IEEE P802.11
Wireless LANs

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| PDT ML element for transmitting AP |
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Abstract

This submission proposes draft text for ML element for transmitting AP based on 802.11be D0.4

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 Bx-1 | Bx  |  Bx+1  |  Bx+2  | Bx+3 B15 |
|  | Type | MLD MAC Address Present | Link ID Info Present | Change Sequence Present | Reserved |
| Bits: | x | 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.

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

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

The Common Info field carries information that are common to all the links except for Link ID Info subfield and 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 |  Link ID Info | Change Sequence | TBD |
| Octets: | 0 or 6 | 0 or 1 | 0 or 1 | TBD |
| Figure 9-788eh—Common Info field of the Basic variant Multi-Link element |

The format of the Link ID Info subfield is defined in Figure 9-788xx (Link ID Info format). The Link ID subfield indicates the link identifier of the AP that transmits the Basic variant Multi-link element or the nontransmitted BSSID in the same multiple BSSID set as the AP that transmits the Basic variant Multi-link element and affiliated with the MLD that is described in the Multi-link element. Link ID Info subfield in the Common info field is not present if the Basic variant Multi-link element is sent by the non-AP STA.

|  |  |  |
| --- | --- | --- |
|  | B0 B3 | B4 B8 |
|  | Link ID | Reserved |
| Bits: | 4 | 4 |
| Figure 9-788xx—Link ID Info |

The Change Sequence subfield in the Common Info field is an unsigned integer, initialized to 0, that increments when a critical update occurs to the operational parameters for the AP that tranmits the Basic variant Multi-link element or the nontransmitted BSSID in the same multiple BSSID set as the AP that transmits the Basic variant Multi-link element and affiliated with an MLD that is described in the Multi-link element. The critical updates are defined in 11.2.3.15 (TIM Broad­cast). The Change Sequence subfiled in the Common info field is not present if the Basic variant Multi-link element is sent by the non-AP STA.

The condition for the presence of the MLD MAC Address subfield, the Link ID Info subfield and the 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), 35.3.4.3 (Multi-link element usage rules in the context of discovery) and 35.3.8 (BSS parameter critical update procedure).

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).

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| 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.

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

***TGbe Editor: please modify Clause 35.3.4.4 in 802.11be D0.4 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 of the Basic variant Multi-Link element carried in the Beacon frame or Probe Response frame shall

* include the MLD MAC address subfiled for the AP MLD with which the AP is affiliated by setting MLD MAC Address Present subfield of the Multi-Link Control field of the Basic variant Multi-Link element to 1include the Link ID Info subfield for the AP by setting the Link ID Info Present subfield of the Multi-Link Control field of the Basic variant Multi-Link element to 1
* include the Change Sequence subfield for the AP by setting the the Change Sequence Present subfield of the Multi-Link Control field of the Basic variant Multi-Link element to 1.

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 D0.4 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 non-AP STA shall include a Basic variant Multi-Link element in the (Re)Association Request frame it transmits.

The Basic variant Multi-Link element carried in the (Re)Association Request frame shall include the Common Info field and the Link Info field.

The Common Info field of the Basic variant Multi-Link element carried in the (Re)Association Request frame shall

* include the MLD MAC address subfield for the non-AP MLD with which the non-AP STA is affiliated by setting the MLD MAC Address Present subfield of the Multi-Link Control field of the Basic variant Multi-Link element to 1
* not include the Link ID Info subfield by setting the Link ID Info Present subfield of the Multi-Link Control field of the Basic variant Multi-Link element to 0

not include the Change Sequence subfield by setting the Change Sequence Present subfield of the Multi-Link Control field of the Basic variant Multi-Link element to 0

The Link Info field of the Basic variant Multi-Link element carried in the (Re)Association Request frame shall include one or more Per-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 a link that is requested for multi-link setup and shall set the Complete Profile subfield of the Multi-Link Control field of the Basic variant Multi-Link element to 1.

The Link ID subfield of the Per-STA Control field of the Per-STA Profile subelement for the corresponding non-AP STA that requests a link for multi-link setup with the AP MLD is set to the link ID of an AP MLD that is operating on that link. The link ID is obtained during discovery.

The AP shall include a Basic variant Multi-Link element in (Re)Association Response frame that it transmits.

The Basic variant Multi-Link element carried in the (Re)Association Response frame shall include Common Info field and Link Info field.

The Common Info field of the Basic variant Multi-Link element carried in the (Re)Association Response frame shall

* include the MLD MAC address subfiled for the AP MLD with which the AP is affiliated by setting MLD MAC Address Present subfield of the Multi-Link Control field of the Basic variant Multi-Link element to 1
* include the Link ID Info subfield for the AP by setting the Link ID Info Present subfield of the Multi-Link Control field of the Basic variant Multi-Link element to 1

include the Change Sequence subfield for the AP by setting the Change Sequence Present subfield of the Multi-Link Control field of the Basic variant Multi-Link element to 1 The Link Info field of the Basic variant Multi-Link element carried in the (Re)Association Response frame shall include one or more Per-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 and shall set the Complete Profile subfield of the Multi-Link Control field of the Basic variant Multi-Link element to 1.

The Link ID subfield of the Per-STA Control field of the Per-STA Profile subelement for the corresponding AP that accepts a link requested by an STA of non-AP MLD with a non-AP MLD is set to the link ID of the AP of the AP MLD that is operating on that link.

Each Per-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.