**IEEE P802.11  
Wireless LANs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CR for RCM relevant CIDs | | | | |
| **Date**: June 5, 2024. | | | | |
| **Author(s):** | | | | |
| **Name** | **Affiliation** | **Address** | **Phone** | **email** |
| Jay Yang | ZTE |  |  | Yang.zhijie@zte.com.cn |
| Yan Li |  |  |  |
| Yun Li |  |  |  |
| Graham Smith | SRT wireless |  |  |  |
| Jouni Malinen | Qualcomm |  |  |  |
| Mark Hamilton | Ruckus/CommScope |  |  |  |
| Jerome Henry | Cisco system |  |  |  |
| Binita Gupta | Cisco system |  |  |  |
| Carol Ansley | Cox |  |  |  |
| Michael Montemurro | Huawei |  |  |  |
| Stephen McCann | Huawei |  |  |  |

**Abstract**

This submission proposes resolutions for following 2 CIDs received for TGbe SA:

23178 , 23179

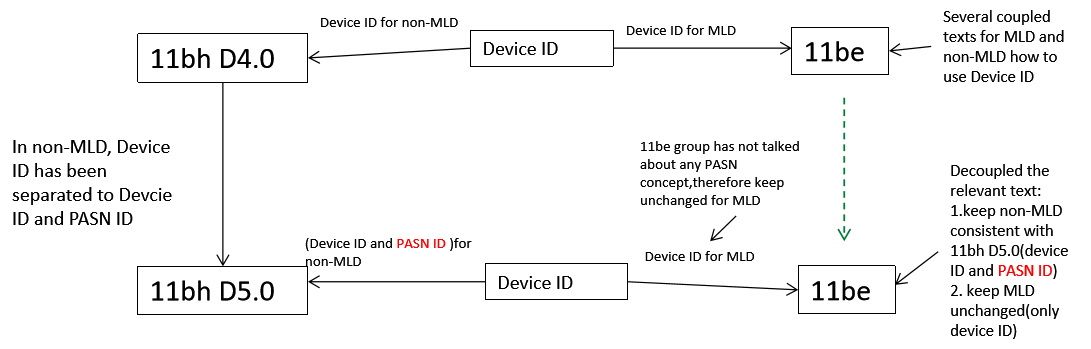
**Revisions:**

Rev 0: Initial version of the document.

Rev 1: incorprate the input from Binita.

Rev 2: update the baseline text to draft5.0

Rev3: minor change based on the feedback from the group



***TGbe editor: The baseline for this document is P802.11beD6.0, P802.11bhD4.0 and P802.11REVmeD5.0***

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.***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Pg/Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 23178 | 12.2.12 | 412/0 | TGbh defines IRM feature, but IRM for MLO is missing from TGbe draft. That's, TGbe draft is not compatible with TGbh draft. According to the latest Timeline of TGbh and TGbe, TGbh is ahead of TGbe, The compatible issue should be addressed in TGbe. Otherwise,TGbe doesn't finish it's Job. | Please add IRM for MLO into TGbe draft ASAP. Otherwise, defer TGbe timeline until such compatible issue can be addressed. | Revised.  Agree in principle.  TGbe editor, please make the changes tagged by CID #23178 in 24/1006r0. |
| 23179 | 12.2.12 | 412/0 | TGbh defines Device ID feature, but Device ID for MLO is missing from TGbe draft. That's TGbe draft is not compatible with TGbh draft. According to the latest Timeline of TGbh and TGbe, TGbh is ahead of TGbe, The compatible issue should be addressed in TGbe. Otherwise,TGbe doesn't finish it's Job | Please add Device ID for MLO into TGbe draft ASAP. Otherwise, defer TGbe timeline until such compatible issue can be addressed. | Revised.  Agree in principle.  TGbe editor, please make the changes tagged by CID #23178 in 24/1006r0. |

**Proposed Texts:**

**3.2 Definitions specific to IEEE Std 802.11**

TGbe editor: please insert the following proposed changes (CID #23178).

**device identification (ID):** [device ID] An ID that a network can provide to a non-access point (non-AP)

station (STA) or a non-access point (non-AP) multi-link device (non-AP MLD) to allow the non-AP STA or the non-AP MLD to identify itself to a known network at a future time.

**identifiable random medium access control (MAC) address:** [IRM] A MAC address that can be used by a non-access point (non-AP) station (STA) or a non-access point (non-AP) multi-link device (non-AP MLD) to identify itself to a network.

