IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| LB275 Remaining CIDs on TWT | | | | |
| Date: Sept 10th, 2023 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | Email |
| Rubayet Shafin | Samsung Research America | 6625 Excellence Way., Plano, TX, 75023 |  | [r.shafin@samsung.com](mailto:r.shafin@samsung.com) |
| Boon Loong Ng |  |  |
| Peshal Nayak |  |  |
| Vishnu Ratnam |  |  |
| Yue Qi |  |  |
| Elliot Jen |  |  |
| Pascal Viger | Canon |  |  |
| Alfred Asterjadhi | Qualcomm |  |  |  |

Abstract

This submission proposes resolutions for the following 12 comments received for TGbe LB275:

* 13 CIDs: 19027, 20114, 20115, 19982, 19983, 19984, 19976, 19977, 19114, 19193, 20108, 20109, 20110

SP: Do you agree to the resolutions provided in doc 11-23/1553r6 for the following CIDs for inclusion in the latest 11be draft?

19027, 20114, 20115, 19982, 19983, 19984, 19976, 19977, 19114, 19193, 20108, 20109, 20110

Revisions:

* Rev 0:
  + Initial version.
  + Rebased on D4.0.
  + Thanks to members who provided feedback on improving the text in the previous round: Abhi, Kaiying, Insun
* Rev 1:
  + Added a note to clarify that any transmission on the nonprimary link shall still follow the rules in the NSTR mobile AP MLD clause. Thanks, Gaurang.
* Rev 2:
  + Changed the name of the element from “B-TWT Information” to “TWT Information Extension”. Added a note to clarify the operation. Thanks, Abhi.
* Rev 3:
  + Added a Capabilities bit to indicate support of the TDLS B-TWT operation.
* Rev 4:
  + Added CID 20115 to the list
* Rev 5:
  + Element ID Extension field is added to Figure 9-xx6. Thanks, Yongho.
* Rev 6:
  + Added a discussion part.

***TGbe editor: Please note Baseline is 11be D4.1***

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.

