IEEE P802.11
Wireless LANs

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| --- |
| Steering to BPE AP MLD Comment Resolution  |
| Date: 2025-05-15 |
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This submission is a comment resolution to the CIDs 760 and 761.

This submission is related to a presentation 11-25-708r0, which discusses on making the BPE AP MLD as part of the larger ESS.

R2 – Added more signaling alternatives for BPE AP MLD information.

R3 – Addresses comments received in 802.11bi meeting 5/13 PM1. The keys used in BPE MLD is clarified.

R4 – Addresses comment received in 802.11 in meeting 5/14 AM1.

* The GTK and identity key topics need more work, and they are removed from this submission.

R5 – Addresses comment received in 802.11 in meeting 5/15 AM1.

Corrected BPE AP MLD Discovery Request field.

R6 – Aligns neighbor report text in baseline with BPE AP MLD Discovery addition

R7 – Fixed a typo

R8 – Added 9.4.2.19.20 BPE AP MLD discovery.

# **Solved comments:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **Page** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| 760 | 96.56 | 10.71.8.1 | The discovery aspect described in this clause is about a STA already knowing an AP and finding it. It does not address the case of a new STA, in a new location, finding a BPE AP it had no relationship with in the past. | Design a mechanism so that a new STA can learn about a BPE AP it did not know about before, for example for BPE-enabled public venues. | REVISED. Agree in principle with the comment. TGBi Editor, please make the changes to 802.11bi draft 1.0 as presented in the submission 11-25-709-r8.  |
| 761 | 96.56 | 10.71.8.1 | The discovery mechanism supposes a single AP. But if neighboring APs are changing their OTA MAC, roaming becomes complicated. | Design a mechanism for a STA associated to a BPE AP to find neighboring APs' MAC (and validity duration) | REVISED. Agree in principle with the comment. TGBi Editor, please make the changes to 802.11bi draft 1.0 as presented in the submission 11-25-709-r8.  |

**Normative Text**

**9.4.2.19.1 General**

*Instructions to the Editor: Please change the following paragraphs as follows:*

The Measurement Request Mode field (shown in Figure 9-242 (Measurement Request Mode field format)) is a bitmap with the following bits defined:

The Parallel subfield is used to request that more than one measurement is to be started in parallel. The Parallel subfield is set to 1 to request that the measurement is to start at the same time as the measurement described by the next Measurement Request element in the same Radio Measurement Request frame. The Parallel subfield is set to 0 if the measurements are to be performed in sequence. The Parallel subfield is reserved when the Enable subfield is 1, in the last or only Measurement Request element in the frame, or when the Measurement Type field is 0, 1, 2 or 18 (spectrum management measurements). See 11.10.6 (Requesting and reporting of measurements).

The Enable subfield is used to differentiate between a request to make a measurement and a request to control the measurement requests and triggered or autonomous reports generated by the destination STA. The Enable subfield is further described in Table 9-135 (Summary of use of Enable, Request, and Report subfields).

The Request subfield is described in Table 9-135 (Summary of use of Enable, Request, and Report subfields).

The Report subfield is described in Table 9-135 (Summary of use of Enable, Request, and Report subfields).

The Duration Mandatory subfield indicates whether the measurement duration contained within the measurement request is interpreted as mandatory by the STA receiving the request. A 0 indicates that the duration requested is a maximum duration, and the requesting STA accepts measurement results taken over any shorter duration. A 1 indicates that the duration requested is a mandatory duration. The Duration Mandatory subfield is reserved when the Enable subfield is 1, or when the Measurement Type field is 0, 1, 2, 8, 18 or 255. See 11.10.4 (Measurement duration).

All other bits are reserved.

**9.4.2.19.1 General**

*Instructions to the Editor: Please make the following changes to the Table 9-136.*

**Table 9-136—Measurement type definitions for measurement requests**

|  |  |
| --- | --- |
| **Name** | **Measurement type** |
| BPE AP MLD Discovery  | 18 |
| Reserved  | ~~18~~ 19 - 254 |
| Measurement Pause  | 255 |

**9.4.2.19.20 BPE AP MLD discovery**

*Instructions to the Editor: Please the new clause*

The Measurement Request field corresponding to a BPE AP MLD discovery request is shown in Figure 9-XXX (Measurement Request field format for an AP MLD Discovery). See 11.8.7 (Requesting and reporting of measurements).

|  |  |  |  |
| --- | --- | --- | --- |
|  | Channel -Number | Measurement Start Time | Measurement Duration |
| Octets: | 1 | 8 | 2 |

**Figure 9- XXX -** **Measurement Request field format for a BPE AP MLD Discovery**

The Channel Number field is set to the channel number for which the measurement request applies where the channel number is a value from the Channel set column in Table E-4 (Global operating classes), in a row having the same value in the Channel spacing (MHz) column as the width of the primary channel.

