IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Comment resolutions for TWT IE | | | | |
| Date: 2019-11-01 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Alfred Asterjadhi | Qualcomm Inc. | 5775 Morehouse Dr, San Diego, CA 92109 | +1-858-658-5302 | aasterja@qti.qualcomm.com |
| Abhishek Patil | Qualcomm Inc. |  |  |  |
| George Cherian | Qualcomm Inc. |  |  |  |

Abstract

This submission proposes resolutions for multiple comments related to TGax D5.0 with the following CIDs (11 CIDs):

* 22090, 22091, 22092, 22093, 22094, 22095, 22096, 22097, 22312, 22313,
* 22314

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 TGax Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGax Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGax Editor: Editing instructions preceded by “TGax Editor” are instructions to the TGax editor to modify existing material in the TGax draft. As a result of adopting the changes, the TGax editor will execute the instructions rather than copy them to the TGax Draft.***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 22090 | Liwen Chu | 172.18 | Change to "A TWT responding STA or TWT scheduling AP accepts the TWT request with the TWT parameters (see NOTE) indicated in the TWT element transmitted by the TWT requesting STA or TWT scheduled AP" | As in comment | Accepted |
| 22091 | Liwen Chu | 172.51 | Add the case that TWT cchediling STA rejects the request from the scheduled STA | As in comment | Revised –  Agree in principle with the comment. Proposed resolution is to add the case of TWT scheduling AP (which seems to be what is referrered to as TWT cchediling STA).  TGax editor to make the changes shown in 11-19/1835r0 under all headings that include CID 22091. |
| 22092 | Liwen Chu | 173.09 | The definition of the field transmitted by TWT responding STA, scheduled STA, scheduling STA should also described | As in comment | Revised –  Agree in principle with the comment. Proposed resolution is to generalize the two paragraphs so that they are generally applicable to any type of TWT STA.  TGax editor to make the changes shown in 11-19/1835r0 under all headings that include CID 22092. |
| 22093 | Liwen Chu | 173.19 | The definition of Flow Type for scheduled STA and scheduling STA is mssing. | Add them | Revised –  Agree in principle with the comment. Proposed resolution adds the missing cases of a TWT scheduled STA and a TWT scheduling AP to the paragraph.  TGax editor to make the changes shown in 11-19/1835r0 under all headings that include CID 22093. |
| 22094 | Liwen Chu | 174.41 | random RU in Trigger frame contradicts with sounding feedback. | Clarify that some Trigger frames in the TAT SP with Broadcast TWT Recommendation field value 2 don't need to include random access RU. | Revised –  Only Basic, BSRP and BQRP Trigger frames can have random RUs. This is stated in 26.5.4. Proposed resolution adds a reference to that subclause in the cited paragraph.  TGax editor to make the changes shown in 11-19/1835r0 under all headings that include CID 22094. |
| 22095 | Liwen Chu | 175.57 | The meaning of the Nominal Minimum Wakeup Duration from TWT responding/scheduling STA is missing. Add the related text | As in comment | Revised –  The meaning is the same. Proposed resolution is to add the case of TWT scheduled STA since it is missing and to improve readability of the sentence. Also removed “associated with the TWT flow identifier” so that it applies to the broadcast TWT case as well.  TGax editor to make the changes shown in 11-19/1835r0 under all headings that include CID 22095. |
| 22096 | Liwen Chu | 176.19 | The sentence of "In an HE BSS, none of the bits, any 1 bit, the 4 LSBs, or the 4 MSBs of the bitmap can have a value of 1." contradicts with the following sentence. | Remove it from the draft. | Revised –  Agree in principle with the comment. Proposed resolution removes the sentence and updates the references as to which subclauses the STA follows when the field is set to 0.  TGax editor to make the changes shown in 11-19/1835r0 under all headings that include CID 22096. |
| 22097 | Liwen Chu | 176.16 | The bit being 1 doesn't mean primary channel in 11ax, e.g. in bitmap with 4-bit 1s, 4 20MHz channels can be all primary channels. | As in comment | Revised –  Agree in principle with the comment. Proposed resolution is to use the term “temporary channel” in this subclause and leave the normative behavior related clauses to clearly define the respective cases (primary for 11ah, and temporary channels for 11ax).  TGax editor to make the changes shown in 11-19/1835r0 under all headings that include CID 22097. |
| 22312 | Mark RISON | 174.00 | Table 9-297a--Broadcast TWT Recommendation field for a broadcast TWT element row 1 says "limited to solicited feedback and status" but row 2 says "solicited status and feedback". Not clear which is solicited (or maybe both are?) | Change both rows to say "limited to solicited feedback and status" | Revised –  Agree in principle with the comment that it is not clear to whch the solicited applies. Broadcast TWT Recommendation field can be set to 1 or 2 only when the Trigger field is 1, and hence both status and feedback are solicited. Proposed resolution clarifies this.  TGax editor to make the changes shown in 11-19/1835r0 under all headings that include CID 22312. |
| 22313 | Mark RISON | 174.00 | Table 9-297a--Broadcast TWT Recommendation field for a broadcast TWT element row 1 says "limited to solicited feedback and status" but row 2 says "solicited status and feedback". Not clear which is solicited (or maybe both are?) | Change both rows to say "limited to solicited status and feedback" | Revised –  [Duplicate of CID 22312]  Agree in principle with the comment that it is not clear to whch the solicited applies. Broadcast TWT Recommendation field can be set to 1 or 2 only when the Trigger field is 1, and hence both status and feedback are solicited. Proposed resolution clarifies this.  TGax editor to make the changes shown in 11-19/1835r0 under all headings that include CID 22313. |
| 22314 | Mark RISON | 174.00 | Table 9-297a--Broadcast TWT Recommendation field for a broadcast TWT element row 1 says "limited to solicited feedback and status" but row 2 says "solicited status and feedback". Not clear which is solicited (or maybe both are?) | Change both rows to say "limited to status and solicited feedback" | Revised –  Agree in principle with the comment that it is not clear to whch the solicited applies. Broadcast TWT Recommendation field can be set to 1 or 2 only when the Trigger field is 1, and hence both status and feedback are solicited. Proposed resolution clarifies this.  [Duplicate of CID 22312]  TGax editor to make the changes shown in 11-19/1835r0 under all headings that include CID 22314. |

