IEEE P802.11
Wireless LANs

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| Proposed resolution of CID 3518 text |
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|  |  |  |  |  |

Abstract

This submission proposes resolutions to CID 3518 related to Multi-band.

The CID is in reference to Comment database on Draft IEEE 802.11ay/D2.0.

# Comment:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **PP.LL** | **Comment** | **Proposed Change** | **Suggested Resolution** |
| 3518 | 11.31.6 | Multi-band discovery assistance allows discovery of an AP or PCP that this STA is connected to however this is not enough. For some use cases, the STA might need to talk to a non-AP/PCP STAs in the same BSS or even in other BSSs . A STA should find other non-AP in that BSS and other BSS | The standard should define a mechanism to allow new STA to find neighbor STAs in an on-demand fashion. Commenter is willing to provide resolution text. | REVISED: Adopt changes proposed in doc11-18/1910r0 |

# Discussion:

An AP/PCP supporting multi-band discovery assistance may propagate a discovery assistance request received from a multi-band STA to other STAs connected to it. The AP/PCP collects the discovery assistance responses from all STAs received the propagated discovery assistance request before sending the discovery assistance response to the STA requesting discovery assistance. The STAs that received the propagated discovery assistance request, support discovery assistance and accepted the request shall offer discovery assistance as indicated in the discovery assistance response sent to the AP/PCP.

The Information Request frame is used to propagate the discovery assistance request from the AP/PCP to the STAs connected to it. The Information Response frame is used to send the discovery assistance response from the STAs received the request to the AP/PCP. The information Request and Information Response frames uses the DMG Discovery Assistance element to carry the discovery assistance request and response information.

# Proposed changes:

Apply the following changes.

Corresponding changes to 802.11ay D2.1 and 802.11md are indicated in the following text with “Track Changes” on, to clarify the direction to the editor.

**6. Layer management**

**6.3 MLME SAP interface**

**6.3.3 Scan**

**6.3.3.2 MLME-SCAN.request**

**6.3.3.2.2 Semantics of the service primitive**

***To TGay Editor: add this parameter to the list of primitive parameters***

**ScanMACAddressList**

***To TGay Editor: add the primitive parameter definition at the end of table***

|  |  |  |  |
| --- | --- | --- | --- |
| ScanMACAddressList | List of MAC addresses | List of valid individual MAC addresses | Specifies a list of MAC address of STAs to scan for during the scanning period. Present only whendot11DiscoveryAssistanceActivated is true. |

**9. Frame formats**

**9.4 Management and Extension frame body components**

**9.4.2 Elements**

***To TGay Editor: Update the subclause 9.4.2:***

**9.4.2.273 DMG Discovery Assistance element**

The DMG Discovery Assistance element indicates parameters and attributes of the discovery assistance. This element is optionally present in FST Setup Request frame, FST Setup Response frame, Information Request frame and Information Response frame. The format of the DMG Discovery Assistance element is shown in Figure 103 (DMG Discovery Assistance element format).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Element ID | Length | Element ID Extension | Discovery Assistance Control | Discovery Assistance Request Status Code | Discovery Assistance Window Length |
| Octets: | 1 | 1 | 1 | 1 | 2 | 3 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Number of STAs Providing Discovery Assistance  | MAC Address of STA 1(Optional) | … | MAC Address of STA N(Optional) | Sector Sweep Start Time(Optional) | Temporary AID (Optional) | Dwelling Time(Optional) |
| 1 | 6 |  | 6 | 4 | 1 | 2 |

**Figure 103 ~~E~~DMG Discovery Assistance element format**

The Element ID, Length, and Element ID extension fields are defined in 9.4.2.1.

The format of the Discovery Assistance Control field is shown in Figure 104. This field is reserved when the element is contained in FST Setup Request frame or the Information Response frame.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B0  | B1 | B2 | B3 B7 |
|  | Discovery Assistance Type | Dwelling Time Present | Scan Mode | Reserved |
| Bits: | 1 | 1 | 1 | 5 |

**Figure 104 Discovery Assistance Control field format**

The Discovery Assistance Type subfield is set to 0, to indicate that Sector Sweep Start Time field is present. When this field is set to 1, the discovery assistance signal schedule is indicated in the Extended Schedule element. This field is reserved when the Discovery Assistance Request Status Code subfield is not equal to SUCCESS or the element is contained in the Information Request frame.

Dwelling Time Present subfield is set to 1 to indicate that the Dwelling Time field is present in the DMG Discovery Assistance element and set to 0 otherwise. This field is reserved when the element is contained in the Information Request frame.

