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 | RevisedThe Management frame is designed base on EML Operating Mode Notification frame (the name is updated to ML Operating Mode Notification frame accordingly). Both frame format and the NSTR status update procedure are added.TGbe editor to make the changes with the CID tag 12326 in doc 11-22/1418r1 |
| 13394 | Liwen Chu | 35.3.16.2 | 453.24 | The Management frame should be clearly mentioned/definded. | Fix the issues mentioned in the comment | RevisedThe Management frame is designed base on EML Operating Mode Notification frame (the name is updated to ML Operating Mode Notification frame accordingly). Both frame format and the NSTR status update procedure are added.TGbe editor to make the changes with the CID tag 12326 in doc 11-22/1418r1 |
| 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. | RevisedThe Management frame is designed base on EML Operating Mode Notification frame (the name is updated to ML Operating Mode Notification frame accordingly). Both frame format and the NSTR status update procedure are added.TGbe editor to make the changes with the CID tag 12326 in doc 11-22/1418r1 |
| 13925 | Ming Gan | 35.3.16.2 | 453.24 | Please specify the corresponding management frame | please complete the missing description for management frame | RevisedThe Management frame is designed base on EML Operating Mode Notification frame (the name is updated to ML Operating Mode Notification frame accordingly). Both frame format and the NSTR status update procedure are added.TGbe editor to make the changes with the CID tag 12326 in doc 11-22/1418r1 |
| 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. | RevisedThe Management frame is designed base on EML Operating Mode Notification frame (the name is updated to ML Operating Mode Notification frame accordingly). Both frame format and the NSTR status update procedure are added.TGbe editor to make the changes with the CID tag 12326 in doc 11-22/1418r1 |
| 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 | RevisedThe Management frame is designed base on EML Operating Mode Notification frame (the name is updated to ML Operating Mode Notification frame accordingly). Both frame format and the NSTR status update procedure are added.TGbe editor to make the changes with the CID tag 12326 in doc 11-22/1418r1 |
| 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).***

Discussion:

There are two different opinions on the frame format design

Opt 1: reuse EML Operating Mode Notification frame

Opt 2: define a new Action frame

1. **Proposed spec text**

***TGbe editor: Modify the 9.4.2.312.2.2 (Common Info field of the Basic Multi-Link element) as follows:***

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 B3 | B4 | B5 B6 | B7 B11 | B12 | B13 | B14 B17 | B18B23 |
|  | Maximum Number Of Simultaneous Links | SRS Support | TID-To-Link Mapping Negotiation Supported | Frequency Separation For STR/AP MLD Type Indication | AAR Support | NSTR Status Update Support | NSTR Status Update Timeout(#12326) | Reserved |
| Bits | 4 | 1 | 2 | 5 | 1 | 1 | 4 | 6 |

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

**Table 9-401i—Subfields of the MLD Capabilities and Operations field**

|  |  |  |
| --- | --- | --- |
| **Subfield** | **Definition** | **Encoding** |
| … | … | … |
| AAR Support | An AP MLD indicates support for receiving a frame with an AAR Con-trol subfield | If the +HTC-HE Support sub-field is 1:Set to 1 if the AP MLD supports the AAR Control subfield functionality.Set to 0 otherwise.Reserved for non-AP MLD or if the +HTC-HE Support subfield is 0.See 35.3.16.8.3 (AP assisted medium synchro-nization recovery procedure). |
| 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) |
| NSTR Status Update Timeout | An AP MLD indicates NSTR status update timeout value | See table 9-401j |

When the NSTR Status Update Timeout subfield is included in a frame sent by an AP affiliated with an AP MLD, the Transition Timeout subfield is set as defined in Table 9-401j (Encoding of the NSTR Status Update Timeout subfield) if the NSTR Status Update Support subfield is set to 1. If the NSTR Status Update Support subfield is set to 0 or when the NSTR Status Update Timeout subfield is included in a frame sent by a non-AP STA affiliated with a non-AP MLD, the NSTR Status Update Timeout subfield is reserved. (#12326)

**Table 9-401j—Encoding of the** NSTR Status Update Timeout subfield(#12326)

|  |  |
| --- | --- |
| NSTR Status Update Timeout subfield value | NSTR status update timeout |
| ***0*** | ***0 us*** |
| ***1*** | ***128 us*** |
| ***2*** | ***256 us*** |
| ***3*** | ***512 us*** |
| ***4*** | ***1 TU*** |
| ***5*** | ***2 TUs*** |
| ***6*** | ***4 TUs*** |
| ***7*** | ***8 TUs*** |
| ***8*** | ***16 TUs*** |
| ***9*** | ***32 TUs*** |
| ***10*** | ***64 TUs*** |
| ***11*** | ***128 TUs*** |
| ***12-15*** | ***Reserved*** |

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

**9.4.312.4 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 B8 B9 B10 B11 B15

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Link ID | Complete Profile | MACAddress Present | Delete Timer Present | Reconfiguration Operation Type | NSTR Link Pair Present | NSTR Bitmap Size | Reserved |

Bits: 4 1 1 1 2 1 1 5

**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 or the link which is indicated for addition or deletion to the existing multi-link setup of a non-AP MLD.

