IEEE P802.11
Wireless LANs

|  |
| --- |
| 11be D3.0 CR for QMF |
| Date: 2023-03-27 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Po-Kai Huang | Intel |  |  |  |

Abstract

This submission proposes resolutions for the following CIDs:

15547, 15409, 16834, 16833

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Editorial revision
* Rev 2: Editorial revision for spelling errors based on the comments from Takuhiro
* Rev 3: Remove change on default QMF policy for HE since without inclusion in the table just means by default AC\_BE. Remove change on default QMF policy for EHT with similar reason and since including of EPCS priority access is the only thing that we motion so far. Remove clause 12 texts to be included in Mike’s document. Add discussions for GQMF and a note that says GQMF follows baseline rule.
* Rev 4: Editorial revison for spelling error.
* Rev 5: update the discussion session.

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** |
| 15547 | Chaoming Luo | 35.3.14.1 | 545.23 | This subclause 35.3.14.1 only talks about the case of an MLD with dot11QMFActivated equal to false, how about the case of an MLD with dot11QMFActivated equal to true? | Either add the following: An MLD shall set dot11QMFActivated to false.Or, add corresponding rules for an MLD with dot11QMFActivated equal to true. | Revised – Agree in principle with the commenter. TGbe editor to make the changes shown in 11-23/0540r5 under all headings that include CID 15547 |
| 15409 | John Wullert | 35.3.14.1 | 545.22 | This clause provides multiple requirements detailing how an MLD with dot11QMFActivated equal to false handles sequencing, duplicate detection, etc. Nowhere in the specification are there similar descriptions of how an MLD with dot11QMFActivated equal to true performs these same actions | Add requirements for how MLDs with dot11QMFActivated equal to true handle sequence generation, duplicate detection, retries, etc. | Revised – Agree in principle with the commenter. TGbe editor to make the changes shown in 11-23/0540r5 under all headings that include CID 15547 |
| 16834 | Mark RISON | 35.3.14.1 | 545.23 | "An MLD with dot11QMFActivated equal to false" -- OK, and what if dot11QMFActivated is true? | Specify the behaviour in this case | Revised – Agree in principle with the commenter. TGbe editor to make the changes shown in 11-23/0540r5 under all headings that include CID 15547 |
| 16833 | Mark RISON | 35.3.14.1 | 545.23 | "An MLD with dot11QMFActivated equal to false" -- dot11QMFActivated is a STA attribute, not an MLD attribute | Refer to the STAs, and require them to all have the same setting. Also at 334.12, 336.19, 338.10 | Revised – Agree in principle with the commenter. TGbe editor to make the changes shown in 11-23/0540r5 under all headings that include CID 15547 |

**Discussion: Implication of QMF in the current spec.**

EPCS priority access is only for MLD, so EPCS priority access frame will only be used between MLD, so define EPCS priority access for default QMF policy implies that QMF is allowed between MLDs.

****

In 12.5.2.4.4 and 12.5.4.4.4, QMF behavior is also described for MLD, which implies that QMF is allowed between MLDs.

***12.5.2.4.4 PN and replay detection***

******

***12.5.4.4.4 PN and replay detection***

****

**Discussion: GQMF**

In baseline sequence number space definition, group addressed management frame that is not GQMF uses SNS1 and GQMF uses SNS4. For MLO, since we do not define additional sequence number space for group addressed management frame that is non-GQMF. Non-GQMF follows baseline rule and GQMF can continue to use SNS4, and we do not need to add extra texts for that.

In baseline receiver cache definition, group addressed management frame that is non-GQMF and GQMF both uses RC1. For MLO, since we do not really add anything, they can continue to use RC1, and we do not need to add extra texts for that.

Finally, since there is no additional rule defined for group addressed management frame handling, group addressed management frame can continue to be per link operation and baseline rule per my search of GQMF in D3.0 can continue to work. This also works nicely with the decision that IGTK and BIGTK are per link and so security clauses seem to be fine.

 In sum, since all the proposed texts focus on IQMF and does not touch GQMF (except capability bit, which I reuse from per STA capability bit and can be use for both) and GQMF can just use baseline, I think we do not need to add further texts. Let me know if you have further comments.