**Discussion: *None.***

* TWT element

Replace Figure 9-686 (TWT element format) with the following:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  | Element ID | Length | Control | TWT Parameter Information |
| Octets: | 1 | 1 | 1 | variable |
| * TWT element format | | | | | |

Change Figure 9-687 (Control field format) as follows.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | ~~B1~~B0 | ~~B2~~B1 | B2              B3 | B4 | B5 | ~~B3~~B6 ~~B8~~B7 |
|  | NDP Paging Indicator | Responder PM Mode | Negotiation Type | TWT Information Frame Disabled | Wake Duration Unit(#20352) | Reserved |
| Bits: | 1 | 1 | 2 | 1 | 1 | ~~6~~2 |
| * Control field format | | | | | | |

Insert the following (including table) after the 5th paragraph (“The Responder PM Mode subfield...”):

The Negotiation Type subfield indicates whether the information included in the TWT element is for the negotiation of parameters of broadcast or individual TWT(s) or a Wake TBTT interval. The MSB of the Negotiation Type subfield is the Broadcast field.

The TWT Information Frame Disabled subfield is set to 1 to indicate that the reception of TWT Information frames is disabled by the STA; otherwise, it is set to 0.

The Wake Duration Unit subfield indicates the unit of the Nominal Minimum TWT Wake Duration field. The Wake Duration Unit subfield is set to 0 if the unit is 256 us and is set to 1 if the unit is a TU. A non-HE STA sets the Wake Duration Unit subfield to 0.(#20352)

If the Broadcast field of the Negotiation Type subfield is 1, then one or more broadcast TWT parameter sets are contained in the TWT element (see Figure 9-687b (Broadcast TWT Parameter Set field format)). If the Broadcast field of the Negotiation Type subfield is 0, then only one Individual TWT parameter set is contained in the TWT element (see Figure 9-687a (Individual TWT Parameter Set field format)). An S1G STA sets the Negotiation Type subfield to 0.

