IEEE P802.11
Wireless LANs

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| Resolution for CIDs on Broadcast TWT for MLD (CC36) |
| Date: February 11th, 2022 |
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 Abstract

This submission proposes resolutions for following 1 comment received for TGbe CC36:

* 1 CID: 6879

SP: Do you agree to the resolutions provided in doc 11-22/0254r0 for the following CIDs for inclusion in the latest 11be draft?

6879

Revisions:

* Rev 0: Initial version of the document.

***TGbe editor: Please note Baseline is 11be D1.4***

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.

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| **CID** | **Commenter** | **Clause** | **Pg/Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 6879 | Rubayet Shafin | 35.6 | 297.57 | 11be includes multi-link operation. However, how restricted TWT will operate on multi-link devices (MLDs) is not clear. In general, mechanism for Broadcast TWT for MLDs need to be defined. | Commenter will present a contribution on this. | **Revised.**Agree in principle. Necessary text on broadcast TWT operation for MLD is included.**TGbe editor, please make change as shown in this doc 11-22/xxxr0 tagged by #6879.** |

**Discussion:**

Text related to broadcast TWT for multi-link operation is currently missing in the spec and needs to be added. In general, an AP affiliated with an AP MLD and an STA affiliated with a non-AP MLD should be able to negotiate a broadcast TWT schedule over one link between the AP MLD and the non-AP MLD on behalf of multiple links between the same AP MLD and the non-AP MLD. We need the necessary signalling to enable this for broadcast TWT (the procedure for individual TWT has been added in Draft 1.1). The following example can be helpful in illustrating this process and the outcome we strive to realize in this document:



Figure D-1: Example of Broadcast TWT schedule negotiation over a single link for multiple links

In the example of Figure D-1, an AP MLD has three affiliated APs: AP 1 operates on 2.4 GHz band, AP 2 operates on 5 GHz band, and AP 3 operates on 6 GHz band. A non-AP MLD has three affiliated STAs: STA 1 operates on 2.4 GHz band, STA 2 operates on 5 GHz band, and STA 3 operates on 6 GHz band. Three links are set up and enabled between the AP MLD and the non-AP MLD: Link 1 between AP 1 and STA 1; Link 2 between AP 2 and STA 2; Link 3 between AP 3 and STA 3. The AP MLD advertises a broadcast TWT schedules, namely Schedule A, over all three links. Non-AP STA 1 affiliated with the non-AP MLD sends a broadcast TWT element to AP 1 affiliated with the AP MLD. The broadcast TWT element contains a Broadcast TWT Parameter Set field corresponding to Schedule A. Also, the Broadcast TWT Parameter Set field sent by non-AP STA 1 indicates (*note--this signalling needs to be defined*) the three links, Link 1, Link 2, and Link 3, and sets the TWT Setup Command field as Request TWT. Upon receiving the TWT element, AP 1 sends a TWT element to non-AP STA 1 and includes the Broadcast TWT Parameter Set field corresponding to Schedule A. AP 1, in this Broadcast TWT Parameter Set field, also indicates the same three links, Link 1, Link 2, and Link 3, and sets the TWT Setup Command field as Accept TWT. After the successful broadcast TWT negotiation, Schedule A is established over all the three links: Link 1, Link 2, and Link 3.

**9. Frame formats**

**9.4.2.199 TWT element**

***TGbe editor: Please* Change Figure 9-766 (Broadcast TWT Parameter Set field format) as follows:**



**Figure 9-766: Broadcast TWT Parameter Set field format (#6879)**

***TGbe editor: Please* add the following paragraph and Figure 9-xxx (Broadcast TWT Enhanced Info subfield format) after the paragraph (The Restricted TWT DL TID Bitmap and Restricted TWT UL TID Bitmap subfields specify which…..):**

The Broadcast TWT Enhanced Info subfield, if present, specifies additional information about the broadcast TWT schedule. The format of the Broadcast TWT Enhanced Info subfield is shown in Figure 9-xxx (Broadcast TWT Enhanced Info subfield format).



**Figure 9-xxx: Broadcast TWT Enhanced Info subfield format (#6879)**

***TGbe editor: Please* add the following paragraph after the paragraph after Figure 9-xxx (Broadcast TWT Enhanced Info subfield format):**

The Broadcast TWT Link ID Bitmap subfield specifies a bitmap indicating the links between an AP MLD and a non-AP MLD for which the corresponding broadcast TWT schedule is being negotiated. A value of 1 in the $k$-th bit position in the Broadcast TWT Link ID Bitmap subfield indicates that the negotiation for the TWT schedule applies for the $k$-th link between the AP MLD and non-AP MLD. A value set to 0 in the $k$-th bit position in the Broadcast TWT Link ID Bitmap subfield indicates that the negotiation for the TWT schedule does not apply for the $k$-th link between the AP MLD and non-AP MLD (#6879).