Sample texts of GQMF rules:

*A QMF AP shall transmit a Management frame as a GQMF when all three of the following conditions are met:*

 *— The RA of the Management frame corresponds to (#1653)a group address.*

*— The transmitting STA has received an Extended Capabilities element that has the QMFActivated*

*subfield equal to 1 from every member of the BSS corresponding to the BSSID field of the Management frame.*

*— The frame is not a time priority Management frame.*

 *— (#3573)The frame is not a PV1 Management frame.*

*A non-AP QMF STA shall transmit a Management frame as a GQMF when all three of the following conditions are met:*

*— The RA of the Management frame corresponds to (#1653)a group address.*

*— The transmitting STA has received an Extended Capabilities element that has the QMFActivated*

*subfield equal to 1 from its associated AP.*

*— The frame is not a time priority Management frame.*

*— (#3573)The frame is not a PV1 Management frame.*

*A QMF STA in an unassociated state shall transmit all (#1333)group addressed Management frames as nonQMF. An associated QMF STA shall follow the QMF policy dictated by its associated AP for transmitting GQMFs as described in 11.24.2 (QMF policy advertisement and configuration procedures). The specific access category assignments of different Management frames in a nondefault QMF policy are beyond the scope of this document. The transmitting QMF STA shall indicate the access category used to transmit GQMFs in the ACI subfield of the sequence number field*

*A QMF STA shall not modify the access category of an IQMF or GQMF frame after an initial transmission of the frame has been performed, regardless of any subsequent modification to the QMF policy under which the STA is operating.*

*When the Individually Addressed subfield is 1, then the QACM applies to IQMFs. When the Group Addressed subfield is 1, then the QACM applies to GQMFs. A STA shall not transmit a QMF Policy element with both the Individually Addressed and Group Addressed subfields set to 0 in any of the included QACM subfields.*

---------------------------------resolution for CID 15547 track change on---------------------------------------

**10.3.2.14 Duplicate detection and recovery** **10.3.2.14.2 Transmitter requirements *Change the first paragraph as follows:***

A STA maintains one or more sequence number spaces that are used when transmitting a frame to determine

the sequence number for the frame. An MLD maintains one or more sequence number spaces that are used when a STA affiliated with the MLD transmits an individually addressed QoS Data frame to a STA affiliated with an associated MLD to determine the sequence number for the frame. If either an MLD1 or an MLD2 is a non-QMF MLD, the MLD1 maintains a single sequence number space that is used when (#10289)the MLD1 transmits through a STA affiliated with the MLD1 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)) to a STA affiliated with another MLD2 to determine the sequence number for the frame. An QMF MLD maintains a single sequence number space for each AC that is used when (#10289)the MLD transmits through a STA affiliated with the MLD an IQMF (except for a frame that is excluded as defined in 35.3.14 (Multi-link device individually addressed Management frame delivery)) to a STA affiliated with another QMF MLD to determine the sequence number for the frame. When multiple sequence number spaces are supported, the appropriate sequence number space is determined by information from the MAC control fields of the frame to be transmitted. Except as noted below, each sequence number space is represented by a modulo 4096 counter, starting at 0 and incrementing by 1, for each MSDU or MMPDU transmitted using that sequence number space. If dot11MACPrivacyActivated is true, the counter in each sequence number space shall be set to a random number modulo 4096 when the STA’s MAC address is changed.

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

A transmitting STA shall support the applicable sequence number spaces defined in [Table 10-5 (Transmitter](#bookmark3) [sequence number spaces(#11529)(#10291))](#bookmark3). An MLD shall support the applicable sequence number spaces defined in [Table 10-5 (Transmitter sequence number spaces(#11529)(#10291)](#bookmark3)) (#10290)with the Status indicated as Mandatory. A STA affiliated with an MLD shall use SNS9 in [Table 10-5 (Transmitter sequence](#bookmark3) [number spaces(#11529)(#10291)](#bookmark3)) maintained by the MLD to determine the sequence number of an individ- ually addressed QoS Data frame that is transmitted to a STA affiliated with (#13119)another MLD. If either an MLD1 or an MLD2 is a non-QMF MLD, a STA affiliated with the MLD1 shall (#10290)use SNS10 in [Table 10-5 (Transmitter sequence number](#bookmark3) [spaces(#11529)(#10291)](#bookmark3)) maintained by the MLD1 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 MLD2. A STA affiliated with a QMF MLD shall (#10290)use SNS12 in [Table 10-5 (Transmitter sequence number](#bookmark3) [spaces(#11529)(#10291)](#bookmark3)) maintained by the QMF MLD to determine the sequence number of an IQMF (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 QMF MLD. An AP MLD shall use SNS11 in [Table 10-5 (Transmitter sequence number spaces(#11529)(#10291))](#bookmark3) maintained by the MLD to determine the sequence number of a group addressed Data frame that is transmit- ted by an AP affiliated with the AP MLD so that the same group addressed Data frame transmitted over mul- tiple 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 num- ber space contains a single counter, or multiple counters and in the latter case identifies any indexes. The Transmitter requirements column identifies requirements for the operation of this sequence number space. The referenced requirements are defined at the end of the table.

