### IEEE P802.11Wireless LANs

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| 11be D1.0 CR for MLD individually addressed Management frame delivery |
| Date: 2021-11-15 |
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Abstract

This submission proposes resolutions for the following CIDs:

6244, 4038, 4251, 6618, 4399, 5220, 5763, 6613, 6614, 6615, 6616, 6252, 4072, 4400, 6032, 4715

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Add related CIDs. Clarify eCSA management frame can be used like CSA management frame. Use existing texts in the spec texts for ML probe request/response and minor fix.
* Rev 2: Add CID 6032 related to protected management frame.
* Rev 3: Editorial fix.
* Rev 4: Revision based on comment received during the teleconference with color blue and SP result 58/21 in favor of option 1. Add resolution for CID 4715
* Rev 5: move some texts to 4715
* Rev 6: Remove controversial part of the texts commented during the teleconference call.
* Rev 7: Minor editorial fix based on the feedback from Jeongki colored green
* Rev 8: Editorial fix to move the bullet up in 35.3.3 (Multi-link device addressing) based on the comments from Chunyu and combine change in 35.3.12.4 (Traffic indication)
* Rev 9: Add CID 6182. Change signaling to Link ID bitmap based on offline discussion with Ming. Editorial change marked with yellow.
* Rev 10: Revision based on offline discussion. Change marked with gray
* Rev 11: Editorial change. Update table 11-3 of bufferable MMPDU based on the suggestion from Mike. Color change with green.
* Rev 12: Editorial change.

