used in the baseline for the context .  *station (STA): A logical entity that is a singly addressable instance of a medium access control (MAC) and physical layer (PHY) interface to the wireless medium (WM).*  Based on the definitions from [Oxford Languages](https://languages.oup.com/google-dictionary-en), “singly” means “one at a time; separately or individually”. |
| 16751 | Mark RISON | 35.3.2 | 480.48 | This prevents EHT STAs from supporting mesh | Refer to the table for mesh STAs too | Rejected –  The comment fails to identify a technical issue. It fails to identify specific changes that would satisfy the comment.  Note that 35.3 is for multi-link operation. MLD has not been updated to support mesh. |
| 16752 | Mark RISON | 35.3.2 | 480.62 | Don't these rules boil down to "the BSSID is the MAC address of the AP" in all cases? | Just say that, rather than two bullets | Rejected –  For MLO, there is a confusion about which AP that we refer to since AP MLD may have multiple affiliated APs. |
| 15543 | Chaoming Luo | 35.3.12.4 | 538.60 | Grammar issue. | Change: An AP MLD shall buffer an MMPDU and intended for receipt by a non-AP STA To: An AP MLD shall buffer an bufferable MMPDU which is to be transmitted to | Revised –  We simply add “bufferable”.  TGbe editor to make the changes shown in 11-23/0547r3 under all headings that include CID 15543 |
| 16527 | Arik Klein | 35.3.12.4 | 538.59 | The sentence need to be rephrased to be understandable by the reader, as suggested | The sentence should be revised as follows: "An AP MLD shall buffer an MMPDU (see Table 11-3 (Bufferable/nonbufferable classification of MMPDUs)) \*in the AP MLD that is\* intended for receipt by a non-AP STA affiliated with a non-AP MLD when all non-AP STAs affiliated with the non-AP MLD are in power save mode." | Rejected –  The suggested addition of “in the AP MLD” is not needed. In the baseline counter part sentence below, there is no addition of “in the AP”.  *The AP shall buffer individually addressed BUs addressed to STAs operating in a PS mode.* |
| 16821 | Mark RISON | 35.3.12.4 | 538.63 | "An AP MLD shall not buffer a TPC Request frame or a Link Measurement Request frame." -- what's the point of not buffering them, if the receiver is asleep? And should they be made non-BUs then? | As it says in the comment | Rejected –  TPC Request frame and Link Measurement Request frame are changed to nonbufferable in 11-3. |
| 18164 | Abhishek Patil | 35.3.12.4 | 540.45 | The NOTE is confusing. It is not clear who is it directed to. Seems to be describing the receive side action at non-AP MLD but it also states reception of PS-Poll. | Please reword the text in the NOTE so that the intention of the note is clearly conveyed | Revised –  The receiver is non-AP MLD  *a buffered MMPDU is intended for one non-AP STA affiliated with a non-AP MLD*  We simply add for an AP MLD at the beginning of the sentence.  TGbe editor to make the changes shown in 11-23/0547r3 under all headings that include CID 18164 |
| 16831 | Mark RISON | 35.3.13 | 544.50 | "The transmit MSDU timer for the MSDU or the A-MSDU (if the A-MSDU is used) exceeds dot11EDCATableMSDULifetime or dot11QAPEDCATableMSDULifetime." -- there is no MSDU timer for an A-MSDU | Change to "The transmit MSDU or A-MSDU timer (as appropriate) exceeds dot11EDCATableMSDULifetime or dot11QAPEDCATableMSDULifetime (as appropriate)" | Revised –  The description follows what is defined in baseline. We only revise the description to align with the latest version of baseline texts.  *When A‑MSDU aggregation is used, the HT STA maintains a single timer for the whole A‑MSDU. The timer is restarted each time an MSDU is added to the A‑MSDU. The result of this procedure is that no MSDU in the A‑MSDU is discarded before a period of dot11EDCATableMSDULifetime for a non-AP STA or dot11QAPEDCATableMSDULifetime for an AP has elapsed.*  *Retries for failed transmission attempts shall continue until one or more of the following conditions occur:*   * *The frame retry count for the MSDU, A‑MSDU, or MMPDU is equal to dot11ShortRetryLimit.* * *The drop-eligible frame retry count for the MSDU, A‑MSDU, or MMPDU is equal to dot11ShortDEIRetryLimit.* * *The unsolicited frame retry count for the A‑MSDU is equal to dot11UnsolicitedRetryLimit.* * *The transmit MSDU/MMPDU timer for the MSDU/MMPDU or any undelivered fragments of that MSDU/MMPDU exceeds dot11EDCATableMSDULifetime for a non-AP STA or dot11QAPEDCATableMSDULifetime for an AP.*   TGbe editor to make the changes shown in 11-23/0547r3 under all headings that include CID 16831 |
| 17295 | Hanqing Lou | 35.3.13 | 544.22 | In "the associated MLD", which MLD does we refer to? If not mentioned before, should we use "an" instead of "the"? | Change "the associated MLD" to "an associated MLD" | Revised –  Agree in principle with the commenter. We revise instances with similar issues.  TGbe editor to make the changes shown in 11-23/0547r3 under all headings that include CID 17295 |
| 15279 | Mengshi Hu | 10.3.2.14.2 | 334.34 | To be consistent, "indexes" should be "indices". The same comment for P336, L34. | Change "indexes" into "indices". | Revised –  This is a baseline issue. Baseline has 19 instances of indexes and 345 instances of indices.  We only change the two instances as pointed out by the commenter.  TGbe editor to make the changes shown in 11-23/0547r3 under all headings that include CID 15279 |