**measurement identifier** (ID): [measurement ID] A transient device ID that a network can provide to a non

access point (non-AP) station (STA) or a non-access point (non-AP) multi-link device (non-AP MLD) to allow the non-AP STA or or a non-access point (non-AP) multi-link device (non-AP MLD) to identify itself to another access point (AP) or another access point (AP) multi-link device (AP MLD) in the same network during a radio measurement procedure

**4.5.4.10 MAC privacy enhancements**

TGbe editor: please insert the following proposed changes (CID #23178).

To mitigate this sort of traffic analysis, a non-AP STA or a non-AP MLD can support the ability to periodically and randomly change its MAC addresses and reset counters and seeds prior to association. A non-AP MLD can also change the MAC addresses of its affiliated STAs prior to an association. Such a STA or a non-AP MLD, upon reconnecting to a network, can provide either a device ID previously provided by the network or can use an identifiable random MAC address (IRM) that the STA or the non-AP MLD previously provided to the network or both. Either approach allows the network to recognize the STA or the non-AP MLD while providing protection against third party tracking or traffic analysis.

While discovering networks, a STA can refrain from gratuitously transmitting Probe Request frames containing SSIDs of favored BSS networks.

TGbe editor: please insert the following changes (CID #23178).

**9.4.2.313 Device ID element**

The Device ID element contains a device ID. The format of the Device ID element is shown in Figure 9-1057a (Device ID element format).

...existing context...

When sent from an AP to a non-AP STA, or when sent from an AP MLD to a non-AP MLD, the Device ID Status field contains one of the values shown in Table 9-415a (Device ID Status field values).

...exising context...

TGbe editor: please insert the following changes (CID #23178).

**9.4.2.314 IRM element**

The format of the IRM element is shown in Figure 9-1057b (IRM element format)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Element ID | Length | Element ID  Extension | IRM Status | IRM |

Octets: 1 1 1 0 or 1 0 or 6

**Figure 9-1057b—IRM element format**

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

When sent to an AP or an AP MLD, the IRM Status field is not present.

When sent from an AP or an AP MLD, the IRM Status field contains one of the values shown in Table 9-415b (IRM Status

field values)

**Table 9-415b—IRM Status field values**

|  |  |  |
| --- | --- | --- |
| **IRM Status** | **Name** | **Meaning** |
| 0 | Recognized | Indicates that the IRM has been recognized |
| 1 | Not Recognized | Indicates that the IRM has not been recognized |
| 2-255 | Reserved |  |

The IRM field contains a MAC address when sent from a non-AP STA to an AP, or when sent from a non-AP MLD to an AP MLD.

The IRM field is not present when sent from an AP to a non-AP STA, or when sent from an AP MLD to a non-AP MLD.

**9.4.2.321.3 Probe Request Multi-Link element**

B0 B1 B2 B11

|  |  |  |
| --- | --- | --- |
| AP MLD ID Present | MLD MAC Address Present | Reserved |

Bits: 1 1 10

**Figure 9-1072q—Presence Bitmap field format of the Probe Request Multi-Link element**

The AP MLD ID Present subfield is set to 1 if the AP MLD ID subfield is present in the Common Info field. Otherwise, the AP MLD ID Present subfield is set to 0.

The MLD MAC Address Present subfield is set to 1 if the MLD MAC Address subfield is present in the Common Info field. Otherwise, the MLD MAC Address Present subfield is set to 0.

The format of the Common Info field of the Probe Request Multi-Link element is defined in Figure 9-1072r (Common Info field format of the Probe Request Multi-Link element).

|  |  |  |
| --- | --- | --- |
| Common Info Length | AP MLD ID | MLD MAC Address |

Octets: 1 0 or 1  0 or 6

**Figure 9-1072r—Common Info field format of the Probe Request Multi-Link element**

The Common Info Length subfield indicates the number of octets in the Common Info field, including the one octet for the Common Info Length subfield.

The AP MLD ID subfield, if present, indicates the identifier of the AP MLD that is targeted by the multi-link probe request, as described in 35.3.4.2 (Use of multi-link probe request and response).

The MLD MAC Address subfield, if present, includes an IRM for the purpose of identifying the non-AP MLD by the AP MLD in the ESS via the multi-link probe request, as described in 35.3.4.2 (Use of multi-link probe request and response).

TGbe editor: please insert the following proposed changes (CID #23178).

**12.2.12 Identifying a non-AP STA or a non-AP MLD with changing MAC address**

To mitigate tracking and traffic analysis by third parties, a non-MLD non-AP STA may randomly change its MAC address while not associated. A non-AP MLD may randomly change any of its affiliated non-AP STA MAC Address(es) or its MLD MAC Address while not associated (see 4.5.4.10 (MAC privacy enhancements)).

