IEEE P802.11
Wireless LANs

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| MLO discovery: Discovery procedures (inclusion probing) and RNR |
| Date: 2020-10-14 |
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1. **Introduction**

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. The introduction and the explanation of the proposed changes are 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).***

**This document proposes resolution for TBDs in the MLD probing section.**

**The different TBDs or clarifications are presented with different colors.**

**Issue 1: addressing of the MLD probe request and MLD probe response**

The proposal is to allow an MLD probe request to be sent broadcasted to multiple APs having the same SSID. The addressing is as follows: *with the Address 1 field set to the broadcast destination address, the Address 3 field set to the wildcard BSSID and the SSID field or the Short SSID element set to the SSID of an AP*

It can be debated whether the SSID should be the SSID of the AP or of the AP MLD. First, the author is of the opinion that all APs of an AP MLD shall have the same SSID as the AP MLD, which solves the debate. Second, even if the AP MLD has a different SSID than the AP, if we follow the same logic as for the addressing for individual addressed probe request, the probe request frame is addressed to the AP and not to the MLD and the SSID should therefore be set to the SSID of the AP.

For the MLD probe response, I suggest to follow the rule defined in 11ax for 6 GHz APs, which mandates to respond with address 1 set to broadcast address, except for stealth APs (APs with hidden SSID). This could also be a “should”, and this rule can be generalized for all probes, not only MLD probes.

**Issue 2: Clarify the rules for complete/partial information.**

The proposal is very straightforward: for complete information, D0.1 already makes the spec clear. For partial info, the proposal is that the MLD probe response shall include the requested elements for the requested APs, except if they are not part of the complete information for the requested APs.

**Issue 3: How to make a request (complete/partial info, all APs/some APs) with MLD probe request**

Following discussion before D0.1, 2 options are proposed (each of them includes the changes for the 2 previous issues.)

First option is to define a new MLD Request element to clarify what AP(s) is(are) requested, and to include the Request element in the Probe Request frame to identify the list of requested elements if the request is partial. Similarly, the inclusion of the Request element allows to make a partial request.

Second option is to reuse the ML element to make this request.

The 2 options work. With second option, it forces that for non-ML probe request frames, no ML elements shall be included at all. It does not seem to be an issue, but may be an issue if a need comes up that we haven’t thought about and that would require inclusion of ML element even in non-ML probe requests.

First option defines a new element, but is very clean.

Slight preference for option 1 as it seems to be the safest/most secure.

Overall, the proposal is to define the Request element in the core of the Probe request, so that the request is the same for all APs, as it seems unnecessary to have a different “partial” request for each AP.

**Issue 4: Inline below**

1. **Proposed spec text**

**Issue 3: Option 1**

***TGbe editor: Insert the new subclause 9.4.2.xxx MLD Request element as follows:***

9.4.2.xxx MLD Request element

The MLD Request element is placed in a Probe Request frame to request complete information on multiple APs of an AP MLD (see 33.3.2.2 (MLD probing)). The element contains a list of Link IDs to identify APs for which complete information is requested. The format of the MLD Request element is shown in Figure xxx (MLD Request element format).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Element ID | Length | Element ID Extension | Link ID information |
| Octets: | 1 | 1 | 1 | 0 or Variable |
|  |  |

Figure xxx – MLD Request element format

|  |  |
| --- | --- |
|  | Link ID |
| Octets: | 1 |
|  |

Figure xxx – Link ID Information field format

The Length field allows to derive the number of Link ID Information fields that are includes in the MLD Request element. If it is set to 0, it indicates that all Link IDs of the AP MLD are requested and zero Link ID Information fields are included in the MLD request element.

The Link ID field indicates the link identifier of the AP within the AP MLD.

***TGbe editor: Modify the following subclause 35.3.4.2 MLD probing in 802.11be D0.1:***

35.3.4.2 MLD probing

An MLD probe request is a Probe Request frame:

* with the Address 1 field set to the broadcast address, the Address 3 field set to the BSSID of an AP, or with the Address 1 field set to the BSSID of an AP, or with the Address 1 field set to the broadcast destination address, the Address 3 field set to the wildcard BSSID and the SSID field or the Short SSID element set to the SSID of an AP.
* and that includes an MLD Request element that identifies that the Probe Request frame is an MLD probe request and that identifies which APs of the AP MLD are requested.

An MLD probe request allows a non-AP STA to request an AP to include the complete set of capabilities, parameters and operation elements of other APs affiliated to the same AP MLD as the AP. The information of an AP affiliated to the same AP MLD as the AP identified in the Address 1 or Address 3 field of the Probe Request frame is requested if one of the following conditions are met:

* the Length field in the MLD Request element in the Probe Request frame is zero.
* the Length field in the MLD Request element is non zero the MLD Request element in the Probe Request frame is non-zero and the AP corresponds to a Link ID field in the MLD Request element in the Probe Request frame.

The requested information for the requested APs in the MLD probe request is complete if no Request element or Extended Request element is present in the Probe Request frame. The requested information for the requested APs in the MLD probe request is partial if a Request element is present in the Probe Request frame, and the Requested Element IDs field in the Request element determines the list of elements that are requested to be included in the MLD probe response.

The complete information of a requested AP sent by a reporting AP is defined as all elements that would be provided if the requested AP was transmitting the Probe Response frame, except the following elements, if present: the Reduced Neighbor Report element, the Multiple BSSID element, the ML element, other exceptions TBD.