A TWT element that has the Broadcast field in the Control field set to 1 is referred to as broadcast TWT element.

The Negotiation Type subfield determines the interpretation of the Target Wake Time, TWT Wake Interval Mantissa and TWT Wake Interval Exponent subfields of the TWT element as defined in Table 9-296a (Interpretation of Negotiation Type subfield, Target Wake Time, TWT Wake Interval Mantissa and TWT Wake Interval Exponent fields).

|  |  |  |  |
| --- | --- | --- | --- |
| * Interpretation of Negotiation Type subfield, Target Wake Time, TWT Wake Interval Mantissa and TWT Wake Interval Exponent fields | | | |
| Negotiation Type subfield | Target Wake Time field | TWT Wake Interval Mantissa and TWT Wake Interval Exponent fields | Description |
| 0 | A future Individual TWT SP start time | Interval between individual TWT SPs | Individual TWT negotiation between TWT requesting STA and TWT responding STA or individual TWT announcement by TWT responder. See 10.48 (Target wake time (TWT)), and 26.8.2 (Individual TWT agreements).  The TWT element contains one individual TWT parameter set. |
| 1 | Next Wake TBTT time | Interval between wake TBTTs | Wake TBTT and wake interval negotiation between TWT scheduled STA and TWT scheduling AP. See 26.8.6 (Negotiation of wake TBTT and wake interval).  The TWT element contains one individual TWT parameter set. |
| 2 | A future Broadcast TWT SP start time | Interval between broadcast TWT SPs | Provide broadcast TWT schedules to TWT scheduled STAs by including the TWT element in broadcast Management frames sent by TWT scheduling AP. See 26.8.3.2 (Rules for TWT scheduling AP).  The TWT element contains one or more broadcast TWT parameter sets. |
| 3 | A future Broadcast TWT SP start time | Interval between broadcast TWT SPs | Manage memberships in broadcast TWT schedules by including the TWT element in individually addressed Management frames sent by either a TWT scheduled STA or a TWT scheduling AP. See 26.8.3 (Broadcast TWT operation).  The TWT element contains one or more broadcast TWT parameter sets. |

The TWT Parameter Information field contains a single Individual TWT Parameter Set field with format defined in Figure 9-687a (Individual TWT Parameter Set field format) if the Broadcast subfield in the Control field is 0 and contains one or more Broadcast TWT Parameter Set fields with format defined in Figure 9-687b (Broadcast TWT Parameter Set field format) if the Broadcast subfield of the Control field is 1. The number of Broadcast TWT Parameter Set fields present is determined by the values of the Last Broadcast Parameter Set subfields(#20112) of the Request Type fields.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  | |  | |  | |  | |  |  |  | |
|  | | Request Type | | Target Wake Time | | TWT Group Assignment | | Nominal Minimum TWT Wake Duration | | TWT Wake Interval Mantissa | TWT Channel | NDP Paging (optional) | |
| Octets: | | 2 | | 0 or 8 | | 0, 3 or 9 | | 1 | | 2 | 1 | 0 or 4 | |
| * Individual TWT Parameter Set field format | | | | | | | | | | | | | |
|  |  | |  | |  | |  | |  | | | |
|  | Request Type | | Target Wake Time | | Nominal Minimum TWT Wake Duration | | TWT Wake Interval Mantissa | | Broadcast TWT Info | | | |
| Octets: | 2 | | 2 | | 1 | | 2 | | 2 | | | |
| * Broadcast TWT Parameter Set field format | | | | | | | | | | | | |

Change the 6th paragraph as follows:

The format of the Request Type field of the Individual TWT Parameter Set field is shown in Figure 9-688 (Request Type field format in an Individual TWT Parameter Set field) and of a Broadcast TWT Parameter Set field is shown in Figure 9-688a (Request Type field format in a Broadcast TWT Parameter Set field).