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Part-1: TWT with TDLS\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Pg/Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 19027 | 614.35 | The broadcast TWT setup is performed between a requesting STA and the AP. In case of P2P communication during a SP between the requesting STA and its peer STA, it is not clear how this peer STA is enrolled in the bTWT agreement. Indeed, if the peer STA is not informed about the TWT agreement, the peer STA could be in doze state and not be able to receive the data from the requesting STA. | The standard shall propose a mean to inform a P2P communication receiver STA that it will be involved as a receiver during a bTWT SP : Broadcast TWT ID can be provided to that purpose. A mechanism is proposed in doc 11-23-1125-05 to communicate over a direct link during broadcast TWT SPs and to make sure that the peer STA is also aware of this bTWT schedule . The motion was not run on this document during last round, please run it. | **Revised**  Agree in principle. A mechanism is needed to communicate over a direct link during broadcast TWT SPs and make sure that the peer STA is also aware of this bTWT schedule so that it makes itself available during the SPs. Necessary text is included.  **TGbe editor, please make change as shown in this doc 11-23/1553r6 tagged by #19027.** |
| 20114 | 580.22 | When a STA becomes a member of a broadcast TWT schedule, if the STA has P2P link with another peer STA, then there needs to be harmonization between the broadcast TWT operation with the AP and the P2P operation. A procedure to enable such harmonization needs to be provided in the spec. | as in comment. | **Revised**  Agree in principle. A mechanism is needed to better harmonize the operation between two peer STAs when either of the STAs has a broadcast TWT schedule with the AP and make sure that the peer STA is also aware of this bTWT schedule so that it makes itself available during the SPs. Necessary text is included.  **TGbe editor, please make change as shown in this doc 11-23/1553r6 tagged by #19027.** |
| 20115 | 580.22 | When a STA affiliated with an MLD has established a broadcast TWT schedule with an AP affiliated with an AP MLD, and the if the STA has established a TDLS direct link with another peer STA, then the TDLS peer STA needs to be aware of the exsitence of the broadcast TWT schedule. Otherwise, it may miss the P2P frame reception. | as in comment. | **Revised**  Agree in principle. A mechanism is needed to communicate over a direct link during broadcast TWT SPs and make sure that the peer STA is also aware of this bTWT schedule so that it makes itself available during the SPs. Necessary text is included.  **TGbe editor, please make change as shown in this doc 11-23/1553r6 tagged by #19027.** |
| 19982 | 575.09 | Restricted TWT would be an important feature for TDLS communication. However, the use of Broadcast TWT schedule, which is the basis of restricted TWT operation, by two TDLS peers STAs for communication over the TDLS direct link is not defined for TDLS operation (though individual TWT agreement can be established for the TDLS direct link by the amendmends made in 11ax). | Please provide text to enable the utilization of broadcast/restricted TWT schedule by two TDLS peer STAs. | **Revised**  Agree in principle. A mechanism is needed to communicate over a direct link during broadcast TWT SPs and make sure that the peer STA is also aware of this bTWT schedule so that it makes itself available during the SPs. Necessary text is included.  **TGbe editor, please make change as shown in this doc 11-23/1553r6 tagged by #19027.** |
| 19983 | 611.35 | The use of Broadcast TWT schedule, which is the basis of restricted TWT operation, by two TDLS peers STAs for communication over the TDLS direct link is not defined for TDLS operation. | Plese add text address the issue described in the comment. | **Revised**  Agree in principle. A mechanism is needed to communicate over a direct link during broadcast TWT SPs and make sure that the peer STA is also aware of this bTWT schedule so that it makes itself available during the SPs. Necessary text is included.  **TGbe editor, please make change as shown in this doc 11-23/1553r6 tagged by #19027.** |
| 19984 | 580.22 | Two non-AP MLDs can establish a TDLS link between them. However, how broadcast TWT operation can take place between the two peer TDLS non-AP MLDs is not clear and the corresponding procedure should be added in the spec. | as in comment. | **Revised**  Agree in principle. A mechanism is needed to communicate over a direct link during broadcast TWT SPs and make sure that the peer STA is also aware of this bTWT schedule so that it makes itself available during the SPs. Necessary text is included.  **TGbe editor, please make change as shown in this doc 11-23/1553r6 tagged by #19027.** |
| 19976 | 580.20 | No guidance is provided in the spec on how to enable Triggered TXOP sharing for P2P communication during a broadcast TWT SP of an broadcast TWT scheduled STA. Such procedure would be essential so that the STA can utilize the TXOP during the broadcast TWT SP to coordinate with its peer STA for P2P communication. | Include a mechanism to enable triggered P2P communication during broadcast TWT. | **Revised**  Agree in principle. A peer-STA harmonization mechanism is added to enable TXOP sharing for P2P during a broadcast TWT schedule.  **TGbe editor, please make change as shown in this doc 11-23/1553r6 tagged by #19027.** |
| 19977 | 575.09 | The procedure to enable Triggered TXOP sharing for a TDLS peer STA where the TDLS peer STA is operating in broadcas TWT is currently missing and needs to be provided. | Include a mechanism to enable triggered TDLS communication during broadcast TWT. | **Revised**  Agree in principle. A peer-STA harmonization mechanism is added to enable TXOP sharing for P2P during a broadcast TWT schedule.  **TGbe editor, please make change as shown in this doc 11-23/1553r6 tagged by #19027.** |

**Discussion:**

When one of the peer STAs (say STA1) establishes a B-TWT/R-TWT with the AP, the STA (STA1) may also want to deliver its P2P traffic to another STA (say STA2) within the corresponding B-TWT/R-TWT SP. However, STA2 may not be a member of the same B-TWT/R-TWT schedule, and may not be aware of the arrangement between the AP and STA1. Therefore, STA2 may not be in Awake state during that B-TWT/R-TWT SP, which can be an issue. Moreover, this can also lead to missed TXOP as some of the comments pointed out—if the B-TWT/R-TWT is trigger-enabled, the AP can send to STA1 an MU-RTS TXS (Mode-2) for its P2P, but STA2 is not aware of STA1’s expectation to receive the P2P frames.