***Change the existing row SNS2 and insert three new rows to*** [***Table 10-5 (Transmitter sequence***](#bookmark3)[***number spaces(#11529)(#10291))***](#bookmark3)***:***.

**Table 10-5—Transmitter sequence number spaces(#11529)(#10291)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sequence number space identifier** | **Sequence number space** | **Applies to** | **Status** | **Multiplicity** | **Transmitter requirements** |
| … |  |  |  |  |  |
| SNS2 | Individually addressed QoS Data | A STA transmitting an indi- vidually addressed QoS Data frame, excluding SNS5 (#10290)and SNS9 | Mandatory | Indexed by<Address 1, TID> |  |
| … |  |  |  |  |  |
| SNS4 | QMF | A QMF STA transmitting aQMF excluding SNS12 | Mandatory | Indexed by<Address 1,AC> | TR2 |
| …. |  |  |  |  |  |
| SNS9 | Individually addressed QoS Data | (#13495)(#13119)An MLD transmitting through any STA affiliated with the MLD an individually addressed QoS Data frame that is not a QoS(+) Null frame to a STA affiliated with another MLD. | Mandatory | Indexed by <MLD MAC Address that the STA iden- tified by Address 1 is affiliated with, TID> per MLD |  |
| SNS10 | Individually addressed Management frame (except the frames that are excluded in 35.3.14 (Multi-link device indi- vidually addressed Management frame deliv- ery)) | (#13495) If either an MLD1 or an MLD2 is a non-QMF MLD, the MLD1 transmit- ting through any STA affiliated with the MLD1 an individually addressed Management frame (except the frames that are excluded in 35.3.14 (Multi-link device individually addressed Man- agement frame delivery)) to a STA affiliated with another MLD2.  | Mandatory | Indexed by <MLD MAC Address that the STA iden- tified by Address 1 is affiliated with> per MLD |  |
| SNS11 | Group addressed data | (#13495)An AP MLD trans-mitting through any AP affili- ated with the AP MLD a group addressed Data frame | Mandatory | Single instance per AP MLD |  |
| SNS12 | IQMF (except the frames that are excluded in 35.3.14 (Multi-link device indi- vidually addressed Management frame delivery)) | An QMF MLD transmitting through any STA affiliated with the MLD an IQMF (except the frames that are excluded in 35.3.14 (Multi-link device individually addressed Man- agement frame delivery)) to a STA affiliated with another QMF MLD. | Mandatory | Indexed by <MLD MAC Address that the STA iden- tified by Address 1 is affiliated with, AC> per MLD  | TR4 |
| TR1: A transmitting STA should cache the last used sequence number per RA for frames that are assigned sequence numbers from this sequence number space. The STA should check that the successively assigned sequence numbers for frames transmitted to a single RA do not have the same value as is found in the cache for that RA. If the check fails the STA should increment the counter by 2, rather than 1.TR2: The STA shall assign the sequence number from one modulo 1024 counter per <Address 1, AC> tuple starting at 0 and incrementing by 1 for each MMPDU carried in one or more QMFs with Address 1 and ACI fields matching the <Address 1, AC> tuple values corresponding to that counter.TR3: Sequence numbers for transmitted QoS (+)Null frames may be set to any value.TR4: The MLD shall assign the sequence number from one modulo 1024 counter per <MLD MAC Address that the STA identified by Address 1 is affiliated with, AC> tuple starting at 0 and incrementing by 1 for each MMPDU carried in one or more IQMFs with Address 1 and ACI fields matching the <MLD MAC Address that the STA identified by Address 1 is affiliated with, AC> tuple values corresponding to that counter. |

