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 11-22/1418r0 |
| 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 11-22/1418r0 |
| 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 11-22/1418r0 |
| 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 11-22/1418r0 |
| 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 11-22/1418r0 |
| 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 11-22/1418r0 |
| 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*** |

------------------------------------------------ Start of Opt 1---------------------------------------------------------------------------------

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

**Table 9-623c—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  | ML Operating Mode Notification(#12326) | No |
| 7 | Link Recommendation | No |
| 8-255 |  |  |

***TGbe editor: modify 9.6.35.8 (EML Operating Mode Notification frame details) as follows:***

**9.6.35.8 ML Operating Mode Notification frame details**

The ML Operating Mode Notification frame is used to indicate that a non-AP MLD with which the transmitting STA is affiliated is changing its EML operation, or updating its NSTR status. (#12326)

The Action field of the ML Operating Mode Notification frame contains the information shown in Table 9-623j (Protected ML Operating Mode Notification frame Action field format).

**Table 9-623j—Protected ML Operating Mode Notification frame Action field format**

|  |  |
| --- | --- |
| **Order** | **Information** |
| 1 | Category |
| 2 | Protected EHT Action |
| 3 | Dialog Token |
| 4 | EML Control (see 9.4.1.74(EML Control field)) |
| 5 | Basic Multi-Link element (#12326) |

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

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

The Dialog Token field is set by a non-AP MLD to a nonzero value and is set by an AP MLD to the value copied from the corresponding received ML Operating Mode Notification frame.

The Basic Multi-Link element, definded in 9.4.2.312.2 (Basic Multi-Link element), includes an NSTR Indication Bitmap subfield(s) to report the NSTR capabilities of the reporting non-AP MLD. (#12326)

***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 an ML Operating Mode Notification frame on any enabled linkto 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 Basic 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 an ML Operating Mode Notification frame.

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 Basic Multi-Link element of an ML Operating Mode Notification frame sent by a non-AP MLD, all subfields in the Presence Bitmap subfield of the Multi-Link Control field in the Basic 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. When the Basic Multi-Link element is present in an ML Operating Mode Notification frame, the EML Control field is reserved.

After successful transmission of the ML Operating Mode Notification frame 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 ML Operating Mode Notification frame. The AP should send an ML Operating Mode Notification frame to the non-AP STA with EML Control field and the Basic Multi-Link element set to the same values as the EML Control and the Basic Multi-Link element in the received ML Operating Mode Notification frame from the non-AP STA before the NSTR status update timeout expires.

The AP MLD shall update the NSTR capability status 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 ML Operating Mode Notification frame 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 ML Operating Mode Notification frame, the AP MLD does not update the NSTR status of these link pairs. (#12326)

***TGbe editor: replace “EML Operating Mode Notification frame” with “ML Operating Mode Notification frame” through the IEEE 802.11be\_D2.2.***

***TGbe editor: Insert below paragraph in 35.3.17 (Enhanced multi-link single radio operation) .***

When a non-AP STA affiliated with a non-AP MLD enables or disables EMLSR mode by transmitting an ML Operating Mode Notification frame, the Basic Multi-Link element shall not present. When an AP affilicated with an AP MLD sends an ML Operating Mode Notification frame for confirming the EMLSR mode switch, the Basic Multi-Link element shall not present.

***TGbe editor: Insert below paragraph in 35.3.18 (Enhanced multi-link multi-radio operation) .***

When a non-AP STA affiliated with a non-AP MLD enables or disables EMLMR mode by transmitting an ML Operating Mode Notification frame, the Basic Multi-Link element shall not present. When an AP affilicated with an AP MLD sends an ML Operating Mode Notification frame for confirming the EMLMR mode switch, the Basic Multi-Link element shall not present.

------------------------------------------------ End of Opt 1---------------------------------------------------------------------------------

------------------------------------------------ Start of Opt 2---------------------------------------------------------------------------------

Opt 2:

***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 | NSTR Capability Update (#12326) | No |
| 9-255 |  |  |

***TGbe editor: add 9.6.35.10 (NSTR Capability Update frame format) as follows:***

**9.6.35.10 NSTR Status Update frame format** (#12326)

The NSTR Status Update 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 status of the NSTR capabilities of the non-AP MLD. The Action field of an NSTR Status Update frame contains the information shown in Table 9-623l (NSTR Capability Update frame Action field values).

**Table 9-623l—NSTR Status Update frame Action field values**

|  |  |
| --- | --- |
| Value | Meaning |
| 1 | Category |
| 2 | Protected EHT Action |
| 3 | Dialog Token |
| 4 | Basic 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 Basic Multi-Link element, definded in 9.4.2.312.2 (Basic Multi-Link element), includes an NSTR Indication Bitmap subfield(s) to report the NSTR status of the reporting non-AP MLD.

***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 an NSTR Status Update frame on any enabled linkto 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 Basic 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 NSTR Status Update frame.

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 Basic Multi-Link element of a NSTR Status Update frame sent by a non-AP MLD, all subfields in the Presence Bitmap subfield of the Multi-Link Control field in the Basic 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 NSTR Status Update frame 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 NSTR Status Update frame. The AP should send a NSTR Status Update frame to the non-AP STA with the Basic Multi-Link element set to the same values as the Basic Multi-Link element in the received NSTR Status Update frame from the non-AP STA before the NSTR status update timeout expires.

The AP MLD shall update the NSTR capability status 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 NSTR Status Update frame 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 Opt 2---------------------------------------------------------------------------------

***End of change***