Scan Mode subfield is set to 1 to indicate that the STA requesting discovery assistance is performing active scanning during the assigned discovery assistance window length otherwise the STA requesting discovery assistance is performing passive scanning. This field is reserved when The Discovery Assistance Type subfield is set to 1.

The Discovery Assistance Request Status Code field contains the result of the discovery assistance request and is one of the status codes specified in Table 9-52 (Status codes) in 9.4.1.9 (Status Code field). This field is reserved when the element is contained in FST Setup Request frame or the Information Request frame.

The Discovery Assistance Window Length field indicates the discovery assistance window length value as confirmed by the STA transmitting this element in microseconds. This field is reserved when the element is contained in FST Setup Request frame or the Information Request frame.

The Number of STAs Providing Discovery Assistance field indicates the number, N, of MAC Address of STA fields following it. This field is reserved when the element is contained in FST Setup Request frame or the Information Request frame.

Each MAC Address of STA field contains the MAC address of a STA that is providing discovery assistance.

The Sector Sweep Start Time field indicates the lower 4 octets of the TSF of the DMG BSS at the time the sector sweep transmission starts. This field is present if the Discovery Assistance Type subfield is 0. This field is reserved when the element is contained in FST Setup Request frame or the Information Request frame.

The Temporary AID field indicates a temporary AID ….

**11. MLME**

**11.29 DMG BSS peer and service discovery**

***To TGay Editor: Insert the following new subclause to the end of subclause 11.29:***

**11.29.3 DMG discovery assistance**

**11.29.3.1 General**

When dot11DiscoveryAssistanceActivated is true, a DMG AP or PCP supports on-demand sector sweeping to assist discovery of the DMG BSS toward a STA requesting discovery assistance (see 11.31.6 (Multi-band discovery assistance procedure) for details). Upon reception of a discovery assistance request, the DMG AP or PCP may send a DMG discovery assistance request to other DMG STAs in its BSS to assist a DMG STA requesting discovery assistance discovering neighbor STAs by offering additional discovery assistance. The DMG discovery assistance request is an Information request frame containing the DMG Discovery Assistance element and the DMG Capabilities element of the STA requesting the discovery assistance. The Information Request frame carries no other DMG Capabilities element in case of DMG discovery assistance request.

The DMG STA offering additional discovery assistance shall respond with DMG discovery assistance response, i.e., an Information Response frame containing the DMG Discovery Assistance element, when an AP or PCP coordinated by the same co-channel coordinated management (see 4.9.5 (Reference model for co-channel coordinated management operation) for details) is in the same device and has dot11DiscoveryAssistanceActivated set to true.

The DMG AP or PCP after transmitting the Information Request frame with the DMG Discovery Assistance element shall wait for a DMG discovery assistance response for dot11DiscoveryAssistanceResponseTimeout microseconds. After the timer expiration or reception of the DMG discovery assistance response, it shall determine the discovery assistance offered to the STA requesting the discovery assistance as described in 11.29.3.3 (Processing discovery assistance responses) and 11.31.6.2 (Discovery assistance action determination and on-demand sector sweeping).

If the DMG STA offering additional discovery assistance accepted the discovery assistance request and sent back a DMG discovery assistance response to the DMG AP or PCP, the AP or PCP coordinated by the same co-channel coordinated management shall start the discovery assistance as specified in the DMG discovery assistance response that it transmitted.

**11.29.3.2 DMG discovery assistance through Information Request and Information Response frames**

A DMG AP or PCP receiving a DMG discovery assistance request may send the DMG discovery assistance request (Information Request frame with DMG Discovery Assistance element and DMG Capability Element of the STA requesting discovery assistance) to other STAs in its BSS to request them to offer additional discovery assistance. The DMG AP or PCP sets the Scan Mode subfield in the Discovery Assistance Control field in DMG Discovery Assistance element to 1 if the new STA is set to use active scanning and sets it to 0 if the new STA is set to use passive scanning. The DMG AP or PCP shall only send the request when these STAs are in awake state.

The DMG STA receiving the Information Request frame containing the DMG Discovery Assistance element shall forward the discovery assistance request to the SME of an AP or a PCP in the same device if that AP or PCP is coordinated by the same co-channel coordinated management entity and has dot11DiscoveryAssistanceActivated set to true. The DMG AP or PCP coordinated by the same co-channel coordinated management entity shall determine if it accepts the request. The DMG AP or PCP coordinated by the same co-channel coordinated management entity shall use the DMG Capabilities element of the DMG STA requesting discovery assistance contained in the Information Request frame to calculate the Discovery Assistance Window Length as described in 11.31.6.2 (Discovery assistance action determination and on-demand sector sweeping) and to schedule sector sweeping.

