IEEE P802.11
Wireless LANs

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| Resolution for comments related to NSTR-EMLSR handling with TDLS |
| Date: September 10, 2022 |
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 Abstract

This submission proposes resolutions for the following 12 comments received for TGbe LB266:

10058 13081 ~~10059~~ ~~11656~~ 10060 11657 13083 13083 10061 13084 10367 11158 10660 13635

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Updated based on feedback from Rojan, Tomo and Stephane
* Rev 2: CIDs 10059 and 11656 are deferred based on offline discussion w/ Morteza

***TGbe editor: Please note baseline is REVme D1.4 and 11be D2.1.1***

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. This introduction is 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 802.11 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.***

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| **CID** | **Commenter** | **Section** | **Pg/Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 10058 | Morteza Mehrnoush | 35.3.21.2 | 471.12 | The current spec text for the TDLS operation only works when all the links of the non-AP MLD has STR link relation, however when the links of non-AP MLD have NSTR link relation (lets say L1 and L2 are NSTR link pair), the peer STA of non-AP MLD may initiate PPDU over L1 and AP of AP MLD may initiate PPDU over L2, and the end time of the PPDUs are not aligned, so the response frame by the non-AP MLD may corrupts either of the PPDUs. A mechanism to prevent such a self interference among NSTR link pair is needed. | as in comment | **Revised**Agree in principle. Baseline (REVme) provides a mechanism (see 9.4.2.85 & 11.21.15) for a STA to inform its associated AP the channel (and schedule) that it intends to use for a TDLS link. The proposed changes suggest that if a non-AP MLD has a TDLS link that forms an NSTR pair with at least one infra link, it must inform the AP via the Channel Usage procedure so that the AP MLD can take care that its transmissions do not overlap with the TDLS link. The non-AP MLD can also provide a schedule (preferred approach) to the AP MLD so that the AP MLD has a deterministic schedule of when the non-AP MLD is participating in the TDLS link and thus avoid any interference w/ the TDLS link. A non-AP MLD can inform the AP its availability (not active on TDLS link) by transmitting a frame to the AP MLD on the infra link that forms an nSTR pair with the TDLS link.**TGbe editor, please make changes as shown in 11-22/1586r2 tagged 10058** |
| 13081 | Chittabrata Ghosh | 35.3.21.2 | 471.12 | The current spec text for the TDLS operation only works when all the links of the non-AP MLD has STR link relation, however when the links of non-AP MLD have NSTR link relation (lets say L1 and L2 are NSTR link pair), the peer STA of non-AP MLD may initiate PPDU over L1 and AP of AP MLD may initiate PPDU over L2, and the end time of the PPDUs are not aligned, so the response frame by the non-AP MLD may corrupts either of the PPDUs. A mechanism to prevent such a self interference among NSTR link pair is needed. | as in comment | **The comment is a duplicate of CID 10058** |
| ~~10059~~ | ~~Morteza Mehrnoush~~ | ~~35.3.21.1~~ | ~~470.60~~ | ~~During the TDLS operation when the STA of the non-AP MLD with STR link pair is doing an off-channel switch, needs to make sure it swithes to a link which has STR link relation, otherwise the TDLS operation with NSTR link pair has extra limitations. Also when switching to off-channel the non-AP MLD (or non-MLD EHT STA) should be able to work with AFC system for 6GHz band channel selection or AP MLD (where the non-AP MLD is associated with) should do the channel selection for the non-AP MLD.~~ | ~~The off-channel selection mechanism for the TDLS operation is needed.~~ | **~~Revised~~**~~Agree in principle. As suggested by the comment, it is recommended that a non-AP MLD selects an off-channel that has sufficient separation for forming STR pair with existing infra link(s) with the AP. However, if such a channel is unavailable non-AP MLD must inform the AP MLD of the off-channel by following the procedures described in 11.21.15. Same resolution as 10058. In addition, see resolution for CID 12370 in doc 11-22/1422 for addressing the AFC when establishing off-channel on 6 GHz.~~**~~TGbe editor, please make changes as shown in 11-22/1586r2 tagged 10058 and changes shown in 11-22/1422r0 tagged 12370.~~** |
| ~~11656~~ | ~~Morteza Mehrnoush~~ | ~~35.3.21.1~~ | ~~470.60~~ | ~~During the TDLS operation when the STA of the non-AP MLD with STR link pair is doing an off-channel switch, needs to make sure it switches to a link which has STR link relation, otherwise the TDLS operation with NSTR link pair has extra limitations. Also when switching to off-channel the non-AP MLD (or non-MLD EHT STA) should be able to work with AFC system for 6GHz band channel selection or AP MLD (where the non-AP MLD is associated with) should do the channel selection for the non-AP MLD.~~ | ~~The off-channel selection mechanism for the TDLS operation is needed.~~ | **~~The comment is a duplicate of CID 10059~~** |
| 10060 | Morteza Mehrnoush | 35.3.21.1 | 470.60 | If non-AP MLD is operating in EMLSR mode, and one STA of non-AP MLD wants to extablish a TDLS link with another device, there will be some limitations. The other deivce could be legacy device or EHT device (MLD and non-MLD); if it's a legacy deivce, it cannot initiate frame exchange considering the EMLSR rules; if it's a EHT device, it needs some information from the non-AP MLD which is operating in EMLSR mode like padding delay, etc, to be able to do the TDLS operation when the non-AP MLD operates in EMLSR mode for some scenarios. | there is no description of TDLS procedure when non-AP MLD operates in EMLSR mode and one of the STAs establishes a TDLS direct with anohter device; please add text to propose a solution for this. | **Revised**Agree in principle. Same resolution as CID 10058**TGbe editor, please make changes as shown in 11-22/1586r2 tagged 10058** |
| 11657 | Morteza Mehrnoush | 35.3.21.1 | 470.60 | If non-AP MLD is operating in EMLSR mode, and one STA of non-AP MLD wants to establish a TDLS link with another device, there will be some limitations. The other device could be legacy device or EHT device (MLD and non-MLD); if it's a legacy device, it cannot initiate frame exchange considering the EMLSR rules; if it's a EHT device, it needs some information from the non-AP MLD which is operating in EMLSR mode like padding delay, etc, to be able to do the TDLS operation when the non-AP MLD operates in EMLSR mode for some scenarios. | there is no description of TDLS procedure when non-AP MLD operates in EMLSR mode and one of the STAs establishes a TDLS direct with another device; please add text to propose a solution for this. | **The comment is a duplicate of CID 10060** |
