IEEE P802.11
Wireless LANs

|  |
| --- |
| Resolution for CID 11700 |
| Date: 2022-08-01 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Abdel Karim Ajami | Qualcomm Inc |  |  | aajami@qti.qualcomm.com |
| Duncan Ho  |  |  |  |
| Alfred Asterjadhi |  |  |  |
| Abhishek Patil |  |  |  |
| George Cherian |  |  |  |
| Gaurang Naik |  |  |  |
| Yanjun Sun |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Abstract

This submission proposes resolution for CID 11700 received in LB266 (11be D2.0).

***TGbe editor: The baseline for this document is 11be D2.0***

**Revisions:**

* Rev 0: Initial version of the document.

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.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Clause** | **Pg/Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 11700 | Abdel Karim Ajami | 9.4.2.316 | 525.12 | The current Target Wake Time field is 2 octets in the TWT element for R-TWT with a granularity of one TU. This may not allow to specify start times that have less than one TU resolution | Please clarify | **Revised**Agree with the comment. We extend the Target Wake Time to specify R-TWT SP start times that are similar to what Individual TWT can specify. This will allow a STA to align the R-TWT SP start time with the latency sensitive traffic arrival defined in frames per second.TGbe editor, please implement changes as shown in 11-22/1373r0 tagged as 11700 |

### Discussion:

Per 11be D2.0 P208L6, in subclause 9.4.2.199 (TWT element), we have the following Broadcast TWT Parameter Set field format:



**Figure 9-766-Broadcast TWT Parameter Set field format**

The Broadcast TWT Parameter Set field includes a Target Wake Time field that is 2 octets.

Also, per baseline REVme D1.3, in subclause 9.4.2.199 (TWT element), the Target Wake Time field is 8 octets in case of Individual TWT whereas in case of Broadcast TWT, the Target Wake Time field is 2 octets with the lowest bit of the 2 octets corresponding to bit 10 of the relevant TSF value.

In addition, per baseline REVme D1.3 P4218L41, we have: The TWT scheduling AP shall set the Target Wake Time field to TSF [10:25], where TSF corresponds to the next TWT that is scheduled for this TWT parameter set when it queues for transmission the frame that contains the TWT element. The TSF timer at which the next TWT is scheduled has bits 0 to 9 equal to 0 and bits 26 to 63 equal to the same value as the respective bits in the current TSF timer.

Thus, the current rules allow to negotiate a Target Wake Time that has 1 TU resolution (>= 1024 µsec). However, latency sensitive traffic such as XR and cloud gaming traffic arrival is defined it terms of frames per second (fps), e.g., 60 fps (1 frame every 16.667 ms), and hence requires a finer time resolution. Thus, the difference between the start time of the r-TWT SP and the latency sensitive traffic arrival will get accumulated. As a result, the current Target Wake Time field does not allow to align the latency sensitive traffic arrival time with the R-TWT SP start time and the latency sensitive traffic may not be able to benefit from the R-TWT SP. In this proposal, we address this issue.

### Proposed Text:

***TGbe editor: Add an entry to the end of Table 9-128 (Element IDs) as follows (CID 11700):***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Element**  | **Element ID** | **Element ID Extension** | **Extensible** | **Fragmentable** |
| Extended TWT element (see 9.4.2.xxx Extended TWT element) | **255** | **ANA** | **Yes** | **Yes** |

***TGbe editor: Add this new subclause under 9.4.2 (CID 11700)***

9.4.2.xxx Extended TWT element

The Extended TWT element is shown in Figure 9-xxx (Extended TWT element format).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|   | Element ID | Length | Element ID extension | Extended TWT Control | Extended TWT Information  |
| **Octets:** | 1 | 1 | 1 | 1 | variable |

**Figure 9-xxxx — Extended TWT element format**

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

The format of the Extended TWT Control field is shown in Figure 9-xxxx (Extended TWT Control field format):

|  |  |  |
| --- | --- | --- |
|   | Count | Reserved |
| **Bits:** | 5 | 3 |

**Figure 9-xxxx — Extended TWT Control field format**

The Count subfield in the Extended TWT Control field contains an unsigned integer that specifies the number of Extended Broadcast TWT Parameter subfields included in the Extended TWT information field.

The Extended TWT Information field includes one or more Extended Broadcast TWT Parameter field (see Figure 9-xxx (Extended Broadcast TWT Parameter field format)).

The Extended Broadcast TWT Parameter field is 2 octets. The format of the Extended Broadcast TWT Parameter field is shown in Figure 9-xxxx (Extended Broadcast TWT Parameter field format):

|  |  |  |  |
| --- | --- | --- | --- |
|   | Broadcast TWT ID | Reserved | Extended Target Wake Time |
| **Bits:** | 5 | 1 | 10 |

**Figure 9-xxxx — Extended Broadcast TWT Parameter field**

The Broadcast TWT ID subfield contains an unsigned integer that specifies the Broadcast TWT ID of the corresponding Restricted TWT parameter set for which the transmitting STA is providing the extended TWT information.

