IEEE P802.11
Wireless LANs

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| CR of NSTR Capability update |
| Date: 2022-08-24 |
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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.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Clause**  | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 12326 | Guogang Huang | 35.3.16.2 | 453.24 | define a Management frame to inform the AP MLD about the ability to change STR operation | As in comment | RevisedTwo protected EHT Action frame, Multi-Link Operation Update Request frame and Multi-Link Operation Update Response frame, are introduced for the updating of NSTR status of non-AP MLD. Both frame format and the NSTR status update procedure are added.TGbe editor to make the changes with the CID tag 12326 in doc 11-22/1418r2 |
| 13394 | Liwen Chu | 35.3.16.2 | 453.24 | The Management frame should be clearly mentioned/definded. | Fix the issues mentioned in the comment | RevisedTwo protected EHT Action frame, Multi-Link Operation Update Request frame and Multi-Link Operation Update Response frame, are introduced for the updating of NSTR status of non-AP MLD. Both frame format and the NSTR status update procedure are added.TGbe editor to make the changes with the CID tag 12326 in doc 11-22/1418r2 |
| 13699 | Yunbo Li | 35.3.16.2 | 453.22 | need to provide the frame format as well as procedure of this Management frame for NSTR capability update. | as in comment. | RevisedTwo protected EHT Action frame, Multi-Link Operation Update Request frame and Multi-Link Operation Update Response frame, are introduced for the updating of NSTR status of non-AP MLD. Both frame format and the NSTR status update procedure are added.TGbe editor to make the changes with the CID tag 12326 in doc 11-22/1418r2 |
| 13925 | Ming Gan | 35.3.16.2 | 453.24 | Please specify the corresponding management frame | please complete the missing description for management frame | RevisedTwo protected EHT Action frame, Multi-Link Operation Update Request frame and Multi-Link Operation Update Response frame, are introduced for the updating of NSTR status of non-AP MLD. Both frame format and the NSTR status update procedure are added.TGbe editor to make the changes with the CID tag 12326 in doc 11-22/1418r2 |
| 10365 | Tomoko Adachi | 35.3.16.2 | 453.24 | "The non-AP MLD may use a Management frame on any enabled link to inform the AP MLD about the ability change to perform STR operation."Which Management frame is used? The NSTR link pair information is in the Basic variant Multi-Link element and the element is carried only in Authentication, (Re)Association Request, and ML Probe Request when it's sent from a STA affiliated with a non-AP MLD to inform the non-AP MLD's capability to an AP MLD. A new(?) Action frames seems to be needed. Or extend the EHT OM Control field. And why is it here only talking about the case when the change is to STR? When the channel change introduces an NSTR link pair, it has to be informed, too. | As in comment. | RevisedTwo protected EHT Action frame, Multi-Link Operation Update Request frame and Multi-Link Operation Update Response frame, are introduced for the updating of NSTR status of non-AP MLD. Both frame format and the NSTR status update procedure are added.TGbe editor to make the changes with the CID tag 12326 in doc 11-22/1418r2 |
| 10082 | Xiangxin Gu | 35.3.16.2 | 453.22 | Define the Management frame to inform the AP MLD about the ability change to perform STA operation | As in the comment | RevisedTwo protected EHT Action frame, Multi-Link Operation Update Request frame and Multi-Link Operation Update Response frame, are introduced for the updating of NSTR status of non-AP MLD. Both frame format and the NSTR status update procedure are added.TGbe editor to make the changes with the CID tag 12326 in doc 11-22/1418r2 |
| 12440 | Ryuichi Hirata | 35.3.16.2 | 453.23 | How a non-AP MLD knows the ability change to perform STR operation on a pair of setup links is unclear. | Define mechanism for MLD to collect information related to the ability to perform STR operation such as NSTR interference. | RejectedFrom the definition of NSTR link pair, how to determine an NSTR link pair is MLD internal implementation related. Don’t see the necessity to introduce an extra mechanism in the standard.***nonsimultaneous transmit and receive (NSTR) link pair:*** *A pair of links within a multi-link device (an MLD) for which the receiver requirements specified in Clause 36 (Extremely high throughput (EHT) PHY specification) are not met on one of the links when a station (STA) of the MLD is transmitting on the other link. Each link of such a pair is a member of the NSTR link pair.* |