Change Figure 9-688 (Request Type field format in an Individual TWT Parameter Set field) as follows:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 | B1 B3 | B4 | B5 | B6 | B7 B9 | B10 B14 | B15 |
|  | TWT  Request | TWT Setup Command | ~~Reserved~~  Trigger | Implicit | Flow  Type | TWT Flow Identifier | TWT Wake Interval Exponent | TWT Protection |
| Bits: | 1 | 3 | 1 | 1 | 1 | 3 | 5 | 1 |
| * Request Type field format(#mdr) in an Individual TWT Parameter Set field | | | | | | | | |

 Insert a new Figure 9-688a (Request Type field format in a Broadcast TWT Parameter Set field) as follows:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 | B1 B3 | B4 | B5 | B6 | B7 B9 | B10 B14 | B15 |
|  | TWT Request | TWT Setup Command | Trigger | Last Broadcast Parameter Set | Flow Type | Broadcast TWT Recommendation | TWT Wake Interval Exponent | Reserved |
| Bits: | 1 | 3 | 1 | 1 | 1 | 3 | 5 | 1 |
| * Request Type field format(#mdr) in a Broadcast TWT Parameter Set field | | | | | | | | |

Change the 7th and 8th paragraphs as follows:

A STA that transmits a TWT element with the TWT Request subfield equal to 1 is a TWT requesting STA or TWT scheduled STA. Otherwise, it is a TWT responding STA or TWT scheduling AP.

The TWT Setup Command subfield values indicate the type of TWT command ~~as shown in Table 9-262k~~. The use of the TWT Setup Command field for the negotiation of individual and broadcast TWT is described in Table 9-297 (TWT Setup Command field values). The entries in the table apply to cases where the Negotiation Type subfield is not 1. For TWT Setup Command field use when the Negotiation Type subfield is 1, see 26.8.6 (Negotiation of wake TBTT and wake interval)(#20113).