**Discussion: None**

*TGbe editor: Change Clause 3.2 as follows (track change on):*

**3.2 Definitions specific to IEEE 802.11**

**mobile access point (AP) multi-link device (MLD):** An access point (AP) multi-link device (MLD) where all affiliated APs are colocated and are mobile APs(#15346).

*TGbe editor: Change Clause 9.3.2.1.2 as follows (track change on):*

* **Address and BSSID fields**

The content of the address fields of Data frames is dependent upon the values of the To DS and From DS subfields in the Frame Control field and whether the Frame Body field contains either an MSDU (or fragment thereof) or an A‑MSDU (or fragment thereof)(11ax), as determined by the A‑MSDU Present subfield of the QoS Control field (see 9.2.4.5.9 (A‑MSDU Present subfield)). The content of the address fields transmitted by nonmesh STAs is defined in Table 9-58 (Address field contents for Data frames transmitted by nonmesh STAs(#462)). The content of the address fields transmitted by mesh STAs is defined in 9.3.5 (Frame addressing in an MBSS), and the content of the fields transmitted by GLK STAs is defined in 10.65 (Addressing of GLK Data frame transmission). Where the content of a field is shown as not applicable (N/A), the field is omitted. Note that Address 1 always holds the receiver address of the intended receiver (or, in the case of group addressed frames, receivers) and that Address 2 always holds the address of the STA that is transmitting the frame.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| * **Address field contents for Data frames transmitted by nonmesh STAs(#462)** | | | | | | | |
| **To DS** | **From DS** | **Address 1** | **Address 2** | **Address 3** | | **Address 4** | |
| **MSDU and Short A‑MSDU case** | **Basic A‑MSDU and Dynamic A-MSDU  case** | **MSDU and Short A‑MSDU case** | **Basic A‑MSDU and Dynamic  A-MSDU case** |
| 0 | 0 | RA = DA | TA = SA | BSSID | BSSID | N/A | N/A |
| 0 | 1 | RA (see NOTE 1) | TA = BSSID | SA | BSSID | N/A | N/A |
| 1 | 0 | RA = BSSID | TA (see NOTE 2) | DA | BSSID | N/A | N/A |
| 1 | 1 | RA | TA | DA | BSSID | SA | BSSID |
| NOTE 1—(#462)The Address 1 field of a frame with (#278)the To DS subfield equal to 0 and the From DS subfield equal to 1 is equal to the DA, except when an individually addressed frame is sent on a link between two MLDs (see 35.3.2 (Multi-link device addressing)) or(#15003) when a frame containing an A-MSDU is used (for DMS, DMG relay or S1G relay the frame is individually addressed; for GCR, it is (group) addressed to the GCR concealment address), (#274)in which case the destination address of the MSDU is indicated in the DA or Mesh DA field of the A-MSDU subframe (see 11.21.16 (Group addressed transmission service), 10.11 (A‑MSDU operation), 10.45 (DMG relay operation), 10.54 (S1G relay operation), and 10.65 (Addressing of GLK Data frame transmission)). In an MBSS, this is the only combination used for group addressed Data frames, and a combination only used for group addressed Data frames (see Table 9-3 (Combinations of To DS subfield and From DS subfield in Data frames(#278)), Table 9-4 (Combinations of To DS and From DS subfields in Management frames(#278)), and Table 9-75 (Address field contents for mesh Data and Multihop Action frames(#462)(#419))).  NOTE 2—(#462)The Address 2 field of a frame with (#278)the To DS subfield equal to 1 and the From DS subfield equal to 0 is equal to the SA, except when an individually addressed frame is sent on a link between two MLDs (see 35.3.2 (Multi-link device addressing)) or(#15003) when an individually addressed frame containing an A-MSDU is used in GLK, DMG relay or S1G relay, (#274)in which case the source address of the MSDU is indicated in the SA or Mesh SA field of the A-MSDU subframe (see 10.11 (A‑MSDU operation), 10.45 (DMG relay operation), 10.54 (S1G relay operation), and 10.65 (Addressing of GLK Data frame transmission)). In an MBSS, this combination is not used for Data frames (see Table 9-3 (Combinations of To DS subfield and From DS subfield in Data frames(#278)) and Table 9-75 (Address field contents for mesh Data and Multihop Action frames(#462)(#419))). | | | | | | | |