***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).***

1. **Proposed spec text**

***TGbe editor: Modify the 9.4.2.312.2.3 (Common Info field of the Basic Multi-Link element) as follows: (#12326)***

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0  | B1 | B2 | B3 | B4 | B5 | B6 | B7 B11 |
|  | Link ID Info Present | BSS Parameters Change Count Present | Medium Synchronization Delay Information Present | EML Capabilities Present | MLD Capabilities and Operations Present | AP MLD ID Present | Extended MLD Capabilities and Operations Present | Reserved |
| Bits | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 5 |

**Figure 9-1002g—Presence Bitmap subfield of the Basic Multi-Link element format**

The (#10453)AP MLD ID Present subfield is set to 1 if the (#10453)AP MLD ID field is present in the Common Info field. Otherwise the (#10453)AP MLD ID Present subfield is set to 0.

The Extended MLD Capabilities and Operations Present subfield is set to 1 if the Extended MLD Capabilities and Operations subfield is present in the Common Info field. Otherwise the Extended MLD Capabilities and Operations Present subfield is set to 0.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Common Info Length | MLD MAC Address | Link ID Info | BSS Parameters Change Count | Medium Synchronization Delay Information | EML Capabilities | MLD Capabilities and Operations | AP MLD ID | Extended MLD Capabilities and Operations |
| Octets: | 1 | 6 | 0 or 1 | 0 or 1 | 0 or 2 | 0 or 2 | 0 or 2 | 0 or 1 | 0 or 2 |

**Figure 9-1002h—Common Info field of the Basic Multi-Link element format**

The (#10453)AP MLD ID subfield indicates the identifier of the AP MLD whose MLD information is carried in the Basic Multi-Link element. (#11393)The (#10453)AP MLD ID subfield is not present in the Basic Multi-Link element included in a frame sent by a non-AP STA affiliated with a non-AP MLD. The (#10453)AP MLD ID subfield is not present in the Basic Multi-Link element when the element is carried in a Beacon, (Re)Association Response, Authentication, or Probe Response frame that is not a (#11318)multi-link probe response. The condition for the presence of the (#10453)AP MLD ID subfield in a (#11318)multi-link probe response is defined in 35.3.4.2 (Use of multi-link probe request and response(#11318)).

The Extended MLD Capabilities and Operations subfield is present in the Common Info field of the Basic Multi-Link element carried in a Beacon, Probe Response, and (Re)Association Response frames.

The format of the Extended MLD Capabilities and Operations subfield is defined in Figure 9-1002xx (Extended MLD Capabilities and Operations subfield format).

The subfields of the Extended MLD Capabilities and Operations subfield are defined in Table 9-401xx (Subfields of the Extended MLD Capabilities and Operations subfield)***.***

|  |  |  |
| --- | --- | --- |
|  | B0 | B1B15 |
|  | NSTR Status Update Support | Reserved |
| Bits | 1 | 15 |

**Figure 9-1002xx— Extended MLD Capabilities and Operations subfield format**

**Table 9-401xx—Subfields of the Extended MLD Capabilities and Operations subfield**

|  |  |  |
| --- | --- | --- |
| **Subfield** | **Definition** | **Encoding** |
| NSTR Status Update Support | An AP MLD indicates support for updating the NSTR status of the associated non-AP MLDs. | Set to 1 if an AP MLD supports updating the NSTR status update of associated non-AP MLDs. Set to 0 otherwise. Reserved for a non-AP MLD.See 35.3.16.2 (Multi-link device capability and operation signaling) |

***TGbe editor: Modify the 9.4.2.312.4 (Reconfiguration Multi-Link element) as follows: (#12326)***

**9.4.2.312.4 Reconfiguration Multi-Link element**

The format of the STA Control field is defined in [Figure 9-1002x (STA Control field format for the Recon-figuration Multi-Link element)](#bookmark168).

B0 B3 B4 B5 B6 B7 B10 B11 B12 B15

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Link ID | Complete Profile | MACAddress Present | Delete Timer Present | Operation Update Type | NSTR Indication Bitmap Present | Reserved |

Bits: 4 1 1 1 4 1 4

**Figure 9-1002x—STA Control field format for the Reconfiguration Multi-Link element**

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

The Complete Profile subfield is set to 0.

The MAC Address Present subfield indicates the presence of the STA MAC Address subfield in the STA Info field and is set to 1 if the STA MAC Address subfield is present in the STA Info field; otherwise set to 0(#10568).The Delete Timer Present subfield is set to 1 to indicate the presence of the Delete Timer subfield in the STA Info field, and that the AP corresponding to the Per-STA Profile subelement will be removed at the time indicated by the Delete Timer subfield; it is set to 0 otherwise.