**TGax Editor: *Change the table below of this subclause as follows (#CID 22090, 20091):***

|  |  |  |  |
| --- | --- | --- | --- |
| * TWT Setup Command field values | | | |
| TWT Setup Command field value | Command name | ~~Description when transmitted by a TWT requesting STA~~  Description | ~~Description when transmitted by a TWT responding STA~~ |
| 0 | Request TWT | ~~The Target Wake Time field of the TWT element contains 0s as the TWT responding STA specifies the target wake time value for this case, other TWT parameters\* are suggested by the TWT requesting STA in the TWT request.~~  A TWT requesting or TWT scheduled STA requests to join a TWT without specifying a target wake time.  This command is valid if the TWT Request field is equal to 1; otherwise the command is not applicable. | ~~N/A~~ |
| 1 | Suggest TWT | ~~TWT requesting STA includes a set of TWT parameters such that if the requested target wake time value and/or other TWT parameters cannot be accommodated, then the TWT setup might still be accepted.~~  A TWT requesting or TWT scheduled STA requests to join a TWT and specifies a suggested set of TWT parameters with the possibility that if the requested target wake time and/or other TWT parameters cannot be accommodated, then the TWT setup might still be accepted by the TWT requesting or TWT scheduled STA.  This command is valid if the TWT Request field is equal to 1; otherwise it is not applicable. | ~~N/A~~ |
| 2 | Demand TWT | ~~TWT requesting STA includes a set of TWT parameters such that if the requested target wake time value and/or other TWT parameters cannot be accommodated, then the TWT setup will be rejected.~~  A TWT requesting or TWT scheduled STA requests to join a TWT and specifies a demanded set of TWT parameters. If the demanded set of TWT parameters is not accommodated by the responding STA or TWT scheduling AP, then the TWT requesting STA or TWT scheduled STA will reject the TWT setup.(#mdr)  This command is valid if the TWT Request field is equal to 1; otherwise it is not applicable. | ~~N/A~~ |
| 3 | TWT Grouping | ~~N/A~~  The TWT responding STA suggests TWT group parameters that are different from the suggested or demanded TWT parameters of the TWT requesting STA  This command is valid if the TWT Request field is 0, the Negotiation Type subfield is 0(#20588) and is sent by an S1G STA; otherwise not applicable. | ~~TWT responding STA suggests TWT group parameters that are different from the suggested or demanded TWT parameters of the TWT requesting STA~~ |
| 4 | Accept TWT | ~~N/A~~  A TWT responding STA or TWT scheduling AP accepts the TWT request with the TWT parameters (see NOTE) indicated in the TWT element transmitted by the TWT requesting STA or TWT scheduling AP. *(#22090)*  This command is valid if the TWT Request field is 0; otherwise not applicable. | ~~TWT responding STA accepts the TWT request with the TWT parameters (See NOTE) indicated in the TWT element transmitted by the responding STA~~ |
| 5 | Alternate TWT | ~~N/A~~  A TWT responding STA or TWT scheduling AP suggests TWT parameters that are different from those suggested by the TWT requesting STA or TWT scheduled STA.  This command is valid if the TWT Request field is 0; otherwise not applicable. | ~~TWT responding STA suggests TWT parameters that are different from TWT requesting STA suggested or demanded TWT parameters~~ |
| 6 | Dictate TWT | ~~N/A~~  A TWT responding STA or TWT scheduling AP indicates TWT parameters that are different from those suggested by the TWT requesting STA or TWT scheduled STA.  This command is valid if the TWT Request field is 0; otherwise not applicable. | ~~TWT responding STA demands TWT parameters that are different from TWT requesting STA TWT suggested or demanded parameters~~ |
| 7 | Reject TWT | ~~N/A~~  A TWT responding STA or TWT scheduling AP rejects setup or a TWT scheduling AP terminates an existing broadcast TWT or a TWT scheduled STA terminates its membership in a broadcast TWT. *(#22091)* | ~~TWT responding STA rejects TWT setup~~ |
| NOTE—TWT Parameters are: TWT, Nominal Minimum Wake Duration, TWT Wake Interval and TWT Channel subfield values indicated in the TWT element. The Trigger subfield value indicated in the TWT element is also a TWT parameter for an HE STA. | | | |

Insert the following paragraph after the 8th paragraph (“The TWT Setup Command subfield...”):

The Trigger field indicates whether or not the TWT SP indicated by the TWT element includes Trigger frames or frames carrying a TRS Control subfield as defined in 26.8 (TWT operation). The Trigger field is set to 1 to indicate that at least one Trigger frame or frame carrying a TRS Control subfield is transmitted during the TWT SP. The Trigger field is set to 0 otherwise.

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 22092):***

~~T~~he Implicit subfield is set to 1 to indicate an implicit TWT and is set to 0 to indicate an explicit TWT.

*(#22092)*The Last Broadcast Parameter Set subfield is set to 0 to indicate that another broadcast TWT Parameter set follows this set. The Last Broadcast Parameter Set subfield is set to 1 to indicate that this is the last broadcast TWT Parameter set in the broadcast TWT element.

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 22093):***

The Flow Type subfield indicates the type of interaction between the TWT requesting STA or TWT scheduled STA and the TWT responding STA or TWT scheduling AP at a TWT. Setting the Flow Type subfield to 0 indicates an announced TWT in which the TWT requesting STA or TWT scheduled STA will send a PS-Poll or an APSD trigger frame (see 11.2.3.5 (Power management with APSD)) to signal its awake state to the TWT responding STA or TWT scheduling AP before a frame that is not a Trigger frame(#20847) is sent from the TWT responding STA or TWT scheduling AP to the TWT requesting STA or TWT scheduled STA. Setting the Flow Type subfield to 1 indicates an unannounced TWT in which the TWT responding STA or TWT scheduling AP will send a frame to the TWT requesting STA or TWT scheduled STA at TWT without waiting to receive a PS-Poll or an APSD trigger frame from the TWT requesting STA or TWT scheduled STA.

