IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Comment resolutions for miscellaneous TWT - part 2 | | | | |
| Date: 2019-09-04 | | | | |
| 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 D4.0 with the following CIDs (13 CIDs):

* 20229, 20230, 20231, 20232, 20235, 20400, 20405, 20543, 20836, 20837,
* 20846, 20847, 21051

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Revised version of the document. Incorporated figure that was missing and resolved last CID.
* Rev 2: Minor editorial fix to the figure.

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** |
| 20229 | Huizhao Wang | 381.26 | This statement is poorly worded. Please change it | Change the statement as below: "A TWT request STA that receives an TWT information as response to a transmitted TWT Information frame from this STA that:" | Revised –  Agree in principle with the comment. The current sentence does not explicitly indicate who transmitted the frame. Proposed resolution clarifies this in the cited paragraph and similar paragraphs in other subclauses of relevance.  TGax editor to make the changes shown in 11-19/0966r2 under all headings that include CID 20229. |
| 20230 | Huizhao Wang | 381.28 | Make the statement more clarity | Change the statement as below:  "Does not contain a Next TWT field shall consider that TWT session suspended, the other TWT sessions (individual TWT and broadcast TWT) and the default PS operations are not affected." | Revised –  Agree in principle with the comment. However, the proposal is to keep the term “agreement” rather than “session” to keep terminology consistency, and to add an independent bullet that indicates that other agreements and schedules are not affected by the transmission of the frame, unless the All TWT subfield is equal to 1 (which suspends, reschedules all TWTs).  TGax editor to make the changes shown in 11-19/0966r2 under all headings that include CID 20230. |
| 20231 | Huizhao Wang | 381.38 | Make the statement more clarity | Change the statement as below:  "When the TWT Information frame's All TWT subfield is equal to 1, and the Next TWT value is none zero, it will resume all individual TWT sessions. The first resumption will occur at or after the time indicated in the Next TWT field". | Rejected –  The comment fails to identify a technical issue. The current wording is clearer than the proposed change. Please note that the paragraph applies not only to the resumptions but also to the suspensions, hence the use of the terms “the above rules apply”. Additionally, there is no “first” resumption but a resumption of a particular TWT agreement. |
| 20232 | Huizhao Wang | 382.06 | Make the statement more clarity | Change the statement as below:  "except that the TWT scheduled STA shall consider all the Broadcast TWT sessions are resumed at or after the time indicated in the Next TWT field in the TWT Information frame." | Revised –  Agree in principle with the comment but not with the proposed change, since it creates more ambiguity as to when the schedules are resumed. Proposed resolution changes the sentence to improve clarity.  TGax editor to make the changes shown in 11-19/0966r2 under all headings that include CID 20232. |
| 20235 | Huizhao Wang | 384.06 | This rule does not make sense, it allows TF which is not addressed to the TWT STA to accidentally terminate its TWT SP | Please change the text to:  ""equal to 0 and is addressed to the TWT requesting STA..." | Rejected –  The rule in question indicates that the STA can go to doze state after receiving a Trigger frame that has the More TF field set to 0 that is not addressed to it provided that the STA is in the awake state but has not yet indicated its awake state to the AP. STAs that are waiting to be polled by the AP can go to doze state in this case since the AP does not intend to poll anybody anymore. Please note that there is no accidental termination of TWT SPs here since the AP is in control of the Trigger frame and the setting of the bits therein. If we were to change the rule as suggested by the commenter then a STA would be going to doze state when the Trigger frame is addressed to the STA, but if the Trigger is addressed to the STA then why would the STA would be allowed to go to doze state? |
| 20400 | Liwen Chu | 373.18 | same value in TWT Setup Comand is not right since one vale is Alternate and another one is accept | As in comment | Revised–  The value of the TWT Setup Command is switched from Alternate TWT to Accept TWT only at the TBTT at which the changes take effect, not during the time that the alternate TWTs are advertised (during which both parameters have a command of Alternate TWT). In order to make it clear what parameters the TWT scheduled STAs follow the proposed resolution is to add a note that indicates that the current broadcast TWT parameters are followed until the future broadcast TWT parameters set come in effect.  TGax editor to make the changes shown in 11-19/0966r2 under all headings that include CID 20400. |
| 20405 | Liwen Chu | 381.46 | Add a note that this operation may create frame loss since the AP may keep transmitting frames to the STA until the end of the TWT SP. | Add a note or change the text to let the power save take effect after the TWT SP | Rejected –  The described behavior here is the same as in baseline from the perspective of a STA going to doze state. I.e., the STA may go to doze state (baseline) and no requirement is poised at the AP to terminate transmissions to the STA after that (baseline). Although obviously the AP should not transmit frames to a STA that is in doze state. Adding a note in this context does not really help. |
