IEEE P802.11
Wireless LANs

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| LB 275 CR for CIDs against 3.1, 3.2, 4.9.6, and 5.1.5.1 |
| Date: 2023-08-01 |
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Abstract

This submission proposes resolutions for following CIDs received for TGbe LB275:

19123, 19486, 19132, 19133, 19134, 19135, 19136, 19347, 19505, 19610, 19734, 19137, 19138, 19139, 19140, 19141, 19487, 19506, 19611, 19612, 19613, 19614

**Revisions:**

* Rev 0: Initial version of the document.

***TGbe editor: The baseline for this document is 11be D4.0***

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** |
| 19123 | Bo Sun | 3.1 | 53.38 | It's strange to exclude AP MLDs from the conception of multicast group address. It's also confusing not including MLD in the conception of multicast group at all. | Change to "A medium access control (MAC) address associated by higher level convention with a group of logically related stations (STAs) and multi-link devices (MLDs). The group of STAs and MLDs is referred to a multicast group" | **Rejected**. (Note the page number the comment refers to should have been 51)Before 11be, a multicast-group address applies to a group of STAs (in the non-MLO case). In MLO case, the address applies to a group of non-AP MLDs, which is a natural extension. It has nothing to do with AP MLDs just like pre-11be it had nothing to do with the APs. |
| 19486 | Michael Montemurro | 3.2 | 57.01 | [WFA-R] The phrase "lower medium access control (MAC)" is not defined.It needs to be defined, or the sentence needs to be reworded. Based on Clause 4.9.6,an MLD always contains an MLD upper MAC sublayer and an MLD lower MAC sublayer.This fact should probably be added to the MLD definition. | As in comment | **Revised.**Agreed in principle.Clarified in the changes tagged by #19486 included in this CR.**TGbe Editor: please apply the changes tagged by #19486 included in this CR.** |
| 19132 | Bo Sun | 4.9.6 | 70.41 | "Communication across links..." is confusing since "across" implies the communication over several links happen simultaneously. | Change to "Communication over links..." | **Revised**.(Note the page number the comment refers to should have been page 68)Agreed with the comment in principle.**TGbe Editor, please apply the proposed change to page 68/line 41.** |
| 19133 | Bo Sun | 4.9.6 | 72.53 | "Some behaviros of MLO require the use of one mor more affiliated AP's upper MAC components" is not in consistent with Figure 4-30c. | Either correct the statement or correct Figure 4-30c | **Rejected**.(Note the page number and line number the comment refers to should have been page 70/line 56)That sentence refers to the group addressed delivery for MLO case, where the group addressed frames are delivered via each affiliated AP. |
| 19134 | Bo Sun | 4.9.6 | 72.57 | "affiliated AP MLD upper MAC sublayer components" is confusing. Does it mean "affiliated AP's upper MAC sublayer components" or "AP MLD's upper MAC sublayer components"? | Clarify the purpose of the sentence and improve the text. | **Revised.**(Note the page number the comment refers to should have been page 70)Agreed in principle.**TGbe Editor, please apply the changes tagged by #19134 in this CR.** |
| 19135 | Bo Sun | 4.9.6 | 73.45 | Why is the non-MLO upper MAC sublayer for the MLO NSTR link pair? | Clarify and mitigate the confliction here. | **Rejected.**(Note the page number the comment refers to should have been page 71)The comment fails to identify a technical issue and is asking a question.For an NSTR mobile AP, only the primary link transmits a beacon hence group addressed frames will only be transmitted on this link for the non-AP MLD. |
| 19136 | Bo Sun | 4.9.6 | 73.57 | Considering MLO is optional to an EHT Non-AP STA, it's misleading to say "The signle upper MAC...can operate...in either MLO...or as a non-AP STA...". It sounds like an EHT Non-AP STA must have such a single upper MAC that can support MLO. | Do not touch non-MLO function in this paragraph. | **Rejected.**(Note the page number the comment refers to should have been page 71)The text clearly says the single upper MAC can operate as a non-AP STA that is not affiliated with a non-AP MLD. No additional changes are required. |
| 19347 | Brian Hart | 4.9.6 | 69.42 | Very unclear how the MLD SAPs are used for groupcast. Fig 4-30a and fig 4-30b disagree with Fig 4-40c/d; and Fig 4-40c/d are unmoored from SAPs or anything definite so offer little insight. | 1) Either a) change title of 4-30a to clarify it is for individually addressed MSDUs and add another figure for group addressed MSDUs or a forward reference to such a figure or b) add support for group addressed MSDUs in this figure. 2) Most readers (and writers?) of the rest of the draft assume that an AP MLD can deliver groupcast (e.g., P552L6/14 etc etc ) MSDUs yet fig 4-30c/d show that an AP MLD is excluded from the vital aspects of this procedure. Either a) define a further term that includes AP MLD + the upper MAC sublayers seen in Fig 4-30c and use that throughout the draft where groupcast traffic at the AP MLD + affiliated APs might be involved or b) widen the definition of an AP MLD in fig 4-30c (and further address the considerations that led to the current 4-30c). 3) In fig 4-30c/d, relate the upper end of the each of the figures to defined interfaces (e.g., legacy MAC-SAPs). 4) Upgrade Fig 4-30b with any additional SAPs to support groupcast MSDUs or b) clarify that this figure is is for indivdually addressed MSDUs and add another figure for group addressed MSDUs or a forward reference to such a figure. | **Revised.**Response to each point:1. Will add “for individually addressed MSDUs” to the title of Figure 4-30a
2. Figure 4-30c/d do document the group addressed traffic so not clear what is “excluded from the vital aspects”.
3. Adding MAC-SAP may create more confusion.
4. Same resolution as 1)