NOTE—The TWT requesting STA or TWT scheduled STA is expected to send the PS-Poll or APSD trigger frame in response to a Trigger frame if the TWT is a trigger-enabled TWT. *(#22093)* (#20847)

The TWT Flow Identifier subfield contains a 3-bit value ~~which~~ that(#mdr) identifies the specific information for this TWT request uniquely from other requests made between the same TWT requesting STA and TWT responding STA pair. The Broadcast TWT Recommendation subfield contains a value that indicates recommendations on the types of frames that are transmitted by TWT scheduled STAs and scheduling AP during the broadcast TWT SP, encoded according to the Broadcast(#20554) TWT Recommendation field for a broadcast TWT element as defined in Table 9-297a (Broadcast TWT Recommendation field for a broadcast TWT element). The Broadcast TWT Recommendation is reserved if transmitted by a TWT scheduled STA.

**TGax Editor: *Change the table below of this subclause as follows (#CID 22094, 22312, 22313, 22314):***

|  |  |
| --- | --- |
| * Broadcast TWT Recommendation field for a broadcast TWT element | |
| Broadcast TWT Recommendation field value | Description when transmitted in a broadcast TWT element |
| 0 | No constraints on the frames transmitted during a broadcast TWT SP. |
| 1 | Frames transmitted during a broadcast TWT SP by a TWT scheduled STA are recommended to be limited to solicited status and solicited feedback:*(#22312, 22313, 22314)*   * PS-Poll and QoS Null frames * Feedback can be contained in the QoS Control field or in the HE variant HT Control field of the frame, if either is present (see 26.5.2 (UL MU operation), 26.9 (Operating mode indication), 26.13 (Link adaptation using the HLA Control subfield), etc.) * Feedback in an HE TB feedback NDP, if solicited by the AP (see 26.5.7 (NDP feedback report procedure)) * BQRs (see 26.5.2 (UL MU operation)) * BSRs (see 26.5.3 (MU cascading sequence)) * Frames that are sent as part of a sounding feedback exchange (see 26.7 (HE sounding protocol)) * Management frames: Action or Action No Ack frames * Control response frames   Trigger frames transmitted by the TWT scheduling AP during the broadcast TWT SP do not contain RUs for random access (see 26.8.3.2 (Rules for TWT scheduling AP)), otherwise, there are no other restrictions on the frames transmitted by the TWT scheduling AP. |
| 2 | Frames transmitted during a broadcast TWT SP by a TWT scheduled STA are recommended to be limited to solicited status and solicited feedback:*(#22312, 22313, 22314)*   * PS-Poll and QoS Null frames * Feedback can be contained in the QoS Control field or in the HE variant HT Control field of the frame, if either is present (see 26.5.2 (UL MU operation), 26.9 (Operating mode indication), 26.13 (Link adaptation using the HLA Control subfield), etc.) * BQRs (see 26.5.2 (UL MU operation)) * BSRs (see 26.5.3 (MU cascading sequence)) * Frames that are sent as part of a sounding feedback exchange (see 26.7 (HE sounding protocol)) * Management frames: Action, Action No Ack frames or (Re)Association Request(#20923) * Control response frames   Trigger frames transmitted by the TWT scheduling AP during the broadcast TWT SP contain at least one RU for random access (see 26.8.3.2 (Rules for TWT scheduling AP) and 26.5.4 (UL OFDMA-based random access (UORA)))*(#22094)*, otherwise there are no restrictions on the frames transmitted by the TWT scheduling AP. |
| 3 | No constraints on the frames transmitted during a broadcast TWT SP except that the AP transmits a TIM frame or a FILS Discovery frame including a TIM element at the beginning of each TWT SP (see 26.14.3.2 (AP operation for opportunistic power save)). |
| 4-7 | Reserved |

Change the 13th and 14th paragraphs as follows:

In a TWT element transmitted by a TWT requesting or TWT scheduled STA, the TWT wake interval is equal to the average time that the ~~TWT requesting~~ STA expects to elapse between successive TWT SPs start times (see Table 9-296a (Interpretation of Negotiation Type subfield, Target Wake Time, TWT Wake Interval Mantissa and TWT Wake Interval Exponent fields)). In a TWT element transmitted by a TWT responding STA or TWT scheduling AP, the TWT wake interval is equal to the average time that the ~~TWT responding~~ STA expects to elapse between successive TWT SPs start times. In a TWT element contained in a TWT request that is sent by the scheduled STA to negotiate its wake intervals, the TWT wake interval indicates the value of the wake interval (see 26.8.6 (Negotiation of wake TBTT and wake interval)). The TWT Wake Interval Exponent subfield is set to the value of the exponent of the TWT wake interval value in microseconds, base 2. The TWT wake interval of the requesting STA is equal to (TWT Wake Interval Mantissa) × 2(TWT Wake Interval Exponent).

~~When~~ If transmitted by a TWT requesting STA or a TWT scheduled STA and the TWT Setup Command subfield contains a value corresponding to the command "Suggest TWT" or "Demand TWT", the Target Wake Time field contains ~~a positive~~ an unsigned integer corresponding to a TSF time at which the STA requests to wake~~, or 0 when the TWT Setup Command subfield contains the value corresponding to the command “Request TWT”~~. If transmitted by a TWT requesting STA or a TWT scheduled STA and the TWT Setup Command subfield contains the value corresponding to the command "Request TWT", the Target Wake Time field contains the value 0. The Target Wake Time field is 8 octets if the Broadcast field is 0; otherwise it is 2 octets with the lowest bit of the 2 octets corresponding to bit 10 of the relevant TSF value. ~~When~~ If a TWT responding STA with dot11TWTGroupingSupport equal to 0 transmits a TWT element to the TWT requesting STA, the TWT element contains a value in the Target Wake Time field corresponding to a TSF time at which the TWT responding STA requests the TWT requesting STA to wake for the corresponding TWT SP and it does not contain the TWT Group Assignment field.

Insert the following paragraphs and figure after paragraph 21 (“The TWT Wake Interval Mantissa...”):

The Broadcast TWT Info subfield is defined in Figure 9-689a (Broadcast TWT Info subfield format).

|  |  |  |  |
| --- | --- | --- | --- |
|  | B0                       B2 | B3                       B7 | B8                     B15 |
|  | Reserved | Broadcast TWT ID | Broadcast TWT Persistence |
| Bits: | 3 | 5 | 8 |
| * Broadcast TWT Info subfield format | | | |

Within a TWT element that includes a TWT setup command value of Request TWT, Suggest TWT or Demand TWT, the Broadcast TWT ID, if present, indicates a specific Broadcast TWT in which the transmitting STA is requesting to participate. Within a TWT element that includes a TWT setup command value of Accept TWT, Alternate TWT, Dictate TWT or Reject TWT, the Broadcast TWT ID, if present, indicates a specific Broadcast TWT for which the transmitting STA is providing TWT parameters. Within a TWT element that includes a TWT setup command value of TWT Grouping, the Broadcast subfield is 0 and the Broadcast TWT ID~~,~~ is not present. The value 0 in the Broadcast TWT ID subfield indicates the broadcast TWT whose membership corresponds to all STAs that are members of the BSS corresponding to the BSSID of the Management frame carrying the TWT element and that(#mdr) is permitted to contain Trigger frames with RA-RUs for unassociated STAs.

The Broadcast TWT Persistence subfield indicates the number of TBTTs during which the Broadcast TWT SPs corresponding to this broadcast TWT Parameter set are present. The number of beacon intervals during which the Broadcast TWT SPs are present is equal to the value in the Broadcast TWT Persistence subfield plus 1 except that the value 255 indicates that the Broadcast TWT SPs are present until explicitly terminated.