**Question: “**Why not STA1 and STA2 just establish a P2P schedule with any existing P2P PSM tool with the “Matching” parameters with that of the B-TWT/R-TWT schedule that STA1 has with the AP?”

**Answer:** First of all, “matching” the parameters of two entirely different PS mechanisms (e.g. B-TWT vs TDLS peer PSM) is not easy since they don’t have the same set of parameter fields and units (the scales are also different). Second is the maintenance issue. B-TWT/R-TWT is schedule is maintained by the AP; the schedule parameters can change with time. Whenever, AP makes changes to that schedule, the peer STA has to make corresponding changes with the P2P PS schedule, which is quite troublesome from implementation point of view.

xxxxxxxxxxxx END OF DISCUSSION PART xxxxxxxxxxxxxxxx

***XXXX***

***TGbe editor: Please insert the following subclause under clause 9.4.2 (Elements):***

**9.4.2.xx3 TWT Information Extension element**

The TWT Information Extension element contains information related to a TWT schedule. The element is defined in Figure 9-xx6



Figure 9-xx6: TWT Information Extension element format

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1 (General).

The format of the Control field is shown in Figure 9-xx7-A



Figure 9-xx7-A: Control field format

The B-TWT Info Present subfield indicates the presence of the B-TWT Info field in the TWT Information Extension element. The B-TWT Info field is present if the subfield is set to 1; otherwise, it is not present.

The format of the B-TWT Info field in the TWT Information Extension element is shown in Figure 9-xx7-B (B-TWT Info field format)



Figure 9-xx7-B: B-TWT Info field format

The Broadcast TWT ID subfield in the B-TWT Info field identifies a broadcast TWT schedule advertised by the AP.

***TGbe editor: Please append a new row to the Table 9-128 (Element IDs) as follows:***

**Table 9-128—Element IDs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Element** | **Element ID** | **Element ID Extension** | **Extensible** | **Fragmentable** |
| : | : | : | : | : |
| TWT Information Extension (see 9.4.2.xx3 (TWT Information Extension element)) | 255 | 136 | Yes | No |

***TGbe editor: Please append the below two rows in Table 9-498 (TDLS Action field values) as follows:***

|  |  |
| --- | --- |
| * TDLS Action field values | |
| Action field value | Meaning |
| : | : |
| 11 | TDLS Broadcast TWT Request |
| 12 | TDLS Broadcast TWT Response |
| 13–255 | Reserved |

***TGbe editor: Please insert the following subclause (9.6.12.xx1 TDLS Broadcast TWT Request Action field format) including the Table (Table 9-xx2—Information for TDLS Broadcast TWT Request Action field) under clause 9.6.12 (TDLS Action field formats)*:**

**9.6.12.xx1 TDLS Broadcast TWT Request Action field format**

The TDLS Broadcast TWT Request Action field contains information shown in Table 9-xx2 (Information for TDLS Broadcast TWT Request Action field).

|  |  |  |
| --- | --- | --- |
| Table 9-xx2: Information for TDLS Broadcast TWT Request Action field | | |
| Order | Information | Notes |
| 1 | Category | The Category field is defined in 9.4.1.11 (Action field) |
| 2 | TDLS Action | The TDLS Action field is defined in 9.6.12.1 (TDLS Action field). |
| 3 | Dialog Token | The Dialog Token field contains a value that is unique among TDLS Broadcast TWT Request Action fields for which a corresponding TDLS Broadcast TWT Response Action field has not been received. The dialog token is specified in 9.4.1.12 (Dialog Token field). |
| 4 | Link Identifier | The Link Identifier element is specified in 9.4.2.60 (Link Identifier element). |
| 5 | TWT Information Extension | The TWT Information Extension element is specified in 9.4.2.xx3 (TWT Extension Information element). |