The STA offering the additional discovery assistance shall respond back to the DMG AP or PCP with DMG discovery assistance response, i.e., an Information Response frame containing a DMG Discovery Assistance element. The DMG STA sets the DMG Discovery Assistance element fields as follows.

* + - Sets the Discovery Assistance Request Status Code field to SUCCESS if the discovery assistance request is accepted and to REFUSED otherwise; and
		- Sets the Discovery Assistance Window Length field to the discovery assistance window length value, in microseconds as described in 11.31.6.2 (Discovery assistance action determination and on-demand sector sweeping); and
		- Sets the Sector Sweep Start Time field to the TSF value indicating when the discovery assistance starts.
		- Sets the Number of STAs Providing Discovery Assistance to 1
		- Sets MAC Address of STA 1 to the MAC address of the DMG AP or PCP providing additional discovery assistance

**11.29.3.3 Processing discovery assistance responses**

After dot11DiscoveryAssistanceResponseTimeout timer expiration or reception of the DMG discovery assistance response, the DMG AP or PCP shall send the discovery assistance response to the DMG STA requesting discovery assistance. If at least one DMG STA is providing discovery assistance, the DMG AP or PCP shall set the Discovery Assistance Request Status Code field in the DMG Discovery Assistance element sent to the STA requesting discovery assistance to SUCCESS otherwise it is set to REFUSED. The DMG STA sets the Number of STAs Providing Discovery Assistance field in the DMG Discovery Assistance element to the number of DMG APs or PCPs providing discovery assistance and sets the following MAC Address of STA fields to the MAC address of these DMG APs or PCPs. The DMG AP or PCP sets the DMG Discovery Assistance element as described in 11.31.6.2 (Discovery assistance action determination and on-demand sector sweeping) and updates the following fields in the transmitting discovery assistance response:

* If discovery assistance is performed through scheduling DMG beacon transmission sweeping all sectors or initiating TDD beamforming:
	+ Sets the Discovery Assistance Window Length field in the DMG Discovery Assistance element to the time duration after Sector Sweep Start Time till all STAs offering discovery assistance finish discovery assistance; and
	+ Sets the Scan Mode subfield in the Discovery Assistance Control field in DMG Discovery Assistance element to 1 if the new STA is set to use active scanning and sets it to 0 if the new STA is set to use passive scanning; and
	+ Sets the Sector Sweep Start Time field in the DMG Discovery Assistance element to the earliest start time value among STAs offering discovery assistance, the time when the first DMG STA offering discovery assistance starts discovery assistance.
* If the discovery assistance is performed through scheduled beamforming training period or scheduled TDD beamforming period:
	+ Sets the Discovery Assistance Window Length field in the DMG Discovery Assistance element to the time duration of all STAs beamforming periods starting from the first allocation, including all time blocks if more than one time block is scheduled; and
	+ Includes all discovery assistance responses allocations to the Allocation fields in the Extended Schedule element. Each discovery assistance response received in response to a discovery assistance request sent to a BSS STA is mapped to an Allocation field where the temporary AID is used for the STA requesting discovery assistance and the broadcast AID is used for the other STAs providing discovery assistance. The Sector Sweep Start Time and the Discovery Assistance Window Length fields in DMG Discovery Assistance element are mapped to the Allocation Start and the Allocation Block Duration subfields in the Allocation field in the Extended Schedule element, respectively.

All DMG APs or PCPs offering discovery assistance start discovery assistance as described in 11.31.6.2 (Discovery assistance action determination and on-demand sector sweeping) at the scheduled time.

**11.31 Multi-band operation**

**11.31.6 Multi-band discovery assistance procedure**

**11.31.6.1 Multi-band discovery assistance request procedure**

***To TGay Editor: Insert a new paragraph after the 5th paragraph as follows:***

The two multi-band capable devices exchange FST Setup Request frame and FST Setup Response frames, as described in 11.31.2 (FST setup protocol), containing the DMG Discovery Assistance element. Upon reception of the MLME-FST-SETUP.indication, the SME of the STA that received the discovery assistance request determines if it accepts the requested discovery assistance.

As an option, the SME may propagate the discovery assistance request to other STAs that belong to a DMG BSS that it created in order to assist the STA requesting discovery assistance finding neighbor DMG STAs, as described in 11.29.3 (DMG discovery assistance). If the SME propagated the discovery assistance request to other STAs, it shall wait for responses up to dot11DiscoveryAssistanceResponseTimeout microseconds and compile the determination result including responses from other DMG STAs.

