**IEEE P802.11
Wireless LANs**

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| CC36 CR for Restricted TWT Setup |
| **Date**: July 22, 2021 |
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 **Abstract**

This submission proposes resolutions for following CIDs received for TGbe (CC36):

4778, 6408, 4781, 6413, 4782, 4432, 4589, 5882, 5883, 5884, 5885, 4123, 5729

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Added discussion section, updated baseline from P802.11beD1.01 to P802.11beD1.1, added resolution to CIDs 4432, 4589, 5882, 5883, 5884, 5885, 4123, 5729
* Rev 2: Editorial revision based on feedback.

***TGbe Editor: Please note, the baseline for this document is P802.11be D1.1***

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 TGaxbe 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** | **Pg/Ln** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| 4432 | Arik Klein | 298.32 | 35.6.2.1 | The sentence "If there is any restricted TWT agreement set up, the EHT AP shall announce the restricted TWT service period schedule information..." assumes that restricted TWT agreement has been set up. However, the setup procedure of restricted TWT agreement is not explained either in section 35.6.2 or in section 35.6.3. | Please add description of the Restricted TWT agreement setup procedure. | **Revised**The text already introduced in P802.11beD1.1 SC 35.7.2 (based on 21/462r9) explains the restricted TWT setup procedure. Please also note that SC 35.6 on Restricted TWT in 11beD1.0 is now SC 35.7 in 11beD1.1.  **Note to the Editor:**No further changes are required for the resolution of this CID in this document. Changes are already reflected in P802.11beD1.1. |
| 4778 | Chunyu Hu | 298.23 | 35.6.2 | rTWT can build in support for a peer-to-peer link so the latency sensitive traffic over the peer-to-peer link can also enjoy any applicable benefit of rTWT (e.g. channel access, txop sharing), regardless how the peer-to-peer link sets up some service periods for latency sensitive traffic (softAP/STA, TDLS or other p2p protocol out of 802.11 scope). The current rTWT is lack of such support. | Please add support of rTWT for p2p. For example, dcn 11-21/462r5 defines the <peer-to-peer> field in Fig. 9-689a for the peer-to-peer latency sensitive traffic tx/rx SP to be aware at AP. (The authors removed this field as there wasn't enough time to discuss.)There might be some details or other aspects (in addition to the setup procedure) to make the rTWT support of P2P to work. Please add. | **Revised**Agreed with the commenter on support for p2p. Peer-to-Peer bit is added to Broadcast TWT Info subfield and other relevant changes are made.**TGbe editor, please make change as shown in this doc 11-21/1224 tagged by 4778.** |
| 4781 | Chunyu Hu | 298.58 | 35.6 | Both the TWT request and response setup frames have DL/UL TID indications (in the restricted TWT traffic info field). What is the expected values in response frames? Are the indicated TIDs per request as notification and/or they can be negotiable? Current text (per 11-21/462r9) is not clear about it. Need to add text in 35.7 (Restricted TWT agreement setup) per 11-21/462r9 and any other necessary place to clarify. | As in comment. | **Revised**Agreed with the commenter that there is need to describe the expected values in response frames. Text is revised to add rules regarding DL/UL TID indications in response frames in rTWT setup negotiations.**TGbe editor, please make change as shown in this doc 11-21/1224 tagged by 4781.** |
| 4782 | Chunyu Hu | 298.23 | 35.6.2 | In the draft text brought in by 11-21/462r9, the third paragraph (When included in an individually addressed TWT Setup frame ...) describes the setting of the Restricted TWT Traffic Info Present field in individually addressed TWT Setup frame, but misses the setting in frames with Negotiation Type set to 2. 11-21/462r8 had the text but didn't get time for discussion and, the text was removed for progress. But we need to add text to address this. | As commented | **Revised**Added text to specify setting for frames with Negotiation Type 2.**TGbe editor, please make change as shown in this doc 11-21/1224 tagged by 6413.** |
| 6408 | Muhammad Kumail Haider | 126.18 | 9.4.2.199 | A PDT and motion(#2920) was passed to make changes to TWT element to accommodate restricted TWT schedule announcements and negotiations. However, the passed version of PDT and motion does not address how the TWT element can be used to signal r-TWT usage for peer-to-peer links of a STA. STAs should be able to use r-TWT operation to provide protection for latency sensitive traffic on their p2p links as well, as it aligns with 802.11be direction to expand support for low-latency traffic and p2p links. | Broadcast TWT parameter set field should have a field/subfield to indicate if the r-TWT schedule is also used by peer-to-peer traffic. | **Revised**Similar comment as 4778. Peer-to-Peer subfield is added to broadcast TWT element.**TGbe editor, please make change as shown in this doc 11-21/1224 tagged by 6408.** |
| 6413 | Muhammad Kumail Haider | 298.30 | 35.6.3 | A PDT and motion(#2920) was passed to make changes to TWT element to accommodate restricted TWT schedule announcements and negotiations. Part of proposed changes is to introduce a r-TWT traffic info field to indicate latency sensitive traffic TIDs. However, it is not specified whether TIDs are also within the scope of TWT setup negotiations. That is, TIDs are also negotiated as part of TWT setup. | TIDs included in TWT request frame should be treated as such (a request) and TWT negotiations (and Setup Commands) should apply to TWT parameters only, not TIDs to simplify the negotiation. | **Revised**Similar comment as 4781. Text is added to definerules regarding DL/UL TID indications in response frames in rTWT setup negotiations.**TGbe editor, please make change as shown in this doc 11-21/1224 tagged by 6413.** |