The Operation Update Type subfield is set to indicate the type of operation update in the ML Operation Update Request frame for the link indicated by the Link ID subfield as per Table 9-401j (Operation Update Type subfield encoding).

Table 9-401j – Operation Update Type subfield encoding

|  |  |
| --- | --- |
| **Value** | **Name** |
| 0 | NSTR Status Update |
| 1 – 15 | Reserved |

The NSTR Indication Bitmap Present subfield indicates the presence of the NSTR Indication Bitmap subfield in the STA Info field and is set to 1 if the NSTR Indication Bitmap subfield is present in the STA Info field; otherwise set to 0.

The STA Info field consists of (#10568)fields whose presence is indicated by the subfields of the STA Control field. The subfields in the STA Info field appear in the same order as their corresponding presence sub- field in the STA Control field.

(#10568)The format of the STA Info field is defined in [Figure 9-1002y (STA Info field format for the](#bookmark169) [Reconfiguration Multi-Link element(#10568))](#bookmark169).

|  |  |  |  |
| --- | --- | --- | --- |
| STA Info Length | STA MAC Address | Delete Timer | NSTR Indication Bitmap |

 Octets: 1 0 or 6 0 or 2 0 or 2

**Figure 9-1002y—STA Info field format for the Reconfiguration Multi-Link element**

(#10568)The STA Info Length subfield indicates the number of octets in the STA Info field, including one octet for the STA Info Length subfield.

The STA MAC Address subfield of the STA Info field carries the MAC address of the AP or non-AP STA that operates or can operate on the link identified by the Link ID subfield and is affiliated with the same MLD as the STA that transmitted the Reconfiguration Multi-Link element.

(#10568)The Delete Timer subfield indicates the number of TBTTs of the AP corresponding to the Per-STA Profile subelement until the AP is removed.

Each bit Bj () in the NSTR Indication Bitmap subfield included in the Per-STA Profile subelement with Link ID subfield equals to (where 0 ≤ <15) is set to 1 if the link pair corresponding to Link IDs equal to <, *j>* is an NSTR link pair; otherwise bit B*j* is set to 0. Bit Bi in the NSTR Indication Bitmap subfield included in the Per-STA Profile subelement with Link ID subfield value equals to is reserved.

***TGbe editor: Modify the Table 9-623d in 9.6.35.1 (Protected EHT Action field) as follows: (#12326)***

**Table 9-623d—Protected EHT Action field values**

|  |  |  |
| --- | --- | --- |
| Value | Meaning | Time priority |
| 0 | TID-To-Link Mapping Request | No |
| 1 | TID-To-Link Mapping Response | No |
| 2 | TID-To-Link Mapping Teardown | No |
| 3 | EPCS Priority Access Enable Request | No |
| 4 | EPCS Priority Access Enable Response | No |
| 5 | EPCS Priority Access Teardown | No |
| 6 | EML Operating Mode Notification | No |
| 7 | Link Recommendation | No |
| 8 | Multi-Link Operation Update Request (#12326) | No |
| 9 | Multi-Link Operation Update Response (#12326) | No |
| 10-255 | Reserved |  |

***TGbe editor: add 9.6.35.10 (Multi-Link Operation Update Request frame format) as follows: (#12326)***

**9.6.35.10 Multi-Link Operation Update Request frame format** (#12326)

The Multi-Link Operation Update Request frame is transmitted by a STA affiliated with a non-AP MLD to an AP affliated with the associated AP MLD to report the updated NSTR status of the link pairs of the non-AP MLD. The Action field of a Multi-Link Operation Update Request frame contains the information shown in Table 9-623l (Multi-Link Operation Update Request frame Action field values).

**Table 9-623l—Multi-Link Operation Update Request frame Action field values**

|  |  |
| --- | --- |
| Value | Meaning |
| 1 | Category |
| 2 | Protected EHT Action |
| 3 | Dialog Token |
| 4 | Reconfigration Multi-Link element (see 9.4.2.312.4 (Reconfiguration Multi-Link element)) |

The Category field is defined in 9.4.1.11 (Category values).

The Protected EHT Action field is defined in 9.6.35.1 (Protected EHT Action field).

The Dialog Token field is defined in 9.4.1.12 (Dialog Token field)

The Reconfiguration Multi-Link element, defined in 9.4.2.312.4 (Reconfigration Multi-Link element), includes NSTR Indication Bitmap subfields to notify the NSTR status of link pairs of the non-AP MLD affiliated with the transmitting non-AP STA.