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 D1.0 Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGbe D1.0 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** |
| 6244 | Ming Gan | 35.x |  | the mechanism for crosslink management transmission is missing | as in the comment | Revised - Agree in principle with the commenter. Detials for this mechanism needs to be specified.TGbe editor to make the changes shown in 11-21/1877r12 under all headings that include CID 6244. |
| 4038 | Abhishek Patil | 35.3.3 | 251.06 | The rules for setting the Address 3 and Address 4 fields of Management frames sent over the air by a transmitting STA affiliated with an MLD are missing | Clarify that the Address 3 (BSSID) is the address of the intended link. | Revised - Agree in principle with the commenter. Detials for this mechanism needs to be specified.TGbe editor to make the changes shown in 11-21/1877r12 under all headings that include CID 6244. |
| 4251 | Alfred Asterjadhi | 35.3.3 | 251.06 | What about MGMT frames? I think they have A3 field as well. Please clarify | As in comment. | Revised - Agree in principle with the commenter. Detials for this mechanism needs to be specified.TGbe editor to make the changes shown in 11-21/1877r12 under all headings that include CID 6244. |
| 6618 | Po-Kai Huang | 35.3.3 | 251.06 | A3 field of management frame shall be set based on 9.3.3.1 Format of (PV0) Management frames. | Add a descripton that A3 field of management frame shall be set based on 9.3.3.1 Format of (PV0) Management frames. | Revised - Agree in principle with the commenter. Detials for this mechanism needs to be specified.TGbe editor to make the changes shown in 11-21/1877r12 under all headings that include CID 6244. |
| 4399 | Arik Klein | 35.3.10.4 | 268.59 | According to the following text:"If a buffered BU is an MMPDU that is intended for one STA affiliated with a non-AP MLD and that is not a Measurement MMPDU, and if it is transmitted on a link where another STA affiliated with the same non-AP MLD is operating on, following the procedure above, \*the frame shall carry information to determine the intended destination STA affiliated with the non-AP MLD\*"Need to detail what is the information that is carried within the MPDU to determine the intended destination STA | As in comment | Revised - Agree in principle with the commenter. Detials for this mechanism needs to be specified.TGbe editor to make the changes shown in 11-21/1877r12 under all headings that include CID 6244. |
| 5220 | Huizhao Wang | 35.3.10.4 | 268.59 | For MMPDU, it should be delivered to the link which it intended, not on the other links in the same AP MLD. Also, if just MMPDU is buffered on a link, then only the AP on the link should update its TIM element, other APs on the other links shall not update their TIM element. | Remove the text of sending MMPDU cross links, only send MMPDU on the link which its content information will be direclty applied. | Revised - We note that certain management like measurement MMPDU indeed needs to satisfiy this rule. Details for other management frame needs to be specified.TGbe editor to make the changes shown in 11-21/1877r12 under all headings that include CID 6244. |
| 5763 | Laurent Cariou | 35.3.10.4 | 268.59 | we need to define how this information is carried in the frame. | as in comment | Revised - Agree in principle with the commenter. Detials for this mechanism needs to be specified.TGbe editor to make the changes shown in 11-21/1877r12 under all headings that include CID 6244. |
| 6613 | Po-Kai Huang | 35.3.10.4 | 268.59 | The capability to send management frame target to a link in a different link shall be extended to non-AP MLD and mandated support by AP MLD. | Extend the capability to send management frame target to a link in a different link to non-AP MLD. | Revised - Agree in principle with the commenter. Detials for this mechanism needs to be specified.TGbe editor to make the changes shown in 11-21/1877r12 under all headings that include CID 6244. |
| 6614 | Po-Kai Huang | 35.3.10.4 | 268.59 | Clarify that that the carried link information for the management frame does not apply to bit in frame header like PM and A-control. | Clarify that that the carried link information for the management frame does not apply to bit in frame header like PM and A-control. | Revised - Agree in principle with the commenter. Detials for this mechanism needs to be specified.TGbe editor to make the changes shown in 11-21/1877r12 under all headings that include CID 6244. |
| 6615 | Po-Kai Huang | 35.3.10.4 | 268.59 | While extending the management frame target to a link in a different link is good, we have to relax the functionality that requires tight timing constriant like TWT info frame. Ex the "shall" requirement below. A non-AP HE STA that transmits a TWT Information frame that contains a flexible TWT to a peer STAmay go to doze state after receiving the acknowledgment sent in response to the TWT Information frame ifit is in PS mode (i.e., the PM subfield of the Frame Control field of the TWT Information frame is 1) andmay be unavailable if it is in active mode (i.e., the PM subfield of the Frame Control field of the TWT Information frame is 0) and shall be in the awake state at the time it indicated in the Next TWT subfield of theTWT Information frame and shall be in the PS mode if the PM subfield of the TWT Information frame was1 and in active mode if the PM subfield of the TWT Information frame was 0. | Relax the rule of TWT info frame when the managmeent frame is sent in a different link. | Revised - Agree in principle with the commenter. Detials for this mechanism needs to be specified.TGbe editor to make the changes shown in 11-21/1877r12 under all headings that include CID 6244. |
| 6616 | Po-Kai Huang | 35.3.10.4 | 268.59 | The information to indicate the link information should be an element with field that carries link ID in the management frame. | Change "the frame shall carry information to determine theintended destination STA affiliated with the non-AP MLD" to "the frame shall carry an element with link ID field set to the link ID corresponding to theintended destination STA affiliated with the non-AP MLD except when the frame carried TWT element with Link ID bitmap present. " | Revised - Agree in principle with the commenter. Detials for this mechanism needs to be specified.TGbe editor to make the changes shown in 11-21/1877r12 under all headings that include CID 6244. |
| 6252 | Ming Gan | 35.3.10.4 | 268.62 | Please specify what is the info carried in the frame to determine the intended destination STA affiliated with the non-AP MLD | as in the comment | Revised - Agree in principle with the commenter. Detials for this mechanism needs to be specified.TGbe editor to make the changes shown in 11-21/1877r12 under all headings that include CID 6244. |
| 4072 | Abhishek Patil | 35.3.10.4 | 268.63 | The details on identifying the intended link of the MMPDU needs to be clearly specified. Today, the A3 field identifies the intended AP. | Extend the meaning of A3 field to identify the intended AP (i.e., carries the BSSID of the intended link). | Revised - Agree in principle with the commenter. Detials for this mechanism needs to be specified.TGbe editor to make the changes shown in 11-21/1877r12 under all headings that include CID 6244. |
| 4400 | Arik Klein | 35.3.10.4 | 268.63 | It is not clear what does "information to determine intended destination STA affiliated with the non-AP MLD" mean? | Need to detail what type of information is needed and where it is carried | Revised - Agree in principle with the commenter. Detials for this mechanism needs to be specified.TGbe editor to make the changes shown in 11-21/1877r12 under all headings that include CID 6244. |
| 6182 | Michael Montemurro | 12.5.3.3.1 | 214.61 | Since the PTKSA is between the non-AP MLD and the AP MLD, unicast management frame exchanges will have to be encapsulated by the MLD entities. The link for the management frame can be identified by the BSSID of the affiliated AP by both the AP MLD and the non-AP MLD. A solution like this would allow a unicast management frame to be transmitted between the affilaited STA and the affiliated AP across any available link through the AP MLD and non-AP MLD. | Update clauses 12.5.3.3, 12.5.5.3, and the appropriate clauses in 35 to specify that unicast management frames use A3 set to the affiliated AP MAC to identify the link and are encapsulated by the MLD prior to transmission.The commenter is willing to create a contribution to update the draft with these changes. | Revised - Due to the reason that MLD MAC address maybe the same as the MAC address of an affiliated AP, and not all the management frame are intended for a specific link, A3 is not a proper choice for the signaling. We introduce the signaling in the framebody.TGbe editor to make the changes shown in 11-21/1877r12 under all headings that include CID 6244. |

