### IEEE P802.11 Wireless LANs

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| 11be D1.0 CR for MLD individually addressed Management frame delivery | | | | |
| Date: 2021-11-15 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Po-Kai Huang | Intel Corporation | 2200 Mission College Blvd, Santa Clara, CA 950542200 |  | po-kai.huang@intel.com |
| Laurent Cariou |  |  |  |
| Muhammad Kumail Haider | Meta |  |  |  |
| Chunyu Hu |  |  |  |
|  |  |  |  |  |

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

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** |
| 6032 | Liwen Chu | 12 | 209.01 | The QMF is introduced by NSEP. The security of Robust management frame should be addressed under MLD. | As in comment | Revised –  Security of robust management frame needs to be addressed under 11be independent of the QMF feature introduced by NSEP.  In the spec, there are MFPC and MFPR used to control PMF.  *A STA in an infrastructure BSS shall, outside the context of TDLS, set the MFPC subfield(#211) to 1 if dot11RSNAProtectedManagementFramesActivated is true and to 0 otherwise, and set the MFPR subfield(#211) to 1 if dot11RSNAUnprotectedManagementFramesAllowed is false and to 0 otherwise.*  We suggest to have EHT STA to be capable of PMF and have MFPC equal to 1 and propose corresponding texts.  TGbe editor to make the changes shown in 11-21/1877r4 under all headings that include CID 6032. |

**Propose for CID 6032:**

*TGbe editor: Add the following at the end of 12.6.19 Protection of robust Management frames: (#6032)*

An EHT STA shall set dot11RSNAProtectedManagementFramesActivated to true. (#6032)

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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 | Resvied –  Agree in principle with the commenter. Detials for this mechanism needs to be specified.  TGbe editor to make the changes shown in 11-21/1877r4 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. | Resvied –  Agree in principle with the commenter. Detials for this mechanism needs to be specified.  TGbe editor to make the changes shown in 11-21/1877r4 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. | Resvied –  Agree in principle with the commenter. Detials for this mechanism needs to be specified.  TGbe editor to make the changes shown in 11-21/1877r4 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. | Resvied –  Agree in principle with the commenter. Detials for this mechanism needs to be specified.  TGbe editor to make the changes shown in 11-21/1877r4 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 | Resvied –  Agree in principle with the commenter. Detials for this mechanism needs to be specified.  TGbe editor to make the changes shown in 11-21/1877r4 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. | Resvied –  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 11-21/1877r4 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 | Resvied –  Agree in principle with the commenter. Detials for this mechanism needs to be specified.  TGbe editor to make the changes shown in 11-21/1877r4 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. | Resvied –  Agree in principle with the commenter. Detials for this mechanism needs to be specified.  TGbe editor to make the changes shown in 11-21/1877r4 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. | Resvied –  Agree in principle with the commenter. Detials for this mechanism needs to be specified.  TGbe editor to make the changes shown in 11-21/1877r4 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 STA may go to doze state after receiving the acknowledgment sent in response to the TWT Information frame if it is in PS mode (i.e., the PM subfield of the Frame Control field of the TWT Information frame is 1) and may 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 the TWT Information frame and shall be in the PS mode if the PM subfield of the TWT Information frame was 1 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. | Resvied –  Agree in principle with the commenter. Detials for this mechanism needs to be specified.  TGbe editor to make the changes shown in 11-21/1877r4 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 the intended 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 the intended destination STA affiliated with the non-AP MLD except when the frame carried TWT element with Link ID bitmap present. " | Resvied –  Agree in principle with the commenter. Detials for this mechanism needs to be specified.  TGbe editor to make the changes shown in 11-21/1877r4 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 | Resvied –  Agree in principle with the commenter. Detials for this mechanism needs to be specified.  TGbe editor to make the changes shown in 11-21/1877r4 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). | Resvied –  Agree in principle with the commenter. Detials for this mechanism needs to be specified.  TGbe editor to make the changes shown in 11-21/1877r4 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 | Resvied –  Agree in principle with the commenter. Detials for this mechanism needs to be specified.  TGbe editor to make the changes shown in 11-21/1877r4 under all headings that include CID 6244. |
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**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.

….(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 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.