***TGbe editor: add 9.6.35.11 (Multi-Link Operation Update Response frame format) as follows:*** (#12326)

**9.6.35.11** Multi-**Link Operation Update Response frame format**

The Multi-Link Operation Update Response frame is transmitted by an AP affiliated with an AP MLD to confirm its update of NSTR status of link pairs of its associated non-AP MLD from which a Multi-Link Operation Update Request frame is receved. The Action field of a Multi-Link Operation Update Response frame contains the information shown in Table 9-623J (Multi-Link Operation Update Response frame Action field values).

**Table 9-623J—** Multi-**Link Operation Update Response frame Action field values**

|  |  |
| --- | --- |
| Value | Meaning |
| 1 | Category |
| 2 | Protected EHT Action |
| 3 | Dialog Token |
| 4 | Status Code |

The Category field is defined in 9.4.1.11 (Category values).

The Protected EHT Action field is defined in 9.6.35.1 (Protected EHT Action field).

The Dialog Token field is defined in 9.4.1.12 (Dialog Token field) and set by an AP MLD to the value copied from the corresponding received Link Recofiguration Notification frame.

The Status Code field is defined in 9.4.1.9 (Status Code field).

***TGbe editor: Modify the paragraphes in 35.3.16.2 (Multi-link device capability and operation signaling) as follows:(#12326)***

**35.3.16.2 Multi-link device capability and operation signaling**The ability of a non-AP MLD to perform STR operation on a pair of setup links may change after multi-link setup if an AP affiliated with the associated AP MLD switches the BSS operating channel. If the non-AP MLD’s ability to perform STR operations changes after the channel switch, the non-AP MLD may transmit a Multi-Link Operation Update Request frame with the Operation Update Type subfield set to 0 on any enabled link to inform the associated AP MLD, from which it has received a Basic Multi-Link element with the NSTR Status Update Support subfield equal to 1, using the NSTR Indication Bitmap subfields of the included Reconfiguration Multi-Link element. Otherwise, the non-AP MLD shall not transmit a Multi-Link Operation Update Request frame with Operation Update Type subfield set to 0.

NOTE – The non-AP MLD provides the NSTR status of each link pair that is setup between the AP MLD and non-AP MLD.

If any STA affiliated with a non-AP MLD has received a Basic Multi-Link element from its associated AP MLD with the NSTR Status Update Support subfield equal to 0, then the affiliated STAs of the non-AP MLD shall not transmit a Multi-Link Operation Update Request frame with Operation Update Type subfield set to 0 in the Reconfiguration Multi-Link element.

APs affiliated with an NSTR mobile AP MLD shall set the NSTR Status Update Support subfield in transmitted Basic Multi-Link element to 0.

In the Reconfiguration Multi-Link element of a Multi-Link Operation Update Request frame with Operation Update Type subfield set to 0 sent by a non-AP MLD:

* all subfields in the Presence Bitmap subfield of the Multi-Link Control field in the Reconfiguration Multi-Link element shall be set to 0,
* all subfields of the STA Control field in the Reconfiguration Multi-Link element except the Link ID and the NSTR Indication Bitmap Present subfields shall be set to 0
* the Link ID subfield shall be set to the identifier of the link whose NSTR status is reported in the Per-STA Profile subelement
* the NSTR Indication Bitmap subfield shall be present and indicates the NSTR status of each pair of links that is setup between the AP MLD and the non-AP MLD .

After receiving a Multi-Link Operation Update Request frame with Operation Update Type subfield equals to 0 from the non-AP STA affiliated with an associated non-AP MLD, the AP shall send a Multi-Link Operation Update Response frame to the non-AP STA with the subfields set as follows:

* Token field set to the same values as the Token field in the received Multi-Link Operation Update Request frame from the non-AP STA;
* Status Code subfield set to 0 (SUCCESS).

Immediately after receiving an acknowledgement to the transmitted Multi-Link Operation Update Response frame to the non-AP MLD, the AP MLD shall update the NSTR status of link pairs of its associated non-AP MLD and the AP MLD and non-AP MLD shall exchange frames using the updated constraints (see 35.3.16.3 (Simultaneous transmit and receive (STR) operation) and 35.3.16.4 (Nonsimultaneous transmit and receive (NSTR) operation)). (#12326)

***End of change***