IEEE P802.11
Wireless LANs

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| LB275 CR for CID 19876 NSTR Operation |
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Abstract

This submission proposes resolutions of comments received from TGbe comment collection LB275 based on TGbe D4.0.

19876 (1 CID)

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Added discussion and editorial changes.
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.

***Editing instructions formatted like this are intended to be copied into the TGbe Draft (i.e. they are instructions to the 802.11be 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.***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **Clause** | **Page** | **Comment** | **Proposed Change** | **Resolution** |
| 19876 | 35.3.16.4 | 556.01 | non-AP MLD may be awake on both links of an NSTR link pair when it is receiving on one link, even though the AP MLD may not send a PPDU on the other link. This is not good for STA power save. | Allow a non-AP MLD to inform the AP MLD that when the non-AP MLD is communivating on one link, the STA on another link of an NSTR link pair will in power save status, so the AP MLD will not send PPDU on the another link to this non-AP MLD. | Revised-Agree with the comment in principle. An indication for power save on the other NSTR link is added.Apply the changes marked as #19876 in this document. |

**Discussion:**

For the two links in a NSTR link pair, the case where one link is transimitting when the other link is receiving is prohibited. The links have to do PPDU end time alignment as per 35.3.16.5 (PPDU end time alignment on an NSTR link pair). The following figure is a brief illustration.



This limitation obviously adds complexity on the transmitter. As a result, an MLD may choose not to transmit on both links in practice. Generally, there are multiple reasons why an MLD does not use both links:

1. One link is sufficient to deliver traffic, especially in low-rate scenarios;
2. To reduce complexity.

As per the current draft standard, the receiver does not know whether the transmitter is going to use both links or not. The receiver has to stay awake/active during the receiption on the other link, although the transmitter does not send anything on the link during the time. (As shown in the following figure.)



The proposed change is to allow the link not being used to transition from awake state to doze state automatically and let both the transmitter and the receiver be aware of that transition. The main purpose is to save power at the non-AP MLD side (and the AP side if it wants to).



**Proposed spec text**

***TGbe editor: Please insert the following paragraphs at the end of subclause 35.3.16.4 (Nonsimultaneous transmit and receive (NSTR) operation): (#19876)***

An AP that is affiliated with an AP MLD shall set the NSTR Power Save subfield in the MLD Capabilities And Operations subfield in a frame that it transmits to 1 if its dot11NSTRPowerSaveImplemented is true. Otherwise, the AP shall set the NSTR Power Save subfield to 0.

A non-AP MLD may notify the updated NSTR power save mode to its associated AP MLD, from which the NSTR Power Save subfield in the MLD Capabilities And Operations subfield set to 1 is received by transmitting an NSTR Power Save Request frame through one of its enabled links. Otherwise, the non-AP MLD shall not send an NSTR Power Save Request frame.

An AP affiliated with an AP MLD shall not transmit an NSTR Power Save Request frame.

An AP MLD that reveived an NSTR Power Save Request frame shall respond with an NSTR Power Save Response frame. The Status Code subfield of the NSTR Power Save Response frame shall be set to 0 (SUCCESS).

The non-AP MLD shall not update its NSTR power save mode indicated in NSTR Power Save Control field of the corresponding NSTR Power Save Request frame until the NSTR Power Save Response frame is reveived.

An AP MLD with the NSTR Power Save subfield in the MLD Capabilities And Operations subfield equal to 1 shall not simultaneously perform frame exchanges with an associated non-AP MLD in NSTR power save mode on any NSTR link pair that belongs to that non-AP MLD. When an AP affiliated with the AP MLD initiates frame exchanges with a non-AP STA affiliated with the non-AP MLD in NSTR power save mode on one link of an NSTR link pair for the non-AP MLD, the non-AP STA affiliated with the same non-AP MLD on another link of that NSTR link pair, if it is in awake state, may enter doze state and shall be in awake state at the end of frame exchange sequence as described in 35.3.18 (Enhanced multi-link multi-radio operation).

