IEEE P802.11
Wireless LANs

|  |
| --- |
| PDT ML element for transmitting AP |
| Date: 2021-03-01 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Ming Gan | Huawei |  |  |  |
| Jason Yuchen Guo | Huawei |  |  |  |
| Yunbo Li | Huawei |  |  |  |
| Guogang Huang | Huawei |  |  |  |
| Yiqing Li | Huawei |  |  |  |
| Mengyao Ma | Huawei |  |  |  |
| Hongjia Su | Huawei |  |  |  |

Abstract

This submission proposes draft text for ML element for transmitting AP based on 802.11be D0.3

Revisions:

* Rev 0: Initial version of the document.

**The texts are based on the following passed** SP

**Straw poll #386**

Do you agree to add Link ID and Change Sequence subfields for the transmitting AP in the common part of an ML element, and a control field indicating the presence or not of these fields in R1. ***[#SP386]***

[20/1124r3 (ML element design, Ming Gan, Huawei), SP#1, No objection]

***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.***

9.4.2 Elements

***TGbe Editor: please modify Clause 9.4.2.247b in 802.11be D0.3 as follows:***

9.4.2.247b Multi-Link element

**9.4.2.247b.1 General**

The format of the Multi-Link element is defined in Figure 9-788ef (Multi-Link element format). The frames carrying this element and usage of this element are described in 35.3.2 (Container for multi-link information).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Element ID | Length | Element ID Extension | Multi-Link Control | Common Info | Link Info |
| Octets: | 1 | 1 | 1 | 2 | variable | variable |
| Figure 9-788ef—Multi-Link element format |

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

The format of the Multi-Link Control field is defined in Figure 9-788eg (Multi-Link Control field).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | B0 TBD | TBD | TBD | TBD | TBD B15 |
|  | Type | MLD MAC Address Present | Transmitting AP Link ID Present | Transmitting AP Change Sequence Present | Reserved |
| Bits: | TBD | 1 | 1 | 1 | TBD |
|  | Figure 9-788eg—Multi-Link Control field  |

The Type subfield is defined in Table 9-322am (Type subfield encoding) and is used to differentiate the various variants of the Multi-Link element. Different variants of the Multi-Link element are used for different multi-link operations.

|  |
| --- |
| Table 9-322am—Type subfield encoding |
| Type subfield value | Multi-Link element variant name |
| 0 | Basic |
| 1 | Probe Request |
| TBD | Reserved |

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

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

The Transmitting AP Change Sequence subfield is set to 1 if the Transmitting AP Change Sequence subfield is present in the Common Info field. Otherwise the Transmitting AP Change Sequence subfield is set to 0.

The Common Info field carries information that are common to all the links except for Transmitting AP Link ID subfield and Transmitting AP Change Sequence subfield which are for the link on which the multi-link element is sent and is optionally present based on the value of the Type subfield (see 9.4.2.295b.2 (Basic variant Multi-Link element) to 9.4.2.295b.3 (Probe Request variant Multi-Link element)).

The Link Info field carries information specific to the links and is optionally present based on the value of the Type subfield (see 9.4.2.295b.2 (Basic variant Multi-Link element) to 9.4.2.295b.3 (Probe Request variant Multi-Link element)).

**9.4.2.247b.2 Basic variant Multi-Link element**

The Basic variant Multi-link element is used to carry information of an MLD and its affiliated STAs during multi-link discovery (see 35.3.4.3 (Multi-link element usage rules in the context of discovery)) and Multi-Link Setup (see 35.3.5.4 (Usage and rules of Multi-link element in the context of multi-link setup)).

The format of the Common Info field of the Basic variant Multi-Link element is defined in Figure 9-788eh (Common Info field of the Basic variant Multi-Link element).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | MLD MAC Address | Transmitting AP Link ID | Transmitting AP Change Sequence | TBD |
| Octets: | 0 or 6 | 1 | 1 | TBD |
| Figure 9-788eh—Common Info field of the Basic variant Multi-Link element |

The format of the Transmitting AP Link ID subfield is defined in Figure 9-788xx (Transmitting AP Link ID format).

|  |  |  |
| --- | --- | --- |
|  | B0 B3 | B4 TBD |
|  | Link ID | Reserved |
| Bits: | 4 | TBD |
| Figure 9-788xx—Transmitting AP Link ID |

The condition for the presence of the MLD MAC Address subfield, the Transmitting AP Link ID subfield and the Transmitting AP Change Sequence subfield in the Common Info field is defined in 35.3.5.4 (Usage and rules of Multi-link element in the context of multi-link setup) and 35.3.4.3 (Multi-link element usage rules in the context of discovery).

Other fields are TBD.

The format of the Link Info field of the Basic variant Multi-Link element is defined in Figure 9-788ei (Link Info field of the Basic variant Multi-Link element).

|  |  |
| --- | --- |
|  | Optional Subelements |
| Octets: | Variable |
| Figure 9-788ei— Link Info field of the Basic variant Multi-Link element |

The Optional Subelements field contains zero or more subelements. The subelement format and ordering of subelements are defined in 9.4.3 (Subelements).

The Subelement ID field values for the defined subelements are shown in Table 9-322an (Optional subelement IDs for Basic variant Multi-Link element).

|  |
| --- |
| Table 9-322an—Optional subelement IDs for Basic variant Multi-Link element |
| Subelement ID | Name | Extensible |
| 0 | Pre-STA Profile | Yes |
| 1–220 | Reserved |  |
| 221 | Vendor Specific | Vendor defined |
| 222–255 | Reserved |  |

Each Per-STA Profile subelement starts with Per-STA Control field followed by variable number of fields and elements as defined in 35.3.2 (Container for multi-link information).