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 22095):***

The Nominal Minimum TWT Wake Duration field indicates the minimum amount of time, in the unit~~s of 256 µs~~ indicated by the Wake Duration Unit subfield,(#20352) that the TWT requesting STA or TWT scheduled STA is expected to be awake in order to complete the frame exchanges for the period of TWT wake interval, where TWT wake interval is the average time that the TWT requesting STA or TWT scheduled STA expects to elapse between successive TWT SPs. *(#22095)*

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 22096, 20097):***

~~When transmitted by a TWT requesting STA, the TWT Channel field contains a bitmap indicating which channel the STA requests to use as a temporary primary channel during a TWT SP. When transmitted by a TWT responding STA, the TWT Channel field contains a bitmap indicating which channel the TWT requesting STA is allowed to use as a temporary channel during the TWT SP.~~ The TWT Channel field includes a bitmap that provides the channel that is being negotiated by a STA as a temporary channel during a TWT SP. Each bit in the bitmap corresponds to one minimum width channel for the band in which the TWT responding STA's associated BSS is currently operating, with the least significant bit corresponding to the lowest numbered channel of the operating channels of the BSS. In an S1G BSS, the ~~The~~ minimum width channel is equal to the SST Channel Unit field of the SST Operation element if such an element has been previously received or is equal to 1 MHz for a BSS with a BSS primary channel width of 1 MHz and 2 MHz for a BSS with a BSS primary channel width of 2 MHz if no such element has been previously received from the AP to which the SST STA is associated. In an HE BSS, the minimum width channel is equal to 20 MHz. A value of 1 in a bit position in the bitmap transmitted by a TWT requesting STA means that operation with that channel as the temporary channel is requested during a TWT SP. A value of 1 in a bit position in the bitmap transmitted by a TWT responding STA means that operation with that channel as the temporary channel is allowed during the TWT SP*(#22097)*. The TWT Channel field is used by an S1G STA as defined in 10.53 (Subchannel Selective Transmission (SST)) and is used by an HE STA as defined in 26.8.7 (HE subchannel selective transmission). If the TWT channel field is 0 then the STA operates as defined in 10.48 (Target Wake Time (TWT) or 26.8.2 (Individual TWT agreements).*(#22096)*

~~A TWT requesting STA sets the TWT Protection subfield to 1 to request the TWT responding STA to provide protection of the set of TWT SPs corresponding to the requested TWT flow identifier by allocating RAW(s) that restrict access to the medium during the TWT SP(s) for that (those) TWTs. A TWT requesting STA sets the TWT Protection subfield to 0 if TWT protection by RAW allocation is not requested for the corresponding TWT(s).~~

A TWT requesting STA sets the TWT Protection subfield to 1 to request the TWT responding STA to provide protection of the set of TWT SPs corresponding to the requested TWT flow identifier by:

* Allocating RAW(s) that restrict access to the medium during the TWT SP(s) for the TWTs that are set up within an S1G BSS
* Enabling NAV protection during the TWT SP(s) for the TWTs that are set up within an HE BSS

A TWT requesting STA sets the TWT Protection subfield to 0 if TWT protection is not requested for the corresponding TWT(s).

~~When transmitted by a TWT responding STA that is an AP, the TWT Protection subfield indicates whether the TWT SP(s) identified in the TWT element will be protected. A TWT responding STA sets the TWT Protection subfield to 1 to indicate that the TWT SP(s) corresponding to the TWT flow identifier(s) of the TWT element will be protected by allocating RAW(s) that restrict access to the medium during the TWT SP(s) for that (those) TWT(s). A TWT responding STA sets the TWT Protection subfield to 0 to indicate that the TWT SP(s) identified in the TWT element might not be protected from TIM STAs by allocating RAW(s).~~

A TWT responding STA or TWT scheduling AP sets the TWT Protection subfield to 1 to indicate that the TWT SP(s) corresponding to the TWT flow identifier(s) of the TWT element will be protected by:

* Allocating RAW(s) that restrict access to the medium during the TWT SP(s) for the TWTs where the TWT responding STA is an S1G STA.
* Enabling NAV protection during the TWT SP(s) for the TWTs where the TWT responding STA is an HE STA.

A TWT responding STA sets the TWT Protection subfield to 0 to indicate that the TWT SP(s) identified in the TWT element might not be protected.