*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 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 STA affiliated with the associated MLD with a setup link to another STA 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 or a Measurement Request frame
* The MMPUD is not a response to a TPC Request frame or a Measurement Request frame
* The MMPDU is classified as a bufferable MMPDU
* The MMPDU is not a TWT information frame for flexible wake time
* The MMPUD 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 for one STA affiliated with the associated MLD with a setup link to another STA affiliated with the associated MLD with a setup link.

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)).

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

35.3.14.2 Identification of the Intended STA

Between an AP MLD and a non-AP MLD associated with the AP MLD, if an individually addressed MMPDU that is not a TWT Setup frame that includes a LinkID Bitmap subfield in its TWT element and that is intended for one STA affiliated with the associated MLD with a setup link is transmitted to another STA 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 of the MMPDU as the last element but before the Vendor Specific element(s) (if present).

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, an individually addressed MMPDU that is intended for more than one STA affiliated with an associated MLD shall not include Multi-Link Link Information element.

NOTE – See 35.7.1 (Individual TWT Agreements) for the case when an individually address MMPDU is a TWT Setup frame that includes a LinkID Bitmap subfield in its TWT element. In such case, the Link ID bitmap provides an indication of the link(s) for which the TWT setup applies to instead of the A3 field.

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 an affiliated STA of the MLD, then the MLD shall determine the intended link of the MMPDU based on the Multi-Link Link Information element and shall discard the MMPDU if the Multi-Link Link Information indicates a 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 contains the link ID that identifies the intented link of the MMPDU that carries the element.

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) for the management frame (See 3.2 Definitions specific to IEEE Std 802.11).

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 |
| Octets: | 1 | 1 | 1 | 1 |

**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 field specifies a value that uniquely identifies the link where the intended STA is operating  
on. The usage of link ID is defined in 35.3.2.1 (General)(#1776).

*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.
* (#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.
* 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).

(…existing texts….)

*TGbe editor: Add the following paragraphs after existing text in 35.7.2 Individual TWT Agreements as follows: (#6244)*

35.7.2 Individual TWT Agreements

(…existing texts …)

Between an AP MLD and a non-AP MLD associated with the AP MLD, if an individually addressed TWT information frame for individual TWT that is intended for one STA affiliated with the associated MLD with a setup link is transmitted to another STA affiliated with the associated MLD with a setup link and an acknowledgement in response to the TWT information frame is received, then the TWT requesting STA of the intended link shall consider the corresponding TWT agreement of the intended link suspended starting from the TWT SP of the respective TWT agreement that occurs immediately after the TWT information frame exchange rather than immediately as described in 26.8.4.2 (TWT Information frame exchange for individual TWT).

*TGbe editor: Add a new subclause in 35.7 TWT Operation as follows: (#6244,4715)*

35.7.3 Broadcast TWT operation

(#6244)Between an AP MLD and a non-AP MLD associated with the AP MLD, if an individually addressed TWT information frame for broadcast TWT with All TWT subfield set to 1 that is intended for one STA affiliated with the associated MLD with a setup link is transmitted by another STA affiliated with the associated MLD with a setup link and an acknowledgement in response to the TWT information frame is received, then the TWT scheduled STA of the intended link shall consider all the broadcast TWT schedules as suspended starting from the broadcast TWT schedule of the intended link that occurs immediately after the TWT information frame exchange rather than immediately as described in 26.8.4.3 (TWT Information frame exchange for broadcast TWT).

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| 4715 | Chittabratta Ghosh | 35.6.4 | 298.42 | Restricted TWT SP schedule in all link should be shared among all STAs affiliated with an MLD | Please add specific behavior to satisy the issue pointed out in the comment | Resvied –  Agree in principle with the commenter.  TGbe editor to make the changes shown in 11-21/1877r4 under all headings that include CID 4715. |

**Propose for CID 4715:**

*TGbe editor: Add the following at the end of a new subclause in 35.7.3 Broadcast TWT operation: (#4715)*

(#4715)If a STA affiliated with an MLD is a TWT scheduling AP or a TWT scheduled STA, its broadcast TWT schedule information shall be known to any other STA(s) affiliated with that MLD. Each broadcast TWT is uniquely identified by the <broadcast TWT ID, MAC address> tuple, where MAC address is the link address of the TWT scheduling AP that sets up the schedule, as specified in 26.8.3 (Broadcast TWT operation).

NOTE-The broadcast TWT schedule information can be used by other STAs of the MLD to make transmission and other channel access decisions on respective links. (#4715)