The Measurement Start Time field is set to the TSF timer at the time (± 32 ms) at which the requested Basic request measurement starts. A 0 indicates it starts immediately.

The Measurement Duration field is set to the duration of the requested measurement, expressed in TUs.

**9.4.2.25 Extended Capabilities element**

*Instructions to the Editor: Please add the following row before the reserved fields to Table 9-192.*

**Table 9-192—Extended Capabilities field**

|  |  |  |
| --- | --- | --- |
| **Bit** | **Information** | **Notes** |
| <ANA> | BPE Available | An AP STA sets the BPE Available to 1 when it belongs to an ESS that has one or more BPE APs available. A non-AP STA sets the BPE Available to 1 when it is BPE capable. |

**9.4.2.35 Neighbor Report element**

*Instructions to the Editor: Please make the following changes to Table 9-212 and at the end of the clause.*

**Table 9-212—Optional subelement IDs for Neighbor Report**

|  |  |  |
| --- | --- | --- |
| **Subelement ID** | **Name** | **Extensible** |
| … | … | … |
| <ANA> | RSNE (see 9.4.2.23 (RSNE)) | No |
| <ANA> | RSNXE (see 9.4.2.240 (RSNXE)) | Yes |
| <ANA> | BSSID Of The Next Epoch | Yes |
| <ANA> | Supported Rates and BSS Membership Selectors (see 9.4.2.3(Supported Rates and BSS Membership Selectors) | No |
| <ANA> | Extended Supported Rates and BSS Membership Selectors (see 9.4.2.11(Extended Supported Rates and BSS Membership Selectors) | No |
| ~~202~~ <ANA>-220 | Reserved |  |

**…**

|  |  |  |
| --- | --- | --- |
| Subelement ID | Length | AP OTA MAC Address |
| 1 | 1 | 6 |

**Figure 9-XXX—BSSID Of The Next Epoch subelement format**

The AP OTA MAC Address field specifies the OTA address that the reported AP affiliated with a BPE AP MLD uses in the next epoch.

**9.4.2.66.2 Transition event report**

*Instructions to the Editor: Please make the following changes to Table 9-238.*

**Table 9-238—Transition and Transition Query reasons**

|  |  |
| --- | --- |
| **Transition Reason code** | **Description** |
| 21 | BPE AP MLD Discovery  |
| ~~21~~ 22 - 255 | Reserved |

**9.6.6.6 Neighbor Report Request frame format**

*Instructions to the Editor: Please make the following changes to Figure 9-1189.*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Category | Radio Measurement Action | Dialog Token | SSID (Optional) | LCI Measurement Request (optional) | Location Civic Measurement Request (optional) | Neighbor DMG Request (optional) | BPE AP MLD Discovery Request (optional) |
| 1 | 1 | 1 | variable | variable | variable | variable | variable |

**Figure 9-1189—Neighbor Report Request frame Action field format**

*Instructions to the Editor: Please insert at the end of clause 9.6.6.6.*

The BPE AP MLD Discovery Request field is optionally present. If present, it contains a Measurement Request element with Measurement Type field equal to BPE AP MLD Discovery (see Table 9-136(Measurement type definitions for measurement requests)). The element indicates a request for a Measurement Report subelement with Measurement Type field equal to BPE AP MLD Discovery for each Neighbor Report element (see 11.10.10.2(Requesting a neighbor report)). The Enable subfield in the Measurement Request mode field in the Measurement Request element is set to 0. The Parallel, Request, Report and Duration Mandatory subfield within the Measurement Request Mode field in the Measurement Request element are reserved (see 9.4.2.19.1(General)). The Measurement Request field is optional. When present, Measurement Request field format is as described in 9.4.2.19.20(BPE AP MLD discovery).

**10.71.8.1 BPE AP MLD Discovery**

*Instructions to the Editor: Please append the following text to the end of the clause*

An ESS may contain non-EDP APs, non-EDP AP MLDs, CPE AP MLDs and BPE AP MLDs. An AP MLD may recommend an associated non-AP MLD to operate with a BPE AP MLD as described in 10.71.8.3(Steering to BPE AP MLD).