This presents a problem for the network in that it is unable to identify a non-AP STA or a non-AP MLD that previously associated and is not able to apply cached information (“shared identity state”) from the previous association to the current association (see 12.2.10). Similarly, this presents a problem for the non-AP STA or a non-AP MLD in that it cannot assume the network can recognize the STA or the non-AP MLD as correlated to any cached information from previous association(s). Two mechanisms are defined to alleviate these problems.

The first mechanism is referred to as the device ID mechanism, where the AP provides an identifier to the non-AP STA during 4-way handshake, FILS authentication or PASN authentication that the non-AP STA may then report back to the AP during a future association , FILS authentication or PASN authentication as defined in 12.2.12.1.

For MLO using the device ID mechanism, the AP MLD provides an identifier to the non-AP MLD during the 4-way handshake or the FILS authentication that the non-AP MLD may then report back to the AP MLD during a future association as defined in 12.2.12.3.

The second mechanism is referred to as the IRM mechanism, where the non-AP STA provides a random MAC address (different from the address it is currently using as TA for its own transmissions) to the AP during 4-way handshake, FILS authentication or PASN authentication and then uses that MAC address as a TA for its own transmissions for identification of the STA, during its next pre association exchanges, PASN authentication, and/or authentication and association exchanges with that AP, as defined in 12.2.12.2.

For MLO using the IRM mechanism, the non-AP MLD provides a random MLD MAC address (that differs from the current MLD MAC address) to the AP MLD during the 4-way handshake or the FILS authentication and then uses the new MLD MAC address to identify the non-AP MLD, during its next preassociation exchanges, and/or authentication and association exchanges with that AP MLD as defined in 12.2.12.4.

The two mechanisms both allow the network to recognize the STA or the non-AP MLD while mitigating the abilities of third parties to do traffic analysis and tracking of the non-AP STA or the non-AP MLD.

The two mechanisms may be used concurrently.

NOTE 1—The IRM mechanism and the device ID mechanism are independent. IRM allows an AP or an AP MLD to recognize a non-AP STA or a non-AP MLD respectively prior to and while it is associated. A device ID allows an AP or an AP MLD to identify a non-AP STA or a non-AP MLD respectively while it is associated. A device ID is allocated by an AP or an AP MLD, and an IRM is selected by a non-AP STA or a non-AP MLD.

If an AP and a non-AP STA both advertise that both the IRM and the device ID mechanisms are activated, the non-AP STA might provide both an IRM and a device ID during association or PASN authentication.

For MLO, if an AP MLD and a non-AP MLD both advertise that both the IRM and the device ID mechanisms are activated, the non-AP MLD might provide both an IRM and a device ID during association.

NOTE 2—The device ID and IRM mechanisms are not specified for use in PBSSs.

**12.2.12.1 Device ID mechanism**

For non-MLO, an AP that has dot11DeviceIDActivated equal to true, advertises activation of the device ID mechanism by setting the Device ID Active field to 1 in the Extended RSN Capabilities field (see 9.4.2.240 (RSNXE)) in Beacon and Probe Response frames. A non-AP STA that has dot11DeviceIDActivated equal to true indicates the device ID mechanism is activated by setting the Device ID Active field to 1 in either the Extended RSN Capabilities field in (Re)Association Request frames or the first PASN frame that is sent to any AP that advertises activation of the device ID mechanism.

For MLO, an AP MLD that has dot11DeviceIDActivated equal to true, advertises activation of the device ID mechanism by setting the Device ID Active field to 1 in the Extended RSN Capabilities field (see 9.4.2.240 (RSNXE)) in Beacon and Probe Response frames transmitted by each of its affiliated AP(s). A non-AP MLD that has dot11DeviceIDActivated equal to true, advertises that the device ID mechanism is activated by setting the Device ID Active field to 1 in the Extended RSN Capabilities field in (Re)Association request frames transmitted by an affiliated non-AP STA.

An AP that includes the PASN AKMP as part of the RSNE included in Beacon and Probe Response frames, i.e., when dot11PASNActivated is true, and has dot11DeviceIDActivated equal to true shall set dot11KEKPASNActivated to true.

A non-AP STA that has dot11DeviceIDActivated equal to true and intends to use PASN, i.e., when dot11PASNActivated is true, shall set dot11KEKPASNActivated to true.

For non-MLO, an AP that has dot11DeviceIDActivated equal to true and that receives a (Re)Association Request frame or the first PASN frame that includes an Extended RSN Capabilities field with the Device ID Active field equal to 1, shall include an Extended RSN Capabilities field in either the (Re)Association Response frame or the second PASN frame,respectively, with the Device ID Active field set to 1.