**TGbe Editor, please add “(for individually addressed MSDUs)” to the end of the Figure 4-30b title.** |
| ↑19505 | Michael Montemurro | 4.9.6 | 70.44 | [WFA-R] It would be clearer to say: "In a MLD, the MAC sublayer is divided into an MLD upper MAC sublayer and an MLD lower MAC sublayer." | As in comment | **Revised.**Agreed in principle.**TGbe Editor, please apply the changes tagged as #19505 in this CR.** |
| 19610 | Mark Hamilton | 4.9.6 | 71.50 | There are not multiple "MLD lower MAC sublayers", there are multiple entities within the (single) MLD lower MAC sublayer. (There can only be a single sublayer - it's a layer.) | Change "MLD lower MAC sublayers" to "MAC entities within the MLD lower MAC sublayer". Add the word "entity" after "MLD lower MAC sublayer" in Figures 4-30b, 4-30c and 4-30d. | **Revised.**Agreed in principle. Accept the proposed resolution to change "MLD lower MAC sublayers" to "MAC entities within the MLD lower MAC sublayer". However, in Figures 4-30b/c/d, need to replace “MLD lower MAC sublayer” with “MLD lower MAC entity”, to be consistent with the resolution of CID19611.**TGbe Editor, please change: "MLD lower MAC sublayers" to "MAC entities within the MLD lower MAC sublayer" and replace in Figure 4-30b/c/d : MLD lower MAC sublayer” with “MLD lower MAC entity”.** |
| 19734 | Abhishek Patil | 4.9.6 | 71.71 | There are several instances of "non-MLD non-AP STA" in the TGbe draft. This is more concise while capturing the intention compared to "non-AP STA that is not affiliated with a non-AP MLD". | Replace all instances of "non-MLD non-AP STA" throughout the TGbe draft. | **Revised.**Confirmed with the commenter he meant to say:“replace all instances of "non-AP STA that is not affiliated with a non-AP MLD" with "non-MLD non-AP STA".Agreed with that.**TGbe Editor: please replace all instances of "non-AP STA that is not affiliated with a non-AP MLD" with "non-MLD non-AP STA".** |
| 19137 | Bo Sun | 5.1.5.1 | 75.20 | The general description for transmission should be specified for MLD cases. | Change to "During MLD transmission, an MSDU from the MAC SAP of an MLD goes through the processes shown in ....". | **Rejected.**(Note the page number the comment refers to should have been page 73)The concept of MAC-SAP applies equally in both non-MLO and MLO cases. The commenter fails to identify an issue with the current text. |
| 19138 | Bo Sun | 5.1.5.1 | 75.27 | The general description for reception should be specified for MLD cases. | Change to "During MLD reception, MPDUs orginating from different PHY SAPs of an MLD go through an MLD lower MAC sublayer, ..." | **Rejected.**(Note the page number the comment refers to should have been page 73)This section refers to MLO and Figure 5-2a, which is MLO. Therefore, it is very clear the context is MLO. |