| 4589 | Bo Yang | 0.00 | 9.4.2.199 | Multiple non-AP STAs may have the same latency sensitive traffics. Consequently, EHT AP may allocate one rTWT SP to multiple STAs. In that case, the EHT AP has to send multiple unicast action frames, containing almost the same information, to those STAs. That is a waste. | To reduce signalling overhead, 11be should include STA ID information in rTWT variant of TWT parameter set field. So an EHT AP can allocate one rTWT SP to multiple STAs with one broadcast frame. | **Reject.** Broadcast TWT negotiations are done via individually addressed frames even though SPs may be shared and rTWT builds on the same signaling mechanism. The latency sensitive traffic requirements from STAs and hence rTWT requests may be different from different STAs. Moreover, rTWT negotiations may comprise multiple frames in both directions and those negotiations cannot be achieved with a single broadcast frame. The overhead with unicast frames is larger but is incurred only once. The overhead may be further reduced by using OFDMA/MU MIMO. |
| 5882 | Liangxiao Xin | 298.34 | 9.4.2.199 | Need extra parameter setting for R-TWT setup, whether there is quiet elment protection, whether R-TWT member STA is allowed to contend channel outside R-TWT SP. | suggest to use all the values of the broadcast TWT recommendation subfield 4~7 for restricted TWT. | **Reject.** Quiet element protection is decided by AP as per network policy and applied to entire restricted SP which may be shared by multiple STAs, and is not negotiated per STA. Quiet intervals are also announced in separate IE. Whether STA is allowed to contend outside r-TWT SP will be addressed by PS rules for rTWT. |
| 5883 | Liangxiao Xin | 298.34 | 9.4.2.199 | When a non-AP STA requests a membership of R-TWT, it should indicate which SCSs whose traffic will be scheduled to transmit during the SPs of that R-TWT. | add a new field called "All SCS" in Figure 9-689a Broadcast TWT Info subfield format. When it is set to "1", it indicates that the traffic of all the existing SCSs are scheudled to be transmitted during the corresponding R-TWT SPs. If it is set to "0", then the TWT membership exchange frame should indicate which SCSs whose traffic will be transmsitted during the R-TWT SP. | **Reject.** If TIDs of corresponding SCSIDs are included in r-TWT traffic info field, those traffic streams are latency sensitive and can be scheduled during corresponding r-TWT SPs. We do not need to specify All SCS; it is implied. Further, the text already introduced in P802.11beD1.1 SC 9.4.2.199 (based on 21/462r9) specifies that TIDs in r-TWT traffic info field identify latency sensitive traffic, and all SCS mapping to the indicated TID can be transmitted during the corresponding r-TWT SP. An SCS negotiation is only optional for r-TWT operation. |
| 5884 | Liangxiao Xin | 298.34 | 9.4.2.199 | A TID number could be shared by latency sensitive traffic and regular traffic. Therefore, TID is not enough to differentiate latency sensitive traffic from regular traffic. | When the Restricted TWT Traffic Info Present field is set to "1" in Figure 9-689a--Broadcast TWT Info subfield format, the SCS information is better than TID bitmap to indicate the traffic of the latency sensitive traffic. | **Reject.** Similar comment as 5883 above. The group has already passed motion and text is incorporated to P802.11be/D1.1 SC 9.4.2.199 that latency sensitive traffic is identified based on TIDs. Agree that the same TID could be shared between regular and latency sensitive traffic. However, operating at TID level is e.g., consistent with BA operation where further resolution can create HOF blocking issue. |
| 5885 | Liangxiao Xin | 298.34 | 9.4.2.199 | Since broadcast TWT and restricted TWT use the same signaling, the TWT scheduling AP should not allocate a same TWT ID to a broadcast TWT and a restricted TWT. A legacy STA can regard a restricted TWT as a special broadcast TWT. | same as in the comment | **Revised.**The text already introduced in P802.11beD1.1 SC 9.4.2.199 (based on 21/462r9) specifies signaling for r-TWT using b-TWT as baseline and specifies bTWT/rTWT parameter sets share the same Broadcast TWT ID field in bTWT Info subfield and as such the IDs are drawn from the same pool and are not reassigned. **Note to the Editor:**No further changes are required for the resolution of this CID in this document. Changes are already reflected in P802.11beD1.1. |
| 4123 | Akira Kishida | 298.01 | 35.6.4.2 | If dot11RestrictedTWTOptionImplemented set to true and the value of restricted TWT service period set to 0, it seems that restricted TWT may not be operated but normal Broadcast TWT will be operated. | If dot11RestrictedTWTOptionImplemented is set to true, the range of the value of the restricted TWT service period should be set to more than 1. | **Reject**There is no difference between bTWT and rTWT in terms of setting the SP duration, and rTWT follows baseline spec on Nominal Minimum TWT Wake Duration. Agreed that 0 SP duration is not very meaningful, but we think that discussion could be had in REVme for bTWT behavior in general if there is interest within the group. |
| 5729 | KENGO NAGATA | 298.01 | 35.6.4.2 | If dot11RestrictedTWTOptionImplemented set to true and the value of restricted TWT service period set to 0, it seems that restricted TWT may not be operated but normal Broadcast TWT will be operated. | If dot11RestrictedTWTOptionImplemented is set to true, the range of the value of the restricted TWT service period should be set to more than 1. | **Reject**Same comment as 4123 above. |