***TGbe editor: Please* Change Figure 9-768 (Request Type field format in Broadcast TWT Parameter Set field) as follows:**

 

**Figure 9-768:** **Request Type field format in Broadcast TWT Parameter Set field (#6879)**

***TGbe editor: Please* add the following paragraph after the paragraph (In a TWT element transmitted by a TWT requesting or TWT scheduled STA, the TWT Wake Interval is equal to…..):**

The Broadcast TWT Enhanced Info Present subfield indicates whether or not a Broadcast TWT Enhanced Info subfield is present in the corresponding Broadcast TWT Parameter Set field. The Broadcast TWT Enhanced Info Present subfield is set to 1 if Broadcast TWT Enhanced Info subfield is present in the corresponding Broadcast TWT Parameter Set field; otherwise, it is set to 0. This subfield is set to 0 when the corresponding Broadcast TWT Parameter Set field is carried in a TWT element with Negotiation Type subfield set to 2 (#6879).

**35.7 TWT operation**

***TGbe editor: Please add the following subsection 35.7.3 (Broadcast TWT operation) under clause 35.7***

**35.7.3 Broadcast TWT operation (#6879)**

A TWT scheduling AP affiliated with an AP MLD and a TWT scheduled STA affiliated with a non-AP MLD, for negotiating membership of a broadcast TWT schedule, shall follow the rules defined in 26.8.3.1 (General), 26.8.3.2 (Rules for TWT scheduling AP), and 26.8.3.3 (Rules for TWT scheduled STA) except the following:

* The TWT scheduled STA affiliated with the non-AP MLD or the TWT scheduling AP affiliated with the AP MLD, while negotiating for a broadcast TWT schedule, may indicate the link(s) between the AP MLD and the non-AP MLD for which the negotiation is being conducted. The TWT scheduled STA or the TWT scheduling AP transmitting the TWT element may make the link indication in the Broadcast TWT Link ID Bitmap subfield in the Broadcast TWT Parameter Set field corresponding to the broadcast TWT schedule.
	+ If one or more links are indicated in the Broadcast TWT Link ID Bitmap subfield in the Broadcast TWT Parameter Set field transmitted by the TWT scheduled STA affiliated with the non-AP MLD or the TWT scheduling AP affiliated with the AP MLD, the corresponding broadcast TWT schedule is negotiated on behalf of the STAs affiliated with the same MLD and operating on the indicated links between the AP MLD and the non-AP MLD. The Target Wake Time field in the Broadcast TWT Parameter Set field shall be in reference to the TSF time of the respective links that are indicated in the Broadcast TWT Link ID Bitmap.
* A TWT scheduling AP affiliated with an AP MLD that receives a TWT element with Broadcast TWT Link ID Bitmap subfield in a Broadcast TWT Parameter Set field from a TWT scheduled STA affiliated with a non-AP MLD may respond by including a Broadcast TWT Link ID Bitmap subfield that indicates the same or different sets of links as that of received Broadcast TWT Link ID Bitmap if the TWT Setup Command field in the Request Type field in the corresponding Broadcast TWT Parameter Set field in the response frame is set to Alternate TWT or Dictate TWT. The TWT scheduling AP shall respond with a Broadcast TWT Link ID Bitmap that indicates the same set of links as that indicated in the received Broadcast TWT Parameter Set field if the TWT Setup Command field in the Request Type field in the corresponding Broadcast TWT Parameter Set field in the response frame is set to Accept TWT or Reject TWT.

For a broadcast TWT element, if at least one Broadcast TWT Parameter Set field in the broadcast TWT element contains a Broadcast TWT Link ID Bitmap subfield, then the Link ID Bitmap Present subfield in the Control field of the broadcast TWT element is set to 1; otherwise, the Link ID Bitmap Present subfield is set to 0.

***TGbe editor: Please add the following subsection 35.8.6 (Restricted TWT with multi-link operation) under clause 35.8***

**35.8 Restricted TWT (r-TWT)**

**35.8.6 Restricted TWT with multi-link operation (#6879)**

An r-TWT scheduling AP or an r-TWT scheduled STA, in the context of multi-link operation, shall follow the rules defined in 35.7.3 (Broadcast TWT operation) with additional rules described in this section.

For restricted TWT operation between an AP MLD and a non-AP MLD, the AP MLD or the non-AP MLD should not transmit a TWT element over any of the links between them that sets the $k$-th bit in the Restricted TWT DL TID Bitmap subfield or Restricted TWT UL TID Bitmap subfield, if present, to 1 if the TID $k$ is not mapped, through TID-to-Link mapping, on the desired link for which the restricted TWT schedule is being negotiated. Moreover, the AP MLD or the non-AP MLD should not transmit a TWT element over any of the links between them that sets the DL TID Bitmap Valid subfield or UL TID Bitmap Valid subfield, if present, to 1 if any of the TIDs is not mapped on the desired link (#6879).