For MLO, an AP MLD that has dot11DeviceIDActivated equal to true and receives an (Re)Association Request frame that includes an Extended RSN Capabilities field with the Device ID Active field equal to 1, through an affiliated AP, shall include an Extended RSN Capabilities element in the (Re)Association Response frame with the Device ID Active field set to 1.

For correct operation of the device ID mechanism, all the AP MLDs and all the APs in the ESS need to have dot11DeviceIDActivated set to true.

NOTE—The criteria and mechanism to distribute device IDs throughout the ESS is out of scope for this standard.

A STA or an MLD should not send a frame containing a device ID (sub)element to any STA or MLD unless the receiving STA or the receiving STA affiliated with the MLD sets the Device ID Active field to 1 in the Extended RSN Capabilities field.

1. Just Note to author, this is the first place to shown

~~For non-MLO, an AP shall provide a device ID to a non-AP STA using the following procedures:~~

~~1) When using PASN authentication, in the Device ID subelement in the second PASN frame.~~

~~2) When using FILS authentication, in the Device ID element in the Association Response frame.~~

~~3) When not using PASN or FILS authentication, in the Device ID KDE in message 3 of the 4-way handshake.~~

For non-MLO, the AP shall provide both a device ID and a PASN ID using the procedure described below:

1) When using FILS authentication and the non-AP STA did not provide a device ID in the Device ID element in the Association Request frame, the AP shall provide a device ID in the Device ID element and a PASN ID in the PASN ID element in the Association Response frame.

2) When not using PASN or FILS authentication and the non-AP STA didn’t provide a device ID in the Device ID KDE in message 2 of the 4-way handshake, the AP shall provide a device ID in the Device ID KDE and a PASN ID in the PASN ID KDE in message 3 of the 4-way handshake.

For non-MLO,if an AP with dot11DeviceIDActivated equal to true receives from a non-AP STA a first PASN frame that

includes an Extended RSN Capabilities field with the Device ID Support field equal to 1 but no PASN ID element, the AP shall provide a device ID in the Device ID element and a PASN ID in the PASN ID element in

the second PASN frame.

For MLO, an AP MLD shall provide a device ID to a non-AP MLD using the following procedures:

1. When using 4-way handshake, in the Device ID KDE in message 3 of the 4-way handshake.
2. When using FILS authentication, in the Device ID element in the Association Response frame.

For non-MLO, if a non-AP STA has been provided a device ID by an AP, then the non-AP STA may provide that device ID subsequently to the APs in the same ESS. When it provides the device ID, then the non-AP STA shall use follow the procedures described to provide the device ID:

1) When using PASN authentication, in the Device ID element in the first PASN frame.

2) When using FILS authentication, in the Device ID element in the Association Request frame.

3) When not using PASN or FILS authentication, in the Device ID KDE in message 2 of the 4-way handshake.

For MLO, if a non-AP MLD has been provided a device ID by an AP MLD, then it may provide that device ID subsequently to the AP MLD(s) in the same ESS. When it provides the device ID, the non-AP MLD shall follow the procedures below to provide the device ID :

1. When using 4-way handshake, in the Device ID KDE in message 2 of the 4-way handshake.
2. When using FILS authentication, in the Device ID element in the Association Request frame.
3. Just Note to author, this is the second place to shown

~~A STA or an MLD may delete a stored device ID at any point in time for implementation specific reasons.~~

~~When a non-AP STA or a non-AP MLD sends a device ID to an AP or AP MLD, it shall use the device ID most recently received from an AP or an AP MLD in the same ESS.~~

For non-MLO, a STA may delete either or both of a stored device ID and a stored PASN ID at any point in time for implementation specific reasons.

For non-MLO, when a non-AP STA sends a device ID or a PASN ID to an AP, it shall use the device ID or the PASN ID

most recently received from any AP belonging to the same ESS.

For MLO, an MLD may delete either or both of a stored device ID at any point in time for implementation specific reasons.

For MLO, when a non-AP STA sends a device ID to an AP, it shall use the device ID most recently received from any AP belonging to the same ESS.

When an AP or an AP MLD with dot11DeviceIDActivated equal to true receives a frame that is not a PASN frame, containing a device ID from a non-AP STA or a non-AP MLD and the AP or the AP MLD recognizes the received device ID, the AP or the AP MLD shall perform one of the following actions:

1) Set the Device ID Status field of the Device ID KDE or Device ID (sub)element to 0 to indicate that the AP or the AP MLD recognizes the non-AP STA or the non-AP MLD and set the Device ID field to zero length (indicating the current device ID is maintained).

2) Assign a new device ID value in the Device ID field and set the Device ID Status field of the Device ID KDE or Device ID (sub)element to 0 in the appropriate frame.