**Discussion:**

1. A couple of CIDs relate to clarification of whether TIDs indicated in UL/DL TID Bitmaps in the Traffic Info field during restricted TWT setup negotiations are negotiable. We propose that the TIDs indicated in the TWT Request frame are treated as such, a request, and hence the TWT Response frame shall carry the same TIDs with an appropriate TWT Setup Command, based on whether AP can accept the request or suggest an alternate or reject. However, if either UL and/or DL TIDs are not specified in the Request frame, those could be included in the Response frame.
2. A related issue is what should be the response if a TWT Request frame indicates TIDs which are not mapped to the corresponding link (in context of TID-to-Link mapping). An EHT STA should not include such TIDs in the TWT Request in the first place. However, if such a request is made, based on above point, we propose that the AP send a TWT Response frame with Reject TWT and indicate the same TIDs as in the Request frame. This simplifies the setup negotiation.
3. Another issue is whether it should be required to indicate some latency sensitive TIDs corresponding to a restricted TWT agreement. We propose that such indication should be required, to limit usage of restricted TWT operation for latency sensitive traffic only. As such, we propose that if a restricted TWT agreement is setup, the final Response frame with Accept TWT command, which establishes the agreement, shall have both UL and DL TID Bitmaps valid, and some TIDs should be specified. Note that there is still the option to indicate all TIDs as latency sensitive, but some indication must be included. Further, we add an exception for the case when rTWT SP is used for p2p traffic.