| 19139 | Bo Sun | 5.1.5.1 | 75.50 | The affiliated AP's upper MAC sublayer components are abviously NOT "the same" as those for the AP MLD since they don't link merging and TID-to-Link mapping. | Change to "The affiliated APs' upper MAC sublayer components are almost the same as those for the AP MLD, but not proceed TID-TO-LINK mapping and link merging, handle traffic to and from..." | **Revised.**(Note the page number and line number the comment refers to should have been page 73/lne 46)Agreed in principle. Clarified below.**TGbe Editor: please apply the changes tagged by #19139 in this CR.** |
| 19140 | Bo Sun | 5.1.5.1 | 77.59 | MPDUs of multicast frame will not be delivered to the AP MLD upper MAC. | Change to "Unicast MPDUs received..." | **Revised.**Agreed in principle.**TGbe Editor: please replace with “Individually addressed MPDUs received…” on page 73/line 58.** |
| 19141 | Bo Sun | 5.1.5.1 | 78.13 | The distribution of GTK/IGTK/BIGTK is part of MLME function and it should not be listed as MLD Upper Mac Sublayer function. | Remove the security management bullet from the data plane function list. | **Rejected.**This list is not just for data plane. It includes management functionalities such as authentication, encryption, etc. |
| 19487 | Michael Montemurro | 5.1.5.1 | 74.09 | The assignment of upper MAC and lower MAC functions for an MLD are critical to understanding how it operates. The text describing these functions is buried in 5.1.5.1 | Create a new sub-clause of 5.1.5 after 5.1.5.1 called "MLD MAC sublayer functions" and move the text between 76.9 and 77.16 to the new subclause. | **Accepted.** |
| 19506 | Michael Montemurro | 5.1.5.1 | 73.30 | [WFA-R] It would be clearer to say: "If an MSDU arrives at a disabled IEEE 802.1X Controlled/Uncontrolled Port and the MSDU does not represent an IEEE 802.1X frame, then the MSDU is discarded." | As in comment | **Accepted.** |
| 19611 | Mark Hamilton | 5.1.5.1 | 73.23 | There are not multiple "MLD lower MAC sublayers", there are multiple entities within the (single) MLD lower MAC sublayer. (There can only be a single sublayer - it's a layer.) | Replace "MLD lower MAC sublayers" with "MLD lower MAC entities" (at P73.23). Same thing at P68.59, P68.61, and P76.27. Remove the "(s)" in "sublayer(s)" at P76.31. | **Accepted.** |
| 19612 | Mark Hamilton | 5.1.5.1 | 75.57 | There are not multiple MLD upper MAC sublayers to chose between. There are multiple entities within the (single) MLD upper MAC sublayer. (There can only be a single sublayer - it's a layer.) | Replace "appropriate upper MAC sublayer" with "appropriate upper MAC entity" | **Accepted.** |
| 19613 | Mark Hamilton | 5.1.5.1 | 73.22 | One MSDU can result in more than one MPDU. | Replace "MPDU" (both occurrences) with "MPDU(s)" at P73.22. | **Accepted.** |
| 19614 | Mark Hamilton | 5.1.5.1 | 76.03 | "The GTK of the associated AP with which a non-AP STA affiliated with a non-AP MLD is associated used to decrypt the group addressed MPDUs and MMPDUs received on a link where the non-AP STA is operating on." Huh? And, this is norrible grammar. | Replace the cited sentence with, "On a non-AP STA affiliated with a non-AP MLD, the GTK of the transmitting AP is used to decrypt the group addressed MPDUs and MMPDUs received from that AP." Also, to help with clarity of this paragraph, move this sentence to the end of the paragraph. | **Accepted.** |