**Discussion:**

**Propose for CID 6244:**

*TGbe editor: Modify 35.3.12.4 Traffic indication as follows: (track change on) (#6244)*

**35.3.12.4 Traffic indication**

….(existing texts)……

….(existing texts)……

(#2302)An AP MLD buffers an MMPDU that is not a TPC Request frame or a Link Measurement Request frame 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. An AP MLD shall not buffer a
a TPC Request frame or a Link Measurement Request frame.

….(existing texts)……

If a buffered BU is an MMPDU that is intended for one STA affiliated with a non-AP MLD and that is not a
a TPC Request frame or a Link Measurement Request frame, 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).

*TGbe editor: change all instances of “that are not measurement MMPDUs” to “that are not a TPC Request frame or a Link Measurement Request frame” in 11be specification(#6244)*

*TGbe editor: Modify 11.2.2 Bufferable MMPDUs as follows: (#6244)*

* **Bufferable MMPDUs**

MMPDUs are categorized as bufferable or nonbufferable, as shown in Table 11-3 (Bufferable/nonbufferable classification of MMPDUs). Bufferable MMPDUs are eligible to be queued for delivery using a power-saving mechanism.

Nonbufferable MMPDUs are delivered without reference to a power saving mechanism.

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| --- |
| * **Bufferable/nonbufferable classification of MMPDUs**
 |
| **Description** | **Classification** |
| For non-MLO, 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 frameFor 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 |

*TGbe editor: Modify 10.28.5 Operation of the Dialog Token field as follows: (#6244)*

**10.28.5 Operation of the Dialog Token field**

A dialog token is an integer value that assists a STA or an MLD in grouping Management frames sent or received at
different times as part of the same dialog. The algorithm by which the integer value for the dialog is selected is implementation specific, but should be selected in a manner that minimizes the probability of a frame associated with one dialog being incorrectly associated with another dialog.

*TGbe editor: Add 35.3.14.1 general at the beginning of 35.3.14 and add paragraphs in 35.3.14 Multi-link device individually addressed Management frame delivery* *as follows: (#6244)*

35.3.14 Multi-link device individually addressed Management frame delivery

35.3.14.1 General

(…existing texts….)

Between an AP MLD and a non-AP MLD associated with the AP MLD, an MLD may transmit an individually addressed MMPDU that is intended for one or more STA(s) affiliated with the associated MLD with setup link(s) to another STA (other than the intended STA(s)) affiliated with the associated MLD with a setup link subject to additional constraints (see 35.3.7 (Link management)) if the MMPDU satisfies all the following conditions:

* The MMPDU is a Class 3 frame or an Extended Channel Switch Announcement frame
* The MMPDU is not a TPC Request frame, a TPC Report frame, a Link Measurement Request frame or a Link Measurement response frame
* The MMPDU is classified as a bufferable MMPDU
* The MMPDU is not the CSI frame, Beamforming frame, and Beamforming frame/CQI frame listed at the beginning of 35.3.14.1 (General).

NOTE – MMPDU only includes the Frame Body field of the management frame and does not include a MAC header and a frame check sequence (FCS) of the management frame (See 3.2 Definitions specific to IEEE Std 802.11).

Otherwise, an MLD with dot11EHTBaseLineFeaturesImplementedOnly equal to true shall not transmit an individually addressed MMPDU that is intended forone or more STA(s) affiliated with the associated MLD with setup link(s) to another STA (other than the intended STA(s)) affiliated with the associated MLD with a setup link.

An individually addressed MMPDU transmitted by an MLD is intended for a STA unless specified otherwise to be intended for an MLD or to be capable of intended for more than one STA.