**9. Frame formats**

**9.4.2.199. TWT element**

***TGbe editor: change Figure 9-689a (Broadcast TWT Info subfield format) of P802.11be D1.1 as follows:***

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| --- | --- | --- | --- | --- | --- |
|  | B0 | B1 | B2~~0~~        B2 | B3         B7 | B8                B15 |
|  | Restricted TWT Traffic Info Present | Peer-to-Peer | Reserved | Broadcast TWT ID | Broadcast TWT Persistence |
| Bits:  | 1 | 1 | ~~2~~1 | 5 | 8 |
| * **Broadcast TWT Info subfield format**
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***TGbe editor: insert the following paragraph after paragraph 1 at Page 145 of P802.11be D1.1 (A Restricted TWT Traffic Info…) as follows:***

The Peer-to-Peer subfield, when included in a Restricted TWT Parameter Set field transmitted by a restricted TWT scheduling AP, is set to 1 to indicate that the AP allows the restricted TWT scheduled STA to transmit or receive latency sensitive traffic for its peer-to-peer link(s) during the restricted TWT SPs of this schedule; and set to 0 otherwise. [CID 4778, 6408]

The Peer-to-Peer subfield, when included in a Restricted TWT Parameter Set field transmitted by a restricted TWT scheduled STA, is set to 1 to indicate that the STA intends to transmit or receive latency sensitive traffic over its peer-to-peer link(s) as part of latency sensitive traffic to be delivered in the corresponding restricted TWT SPs; and set to 0 otherwise. [CID 4778, 6408]

The Peer-to-Peer subfield, when included in a Broadcast TWT Parameter Set field which is not a Restricted TWT Parameter Set field, is reserved. [CID 4778, 6408]

**35.7. Restricted TWT**

**35.7.2.2. The setup procedure**

***TGbe editor: insert the following paragraphs after paragraph 5 at Page 345 of P802.11be D1.1 (When included in an individually addressed…) as follows:***

If the Negotiation Type subfield of a broadcast TWT element is set to 2, the Restricted TWT Parameter Set field, if included, shall have the Restricted TWT Traffic Info Present subfield set to 0, and shall not include the Restricted TWT Traffic Info field accordingly. [CID 4782]

If the TWT Setup Command field of a restricted TWT element included in a TWT Response frame indicates Accept TWT, both the DL TID Bitmap Valid and the UL TID Bitmap Valid bits of included restricted TWT parameter set(s) shall be set to 1, except when the Peer-to-Peer subfield in the Broadcast TWT Info subfield is set to 1, in which case the respective bitmap valid bits may be set to 1. [CID 4781]

If the DL TID Bitmap Valid bit in the Traffic Info Control subfield of TWT element in a TWT Request frame is set to 1, the ﻿Restricted TWT DL TID Bitmap of the TWT Response frame shall be the same as that of TWT Request frame. Similarly, if the UL TID Bitmap Valid bit in the Traffic Info Control subfield of TWT element in a TWT Request frame is set to 1, the ﻿Restricted TWT UL TID Bitmap of the TWT Response frame shall be the same as that of TWT Request frame. If the AP receives a TWT Request frame with a TID specified either in UL and/or DL which is not mapped to the link on which the TWT agreement is requested to be established, the AP shall send a TWT Response frame with Reject TWT with the same TID bitmaps as the Request frame. [CID 4781, 6413]