***TGbe editor: Please make the following changes in subclause 9.4.2.312.2.3 (Common Info field of the Basic Multi-Link element): (#19876)***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B0 B3 | B4 | B5 B6 | B7 B11 |
|  | Maximum Number of Simultaneous Links | SRS Support | TID-To-Link Mapping Negotiation Supported | Frequency Separation For STR/AP MLD Type Indication |
| Bits: | 4 | 1 | 2 | 5 |
|  |  |  |  |  |
|  | B12 | B13 | B14 | B15 |
|  | AAR Support | Link Reconfiguration Operation Support | Aligned TWT Support | NSTR Power Save |
| Bits: | 1 | 1 | 1 | 1 |

**Figure 9-1001k—MLD Capabilities And Operations subfield format**

**Table 9-404j—Subfields of the MLD Capabilities And Operations subfield**

|  |  |  |
| --- | --- | --- |
| **Subfield** | **Definition** | **Encoding** |
| **…** |  |  |
| Aligned TWT Support | Indicates support for an alignement or nonalignment of the TWTs across more than one link | For an MLD:Set to 1 to indicate that an MLD with which the STA is affiliated is capable of receiving a TWT setup frame that requests an alignment or nonalignment of the TWTs acress more than one link. Set to 0 otherwise. |
| NSTR Power Save | An AP MLD indicates support for NSTR power save mode on NSTR link pairs that belong to the associated non-AP MLDs. | For AP MLD:Set to 1 if the AP MLD supports NSTR power save mode.Set to 0 otherwise.Reserved for a non-AP MLD.See 35.3.16.4 (Nonsimultaneous transmit and receive (NSTR) operation). |
| NOTE—Indicating support for TTLM negotiation by setting the TID-To-Link Mapping Negotiation Support subfield to a nonzero value also indicates support for negotiations applicable to all smaller values. Also see 35.3.7.2.1 (General) for rules related to performing ML (re)setup with an AP MLD that has the subfield set to a nonzero value. |

***TGbe editor: Please make the following changes in subclause 9.6.35.1 (Protected EHT Action field): (#19876)***

**Table 9-628c—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 Enable Teardown | No |
| 6 | EML Operating Mode Notification | No |
| 7 | Link Recommendation | No |
| 8 | Multi-Link Operation Update Request | No |
| 9 | Multi-Link Operation Update Response | No |
| 10 | Link Reconfiguration Notify | No |
| 11 | Link Reconfiguration Request | No |
| 12 | Link Reconfiguration Response | No |
| 13 | NSTR Power Save Request | No |
| 14 | NSTR Power Save Response | No |
| 15-255 |  |  |

***TGbe editor: Please insert following subclauses after subclause 9.6.35.14 (Link Reconfiguration Response frame format): (#19876)***

**9.6.35.15 NSTR Power Save Request frame format**

The NSTR Power Save Request frame is sent by a non-AP STA affiliated with a non-AP MLD to request to update its NSTR Power Save mode specified in the NSTR Power Save Control field. The Action field of the NSTR Power Save Request frame contains the information shown in Table 9-628q (NSTR Power Save Request frame Action field format).

**Table 9-628q—NSTR Power Save Request frame Action field format**

|  |  |
| --- | --- |
| **Order** | **Information** |
| 1 | Category |
| 2 | Protected EHT Action |
| 3 | Dialog Token |
| 4 | NSTR Power Save Control (see 9.4.1.77(NSTR Power Save Control field)) |

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 defined in 9.4.1.12 (Dialog Token field) and set by the requesting MLD.

NSTR Power Save Control field is defined in 9.4.1.73 (NSTR Power Save Control field) to indicate the updated status of NSTR power save mode.

**9.6.35.16 NSTR Power Save Response frame format**

The NSTR Power Save Response frame is sent by an AP affiliated with an AP MLD in response to a NSTR Power Save Request frame to accept the request of NSTR power save status update in the NSTR Power Save Request frame. The Action field of the NSTR Power Save Response frame contains the information shown in Table 9-628r (NSTR Power Save Response frame Action field format).

**Table 9-628r—NSTR Power Save Response frame Action field format**

|  |  |
| --- | --- |
| **Order** | **Information** |
| 1 | Category |
| 2 | Protected EHT Action |
| 3 | Dialog Token |
| 4 | Status Code |

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 value is copied from the Dialog Token field in the corresponding NSTR Power Save Request frame.

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

***TGbe editor: Please insert following subclause after subclause 9.4.1.72 (EMLSR Parameter Update field): (#19876)***

**9.4.1.73 NSTR Power Save Control field**

The NSTR Power Save field is defined in Figure 9-189g (NSTR Power Save Control field format).

|  |  |  |
| --- | --- | --- |
|  | B0 | B1 B7 |
|  | NSTR Power Save Mode | Reserved |
| Bits: | 1 | 7 |

**Figure 9-189g—NSTR Power Save Control field format**

A non-AP MLD sets the NSTR Power Save Mode subfield to 1 to indicate that the NSTR power save mode is enabled for the non-AP MLD and to 0 to indicate that the NSTR power save mode is disabled for the non-AP MLD.