When an AP with dot11DeviceIDActivated equal to true receives a first PASN frame containing a device ID that it recognizes, the AP shall assign a new device ID value to the non-AP STA and include this new device ID in a Device ID element in the second PASN frame, setting the Device ID Status field of the Device ID subelement to 0 to indicate Recognized.

For non-MLO, when a non-AP STA receives a frame that contains a Device ID Status field in the Device ID KDE or Device ID (sub)element equal to 0, indicating Recognized, it may proceed with the assumption that the shared identity state of the non-AP STA with the AP or the ESS (as per the concepts of 12.2.12 (Identifying a non-AP STA with changing MAC address)) is now bound to the Address 2 field in the Association Request frame or the first PASN frame most recently transmitted by the non-AP STA.

For MLO, when a non-AP MLD receives a frame that contains a Device ID Status field in the Device ID KDE or Device ID (sub)element equal to 0, indicating Recognized, it may proceed with the assumption that the “shared identity state” of the non-AP MLD with the AP MLD or the ESS (as per the concepts of 12.2.12 (Identifying a non-AP MLD with changing MAC address)) is now bound to the MLD MAC Address in the Basic Multi-Link element in the Association Request frame most recently transmitted by an affiliated non-AP STA of the non-AP MLD.

1. Just a note to the author, this is the third place to shown

~~If an AP or an AP MLD has a Device ID (sub)element or Device ID KDE with the Device ID Status field set to 1, indicating Not Recognized, then the AP or the AP MLD may also provide in that same Device ID (sub)element or Device ID KDE a new device ID, thus establishing a new shared identity. An AP or an AP MLD may set a Device ID Status field to 1 indicating “Not Recognized” if the AP or the AP MLD cannot unequivocally identify the non-AP STA or the non-AP MLD shared identity state.~~

For non-MLO, if an AP has a Device ID element or Device ID KDE with the Device ID Status field set to 1, indicating Not Recognized, then the AP may also provide in that same Device ID element or Device ID KDE a new device ID and, in a PASN ID element or PASN ID KDE, a new PASN ID, thus establishing a new shared identity state. An AP shall set a Device ID Status field to 1 indicating Not Recognized if the AP cannot unequivocally identify the non-AP STA shared identity state.

For MLO, if an AP MLD has a Device ID element or Device ID KDE with the Device ID Status field set to 1, indicating Not Recognized, then the AP MLD may also provide in that same Device ID element or Device ID KDE a new device ID, thus establishing a new shared identity state. An AP MLD shall set a Device ID Status field to 1 indicating Not Recognized if the AP MLD cannot unequivocally identify the non-AP MLD shared identity state.

1. Just a note to the author, this is the forth place to shown

~~When a non-AP STA or a non-AP MLD receives a frame that contains a Device ID Status field in a Device ID KDE or Device ID (sub)element equal to 1, indicating Not Recognized, it shall assume that no shared identity state exists with the AP or the AP MLD or the ESS (as per the concepts of 12.2.12 (Identifying a non-AP STA with changing MAC address)).~~

For non-MLO, when a non-AP STA receives a frame that contains a Device ID Status field in a Device ID KDE or Device ID

element equal to 1, or a PASN ID status field in a PASN Status field in a PASN ID element equal to 1, indicating Not Recognized, it shall assume that no shared identity state exists with the AP or the ESS (as per the concepts of 12.2.13 (Identifying a non-AP STA with changing MAC address)).

For MLO, when a non-AP MLD receives a frame that contains a Device ID Status field in a Device ID KDE or Device ID

element equal to 1, indicating Not Recognized, it shall assume that no shared identity state exists with the AP MLD or the ESS (as per the concepts of 12.2.13 (Identifying a non-AP STA with changing MAC address)).

A non-AP MLD that stores a device ID received from an AP MLD in an ESS and later becomes a non-AP STA for the purpose of communicating with an AP in the same ESS, may provide that device ID in a frame following the procedures defined in this subclause for the non-AP STA. Similarly, a non-AP STA that stores a device ID received from an AP in an ESS and later becomes a non-AP MLD for the purpose of communicating with an AP MLD in the same ESS, may provide that device ID in a frame following the procedures defined in this subclause for the non-AP MLD.

**12.2.12.2 Identifiable random MAC address (IRM) operation**

For non-MLO, an AP that has dot11IRMActivated equal to true advertises activation of the IRM mechanism by setting the IRM Active field to 1 in the Extended RSN Capabilities field (see 9.4.2.240 (RSNXE)) in Beacon and Probe Response frames. A non-AP STA that has dot11IRMActivated equal to true indicates the IRM mechanism is active by setting the IRM Active field to 1 in either the Extended RSN Capabilities field in (Re)Association Request frames or the first PASN frame that is sent to any AP that advertises activation of the IRM mechanism.

