IEEE P802.11
Wireless LANs

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| Restricted TWT Spec Text - Restricted TWT SP Protection |
| Date: 2022-02-04 |
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Abstract

This submission proposes resolutions for the following CIDs for TGbe CC36:

6544,6548,6744,7338

Revisions:

* Rev 0: Initial version of the document
* Rev 1: Remove some CIDs not directly related and cosmetics adjustment.
* Rev 2 (Green): Amend proposed text considering comments got during the presentation and offline discussions
* Rev 3 (blue): Remove sentence related to a particular NAV management for rTWT scheduled STAs.

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.***

***TGbe editor: The baseline for this document is 11be D1.2.***

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| **CID** | **Commenter** | **Clause** | **Pg/Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 6544 | Patrice NEZOU | 35.6.4.2 | 298/49 | An EHT AP with dot11RestrictedTWTOptionImplemented set to true may schedule a quiet interval that overlaps with a restricted TWT service period. Each such service interval, referred to as an overlapping quiet interval in this subclause, if scheduled, shall have a duration of 1 TU, and shall start at the same time as the corresponding restricted TWT service period.Comment: Usage of quiet element is not sufficient to ensure an accurate starting time of the service period because the support of the quiet element is not mandatory for all STAs. | Additional mechanism is required. | Revised – Agree in principle.Current document provides a NAV protection in advance to the rTWT SP, so that the AP ensures correct rTWT starting time.TGbe editor to make the changes shown in 11-21/1718r3 under all headings that include CID 6544. |
| 6744 | Rojan Chitrakar | 35.6.4.2 | 298/51 | Why mandate the overlapping quiet interval to be 1 TU; if the intention is to disallow legacy STAs from transmitting during the rTWT SP, the quiet interval should cover the entire rTWT SP. | Allow the AP to indicate the duration of the quiet interval to cover the entire rTWT SP. | Revised – Agree in principle.Current document provides a NAV protection in advance to the rTWT SP, so that the AP ensures correct rTWT starting time.TGbe editor to make the changes shown in 11-21/1718r3 under all headings that include CID 6744. |
| 7338 | Stéphane BARON | 35.6.4.2 | 288/47 | Quieting all the legacy stations in the BSS, creates unfairness compared to EHT STAs, and requires additional mechanism to quiet OBSS STAs. Please propose a fair mechanism able to protect the rTWT from any kind of concurent transmissions (including OBSS ) | Commenter will provide a contribution based on NAV protection. | Revised – Agree in principle.Current document provides a NAV protection in advance to the rTWT SP, so that the AP ensures correct rTWT starting time.TGbe editor to make the changes shown in 11-21/1718r3 under all headings that include CID 7338. |

**Discussion on CIDs #6544, #6744, #7338: rTWT SP protection**

The rTWT SP is protected thanks to a dedicated quiet element with 1 TU length. Additionnaly a rule is defined in the subclause 35.7.4.1:

“A non-AP EHT STA with dot11RestrictedTWTOptionImplemented set to true as a TXOP holder shall ensure the TXOP ends before the start of any restricted TWT service periods if the TXOP is obtained outside of a restricted TWT service period. “

As mentioned by the CIDs #6544, #6744, #7338, additional rules are required to ensure the accuracy of the starting date of the restricted TWT, all STAs shall stop their current transmissions before the starting date of the TWT SP. The use of quiet element is a first answer but it is not sufficient against OBSS STAs. Moreover, as mentioned in the subclause 35.7.4.2, a non-AP EHT STAs may behave as if overlapping quiet intervals do not exist.

A stronger solution is the NAV protection. So, it is proposed to define a provision period just before the rTWT SP. When an EHT AP accesses the medium during a MaxProvisionTime (for instance 1 TXOPLimits) before the start of the rTWT SP, it reserves a TXOP time that encompasses the next rTWT SP.

Upon the reception of multiple comments concerning the length of the TXOP, I propose not to extend the TXOPLimit value. In that case, the AP will try to reserve a TXOP that overlaps at the minimum the rTWT SP. This provides a better protection of the rTWT SP based on the NAV protection. This overlapping is driven with the TWT protection bit.