**10.3.2.14.3 Receiver requirements**

***Change the first paragraph as follows:***

A STA (#12265)and an MLD maintains one or more duplicate detection caches. [Table 10-6 (Receiver](#bookmark4) [caches(#11529)(#11924))](#bookmark4) defines the conditions under which a duplication detection cache is supported and the rules followed by the receiver for the cache. When a Data, Management or Extension frame is received, a record of that frame is inserted in an appropriate cache. That record is identified by a sequence number and possibly other information from the MAC control fields of the frame. When a Data, Management or Extension

frame is received in which the Retry subfield of the Frame Control field is equal to 1, the appropriate cache, if any, is searched for a matching frame. In DMG, when a group addressed frame is received the appropriate cache is searched for a matching frame. When a PV1 Data frame or PV1 Management frame is received, the appropriate cache is searched for a matching frame, regardless of the presence of the Retry subfield of the Frame Control field. If the search is successful, the frame is considered to be a duplicate. Duplicate frames are discarded.

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

A receiving STA shall implement the applicable receiver requirements defined in [Table 10-6 (Receiver](#bookmark4) [caches(#11529)(#11924))](#bookmark4) with (#12266)the Status indicated as Mandatory. An MLD shall implement the applicable receiver requirements defined in [Table 10-6 (Receiver caches(#11529)(#11924)](#bookmark4)) with the Status indicated as Mandatory. All STAs affiliated with an MLD shall (#10291)use RC14 in [Table 10-6 (Receiver](#bookmark4) [caches(#11529)(#11924))](#bookmark4), where the duplicate detection cache is maintained 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 (#13119)another MLD. If either an MLD1 or an MLD2 is a non-QMF MLD, all STAs affiliated with the MLD1 shall use RC15 in [Table 10-6 (Receiver caches(#11529)(#11924))](#bookmark4), where the duplicate detection cache is maintained by the MLD, to assist the MLD1 in discarding 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 (#13119)another MLD2. All STAs affiliated with an QMF MLD shall use RC17 in [Table 10-6 (Receiver caches(#11529)(#11924))](#bookmark4), where the duplicate detection cache is maintained by the QMF MLD, to assist the QMF MLD in discarding duplicate IQMF (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 (#13119)another QMF MLD. An MLD shall implement RC16 in [Table 10-6 (Receiver](#bookmark4) [caches(#11529)(#11924)](#bookmark4)) maintained (#14042)by the MLD to discard duplicate group addressed Data that are delivered from the associated MLD. A group addressed Data frame received on any link shall be dis- carded using an implementation specific duplicate (#11923)detection mechanism. A receiving STA should implement the applicable receiver requirements defined in [Table 10-6 (Receiver caches(#11529)(#11924))](#bookmark4) with (#12266)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(#11529)(#11924))](#bookmark4) 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 indexes that identify a cache entry and the number of entries that shall be supported. The Receiver requirements column 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.

***Change the existing rows RC1 and RC2, insert three new rows and two new footnotes after RR6 to*** [***Table 10-6 (Receiver caches(#11529)(#11924))***](#bookmark4)***:***

**Table 10-6—Receiver caches(#11529)(#11924)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Receiver cache identifier** | **Cache name** | **Applies to** | **Status** | **Multiplicity / Cache size** | **Receiver requirements** |
| RC1 | Not QoS Data | A STA receiving frames (individually or group addressed) that are not QoS Data, excluding if supported:RC4 RC5 RC6 RC7 RC8 RC10 RC15(#10291)RC16RC17 | Mandatory | Indexed by: <Address 2, sequence number, frag- ment number>.At least the most recent cache entry per<Address 2>. | RR1 RR2 RR5 |
| RC2 | QoS Data | A STA receiving an (indi- vidually or group addressed) QoS Data frame, excluding RC3, and if supported:RC7, RC8, RC9, ~~and~~ RC10, and RC14 | Mandatory | Indexed by: <Address 2, TID, sequence number, fragment number>.At least the most recent cache entry per<Address 2, TID> pair in this cache. | RR1 RR5 |
| RC6  | QMFs  | A STA receiving anindividually addressedQMF excluding RC17 | Mandatory  | Indexed by: <Address 2,AC, sequence number,fragment number>The most recent cacheentry per <Address 2,AC, sequence-number,fragment-number>. | RR2RR3RR5 |
| RC14 | Individu ally addressed QoS Data | (#13496)(#13119)An MLD receiving through any STA affiliated with the MLD an individually addressed QoS Data frame that is not a QoS(+) Null frame from a STA affiliated with another MLD. | Mandatory | Indexed by <MLD MAC address that the STA identified by Address 2 is affiliated with, TID, sequence number> per MLD.At least the most recent cache entry per <MLD MAC address that the STA identified by Address 2 is affiliated with, TID> pair in this cache. | RR7 |