| 20543 | Mark RISON | 371.52 | There is a Figure 27-8---Example of broadcast TWT operation with optional TBTT negotiation but nothing for individual TWT | Add a figure in 26.8.2 showing an example of individual TWT operation (triggered and non-triggered, announced and unannounced) | Revised –  Agree in principle with the comment. Proposed resolution adds a figure and some descriptive text to provide an overview of the example for TWT setups with two STAs. Example is not meant to be exhaustive hence focused on providing descriptions for trigger-enabled TWTs, solicited and unsolicited TWT setups.  TGax editor to make the changes shown in 11-19/0966r2 under all headings that include CID 20543. |
| 20836 | Mark RISON | 384.05 | "The reception of a Trigger frame sent by the TWT responding STA or TWT scheduling AP that has the More TF field equal to 0 and is not addressed to the TWT requesting STA or TWT scheduled STA" -- reception of a Trigger frame intended for the STA with More TF set to 0 should be a TWT SP termination event too, once the TF has been responded to | As it says in the comment | Rejected –  A STA that responds to a Trigger frame that is addressed to it declares to the AP that it is in the awake state, as such the AP can schedule DL BU delivery for that STA. Hence, the STA cannot go to doze state after responding to the Trigger frame. The AP can terminate the SP of the STA by sending an EOSP = 1 or MD = 0 to the STA. |
| 20837 | Mark RISON | 368.55 | "An HE STA that successfully sets up an individual TWT agreement and operates in PS mode may listen to Beacon frames, but is exempt from the requirements for receiving Beacon frames as defined in 11.2.2.1 (General). " -- in that case there needs to be a requirement on the AP to replicate everything communicated in the beacon in the individual TWTs (e.g. channel switch announcements, EDCA params updates, planned ESS information) | As it says in the comment | Revised –  The AP (TWT responding STA) is expected to send a MGMT frame that contains an updated set of elements when such an event occurs. As for the group addressed frames reception the STA can wake at the DTIM to receive them if needed.  TGax editor to make the changes shown in 11-19/0966r2 under all headings that include CID 20837. |
| 20846 | Mark RISON | 366.26 | The four instances of "Other indications that the STA is in the awake state are [...] the transmission of a frame that indicates that the STA is in active mode (see 11.2.3.2 (STA power management modes))." make no sense in the context since the context is a "TWT requesting STA that is in PS mode"/"TWT scheduled STA that is in PS mode" | Delete all 4 instances of " or the transmission of a frame that indicates that the STA is in active mode (see 11.2.3.2 (STA power management modes))" | Rejected –  The STA can be in PS mode and once it sends a frame to the AP with PM of 0 it becomes in active mode. There is no inconsistency in these instances. |
| 20847 | Mark RISON | 369.31 | "The TWT responding STA of a trigger-enabled TWT agreement shall schedule for transmission of a Trigger frame for the TWT requesting STA, as described in 26.5.3 (UL MU operation), within each TWT SP for that TWT agreement." is prima facie incompatible with the baseline 9.4.2.199 "A value of 0 in the Flow Type subfield indicates an announced TWT in which the TWT requesting 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 before a frame is sent from the TWT responding STA to the TWT requesting STA." | Amend the baseline wording to have a different rule for trigger-enabled TWT | Revised –  Agree in principle with the comment. Proposed resolution amends the wording in the baseline to fix the inconsistency and adds a note to specify that the STA is expected to send the PSP or APSD TF in response to a Trigger frame if the TWT is a trigger-enabled TWT.  TGax editor to make the changes shown in 11-19/0966r2 under all headings that include CID 20847. |
| 21051 | Matthew Fischer | 383.50 | The TWT Information frame is a management frame for which reception and parsing at the receiving STA can be incovenient but is currently the only effective means for a STA to cause an early termination of a TWT SP. There needs to be a more convenient mechanism for a STA to cause a TWT SP early termination. Suggest using an A control value to signal a STA state transition with timing information. | Include a mechanism for signaling STA state transition which can be used by a STA to create an early termination of a TWT SP, such as is described in 11-18-1821 | Rejected –  This comment is very similar to the comment 15757 that was rejected in the previous LB.  This comment also fails to identify a technical issue and seems to be hinting into an implementation issue which is out of scope of the standard. The proposed change on the other hand suggests the addition of another option for providing an existing functionality. |

**Discussion: *None.***

* Individual TWT agreements

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 20837):***

An HE STA that successfully sets up an individual TWT agreement and operates in PS mode may listen to Beacon frames, but is exempt from the requirements for receiving Beacon frames as defined in 11.2.3.1 (General). The HE STA follows the rules defined in 11.2.3 (Power management in a non-DMG infrastructure network) to receive group-addressed frames.