The SME shall encode the determination results in the DMG Discovery Assistance element …

**11.31.6.2 Discovery assistance action determination and on-demand sector sweeping**

***To TGay Editor: update the 1st paragraph as follows:***

When the SME receiving the discovery assistance request accepts the request, it shall set the Discovery Assistance Request Status Code field of the DMG Discovery Assistance element transmitted in the FST Setup Response frame containing the discovery assistance response to SUCCESS, set the Number of STAs Providing Discovery Assistance field of the DMG Discovery Assistance element transmitted in the FST Setup Response frame to 1, set the MAC Address of STA field of the DMG Discovery Assistance element transmitted in the FST Setup Response frame to the MAC address of the DMG STA providing discovery assistance and take one of the following actions with the corresponding DMG STA.

If the DMG STA operates non-TDD channel access, the DMG STA shall provide discovery assistance through one of the following two options:

* Option 1: The DMG STA schedules DMG Beacon frame transmissions sweeping all of its sectors 1 so that the STA requesting discovery assistance can attempt to receive it. The STA sets fields in the 2 DMG Discovery Assistance element as follows, and includes it in transmitting response:
	+ Sets the Discovery Assistance Type subfield in the Discovery Assistance Control field to 0; and
	+ Sets the Scan Mode to 1 if the new STA is set to use active scanning and sets it to 0 if the new STA is set to use passive scanning; and
	+ Sets the Sector Sweep Start Time field to the TSF value indicating its TBTT when the discovery assistance starts; and
	+ Sets the Discovery Assistance Window Length to the time duration of the discovery assistance, i.e., DMG Beacon sweeping. If Scan Mode is set to 0, the number of transmit antenna sectors in the STA requesting discovery assistance is used to determine the exact number of slots needed in the A-BFT period for the responder TXSS. The DMG STA might use multiple beacon intervals to complete full DMG Beacon sweeping. The Discovery Assistance Window Length might include one or more complete full DMG Beacon Sweep. If Scan Mode is set to 1, the number of transmit antenna sectors in the STA requesting discovery assistance is used to determine the time the AP is listening for the new STA sweeping frames.

***To TGay Editor: update the 5th paragraph as follows:***

The SME shall issue an MLME-SCAN.request to its New Band MLME, set the BSSID and ChannelList parameters according to the BSSID, Band ID, Operating Class and Channel Number fields captured from the Multi-band element, set MinChannelTime to the Discovery Assistance Window Length field in the received DMG Discovery Assistance element and set the ScanMACAddressList to the set of MAC addresses of STAs providing discovery assistance captured from the MAC Address of STA fields in the DMG Discovery Assistance element in the FST Setup Response frame. If more than on MAC Address exists, the BSSID should be set to a wildcard BSSID.

Depending on the values contained in the Discovery Assistance Control field in the received DMG Discovery Assistance element, the MLME-SCAN.request is issued in one of the following manners:

If the Dwelling Time Present subfield is 0 and the Discovery Assistance Type subfield is 0, the MLME-SCAN.request is issued before the time specified in the Sector Sweep Start Time field in the received DMG Discovery Assistance element and the ScanType is set to passive scanning if Scan Mode subfield is set to 0 and set to active scanning otherwise.

**Annex C**

**C.3 MIB Detail**

***To TGay Editor: Change the definition of “Dot11DMGSTAConfigEntry” in C.3 as follows:***

Dot11DMGSTAConfigEntry ::=

 SEQUENCE {

 dot11DMGOptionImplemented TruthValue,

 dot11RelayActivated TruthValue,

 dot11REDSActivated TruthValue,

 dot11RDSActivated TruthValue,

 dot11MultipleMACActivated TruthValue,

 dot11ClusteringActivated TruthValue,

 dot11DiscoveryAssistanceActivated TruthValue,

 dot11DiscoveryAssistanceResponseTimeout Unsigned32

 }

***To TGay Editor: Insert the definition of (dot11DiscoveryAssistanceResponseTimeout) to the end of dot11DMGSTAConfigTable in C.3 as follows:***

dot11DiscoveryAssistanceResponseTimeout OBJECT-TYPE

 SYNTAX unassgned32 (0..262143)

 UNITS "microseconds"

 MAX-ACCESS read-write

 STATUS current

 DESCRIPTION

 "This is a control variable.

 It is written by the SME or external management entity.

 Changes take effect as soon as practical in the implementation.

 This attribute indicates the maximum wait time for a discovery assistance response after transmitting a discovery assistance request."

 ::= { dot11DMGSTAConfigEntry 8 }