| 13083 | Chittabrata Ghosh | 35.3.21.1 | 470.60 | If non-AP MLD is operating in EMLSR mode, and one STA of non-AP MLD wants to extablish a TDLS link with another device, there will be some limitations. The other deivce could be legacy device or EHT device (MLD and non-MLD); if it's a legacy deivce, it cannot initiate frame exchange considering the EMLSR rules; if it's a EHT device, it needs some information from the non-AP MLD which is operating in EMLSR mode like padding delay, etc, to be able to do the TDLS operation when the non-AP MLD operates in EMLSR mode for some scenarios. | there is no description of TDLS procedure when non-AP MLD operates in EMLSR mode and one of the STAs establishes a TDLS direct with anohter device; please add text to propose a solution for this. | **The comment is a duplicate of CID 10060** |
| 13083 | Chittabrata Ghosh | 35.3.21.1 | 470.60 | If non-AP MLD is operating in EMLSR mode, and one STA of non-AP MLD wants to extablish a TDLS link with another device, there will be some limitations. The other deivce could be legacy device or EHT device (MLD and non-MLD); if it's a legacy deivce, it cannot initiate frame exchange considering the EMLSR rules; if it's a EHT device, it needs some information from the non-AP MLD which is operating in EMLSR mode like padding delay, etc, to be able to do the TDLS operation when the non-AP MLD operates in EMLSR mode for some scenarios. | there is no description of TDLS procedure when non-AP MLD operates in EMLSR mode and one of the STAs establishes a TDLS direct with anohter device; please add text to propose a solution for this. | **The comment is a duplicate of CID 10060** |
| 10061 | Morteza Mehrnoush | 35.3.21.1 | 470.60 | There is no text in spec to explain the TDLS power save procedure for the non-AP MLD which establishes TDLS direct link over a single link. The description of the procedure and solution to potential issues for the non-AP MLD operating in NSTR/EMLSR/EMLMR modes needs to be discussed. | as in comment | **Revised**Baseline provides a mechanism for TDLS power-save (see 11.2.3.12 (TDLS peer power save mode)). Regarding the NSTR/EMLSR/EMLMR handling, same resolution as CID 10058**TGbe editor, please make changes as shown in 11-22/1586r2 tagged 10058** |
| 13084 | Chittabrata Ghosh | 35.3.21.1 | 470.60 | There is no text in spec to explain the TDLS power save procedure for the non-AP MLD which establishes TDLS direct link over a single link. The description of the procedure and solution to potential issues for the non-AP MLD operating in NSTR/EMLSR/EMLMR modes needs to be discussed. | as in comment | **The comment is a duplicate of CID 10061** |
| 10367 | Tomoko Adachi | 35.3.21 | 0.00 | When an AP MLD having an NSTR link pair with a non-AP MLD and the non-AP MLD starts direct link communication in one of the NSTR link pair with a peer STA, as the non-AP MLD cannot receive frames on the other link, the AP MLD needs to be aware of which link is used for direct link communication in order to select the proper link where the non-AP MLD can receive frames from the AP MLD. | "Add a mechanism or constraints to solve the problem. | **Revised**Agree in principle. Same resolution as CID 10058**TGbe editor, please make changes as shown in 11-22/1586r2 tagged 10058** |
| 11158 | Boon Loong Ng | 35.3.21 | 470.55 | TDLS operation with a non-AP MLD can be impacted by NSTR constraints of the non-AP MLD or peer non-AP MLD hosting that TDLS peer STA. | A procedure to handle the TDLS operation with MLD under NSTR constraints needs be described in the spec. | **Revised**Agree in principle. Same resolution as CID 10058**TGbe editor, please make changes as shown in 11-22/1586r2 tagged 10058** |
| 10660 | Abhishek Patil | 35.3.21 | 470.57 | Baseline spec provides Channel Usage feature to enable an AP/non-AP coordinate the channel to use for p2p operation so that it doesn't interfere with infra-BSS operation. TGbe spec should explore utilizing and if needed expanding this feature for p2p operation when at least one of the link between the AP and non-AP MLD is an nSTR link. | As in comment | **Revised**Agree in principle. Same resolution as CID 10058**TGbe editor, please make changes as shown in 11-22/1586r2 tagged 10058** |
| 13635 | Rubayet Shafin | 35.3.21.2 | 471.09 | Whenever, there is a peer-to-peer link (e.g. TDLS link) between any pair of STAs affiliated with a pair of non-AP MLDs over one link, and if any of the non-AP MLDs is not STR capable over any of the links, the other NSTR link(s) become essentially ineffective. Consider the following scenario that illustrates this situation--Assume that MLD\_S and MLD\_R are two non-AP MLDs and MLD\_A is an AP MLD. STA1 and STA2 are two non-AP STAs affiliated with the non-AP MLD, MLD\_S; STA3 and STA4 are two non-AP STAs affiliated with non-AP MLD, MLD\_R; and AP1 and AP2 are two APs affiliated with AP MLD, MLD\_A. Two links have been set up between MLD\_S and MLD\_A--- one between STA1 and AP1 over Link 1, and the other between STA2 and AP2 over Link 2. Moreover, two links have been set up between MLD\_R and MLD\_A--- one between STA3 and AP1 over Link 1, and the other between STA4 and AP2 over Link 2. STA3 and STA4, operating on Link 1 and Link 2, respectively, form an NSTR link pair. Now, a TDLS link has been established between STA1 and STA3. When STA3 is communicating to STA1 over the TDLS direct link, AP MLD, MLD\_A, usually is not aware of the communication over the TDLS link. MLD\_A is aware of MLD\_R' s NSTR capability; so without the TDLS link as long as STA3 is not transmitting to AP1 over Link 1, AP2 can perform downlink transmission to STA4 over Link 2. However, over the TDLS direct link, if STA3 is transmitting to STA1, then STA4 would not be able to receive packets from AP2 over Link2. | Spec needs to provide solution/guideline for handling NSTR issue when one or more non-AP STAs, affiliated with a non-AP MLD and forming NSTR link pair(s), establish TDLS direct link with one or more non-AP STAs affiliated with another non-AP MLD. | **Revised**Agree in principle. Same resolution as CID 10058**TGbe editor, please make changes as shown in 11-22/1586r2 tagged 10058** |