**Table 10-6—Receiver caches(#11529)(#11924) *(continued) (continued)***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Receiver cache identifier** | **Cache name** | **Applies to** | **Status** | **Multiplicity / Cache size** | **Receiver requirements** |
| RC15 | Individ- ually addresse d Man- age- ment frame (except the frames that are exclude d in 35.3.14 (Multi- link device individ- ually addresse d Man- age- ment frame deliv- ery)) | (#13496) If either an MLD1 or an MLD2 is a non-QMF MLD, the MLD1 receiving through any STA affiliated with the MLD1 an individually addressed Management frame (except the frames that are excluded in 35.3.14 (Multi-link device individually addressed Management frame delivery)) from a STA affiliated with another MLD2. | Mandatory | Indexed by <MLD MAC address that the STA identified by Address 2 is affiliated with, sequence number> per MLD. At least the most recent cache entry per MLD MAC address that the STA identified by Address 2 is affiliated with in this cache. | RR7 |
| RC16 | Group addresse d Data | (#13496)An MLD receiving through any STA affiliated with the MLD a group addressed Data frame | Mandatory | Indexed by <MLD MAC Address that the STA identified by Address 2 is affiliated with, sequence number> per MLD. At least the most recent cache entry per MLD MAC address that the STA identified by Address 2 is affiliated with in this cache. | RR8 |
| RC17 | IQMF (except the frames that are exclude d in 35.3.14 (Multi- link device individ- ually addresse d Man- age- ment frame deliv- ery)) | (#13496)A QMF MLD receiving through any STA affiliated with the QMF MLD an IQMF (except the frames that are excluded in 35.3.14 (Multi-link device individually addressed Management frame delivery)) from a STA affiliated with another QMF MLD. | Mandatory | Indexed by <MLD MAC address that the STA identified by Address 2 is affiliated with, AC, sequence number> per MLD. At least the most recent cache entry per MLD MAC address that the STA identified by Address 2 is affiliated with in this cache. | RR7 |
| RR7: The MLD shall discard the frame if the Retry subfield of the Frame Control field is 1 and it matches an entry in the cache.RR8: The MLD shall discard the frame based on an implementation specific duplicate (#11923)detection mechanism. |

**35.3.14 Multi-link device individually addressed Management frame delivery**

**35.3.14.1 General**

(#10319)This subclause describes rules for individually addressed management frame delivery by a MLD with the exception of the following frames specified below:

* CSI frame
* Noncompressed Beamforming frame
* Compressed Beamforming frame
* VHT Compressed Beamforming frame
* HE Compressed Beamforming/CQI frame
* EHT Compressed Beamforming/CQI frame
* Probe Response frame
* LMR frame
* FTM frame

An MLD shall follow the rules described in 10.3.2.14.2 (Transmitter requirements) to determine the sequence number of an individually addressed Management frame (except the frames that are excluded above) that is delivered to the associated MLD.

An MLD shall follow the rules as described in 10.3.2.14.3 (Receiver requirements) to discard duplicate individually addressed Management frames (except the frames that are excluded above) that are delivered from the associated MLD.

An MLD shall maintain a transmit MMPDU timer for each MMPDU (except the frames that are excluded above). The transmit MMPDU timer shall be started when the MMPDU is passed to the MAC.

For an MLD, the frame retry counter and retry limit for each MMPDU that belongs to a TC that requires acknowledgment is implementation specific.

An MLD shall continue to deliver the failed individually addressed Management frame (except the frames that are excluded above) to an associated MLD on the setup links subject to additional constraints (see [35.3.7 (Link management)](#bookmark50))) until any of the following conditions occurs:

* The retry limit is met.
* The transmit MMPDU timer for the MMPDU exceeds dot11EDCATableMSDULifetime.
* The individually addressed Management frame is successfully delivered.

(#12645)Between a MLD and an associated peer MLD, a STA affiliated with the MLD shall not transmit other individually addressed Management frames (except the frames that are excluded above) over a setup link while the current individually addressed Management frame (except the frames that are excluded above) having been assigned its sequence number from the same sequence number and being transmitted by any STA affiliated with the same MLD over a setup link has not yet completed to the point of success, failed due to retry limit, or other MAC discard (e.g., lifetime expiration).