(…existing tests…)

*TGbe editor: Change Clause 35.3.2 as follows (track change on):*

* + 1. **Multi-link device addressing**

An MLD uses an MLD MAC address that singly identifies the MLD. STAs affiliated with an MLD shall use different MAC addresses.

NOTE 1—The MLD MAC address of an MLD might be the same as the MAC address of one affiliated STA or might be different from the MAC address of any affiliated STA.

For an individually addressed frame sent on a link between two MLDs, the following applies:

* the value of the Address 2 (TA) field (if present) in the MAC header of the frame that is not a Probe Response frame shall be the MAC address of the transmitting STA affiliated with the MLD corresponding to that link except for the Individual/Group bit, which is set to 1 when the TA field value is a bandwidth signaling TA and set to 0 otherwise.
* if the (#16750)frame is a Probe Response frame and the AP operating on the link is an AP affiliated with the AP MLD
  + (#16749)if the AP does not belong to a multiple BSSID set or corresponds to the transmitted BSSID in a multiple BSSID set, then the value of the Address 2 (TA) field in the MAC header of the frame shall be set to the MAC address of the AP.
  + (#16749)if the AP corresponds to the nontransmitted BSSID in a multiple BSSID set, then the value of the Address 2 (TA) field in the MAC header of the frame shall be set to the transmitted BSSID in the multiple BSSID set (see 11.1.4.3.4 (Criteria for sending a response)).
* the value of the Address 1 (RA) field in the MAC header of the frame shall be the MAC address of the receiving STA affiliated with the MLD corresponding to that link.
* if the (#16750)frame is a Management frame, the value of the Address 3 field in the MAC header of the Management frame shall be set based on 9.3.3.1 (Format of (PV0) Management frames).
* if the (#16750)frame is a Data frame, the value of the Address 3 field and the Address 4 field (if present) in the MAC header of the Data frame shall be set based on Table 9-58 (Address field contents for Data frames transmitted by nonmesh STAs) and the settings of the To DS and From DS bits in the MAC header of the Data frame, where the BSSID is the MAC address of the AP affiliated with the AP MLD corresponding to that link.
* if the frame is a data frame that carries EAPOL PDUsfrom AP MLD to non-AP MLD with SA field or DA field in Table 9-58 (Address field contents for Data frames transmitted by nonmesh STAs), then the value of the SA field is the MLD MAC address of the AP MLD and the value of the DA field is the MLD MAC address of the non-AP MLD.(#15140)
* if the frame is a data frame that carries EAPOL PDUsfrom non-AP MLD to AP MLD with SA field or DA field in in Table 9-58 (Address field contents for Data frames transmitted by nonmesh STAs), then the value of the SA field is the MLD MAC address of the non-AP MLD and the value of the DA field is the MLD MAC address of the AP MLD.(#15140)