**35.3.21.1 General**

***TGbe editor: Please add the following paragraphs and NOTEs at the end of this subclause as shown below:***

[10058]If a non-AP MLD has established a TDLS direct link that forms an NSTR pair with at least one link with its associated AP MLD, then the non-AP MLD shall inform the AP of the channel used by the TDLS direct link by transmitting a Channel Usage element (see 9.4.2.85 (Channel Usage element)) and following the procedure described in 11.21.15 (Channel usage procedures). The Channel Usage Request frame may include one or more TWT elements to provide a schedule (if established) of the times when non-AP MLD is participating on the TDLS link.

An AP MLD that has received Channel Usage frame from an associated non-AP MLD shall use the channel information to determine if any of its link with the non-AP MLD form an NSTR pair with the TDLS link. If the Channel Usage Request frame provides a schedule (i.e., TWT SPs) of activity on TDLS link, the AP MLD shall use this information for making scheduling decisions so that its transmissions to the non-AP MLD do not interfere with the TDLS link that forms an NSTR pair. If scheduling information is not available, the AP MLD should apply schemes such as preceding its DL, with an initiating frame such as an RTS frame, on the link that forms an NSTR pair with the TDLS link.

NOTE 1 – An AP MLD can use the value in the Frequency Separation For STR subfield in the MLD Capabilities field in the Basic Multi-Link element (see Table 9-401j (Subfields of the MLD Capabilities and Operations field)) received from the non-AP MLD during (Re)Association to determine if any of its setup link with the non-AP MLD forms an NSTR link pair with the non-AP MLD’s TDLS link

NOTE 2 – A STA affiliated with the non-AP MLD that is operating on a link that forms NSTR pair with the TDLS link can indicate inactivity or nonparticipation on the TDLS link by transmitting a QoS Data frame or QoS Null frame to its associated AP (as described in 11.21.15 (Channel usage procedures)).