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 Reconfiguration Operation Type subfield is set to indicate the type of multi-link reconfiguration operation in the ML Reconfiguration Request frame for the link indicated by the Link ID subfield as per Table 9-401j.

Table 9-401j – Reconfiguration Operation Type

|  |  |
| --- | --- |
| **Value** | **Name** |
| 0 | NSTR Status Update |
| 1 – 3 | Reserved |

The NSTR Link Pair Present subfield is set to 1 if an NSTR Indication Bitmap is included in the STA Info field, otherwise this subfield is set to 0. The NSTR Bitmap Size subfield is set to indicate the size of the NSTR Indication Bitmap in the STA Info field as defined for the Basic Multi-Link element in 9.4.2.312.2.4 (Link Info field of the Basic Multi-Link element).

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 1 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.

The NSTR Indication Bitmap subfield indicates updates to NSTR link pairs for the non-AP MLD associated with the link(s) to be added. 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:***

**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 | Link Reconfiguration Notification (#12326) | No |
| 9 | Link Reconfiguration Confirmation (#12326) | No |
| 10-255 | Reserved |  |

***TGbe editor: add 9.6.35.10 (Link Reconfiguration Notification frame format) as follows:***

**9.6.35.10 Link Reconfiguration Notification frame format** (#12326)

The Link Reconfiguration Notification 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 Link Reconfiguration Notification frame contains the information shown in Table 9-623l (NSTR Capability Update frame Action field values).

**Table 9-623l—Link Reconfiguration Notification 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, definded in 9.4.2.312.4 (Reconfigration Multi-Link element), includes an NSTR Indication Bitmap subfield(s) 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 (Link Reconfiguration Confirmation frame format) as follows:***

**9.6.35.10 Link Reconfiguration Confirmation frame format** (#12326)

The Link Reconfiguration Confirmation 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 Link Reconfiguration Notification frame is receved. The Action field of a Link Reconfiguration Confirmation frame contains the information shown in Table 9-623J (Link Reconfiguration Confirmation frame Action field values).

**Table 9-623J—Link Reconfiguration Confirmation frame Action field values**

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

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.

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

**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 ssetup links may change after multi-link setup. The non-AP MLD may transmit a Link Reconfiguration Notification frame 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 about a change in the ability to perform STR operation using the NSTR Indication Bitmap subfield(s) of the included Reconfiguration Multi-Link element. (#12326)

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 Link Reconfiguration Notification frame with Reconfiguration Operation 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.

NOTE 2—The ability might change due to an AP switching BSS operating channels of one or more of the setup links with the non-AP MLD.

In the Reconfiguration Multi-Link element of a Link Reconfiguration Notification frame with Reconfiguration Operation 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 Basic Multi-Link element except the Link ID, NSTR Link Pair Present, and NSTR Bitmap Size subfields shall be set to 0.

After successful transmission of the Link Reconfiguration Notification frame with Reconfiguration Operation Type subfield equals to 0 from the non-AP STA affiliated with the non-AP MLD to an AP affiliated with an AP MLD, the non-AP STA and the AP initialize the NSTR status update timeout timer with the NSTR Status Update Timeout subfield value in the MLD Capabilities and operation subfield of the Basic Multi-Link element received from the AP. The NSTR status update timeout timer begins counting down from the end of the PPDU containing the immediate response to the Link Reconfiguration Notification frame. The AP should send a Link Reconfiguration Confirmation frame to the non-AP STA with the Token field set to the same values as the Token field in the received Link Reconfiguration Notification frame from the non-AP STA before the NSTR status update timeout expires.

The AP MLD shall update the NSTR status of link pairs of its associated non-AP MLD and exchange frames with the non-AP MLD 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)) immediately after receiving an acknowledgement to the transmitted Link Reconfiguration Confirmation frame with Reconfiguration Operation Type subfield equals to 0 to the non-AP MLD or immediately after the expiry of the NSTR status update timeout timer, whichever comes first. If the NSTR status of some link pairs are not included in the NSTR Status Update frame, the AP MLD does not update the NSTR status of these link pairs. (#12326)

***End of change***