***TGbe editor: Please insert the following subclause (9.6.12.xx4 TDLS Broadcast TWT Response Action field format) including the Table (Table 9-xx5—Information for TDLS Broadcast TWT Response Action field) under clause 9.6.12 (TDLS Action field formats)*:**

**9.6.12.xx4 TDLS Broadcast TWT Response Action field format**

The TDLS Broadcast TWT Response Action field contains information shown in Table 9-xx5 (Information for TDLS Broadcast TWT Response Action field).

|  |  |  |
| --- | --- | --- |
| Table 9-xx5: Information for TDLS Broadcast TWT Response Action field | | |
| Order | Information | Notes |
| 1 | Category | The Category field is defined in 9.4.1.11 (Action field) |
| 2 | TDLS Action | The TDLS Action field is defined in 9.6.12.1 (TDLS Action field). |
| 3 | Dialog Token | The Dialog Token field is set to a value contained in the corresponding TDLS Broadcast TWT Request Action field. The dialog token is specified in 9.4.1.12 (Dialog Token field). |
| 4 | Status Code | The Status Code is specified in 9.4.1.9 (Status Code field) |
| 5 | Link Identifier | The Link Identifier element is specified in 9.4.2.60 (Link Identifier element). |
| 6 | TWT Information Extension | The TWT Information Extension element is specified in 9.4.2.xx3 (TWT Information Extension element). |

***TGbe editor: Please add a new row to Table 9-190 (Extended Capabilities field) as follows***

**Table 9-190—Extended Capabilities field *(continued)***

|  |  |  |
| --- | --- | --- |
| **Bit** | **Information** | **Notes** |
| … |  |  |
| <ANA> | TDLS Broadcast TWT Support | The STA sets the TDLS Broadcast TWT Support field to 1 when the STA sets the Broadcast TWT Support field in the HE Capabilities element it transmits to 1 and the STA supports TDLS operation with broadcast TWT as specified in 35.3.21.1 (General). |

***TGbe editor: Please insert the following paragraph under subclause 35.3.21.1 (General)***

If a TDLS peer STA that is a member of a broadcast TWT schedule intends to transmit frames to another TDLS peer STA over a TDLS direct link during the TWT SP corresponding to the broadcast TWT schedule, then the TDLS peer STA may send a TDLS Broadcast TWT Request frame to the other TDLS peer STA if both of the TDLS peer STAs set the TDLS Broadcast TWT Support field in the Extended Capabilities element they transmit to 1, where the broadcast TWT schedule is identified by the Broadcast TWT ID subfield in the TWT Information Extension element in the TDLS Broadcast TWT Request frame. If the other TDLS peer STA, upon reception of the TDLS Broadcast TWT Request frame, responds by transmitting a TDLS Broadcast TWT Response frame with the status code SUCCESS, then the other TDLS peer STA is expected to be in the Awake state during the TWT SPs corresponding to the broadcast TWT schedule. In the TDLS Broadcast TWT Response frame, the Broadcast TWT ID subfield value in the TWT Information Extension element shall be the same as that in TDLS Broadcast TWT Request frame.

NOTE-1: Before obtaining membership to a broadcast TWT schedule for TDLS operation (see 35.3.21.1), the TWT scheduled STA needs to ensure that the TDLS peer STA is be available during the TWT SPs corresponding to that broadcast TWT schedule.