If an AP that is part of an AP MLD receives an MLD Probe Request from a non-AP STA requesting complete information, it shall respond with an MLD probe response, which is a Probe Response frame that includes an ML element with a STA profile with the complete information for each of the APs that are affiliated to the same AP MLD as the AP and that are requested by the MLD probe request. If it receives an MLD Probe Request from a non-AP STA requesting partial information, it shall respond with an MLD probe response that includes an ML element with a STA profile with at least the elements requested for each of the APs that are affiliated to the same AP MLD as the AP and that are requested by the MLD probe request, unless the elements requested are not part of the complete information for each of the APs.If an AP that is part of an AP MLD receives an MLD probe request frame and responds with an MLD probe response frame (per 11.1.4.3.4 (Criteria for sending a response)), the Address 1 field of the Probe Response frame shall be set to the broadcast address unless the AP is not indicating its actual SSID in the SSID element of its Beacon frames.

**End of Issue 3: Option 1**

**Issue 3: Option 2**

***TGbe editor: Modify the following subclause 35.3.4.2 MLD probing in 802.11be D0.1:***

35.3.4.2 MLD probing

An MLD probe request is a Probe Request frame:

* with the Address 1 field set to the broadcast address, the Address 3 field set to the BSSID of an AP, or with the Address 1 field set to the BSSID of an AP, or with the Address 1 field set to the broadcast destination address, the Address 3 field set to the wildcard BSSID and the SSID field or the Short SSID element set to the SSID of an AP..
* and that includes an ML element that identifies that the Probe Request frame is an MLD probe request and that identifies which APs of the AP MLD are requested.

An MLD probe request allows a non-AP STA to request an AP to include the complete set of capabilities, parameters and operation elements of other APs affiliated to the same AP MLD as the AP. The information of an AP affiliated to the same AP MLD as the AP identified in the Address 1 or Address 3 field of the Probe Request frame is requested if one of the following conditions are met:

* the ML element in the Probe Request frame does not include any per-STA profile.
* the Link ID of the AP corresponds to the Link ID field in a per-STA profile in the ML element in the Probe Request frame.

The requested information for the requested APs in the MLD probe request is complete if no Request element is present in the Probe Request frame. The requested information for the requested APs in the MLD probe request is partial if a Request element is present in the Probe Request frame, and the Requested Element IDs field in the Request element determines the list of elements that are requested to be included in the MLD probe response.

The complete information of a requested AP sent by a reporting AP is defined as all elements that would be provided if the requested AP was transmitting the Probe Response frame, except the following elements, if present: the Reduced Neighbor Report element, the Multiple BSSID element, the ML element, other exceptions TBD.

If an AP that is part of an AP MLD receives an MLD Probe Request from a non-AP STA requesting complete information, it shall respond with an MLD probe response, which is a Probe Response frame that includes an ML element with a STA profile with the complete information for each of the APs that are affiliated to the same AP MLD as the AP and that are requested by the MLD probe request. If it receives an MLD Probe Request from a non-AP STA requesting partial information, it shall respond with an MLD probe response that includes an ML element with a STA profile with at least the elements requested for each of the APs that are affiliated to the same AP MLD as the AP and that are requested by the MLD probe request, unless the elements requested are not part of the complete information for each of the APs.

If an AP that is part of an AP MLD receives an MLD probe request frame and responds with an MLD probe response frame (per 11.1.4.3.4 (Criteria for sending a response)), the Address 1 field of the Probe Response frame shall be set to the broadcast address unless the AP is not indicating its actual SSID in the SSID element of its Beacon frames.

***TGbe editor: Modify the following subclause 35.3.4.3 (Multi-link element usage rules in the context of discovery) in 802.11be D0.1:***

35.3.4.3 Multi-link element usage rules in the context of discovery

A Probe Request frame that is a non-ML probe request shall not include an ML element.

**End of Issue 3: Option 2**

**Issue 4: When performing active scanning, Probe Request frames currently include all capabilities of the STA. Following rules in 802.11, the AP will broadcast the Probe Response, so will provide information so that it is useful for all STAs receiving the Probe Response, even if those STAs didn’t send a Probe Request. The conclusion of this is that a Probe Response sent in response to a Probe Request and an unsolicited Probe Response are carrying the same information. Almost all the elements are therefore not required to be included in the Probe Request frame and we can make this Probe Request a very short frame, just intending at triggering the transmission of a generic Probe Response.**

***TGbe editor: Add the following subclause 35.x.x (Active scanning for an EHT non-AP STA) in 802.11be D0.1:***

35.x.x Active scanning for an EHT non-AP STA

Option 1: If an EHT non-AP STA sends a Probe Request frame, it shall not include in the Probe Request frames it transmits any element, except that:

Option 2: If an EHT non-AP STA is actively scanning a channel and sends a Probe Request frame, it shall not include in the Probe Request frames it transmits any element, except that:

* it shall include the SSID element,
* it may include, if the conditions in 9.3.3.9 (Probe Request frame format) are met, the Request element, the SSID List element, the Extended Request element, the FILS Request Parameters, the Short SSID List element, Vendor Specific elements, the ML element.

**End of Issue 4**

**To identify that the probe request is an MLD probe request or a non-MLD probe request, do you prefer:**

* **option 1: define a new MLD Request element**
* **option 2: reuse the ML element and mandate ML element is not present in non-MLD probe request**
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