(…existing texts…)

Between an AP MLD and a non-AP MLD(#11749), 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
— (#11318)Multi-link probe request/response
— WNM Sleep Mode Request/Response frame
— TID-To-Link Mapping Request/Response/Teardown frame
— EPCS Priority Access Enable Request/Enable Response/Teardown frame
— EML Operating Mode Notification frame
— SCS Request/Response frame
— MSCS Request/Response frame
— (#11750)BSS Transition Management Request/Response frame

— QMF Policy Change frame and QMF Policy frame

**35.3.14.1a QMF**

All affiliated STAs of an MLD shall set dot11QMFActivated to the same value.

All affiliated STAs of an MLD shall set dot11QMFReconfigurationActivated to the same value.

If all affiliated STAs of an MLD set dot11QMFActivated to true, then the MLD is a QMF MLD. Otherwise, the MLD is a non-QMF MLD.

An AP affiliated with a QMF AP MLD may set dot11QMFReconfigurationActivated to true or false.

A non-AP STA affiliated with an QMF non-AP MLD shall set dot11QMFReconfigurationActivated to true.

If one AP affiliated with a QMF AP MLD advertises the QMF policy for IQMFs, then all APs affiliated with the AP MLD shall advertise the QMF policy for IQMFs. Each AP affiliated with a QMF AP MLD shall advertise the same QMF policy for IQMFs.

Each AP affiliated with a QMF AP MLD shall set the same QMF policy for the transmission of IQMFs to each affiliated non-AP STA of associated non-AP MLD.

QMF non-AP MLDs acquire QMF policy configuration information for IQMF from QMF Policy elements received in Beacon, Association Response, Reassociation Response, Probe Response, and QMF Policy frames.

A QMF non-AP MLD shall not transmit a QMF Policy frame through its affiliated non-AP STA to an AP affiliated with the associated AP MLD.

The access category for a IQMF that is transmitted by a QMF non-AP MLD through any of the affiliated non-AP STA to an AP affiliated with the associated QMF AP MLD shall be determined from the IQMF policy received from any AP affiliated with the AP MLD if a QMF policy for IQMF has been received from any AP affiliated with the AP MLD. Otherwise, the default policy shall be used for an IQMF. The access category for IQMF that is transmitted by an AP affiliated with the QMF AP MLD is determined from the QMF policy for IQMF configured at that AP, which is the same for any AP affiliated with the AP MLD.

A QMF MLD shall not modify the access category of an IQMF frame after an initial transmission of
the frame has been performed, regardless of any subsequent modification to the QMF policy under which the
STA is operating.

An associated QMF non-AP MLD transmitting IQMFs through its affiliated non-AP STAs shall transmit those frames in accordance with the QMF policy for IQMF received from its associated QMF AP MLD in the following order of precedence, from highest to lowest:

* QMF policy defined in an unsolicited QMF Policy frame from the associated QMF AP MLD or the QMF Policy Change frame that resulted in a successful response QMF Policy frame from the associated AP MLD, whichever occurred most recently
* QMF policy defined in the QMF Policy element received in the successful (Re)Association Response frame

A QMF MLD shall transmit all individually addressed Management frames to non-QMF MLDs using access category AC\_VO.A QMF AP MLD and a QMF non-AP MLD follows the procedure to change QMF policy for IQMFs defined in 11.24.2.2 (QMF policy change in an infrastructure BSS or in an MBSS) between a QMF AP and a QMF non-AP STA except that support of QMF policy change for an MLD is indicated by the QMFReconfigurationActivated subfield in the Extended Capabilities element received from any STA affiliated with the MLD.

NOTE – Each STA affiliated with an QMF MLD follows the rules of GQMF defined in 11.24 (Quality-of-service Management frame (QMF)).

**9.4.2.26 Extended Capabilities element**

Table 9-190—Extended Capabilities field (continued)

|  |  |  |
| --- | --- | --- |
| Bit  | Information  | Notes |
| 49 | QMFActivated | The STA sets the QMFActivated field to 1 when dot11QMFActivated is true and sets it to 0 otherwise. See 11.24 (Quality-of-service Management frame (QMF)). All STAs affiliated with an MLD set the QMFActivated field to the same value. |
| 50  | QMFReconfigurationActivated | The STA sets the QMFReconfigurationActivated field to 1 whendot11QMFReconfigurationActivated is true and sets it to 0 otherwise. See 11.24 (Quality-of service Management frame (QMF)). All STAs affiliated with an MLD set the QMFReconfigurationActivated field to the same value. |