NOTE 2—For frames sent over a direct path in a single link TDLS direct link, by a non-AP STA affiliated with a non- AP MLD, the value of the Address 2 (TA) field is set to the MLD MAC address of the non-AP MLD as described in

[35.3.21.2 (TDLS direct link over a single link)](#bookmark104).

For a frame sent by a STA affiliated with the MLD with Address 1 field set to a group address (if allowed as described in 9.3.1 (Control frames), 9.3.2 (Data frames), and 9.3.3 ((PV0) Management frames)), the value of the Address 2 field, the Address 3 field (if present), and the Address 4 field (if present) in the MAC header of the frame shall be set as defined in 9.3.1 (Control frames), 9.3.2 (Data frames), and 9.3.3 ((PV0) Management frames), where the BSSID is the following:

* if the STA is an AP, then the BSSID is the MAC address of the AP
* if the STA is a non-AP STA affiliated with the non-AP MLD that has performed multi-link setup with an AP MLD, and a link is set up between the non-AP STA affiliated with the non-AP MLD and an AP affiliated with the AP MLD, then the BSSID is set to the MAC address of the AP affiliated with the AP MLD.

*TGbe editor: Change Clause 35.3.12.4 as follows (track change on):*

* + - 1. **Traffic indication**

(…existing texts…..)

An AP MLD shall buffer a bufferable(#15543) MMPDU (see Table 11-3 (Bufferable/nonbufferable classification of MMPDUs)) (#16099)that is intended for a non-AP STA affiliated with a non-AP MLD when all non-AP 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. An AP MLD shall not buffer a TPC Request frame or a Link Measurement Request frame.

(…existing texts…..)

For an AP MLD, if(#18164) a buffered BU is an MMPDU that is intended for one non-AP STA affiliated with a non-AP MLD (see Table 11-3 (Bufferable/nonbufferable classification of MMPDUs)), and if it is transmitted on a link where another non-AP STA (other than the intended non-AP STA) affiliated with the same non-AP MLD is operating on, following the procedure above, the MMPDU shall carry (#16103)the MLO Link Information element to determine the intended destination non-AP STA affiliated with the non-AP MLD (see [35.3.14.2](#bookmark78) [(Identification of the intended STA(#16839))](#bookmark78)).

NOTE—For an AP MLD, if(#18164) a buffered MMPDU is intended for one non-AP STA affiliated with a non-AP MLD (see Table 11-3 (Bufferable/nonbufferable classification of MMPDUs)), the MMPDU does not carry information in the frame body to determine the intended destination non-AP STA affiliated with the non-AP MLD or does not have correct content to be transmitted to another non-AP STA affiliated with a non-AP MLD, and the MMPDU needs to be transmitted due to reception of a PS-Poll frame or a U-APSD trigger frame from another non-AP STA affiliated with an associated non-AP MLD that is in power save mode, then the MMPDU needs to be discarded.

(…existing texts…..)

*TGbe editor: Change Clause 35.3.13 as follows (track change on):*

* + 1. **Multi-link device individually addressed data delivery without block ack negotiation**

(…existing texts…)

An MLD shall follow the rules described in 10.3.2.14.2 (Transmitter requirements) to determine the sequence number of an individually addressed QoS Data frame belonging to a TID that is delivered to an(#17295) associated MLD.

An MLD shall follow the rules as described in 10.3.2.14.3 (Receiver requirements) to discard duplicate individually addressed QoS Data frames belonging to a TID without block ack negotiation that are delivered from an(#17295) associated MLD.