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CID 19486

**3.2 Definitions specific to IEEE 802.11**

[…]

affiliated STA: A station (STA), which can be an access point (AP) STA or non-access point (non-AP) STA, that provides link-specific, MLD lower medium access control (MAC) sublayer and physical layer (PHY) services within a multi-link device (an MLD).

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CID 19134

**4.9.6 Reference model for multi-link operation (MLO)**

[…]

(#19505) In an MLD, the MAC Sublayer is divided into an MLD upper MAC sublayer and an MLD lower MAC sublayer. The MLD upper MAC sublayer performs functionalities that are common across all links, and the MLD lower MAC sublayer (shared with an AP or non-AP STA affiliated with the MLD) performs functionalities that are local to each link. Some of the functionalities require joint processing of both the MLD upper MAC sublayer and the MLD lower MAC sublayer.

(#19134)An AP MLD always operates in cooperation with one or more affiliated APs, one for each link. The MLD lower MAC sublayer components implement link specific functions that operate independently of the lower MAC in other affiliated APs. Use of these MLD lower MAC functions is shared by the AP MLD’s upper MAC sublayer, and the affiliated AP’s upper MAC sublayer (see [Figure 4-30c (High level architecture for](file:///C%3A%5CUsers%5Cdho%5CAppData%5CLocal%5CTemp%5CTemp63c3d4dc-fd04-484f-97b6-872ea1e5ef8f_Draft%20P802.11be_D4.0%20-%20Word.zip%5CWord%5CTGbe_Cl_04.doc#bookmark4) [AP MLD with affiliated APs)](file:///C%3A%5CUsers%5Cdho%5CAppData%5CLocal%5CTemp%5CTemp63c3d4dc-fd04-484f-97b6-872ea1e5ef8f_Draft%20P802.11be_D4.0%20-%20Word.zip%5CWord%5CTGbe_Cl_04.doc#bookmark4)). Some behaviors of MLO require the use of one or more affiliated APs’ upper MAC sublayer components. In particular, the affiliated APs’ upper MAC sublayer components support group addressed traffic, and any group or individually addressed traffic to or from any non-AP STAs that are not affiliated with non-AP MLDs. The high-level structure of an AP MLD along with its affiliated APs is shown in [Figure 4-30c (High level architecture for AP MLD with affiliated APs)](file:///C%3A%5CUsers%5Cdho%5CAppData%5CLocal%5CTemp%5CTemp63c3d4dc-fd04-484f-97b6-872ea1e5ef8f_Draft%20P802.11be_D4.0%20-%20Word.zip%5CWord%5CTGbe_Cl_04.doc#bookmark4).

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CID 19139

* + 1. **MAC data service architecture**

[…]

(#19139)For an AP MLD to support group addressed transmissions and also associations from non-AP STAs that are not affiliated with non-AP MLDs, [Figure 5-2a (MAC data plane architecture (MLO) for unicast data frames)](file:///C%3A%5CUsers%5Cdho%5CAppData%5CLocal%5CTemp%5CTemp70bd3006-004b-446f-883e-3739216aa8ae_Draft%20P802.11be_D4.0%20-%20Word.zip%5CWord%5CTGbe_Cl_05.doc#bookmark0) is combined with *n* affiliated APs, within a structure as shown in Figure 4-30c (High level architecture for AP MLD with affiliated APs). The affiliated APs’ upper MAC sublayer components are mostly the same as those for the AP MLD (except for TID-to-link mapping and link merging functions), but handle group addressed security associations (GTK, IGTK, and BIGTK), and handle traffic to and from associated non-AP STAs (not operating in MLO) with single link security associations for pairwise transient keys (PTKs). The overall structure is as shown in [Figure 5-2b (MAC data plane](file:///C%3A%5CUsers%5Cdho%5CAppData%5CLocal%5CTemp%5CTemp70bd3006-004b-446f-883e-3739216aa8ae_Draft%20P802.11be_D4.0%20-%20Word.zip%5CWord%5CTGbe_Cl_05.doc#bookmark1) [architecture for AP MLD and affiliated APs).](file:///C%3A%5CUsers%5Cdho%5CAppData%5CLocal%5CTemp%5CTemp70bd3006-004b-446f-883e-3739216aa8ae_Draft%20P802.11be_D4.0%20-%20Word.zip%5CWord%5CTGbe_Cl_05.doc#bookmark1)

Do you agree to the resolution provided in doc 11-23/014430 for the following CIDs?

19123, 19486, 19132, 19133, 19134, 19135, 19136, 19347, 19505, 19610, 19734, 19137, 19138, 19139, 19140, 19141, 19487, 19506, 19611, 19612, 19613, 19614