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* *End of Part-1*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Part-2: TWT with NSTR mobile AP MLD\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CID** | **Pg/Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 19114 | 580.20 | When NSTR mobile AP MLD announces a Broadcast TWT schedule, it should be informed using the primary link. | As in the comment. | **Revised**  Agree in principle. Since there is no beaconing in the nonprimary link of an NSTR mobile AP MLD, the advertisement of any broadcast TWT schedule needs to be made through the primary link’s AP.  **TGbe editor, please make change as shown in this doc 11-23/1553r6 tagged by #20108.** |
| 19193 | 580.20 | When NSTR mobile AP MLD announces a Broadcast TWT schedule, it should be informed using the primary link. | As in the comment. | **Revised**  Agree in principle. Since there is no beaconing in the nonprimary link of an NSTR mobile AP MLD, the advertisement of any broadcast TWT schedule needs to be made through the primary link’s AP.  **TGbe editor, please make change as shown in this doc 11-23/1553r6 tagged by #20108.** |
| 20108 | 580.22 | How would an AP MLD manage a broadcast TWT on the non-primary link of an AP MLD needs to be clarified in the spec since there is no beaconing on the nonprimary link. | as in comment. | **Revised**  Agree in principle. Since there is no beaconing in the nonprimary link of an NSTR mobile AP MLD, the advertisement of any broadcast TWT schedule needs to be made through the primary link’s AP.  **TGbe editor, please make change as shown in this doc 11-23/1553r6 tagged by #20108.** |
| 20109 | 611.35 | Restricted TWT operation procedure for NSTR Mobile AP MLD needs to be clarified in the specification. | as in comment. | **Revised**  Agree in principle. Since there is no beaconing in the nonprimary link of an NSTR mobile AP MLD, the advertisement of any broadcast TWT schedule needs to be made through the primary link’s AP.  **TGbe editor, please make change as shown in this doc 11-23/1553r6 tagged by #20108.** |
| 20110 | 611.35 | How would an AP MLD manage and advertise an R-TWT schedule on the non-primary link of an AP MLD needs to be clarified in the spec since there is no beaconing on the nonprimary link. | as in comment. | **Revised**  Agree in principle. Since there is no beaconing in the nonprimary link of an NSTR mobile AP MLD, the advertisement of any broadcast TWT schedule needs to be made through the primary link’s AP.  **TGbe editor, please make change as shown in this doc 11-23/1553r6 tagged by #20108.** |

***TGbe editor: Please add the following paragraph as the new last paragraph in clause 35.3.24.3 (Broadcast TWT operation) (#20108)***

(#20108)An AP affiliated with an NSTR mobile AP MLD and operating on the primary link may advertise a broadcast TWT schedule for the other AP affiliated with the same NSTR mobile AP MLD and operating on the nonprimary link by including the TWT element containing the corresponding Broadcast TWT Parameter Set field in the STA Profile field of the Per-STA Profile subelement of the Basic Multi-link element corresponding to the AP operating on the nonprimary link carried in the Beacon frames and Probe Response frame that it transmits on the primary link. The value in the Broadcast TWT Persistence subfield corresponding to the broadcast TWT schedule shall be in reference to the most recent TBTT and BI indicated by the AP operating on the primary link.

***TGbe editor: Please revise the first paragraph of clause 35.3.4.4 (Multi-Link element usage in the context of discovery) as follows (#20108)***

If an AP affiliated with an AP MLD is not in a multiple BSSID set or the AP corresponds to a transmitted BSSID in a multiple BSSID set, then the AP, in a Beacon frame and a Probe Response frame that is not a multi-link probe response that it transmits,

— shall include the Multi-Link Control field and the Common Info field of the Basic Multi-Link element for the AP MLD as defined in 9.4.2.312.2 (Basic Multi-Link element)

— shall not include the Link Info field of the Basic Multi-Link element for the AP MLD unless conditions in 35.3.11 (Multi-link procedures for (extended) channel switching and channel quieting) are satisfied

— shall not include the Link Info field of the Basic Multi-Link element for the AP MLD unless the AP is affiliated with an NSTR mobile AP MLD and operating on the primary link, and advertises a broadcast TWT schedule for the other AP affiliated with the same NSTR mobile AP MLD and operating on the nonprimary link, in which case the Link Info field only includes a Broadcast TWT element for that AP operating on the nonprimary channel. (#20108)

— may include a Reconfiguration Multi-Link element as defined in 9.4.2.312.4 (Reconfiguration Multi-Link element) and 35.3.6 (ML reconfiguration).

NOTE 1— Any transmission on the nonprimary link of an NSTR mobile AP MLD follows the rules specified in 35.3.19 (NSTR mobile AP MLD operation).

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* *End of Part-2* \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***