For MLO, an AP MLD that has dot11IRMActivated equal to true advertises activation of the IRM mechanism by setting the IRM Active field to 1 in the Extended RSN Capabilities field (see 9.4.2.240 (RSNXE)) in Beacon and Probe Response frames transmitted by each of its affiliated AP(s). A non-AP MLD that has dot11IRMActivated equal to true, indicates that the IRM mechanism is active by setting the IRM Active field to 1 in the Extended RSN Capabilities field in (Re)Association Request frames transmitted through an affiliated STA sent to any AP MLD that advertises activation of the IRM mechanism.

For non-MLO, an AP that has dot11IRMActivated equal to true and that receives a (Re)Association Request frame or the first PASN frame that includes an Extended RSN Capabilities field with the IRM Active field equal to 1 shall include an Extended RSN Capabilities element in either the (Re)Association Response frame or the second PASN frame, respectively, with the IRM Active field set to 1.

For MLO, an AP MLD that has dot11IRMActivated equal to true, and that receives a (Re)Association Request frame that includes an Extended RSN Capabilities field with the IRM Active field equal to 1 through an affiliated AP, shall include an Extended RSN Capabilities element in the (Re)Association Response frame with the IRM Active field set to 1.

An AP that includes the PASN AKMP as part of the RSNE included in Beacon and Probe Response frames, i.e., when dot11PASNActivated is true, and has dot11IRMActivated equal to true shall set dot11KEKPASNActivated to true.

A non-AP STA that has dot11IRMActivated equal to true and intends to use PASN, i.e., when dot11PASNActivated is true, shall set dot11KEKPASNActivated to true.

Correct operation of the IRM mechanism depends on all APs not affiliated with AP MLDs and all AP MLDs in the ESS being configured with dot11IRMActivated set to true. Activation of the IRM mechanism needs to be advertised by all APs and AP MLDs through affiliated APs in an ESS in Beacons and Probe Response frames.

NOTE 1—The criteria and mechanism to distribute IRMs throughout the ESS is out of scope for this standard.

An IRM is a MAC address that is constructed from the locally administered address space. A non-AP STA or a non-AP MLD should construct randomized IRMs according to IEEE Std 802-2014 and IEEE Std 802c-2017.

For non-MLO, when associating or authenticating using PASN with an AP in an ESS for the first time, the non-AP STA may use any MAC address. Each time the non-AP STA associates with an AP in an ESS, it may provide a new IRM to the AP during the 4-way handshake or FILS authentication. That IRM may be shared with all of the APs and AP MLDs in the ESS. The non-AP STA may then use that IRM as its TA the next time it requests association to any AP in that same ESS. The non-AP STA may also use that IRM as its TA for any probes, directed or broadcast, public Action frames, Authentication and (Re)Association frames, that it may transmit when it intends to be identified.

For MLO, when associating with an AP MLD in an ESS for the first time, the non-AP MLD may use any MLD MAC address. Each time a non-AP MLD associates with an AP MLD in an ESS, it may provide an IRM to the AP MLD during the 4-way handshake or FILS authentication. That IRM may be shared with all of the AP MLDs and APs in the ESS. A non-AP MLD may set the MLD MAC Address field to the IRM in the Probe Request Multi-Link element of a multi-link Probe Request frame, and it may set MLD MAC address field to the IRM in the Basic Multi-Link element of Authentication and Association frames that it transmits when it intends to be identified.

A non-AP MLD shall only include the MLD MAC Address field in the Probe Request Multi-Link element of a multi-link Probe Request frame sent to an AP MLD, if the AP MLD advertises the activation of the IRM mechanism with IRM Active field set to 1 in the Extended RSN Capabilities field in Beacon and Probe Response frames transmitted by its affiliated AP(s), otherwise the non-AP MLD shall not include the MLD MAC Address field in the Probe Request Multi-Link element of a multi-link Probe Request frame.

For non-MLO, when associating to an AP that advertises activation of the IRM mechanism, the non-AP STA may provide a new IRM to the AP by including an IRM KDE in message 4 of the 4-way handshake or, when using FILS authentication, including the IRM element in the Association Request frame. When using PASN, the non-AP STA may provide a new IRM to the AP by including the IRM subelement in the third PASN frame. If a newly provided IRM is already in use within the ESS, or is identical to an IRM stored by the AP for another STA, then, after association or authentication using PASN, the AP should send a Duplicate IRM frame (see 9.6.35.2 (Duplicate IRM)) to the non-AP STA indicating to the STA that the provided IRM is a duplicate. The non-AP STA may then respond with a New IRM frame (see 9.6.35.3 (New IRM)) which provides a new IRM to the AP.