The “TWT protection” bit is used also by the non-AP STAs registered to the rTWT procedure to adapt their NAV setting.

A *NOTE* was also added to explain the behavior of the AP and non-AP STAs during the TXOP gained by the TWT scheduling EHT AP and before the beginning of the rTWT SP.



The reservation frame can be a basic trigger frame or a MU-RTS frame. The reservation frame defines a TXOP duration that encompasses the next rTWT SP. During the provision period, MU transmissions are preferable to ensure an accurate starting time of the rTWT SP.

**Proposal:**

# 9. Frame formats

## 9.4.2.199 TWT element (#6544, #6744, #7338)

***TGbe editor: change Figure 9-688a (Request Type Field format in Broadcast TWT Parameter set) as follows:***

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|   | TWT Request | TWT Setup Command | Trigger | Last Broadcast Parameter Set | Flow Type | Broadcast TWT Recommandation | TWT Wake Interval Exponent | ~~Reserved~~ TWT Protection |
| Bits: | 1 | 3 | 1 | 1 | 1 | 3 | 5 | 1 |
| **Figure 9-688a Request Type field format in Broadcast TWT Parameter Set** |

***TGbe editor: insert the following paragraph:***

The TWT Protection bit is set to 1 if the EHT AP with dot11RestrictedTWTOptionImplemented set to true provides protection of the TWT service period when the Broadcast TWT Recommandation field is set to 4.

# 35. Extremely High Throughput (EHT) MAC specification

# 35.7 Restricted TWT

# 35.7.4 Channel access rules for restricted TWT service periods

# 35.7.4.1 General (#6744, #6745, #7338, #6544)

***TGbe editor: insert the following paragraphs:***

A TWT scheduling EHT AP, with dot11RestrictedTWTOptionImplemented set to true, should set the the “TWT Protection” bit of the “Request Type field format” field to 1 to indicate that the rTWT service period will be NAV-protected before the start time of the rTWT SP. Such rTWT service period is called a NAV-protected rTWT service period.

If the “TWT Protection” bit is set to 1, the TWT scheduling EHT AP shall schedule for transmission a frame to reserve a TXOP overlapping the rTWT service period.

NOTE: During the corresponding TXOP gained by the TWT scheduling EHT AP and before the beginning of the rTWT SP, the TWT scheduling EHT AP may solicit any non-AP STAs to transmit any frames.

~~Upon the reception of a frame from the TWT scheduling EHT AP reserving a TXOP overlapping a NAV-protected rTWT service period, a r-TWT scheduled STA shall set its NAV until the beginning of the rTWT service period.~~

The r-TWT scheduled STA may set the TWT Protection field to 1 to indicate that TXOPs within the TWT SPs shall be initiated with a NAV protection mechanism, such as (MU) RTS/CTS or CTS-to-self frame; otherwise, it shall set it to 0.

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| **CID** | **Commenter** | **Clause** | **Pg/Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 6548 | Patrice NEZOU | 35.6.4 | 298/40 | A medium access mechanism during the TWT service period is not specified. The AP has to control the medium access of STAs and sollicits them thanks to trigger frames. | Force using triggered communication by forcing the Trigger bit during the TWT negotitation process. | Revised – Agree in principle.It is proposed to to set the “Trigger” bit to 1 to indicate that the AP will preferably solicit STAs with trigger frames.TGbe editor to make the changes shown in 11-21/1718r3 under all headings that include CID 6548. |

**Discussion on CIDs #6547, #6745: Medium access during the rTWT service period**

During the rTWT service period, it is preferable to control the medium access to avoid collisions and abuses among STAs participating to the rTWT service period. So, MU transmissions may be the best solution. It is proposed to force to 1 the “Trigger” field of the “Request Type field format” field for rTWTs.

**Proposal**:

# 35.7 Restricted TWT

# 35.7.4 Channel access rules for restricted TWT service periods

# 35.7.4.1 General (#6548)

***TGbe editor: insert the following paragraph:***

The TWT scheduling AP should set the Trigger field to 1 if the Broadcast TWT Recommendation subfield is 4.