Between an AP MLD and a non-AP MLD associated with the AP MLD, the following individually addressed MMPDUs shall be intended for an MLD:

* Authentication frame that includes a Basic multi-link element
* (Re)Association Request/Response frame that includes a Basic multi-link element
* Deauthentication frame
* Disassociation frame
* Block Ack Action frame
* SA Query Action frame
* ML probe request/response frame
* WNM Sleep Mode Request/Response frame
* TID-To-Link Mapping Request/Response/Teardown frame
* NSEP Priority Access Enable Request/Enable Response/Teardown frame
* EML Operating Mode Notification frame
* SCS Request/Response frame
* MSCS Request/Response frame

A non-AP MLD may transmit an individually addressed MMPDU that is an Authentication frame that includes a Basic multi-link element or a (Re)Association Request frame that includes a Basic multi-link element or a ML probe request frame or a Deauthentication frame or a Disassociation frame to any AP affiliated with the AP MLD subject to additional constraints (see 35.3.7 (Link management)).

An AP MLD may transmit an individually addressed MMPDU that is a Deauthentication frame or a Disassociation frame to any non-AP STA affiliated with the non-AP MLD subject to additional constraints (see 35.3.7 (Link management)).

An MLD may transmit an individually addressed MMPDU that is a Classs 3 frame that is intended for an associated MLD through any STA affiliated with the associated MLD with a setup link subject to additional constraints (see 35.3.7 (Link management)).

35.3.14.2 Identification of the Intended STA

Between an AP MLD and a non-AP MLD associated with the AP MLD, an individually addressed MMPDU that is not a TWT Setup frame that includes a Link ID Bitmap subfield in its TWT element and that is intended for one or more STA(s) affiliated with the associated MLD with setup link(s) shall follow the below procedure:

* If the individually addressed MMPDU is transmitted to another STA (other than the intended STA(s)) affiliated with the associated MLD with a setup link, then the individually addressed MMPDU shall include Multi-Link Link Information element that identifies the intended link(s) of the MMPDU as the last element but before the Vendor Specific element(s) (if present).
* Otherwise, the individually addressed MMPDU may include Multi-Link Link Information element that identifies the intended link(s) of the MMPDU as the last element but before the Vendor Specific element(s) (if present).

NOTE - If the Multi-Link Link Information element is not present in the individually addressed MMPDU, the individually addressed MMPDU cannot be retransmitted to different STA as described in the first bullet above.

Between an AP MLD and a non-AP MLD associated with the AP MLD, a TWT Setup frame that includes a Link ID Bitmap subfield in its TWT element shall not include a Multi-Link Link Information element.

If dot11EHTBaseLineFeaturesImplementedOnly is equal to true, only one bit in the Link ID bitmap of the Multi-Link Link Information element shall be set to 1.

Between an AP MLD and a non-AP MLD associated with the AP MLD, an individually addressed MMPDU that is intended for an associated MLD shall not include Multi-Link Link Information element.

Between an AP MLD and a non-AP MLD associated with the AP MLD, if an individually addressed MMPDU that carries Multi-Link Link Information element is received by a STA affiliated with the MLD, then the MLD shall discard the MMPDU if the Multi-Link Link Information indicates any link without being set up.

***TGbe editor: Add a new subclause 9.4.2.xxx Multi-Link Link Information element as follows: (#6244)***

**9.4.2.xxx Multi-Link Link Information element**

The Multi-Link Link Information element identifie the intented link(s) of the MMPDU that carries the element.

The Multi-Link Link Information element is defined in Figure 9-xxxx (Multi-Link Link Information element format).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Element ID | Length | Element ID Extension | Link ID Bitmap |
| Octets: | 1 | 1 | 1 | 2 |

**Figure 9-xyz1—Multi-Link Link Information element format**

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1 (General).

The Link ID Bitmap field indicates the link(s) where the intended STA(s) are operating on (See 35.3.2.1 for the usage of link ID).

*TGbe editor: Modify 35.3.3 Multi-link device addressing as follows: (#6244)*

35.3.3 Multi-link device addressing

(…existing texts….)

(#8227)For an individually addressed frame sent on a link between two MLDs, the following applies:

* (#8230)(#1158)the value of the Address 2 (TA) field (if present) in the MAC header of the frame
shall be the MAC address of the transmitting STA affiliated with the MLD corresponding to that link
except for(#2474) the Individual/Group bit, which is set to 1 when the TA field value is a bandwidth
signaling TA and set to 0 otherwise.
* (#8227)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.
* the value of the A3 field in the MAC header of a management frame shall be set based on 9.3.3.1 Format of (PV0) Management frames).
* (#6185)(#8228)(#1670)the value of the Address 3 field and the Address 4 field (if present) in the
MAC header of a data frame shall be set based on Table 9-30 (Address field contents) and the
settings of the To DS and From DS bits, where the BSSID is the MAC address of the AP affiliated
with the AP MLD corresponding to that link.

(…existing texts….)