**10.71.8.3 Steering to BPE AP MLD**

*Instructions to the Editor: Please add the new clause as shown below*

An AP sets the BPE Available field of the Extended Capabilities element of the Beacon, Probe Response and (Re)Association Response frames to indicate that the ESS in which the AP operates contains one or more BPE AP MLDs.

A BPE capable non-AP MLD sets the BPE Available field in the Extended Capabilities element of the (Re)Association Request frame to indicate that it is capable to receive encrypted individually addressed BTM Request, Neighbor Report Response or ANQP Response frames that include BPE AP MLDs in the Neighbor Report elements.

A non-AP STA that has received a Beacon, Probe Response or (Re)Association Response frame with BPE Available field equal to 1 in the Extended Capabilities element from its associated AP may query information of available BPE AP MLDs by sending an encrypted BTM Query frame to its associated AP. The BTM Query frame with the BSS Transition Query Reason field set to a BPE AP MLD indicates that the non-AP MLD is interested to only receive information of the available BPE AP MLDs.

An AP may send an encrypted solicited or unsolicited BTM Request frame that contains information of BPE AP MLDs to an associated non-AP STA that has set the BPE Available field of the Extended Capabilities element on its (Re)Association Response frame to 1.

The non-AP STA may send a unicasted encrypted Neighbor Report Request frame with a BPE AP MLD Discovery Request field to request Neighbor Report elements of available BPE AP MLDs in the ESS. The responding AP may include BPE AP MLD information in the Neighbor Report elements of the encrypted unicasted Neighbor Report Response frames transmitted to the requesting STA.

The non-AP STA may send a unicasted encrypted ANQP Request frame that requests Neighbor Reports to be included in the ANQP Response frame. The responding AP may send unicasted encrypted ANQP Response frames that may include BPE AP information in the Neighbor Report elements to the requesting STA.

Each AP affiliated with the BPE AP MLD should be reported in a separate Neighbor Report element. Such a Neighbor Report element shall include at least the following subelements: BSSID of the current and next epoch, RSNE, RSNXE, Supported Rates and BSS Membership Selectors, Extended Supported Rates and BSS Membership Selectors, BSS Load, HT Capabilities, HT Operation, VHT Capabilities, VHT Operation, HE Capabilities, EHT Capabilities, EHT Operation and Basic Multi-link element.

A STA that has received a BPE AP information in a Neighbor Report element may detect the presence of a reported AP affiliated with BPE AP MLD by receiving a frame with transmitter address or receiver address in the MAC header by matching the transmitter address or the receiver address in the MAC header of a received frame to the BSSID reported in the Neighbor Report.

**11.10.10.2. Requesting a neighbor report**

A STA requesting a neighbor report from an AP shall send a Neighbor Report Request frame to its associated AP.

A STA can request LCI information of an AP and its neighboring APs, if the AP advertises the FTM responder capability (Extended Capabilities element with the FTM Responder field set to 1), the geospatial location capability (Extended Capabilities element with the Geospatial Location field set to 1), and the neighbor report capability (RM Enabled Capabilities element with the Neighbor Report Capability Enabled field set to 1). A STA can request civic location information of an AP and its neighboring APs, if the AP advertises the FTM responder capability (Extended Capabilities element with the FTM Responder field set to 1), the location civic capability (Extended Capabilities element with the Civic Location field set to 1), and the neighbor report capability (RM Enabled Capabilities element with the Neighbor Report Capability Enabled field set to 1).

To request the LCI of neighboring APs, the STA shall transmit a Neighbor Report Request frame that includes a Measurement Request element with the value of its Measurement Type field equal to LCI. To request the location civic of neighboring APs, the STA shall transmit a Neighbor Report Request frame that includes a Measurement Request element with the value of its Measurement Type field equal to Location Civic.

To request a list of neighboring APs that support DMG location services, the STA shall transmit a Neighbor Report Request frame that includes a Neighbor DMG request field with a Measurement Request element with the value of its Measurement Type field equal to Neighboring DMG APs. A STA shall not send this type of request to an AP unless it received an Extended Capabilities element from the AP with the DMG Location Supporting APs Information field equal to 1. The Neighbor Report Request frame shall include an SSID element with the SSID set to wildcard SSID.

To request a list of neighboring BPE APs, the STA shall transmit a Neighbor Report Request frame that includes a BPE AP MLD Discovery Request field with a Measurement Request element with the value of its Measurement Type field equal to BPE AP MLD Discovery. A STA shall not send this type of request to an AP unless it received an Extended Capabilities element from the AP with the BPE Available Information field equal to 1.