An MLD shall maintain a transmit MSDU timer for each MSDU passed to the MAC through the MAC SAP. The transmit MSDU timer shall be started when the MSDU is passed to the MAC through the MAC SAP. Non-AP STAs affiliated with a(#16831) non-AP MLD shall have the same dot11EDCATableMSDULifetime, and APs affiliated with an AP MLD shall have the same dot11QAPEDCATableMSDULifetime.

When A-MSDU aggregation is used, the MLD maintains a single timer for the whole A-MSDU. The timer is restarted each time an MSDU is added to the A-MSDU. The result of this procedure is that no MSDU in the A-MSDU is discarded before a period of dot11EDCATableMSDULifetime for a non-AP MLD or dot11QAPEDCATableMSDULifetime for an AP MLD has elapsed. (#16831)

For an MLD, the frame retry count and retry limit for each MSDU or A-MSDU that belongs to a TID that requires acknowledgment is implementation specific.

An MLD shall continue to deliver the failed individually addressed QoS Data frame belonging to a TID without block ack negotiation to an associated MLD on the setup links subject to additional constraints (see

[35.3.7 (Link management)](#bookmark49)) until any of the following conditions occurs:

* The retry limit is met.
* The transmit MSDU timer for the MSDU or the A-MSDU (if the A-MSDU is used) exceeds dot11EDCATableMSDULifetime for a non-AP MLD or dot11QAPEDCATableMSDULifetime for an AP MLD. (#16831)
* The individually addressed QoS Data frame is successfully delivered.

(…existing texts…)

*TGbe editor: Change Clause 35.3.14 as follows (track change on):*

* + 1. **Multi-link device individually addressed Management frame delivery**
       1. **General**

(…existing texts…)

An MLD with dot11QMFActivated equal to false shall maintain a transmit MMPDU timer for each MMPDU (except the frames (#15548)listed at the beginning of [35.3.14.1 (General)](#bookmark77)). The transmit MMPDU timer shall be started when the MMPDU is passed to the MAC.

For an MLD with dot11QMFActivated equal to false, the frame retry counter and retry limit for each MMPDU that belongs to a TC that requires acknowledgment (#16835)are implementation specific.

An MLD with dot11QMFActivated equal to false shall continue to deliver the failed individually addressed Management frame (except the frames (#15548)listed at the beginning of [35.3.14.1 (General)](#bookmark77)) to an associated MLD on the setup links subject to additional constraints (see [35.3.7 (Link management)](#bookmark49))) until any of the following conditions occurs:

* The retry limit is met.
* The transmit MMPDU timer for the MMPDU exceeds dot11EDCATableMSDULifetime for a non-AP MLD or dot11QAPEDCATableMSDULifetime for an AP MLD. (#16831)
* The individually addressed Management frame is successfully delivered.

(…existing texts…)

*TGbe editor: Change Clause 10.3.14 as follows (track change on):*

**10.3.2.14 Duplicate detection and recovery**

**10.3.2.14.2 Transmitter requirements**

(…existing texts…)

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

A transmitting STA shall support the applicable sequence number spaces defined in [Table 10-5 (Transmitter](#bookmark5) [sequence number spaces)](#bookmark5). An MLD shall support the applicable sequence number spaces defined in [Table 10-5 (Transmitter sequence number spaces](#bookmark5)) with the Status indicated as Mandatory. A STA affiliated with an MLD shall use SNS9 in [Table 10-5 (Transmitter sequence number spaces](#bookmark5)) maintained by the MLD to determine the sequence number of an individually addressed QoS Data frame that is transmitted to a STA affiliated with another MLD. A STA affiliated with an MLD shall use SNS10 in [Table 10-5 (Transmitter](#bookmark5) [sequence number spaces](#bookmark5)) maintained by the MLD to determine the sequence number of an individually addressed Management frame (except for a frame that is excluded as defined in 35.3.14 (Multi-link device individually addressed Management frame delivery)) that is transmitted to a STA affiliated with another MLD. An AP MLD shall use SNS11 in [Table 10-5 (Transmitter sequence number spaces](#bookmark5)) maintained by the MLD to determine the sequence number of a group addressed Data frame that is transmitted by an AP affil- iated with the AP MLD so that the same group addressed Data frame transmitted over multiple links by the AP MLD uses the same sequence number for transmission on each link. Applicability is defined by the Applies to column. The Status column indicates the level of support that is required if the Applies to column matches the transmission. The Multiplicity column indicates whether the sequence number space contains a single counter, or multiple counters and in the latter case identifies any indices.(#15279) The Transmitter require- ments column identifies requirements for the operation of this sequence number space. The referenced requirements are defined at the end of the table.