The Extended Target Wake Time field contains an unsigned integer that specifies bit 0 to 9 of the relevant TSF time at which the R-TWT scheduled STA requests to wake or the R-TWT scheduling AP requests the R-TWT scheduled STA to wake for the corresponding R-TWT SP with the specified Broadcast TWT ID.

The subfields values of the Extended Broadcast TWT Parameter field are set as described in 35.9.2 (R-TWT agreement setup) and 35.9.3 (R-TWT service periods announcement).

TGbe editor: Add a row at the end of table 9-589 as follows ***(CID 11700)***

### 9.6.24.8 TWT Setup frame format

**Table 9-589—TWT Setup frame Action field format**

|  |  |
| --- | --- |
| **Order** | **Information** |
| 1 | Category |
| 2 | Unprotected S1G Action |
| 3 | Dialog Token |
| 4 | One or two TWT (9.4.2.199 (TWT element)) |
| 5 | Extended TWT Element (9.4.2.xxx (Extended TWT element)) |

The TWT Setup frame contains an Extended TWT Element if used for the establishment of a Restricted TWT agreement (see 35.9.2.2 (The setup procedure)).

TGbe editor: Add a row toward the end of table 9-60 as follows ***(CID 11700)***

### 9.3.3.2 Beacon frame format

**Table 9-60—Beacon frame body**

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| <Last assigned + 1> | Extended TWT element | The Extended TWT element is present if the dot11RestrictedTWTOption Implemented is true and the AP has at least one r-TWT schedule as described in 35.9.3 (r-TWT service periods announcement). Otherwise, the TWT element is not present. Otherwise, it is not present. |

TGbe editor: Add a row toward the end of table 9-63 as follows ***(CID 11700)***

**9.3.3.6 Association Response frame format**

**Table 9-63—Association Response frame body**

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| <Last assigned + 1> | Extended TWT element | The TWT element is present if dot11RestrictedTWTOptionImplemented is true and the soliciting Association Request frame is sent by an EHT STA that has the Restricted TWT Support subfield in transmitted EHT Capabilities elements set to 1, and the AP has at least one R-TWT schedule as described in 35.9.3 (R-TWT SPs announcement). Otherwise, it is not present. |

TGbe editor: Add a row toward the end of table 9-63 as follows ***(CID 11700)***

**9.3.3.8 Reassociation Response frame format**

**Table 9-65—Reassociation Response frame body**

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| <Last assigned + 1> | Extended TWT element | The Extended TWT element is present if dot11RestrictedTWTOptionImplemented is true and the soliciting Reassociation Request frame is sent by an EHT STA that has the Restricted TWT Support subfield in transmitted EHT Capabilities elements set to 1, and the AP has at least one R-TWT schedule as described in 35.9.3 (R-TWT SPs announcement). Otherwise, it is not present. |

TGbe editor: Add a row toward the end of table 9-67 as follows ***(CID 11700)***

**9.3.3.10 Probe Response frame format**

**Table 9-67—Probe Response frame body**

|  |  |  |
| --- | --- | --- |
| **Order** | **Information** | **Notes** |
| <Last assigned + 1> | Extended TWT element | The Extended TWT element is present if the dot11RestrictedTWTOption Implemented is true and the AP has at least one r-TWT schedule as described in 35.9.3 (r-TWT service periods announcement). Otherwise, the TWT element is not present. |

***TGbe editor: Please add this paragraph at the end of subclause 35.9.2.2 (The setup procedure) (CID 11700)***

**35.9.2.2 The setup procedure**

An R-TWT scheduled STA or R-TWT scheduling AP when negotiating an R-TWT schedule shall provide the extended target wake time in the Extended TWT element in the transmitted TWT setup frame that includes a restricted TWT parameter set with Negotiation Type subfield set to 3 if the R-TWT parameter set specifies a target wake time as described in 9.4.2.199 (TWT element).

The R-TWT scheduled STA or R-TWT scheduling AP shall set the Broadcast TWT ID subfield of the Extended TWT element to the same value as that of the corresponding R-TWT parameter set for which the STA or the AP is providing extended TWT information.

The R-TWT scheduled STA or R-TWT scheduling AP shall set the Extended Target Wake Time subfield to TSF [0:9], where TSF corresponds to the next TWT that is requested or scheduled for this TWT parameter set when it queues for transmission the frame that contains the TWT element and the Extended TWT element. The TSF timer at which the next TWT is requested or scheduled has bits 0 to 9 equal to the same value as the respective bits 0 to 9 of the Extended Target Wake Time subfield, bits 10 to 25 equal to the same value as the respective bits 0 to 15 of the Target Wake Time field, and bits 26 to 63 equal to the same value as the respective bits in the current TSF timer.

***TGbe editor: Please add this paragraph at the end of subclause 35.9.3 (r-TWT service periods announcement) (CID 11700)***

**35.9.3 r-TWT service periods announcement**

An R-TWT scheduling AP, while advertising an R-TWT schedule, shall include an Extended TWT element in the transmitted Management frames that includes a TWT element with Restricted TWT Parameter Set field(s). The R-TWT scheduling AP shall set the values of the Extended TWT element fields as specified in 35.9.2.2 (The setup procedure).