For MLO, when associating to an AP MLD that advertises activation of the IRM mechanism, the non-AP MLD may provide a new IRM to the AP MLD by including an IRM KDE in message 4 of the 4-way handshake. If any newly provided IRM from a non-AP MLD is already in use within the ESS, or is identical to an IRM stored by the AP MLD for another non-AP MLD or non-AP STA, then, after association and the 4-way handshake, the AP MLD should send a Duplicate IRM frame (see 9.6.35.2(Duplicate IRM)) to the non-AP MLD through an affiliated STA, indicating to the non-AP MLD that the provided IRM is a duplicate. The non-AP MLD may then respond with a New IRM frame (see 9.6.35.3 (New IRM)), providing a new IRM to the AP MLD.

For non-MLO, the non-AP STA should store the newly allocated IRM as an identifier for use with the AP(s) in that ESS and the AP(s) in that ESS should store the IRM as an identifier for that non-AP STA. The non-AP STA then should use that allocated IRM as its TA when it next associates or uses PASN to preassociate with that same AP or another AP in the same ESS. In this way, the AP can identify the non-AP STA.

For MLO, the non-AP MLD should store the newly allocated IRM as an identifier for use with the AP MLDs in that ESS. The AP MLDs in the ESS should store the IRM as an identifier for that non-AP MLD. The non-AP MLD should then use that allocated IRM as its MLD MAC address when it next associates with an AP MLD in the same ESS. In this way, the AP MLD can identify the non-AP MLD.

For non-MLO, if a non-AP STA indicates the IRM mechanism is activated in an Association Request frame or first PASN frame and the AP indicates the IRM mechanism is activated in the corresponding Association Response frame or second PASN frame, then the AP shall support the following options:

— if executing a 4-way handshake, the AP shall include an IRM KDE in message 3 of the 4-way handshake.

— if using FILS authentication, the AP shall include an IRM element in the Association Response frame.

— if using PASN authentication, the AP shall include an IRM element in the second PASN frame.

For non-MLO, if the AP recognizes the IRM used as the TA in the received frame(s) from the non-AP STA, the IRM Status field of the IRM KDE or IRM element is set to indicate Recognized and the IRM field is not present. If the AP does not recognize the IRM, the IRM Status field of the IRM KDE or IRM element is set to indicate Not recognized and the IRM field is not present. On receipt of an IRM Status field equal to 1, indicating that the AP has not recognized the IRM, the non-AP STA may either:

-- if executing a 4-way handshake, optionally provide a new IRM in an IRM KDE in message 4 of the 4-way handshake, or

-- if using PASN authentication, optionally provide an IRM element in the third PASN frame

--otherwise, disassociate or deauthenticate.

An AP may set an IRM status field to 1 indicating Not Recognized if the AP cannot unequivocally identify the non-AP STA shared identity state.

For MLO, if a non-AP MLD indicates that the IRM mechanism is activated in an Association Request frame and an AP MLD indicates the IRM mechanism is activated in the corresponding Association Response frame, then the AP MLD shall support the following options:

--if executing a 4-way handshake, the AP MLD shall include an IRM KDE in message 3 of the 4-way handshake.

-- if using FILS authentication, the AP MLD shall include an IRM element in the Association Response frame.

For MLO, if an AP MLD recognizes the IRM in a received frame from a non-AP MLD, the IRM Status field of the IRM KDE is set to indicate Recognized and the IRM field is not present. If the AP MLD does not recognize the IRM, the IRM Status field of the IRM KDE is set to indicate Not Recognized and the IRM field is not present. On receipt of a frame with IRM Status field equal to 1, indicating that the AP MLD has not recognized the IRM, the non-AP MLD may either:

--if executing a 4-way handshake, optionally provide a new IRM in an IRM KDE in message 4 of the 4-way handshake, or

-- disassociate or deauthenticate.

An AP MLD may set an IRM status field to 1 indicating Not Recognized if the AP MLD cannot unequivocally identify the non-AP MLD shared identity state.

NOTE 2—In the case of an initial association to an AP or an AP MLD in an ESS, the AP or the AP MLD indicates that the non-AP STA or the non-AP MLD is not recognized, but the non-AP STA or the non-AP MLD would ignore that.