The format of the Per-STA Control field is defined in Figure 9-788ej (Per-STA Control field format).

|  |  |  |
| --- | --- | --- |
|  | B0 B3 | B4 TBD |
|  | Link ID | Reserved |
| Bits: | 4 | TBD |
| Figure 9-788ej—Per-STA Control field format |

The Link ID subfield specifies a value that uniquely identifies the link where the reported STA is operating on.

Other subfields are TBD.

The Vendor Specific subelements have the same format as their corresponding elements (see 9.4.2.25 (Vendor Specific element)). Zero or more Vendor Specific subelements are included in the list of optional subelements.

**9.4.2.247b.3 Probe Request variant Multi-Link element**

The Probe Request variant Multi-Link element is used to request an AP to provide information of other APs affiliated with the same AP MLD as the AP. The inclusion of a Probe Request variant Multi-Link element in a Probe Request frame identifies it as an MLD probe request.

The subfields of the Multi-Link Control field of the Probe Request variant Multi-Link element except the Type subfield are TBD.

The format of the Common Info field of the Basic variant Multi-Link element is defined in Figure 9-788yy (Common Info field of the Probe Request variant Multi-Link element).

|  |  |  |  |
| --- | --- | --- | --- |
|  | MLD ID | Transmitting AP Link ID | TBD |
| Octets: | 1 | 0 or 1 | TBD |
| Figure 9-788yy—Common Info field of the Probe Request variant Multi-Link element |

The format of the Link Info field of the Probe Request variant Multi-Link element is defined in Figure 9-788ek (Link Info field of the Probe Request variant Multi-Link element).

|  |  |
| --- | --- |
|  | Per-STA Profile Subelements |
| Octets: | Variable |
| Figure 9-788ek—Link Info field of the Probe Request variant Multi-Link element |

The Per-STA Profile Subelements field contains zero or more Per-STA Profile subelements as defined in 9.4.2.295b.2 (Basic variant Multi-Link element). Each Per-STA Profile subelement starts with a Per-STA Control field as defined in 9.4.2.295b.2 (Basic variant Multi-Link element). Presence of other fields and/or elements is TBD.

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

***TGbe Editor: please modify the new approved CR document 21-0242/r4 as follows:***

An AP affiliated with an AP MLD should include, in a Beacon frame or a Probe Response frame, that is not an ML probe response, only the Common Info field of the Basic variant Multi-Link element as defined in 9.4.2. 295b (Multi-Link element). The Common Info field shall include MLD MAC address subfield, the Transmitting AP Link ID subfield and the Transmitting AP Change Sequence subfield.

NOTE—Whether the Basic variant Multi-Link element is always present in a Beacon frame or a Probe Response frame, that is not an ML probe response, or is optionally present is TBD.

An AP affiliated with an AP MLD that supports SAE authentication shall include the MLD MAC address of that AP MLD in the Beacon and Probe Response frames it transmits in the Common Info field of the Basic variant of the Multi-Link element.

A Probe Request frame that is not an ML probe request shall not include a Multi-Link element of any type.

A Probe Request frame that is an ML probe request shall not include a Basic variant Multi-Link element.

A Probe Request frame that is an ML probe request shall include a Probe Request variant Multi-Link element.

**35.3.5.4 Usage and Rules of Basic variant Multi-Link element in the context of multi-link setup**

***TGbe Editor: please modify Clause 33.3.5.4 in 802.11be D0.3 as follows:***

A non-AP MLD may initiate a multi-link setup with an AP MLD to setup more than one link with a subset of APs that are affiliated with the AP MLD. When a non-AP MLD initiates a multi-link setup with an AP MLD, a non-AP STA that is affiliated with the non-AP MLD shall transmit an (Re-)Association Request frame on the link it is operating on. An AP that is affiliated with the AP MLD and that received the (Re-)Association Request frame shall transmit an (Re-)Association Response frame.

The Basic variant Multi-Link element carried in the (Re-)Association Request frame shall include at least the MLD MAC address subfield, the Transmitting AP Link ID subfield and the Transmitting AP Change Sequence subfield where the Transmitting AP Change Sequence subfield is reserved in the Common Info field of the Basic variant Multi-Link element as defined in 9.4.2.247b (Multi-Link element).

The Basic variant Multi-Link element carried in the (Re-)Association Request frame shall include one or more STA profile subelement(s), each of which contains the complete information (such as capabilities) of a non-AP STA affiliated with the non-AP MLD and corresponding to athe link that is requested for multi-link setup.

The Basic variant Multi-Link element carried in the (Re-)Association Response frame shall include at least the MLD MAC address subfield, the Transmitting AP Link ID subfield and the Transmitting AP Change Sequence subfield in the Common Info field of the Basic variant Multi-Link element as defined in 9.4.2.295b (Multi-Link element).

The Basic variant Multi-Link element carried in the (Re-)Association Response frame shall include one or more STA profile subelement(s), each of which contains the complete information (such as capabilities and operational parameters) of an AP affiliated with the AP MLD and corresponding to a link that is accepted by the AP MLD and requested by the non-AP MLD.

Each STA profile subelement included in the Basic variant Multi-Link element carried in the (Re-)Association Request frame and the (Re-)Association Response frame shall not include another Basic variant Multi-Link element.

An STA affiliated with an MLD shall include a Basic variant Multi-Link element containing the MLD MAC address of the MLD with which the STA is affiliated in the Authentication frame that it transmits.

An STA, which is affiliated with an MLD, may select and manage its operating parameters independently from the other STA(s) affiliated with the same MLD, unless specified otherwise.