(…existing texts…)

**10.3.2.14.3 Receiver requirements**

(…existing texts…)

***Change the third paragraph as follows:***

A receiving STA shall implement the applicable receiver requirements defined in [Table 10-6 (Receiver](#bookmark6) [caches)](#bookmark6) with the Status indicated as Mandatory. An MLD shall implement the applicable receiver require- ments defined in [Table 10-6 (Receiver caches](#bookmark6)) with the Status indicated as Mandatory. All STAs affiliated with an MLD shall use RC14 in [Table 10-6 (Receiver caches)](#bookmark6), where the duplicate detection cache is main- tained by the MLD, to assist the MLD in discarding duplicate individually addressed QoS Data frames belonging to a TID without BA negotiation that are transmitted from the STAs affiliated with another MLD. All STAs affiliated with an MLD with dot11QMFActivated equal to false shall use RC15 in [Table 10-6](#bookmark6) [(Receiver caches)](#bookmark6), where the duplicate detection cache is maintained by the MLD, to assist the MLD in dis- carding duplicate individually addressed Management frame (except the frames that are excluded in 35.3.14 (Multi-link device individually addressed Management frame delivery)) that are transmitted from the STAs affiliated with another MLD. An MLD shall implement RC16 in [Table 10-6 (Receiver caches](#bookmark6)) maintained by the MLD to discard duplicate group addressed Data that are delivered from the associated MLD. A dupli- cated group addressed Data frame received on any link shall be discarded. The method used to handle the sequence number wrap around for duplicate detection is implementation specific. A receiving STA should implement the applicable receiver requirements defined in [Table 10-6 (Receiver caches)](#bookmark6) with the Status indicated as Recommended. A receiving STA and a receiving MLD may implement the applicable receiver requirements defined in [Table 10-6 (Receiver caches)](#bookmark6) with Status indicated as Optional. Applicability is defined by the Applies to column. The Status column indicates the level of support that is required if the Applies to column matches the received frame. The Multiplicity / Cache size column indicates the indices(#15279) that identify a cache entry and the number of entries that shall be supported. The Receiver requirements col- umn identifies requirements for the operation of this cache. The referenced requirements are defined at the end of the table. The requirements relate to caching information that identifies a cache entry and discarding duplicate MPDUs.

(…existing texts…)

*TGbe editor: Change Clause 35.1 as follows (track change on):*

**35.1 Introduction**

An EHT STA has dot11EHTOptionImplemented equal to true.

An EHT STA supports the MAC and MLME functions defined in Clause 35 (Extremely high throughput (EHT) MAC specification) in addition to the MAC functions defined in Clause 26 (High efficiency (HE) MAC specification) and Clause 10 (MAC sublayer functional description), the MLME functions defined in Clause 11 (MLME), and the security functions defined in Clause 12 (Security) except when the functions in Clause 35 (Extremely high throughput (EHT) MAC specification) supersede the functions in Clause 10 (MAC sublayer functional description), Clause 11 (MLME), Clause 12 (Security), or Clause 26 (High efficiency (HE) MAC specification).

An EHT STA supports multi-link operation defined in 35.3 (Multi-link operation). MLO allows an AP MLD and a non-AP MLD to set up multiple links between them. A reference model for MLO is described in 4.9.6 (Reference model for multi-link operation (MLO)).

NOTE – Mandatory or optional support for the main MAC and PHY features are described in 4.3.16a (Extremely high throughput (EHT) STA).(#17974)