For non-MLO, if a non-AP STA has previously provided an IRM to an AP in as ESS, and the non-AP STA sends an Authentication frame using that IRM as the TA to any AP in the ESS, then the AP receiving the Authentication frame is able to identify the non-AP STA before association is started or completed. A non-AP STA may use the previously provided IRM as TA for active scan for AP(s) in the same ESS, such that the AP(s) in that ESS can identify the non-AP STA. A non-AP STA may use the previously provided IRM as TA in a Public Action frame (e.g., a GAS frame) such that APs in that ESS can identify the non-AP STA.

For MLO, if a non-AP MLD has previously provided an IRM to an AP MLD in an ESS and the non-AP MLD sends an Authentication frame using that IRM as the MLD MAC Address to any AP MLD in the ESS, then the AP MLD receiving the Authentication frame is able to identify the corresponding non-AP MLD before association is started or completed.

A non-AP MLD that stores a newly allocated IRM that it previously provided to an AP MLD in an ESS and later becomes a non-AP STA for the purpose of communicating with an AP in the same ESS, may provide that IRM as its MAC address in the TA field of a frame following the procedures defined in this subclause for the non-AP STA. Similarly, a non-AP STA that stores a newly allocated IRM that it previously provided to an AP in an ESS and later becomes a non-AP MLD for the purpose of communicating with an AP MLD in the same ESS, may provide that IRM as its MLD MAC address in a frame following the procedures defined in this subclause for the non-AP MLD.

NOTE 3: A non-AP MLD becomes a non-AP STA for the purpose of communicating with an AP when sending regular Probe Request frames, directed or broadcast, and public Action frames.

A non-AP STA should change its IRM in each association or PASN preassociation. For MLO, a non-AP MLD should change its IRM in each association and should use randomized MAC addresses for its affiliated non-AP STAs.

**35.3.4.2 Use of multi-link probe request and response**

An MLD SME may generate a multi-link probe request by calling MLME-SCAN.request with the ScanType parameter set to MULTI-LINK PROBE. A multi-link probe request is a Probe Request frame that is sent as a non-scanning probe request transmission (see 11.1.4.3.8 (Non-scanning probe request transmission)). The Probe Request frame shall be formatted as follows:

— either with the Address 1 field set to the broadcast address and the Address 3 field set to the BSSID of an AP, or with the Address 1 and Address 3 fields set to the BSSID of an AP.

— with the AP MLD ID subfield (if present in the Probe Request Multi-Link element) set to the AP MLD ID that identifies the targeted AP MLD with which the requested AP(s) are affiliated.

— with the MLD MAC Address subfield (if present in the Probe Request Multi-Link element) set to the IRM following the rules defined in 12.2.12.2(Identifiable random MAC address (IRM) operation).

— including a Probe Request Multi-Link element defined in 9.4.2.321.3 (Probe Request Multi-Link element).

— following the rules defined in 35.3.4.5 (Probe Request frame content for a non-AP EHT STA) for the inclusion of elements.

NOTE 1: The MLD MAC Address subfield is only included in the multi-link probe request if the AP MLD advertises the activation of the IRM mechanism as per rules defined in 12.2.12.2(Identifiable random MAC address (IRM) operation).

TGbe editor: please insert the following proposed changes (CID #23178).

**B.4 PICS proforma—IEEE Std 802.11-2020**

**IUT configuration**

TGbe editor: please insert the following proposed change (CID #22393).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **IUT configuration** | **References** | **Status** | **Support** |
| CFDID | Device ID mechanism | 12.2.12.1  (Device ID  Mechanism) | PC34 AND  CFAP:O  PC34 AND  CFSTAofAP: O  PC34 AND  CFEHTMLD:O | Yes  No  |
| CFIRM | IRM operation | 12.2.12.2  (Identifiable random  MAC address (IRM)  Operation) | PC34 AND  CFAP:O  PC34 AND  CFSTAofAP: O  PC34 AND  CFEHTMLD:O | Yes  No  |

TGbe editor: please insert the following proposed changes (CID #23178).

**C.3 MIB detail**

....exist text....

dot11DeviceIDActivated OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

“This is a control variable. It is written by an external management

entity or the SME. Changes take effect as soon as practical in the implementation.

This attribute, when true, indicates that the STA or the MLD implementation is capable of transmitting a device ID.” [20]

DEFVAL { false }

::= { dot11StationConfigEntry <ANA> }

dot11IRMActivated OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This is a control variable. It is written by an external management

entity or the SME. Changes take effect as soon as practical in the implementation. This attribute, when true at a non-AP STA or a non-AP MLD, indicates that the

STA or the non-AP MLD implementation is capable of transmitting an IRM.[21] This attribute,

when true at an AP or an AP MLD indicates that the AP or the AP MLD supports IRM."

DEFVAL { false }

::= { dot11StationConfigEntry <ANA> }

....exist text....