NOTE--The TWT responding STA is expected to inform the TWT requesting STA of any critical update (as defined in 11.2.3.15 (TIM broadcast) by sending a Management frame to the TWT requesting STA when the STA is in the awake state.*(#20837)*

**26.8.4 Use of TWT Information frames**

* General

An HE STA may transmit a TWT Information frame to its peer STA during an individual TWT agreement, broadcast TWT schedule, or at any time as defined in 26.8.4.2 (TWT Information frame exchange for individual TWT), 26.8.4.3 (TWT Information frame exchange for broadcast TWT) and 26.8.4.4 (TWT Information frame exchange for flexible wake time), respectively.

NOTE—An HE AP might include multiple TWT Information frames, each addressed to a different peer STA, in an HE MU PPDU (see 26.5.1 (HE DL MU operation)).

The TWT Information frame shall have the Response Requested subfield equal to 0, the Next TWT Request subfield equal to 0, and one of the following:

* A nonzero value in the Next TWT subfield if the frame is transmitted by a TWT responding STA, a TWT scheduling AP, or by any HE STA to a peer STA that has set the Flexible TWT Schedule Support field to 1 in the HE Capabilities element it transmits.
* The value of the Next TWT subfield shall be selected from existing TWT values for an individual TWT agreement if the Flexible TWT Schedule Support field in the HE Capabilities element received from the peer STA is 0 and shall be selected from existing TWT values for a broadcast TWT schedule regardless of the value of the Flexible TWT Schedule Support field received from the peer STA.
* The Next TWT subfield may contain any nonzero value if Flexible TWT Schedule Support field in the HE Capabilities element received from the peer STA is 1.
* The All TWT field is 1 if the resumption applies to all broadcast TWT schedules followed by the TWT scheduled STA and/or to all individual TWT agreements followed by the TWT responding STA.
* A Next TWT subfield that is present if the frame is transmitted by a TWT requesting STA, a TWT scheduled STA, or if the frame is transmitted by any HE STA to a peer STA that has set the Flexible TWT Schedule Support field to 1 in the HE Capabilities element it transmits.
* The Next TWT subfield indicates the earliest TWT at which the individual TWT agreement or broadcast TWT schedule is resumed and shall be selected from existing TWT values for that TWT agreement or broadcast TWT schedule if the Flexible TWT Schedule Support field in the HE Capabilities element received from the peer STA is 0.
* The All TWT field is 1 if the resumption applies to all broadcast TWT schedules followed by the TWT scheduled STA and/or to all individual TWT agreements followed by the TWT requesting STA.
* The Next TWT subfield may contain any nonzero value if Flexible TWT Schedule Support field in the HE Capabilities element received from the peer STA is 1.
* A Next TWT subfield that is not present if the frame is transmitted by a TWT requesting STA or a TWT scheduled STA to indicate suspension of the individual TWT agreement or broadcast TWT schedule.
* The All TWT subfield is 1 if the suspension applies to all broadcast TWT schedules followed by the TWT scheduled STA and/or to all individual TWT agreements followed by the TWT requesting STA.
* The Next TWT subfield may contain any nonzero value if Flexible TWT Schedule Support field in the HE Capabilities element received from the peer STA is 1.

The use of TWT Information frames for suspending and/or resuming existing individual TWT agreements is described in 26.8.4.2 (TWT Information frame exchange for individual TWT). The use of TWT Information frames for suspending and/or resuming existing broadcast TWT schedules is described in 26.8.4.3 (TWT Information frame exchange for broadcast TWT). The use of TWT Information frames for providing a flexible TWT that is independent of any existing TWT agreements or TWT schedules is described in 26.8.4.4 (TWT Information frame exchange for flexible wake time).

* TWT Information frame exchange for individual TWT

An HE STA that has an individual TWT agreement may transmit a TWT Information frame to a peer STA with which it has the agreement if the peer STA has set the TWT Information Frame Disabled field to 0 in the TWT element sent during TWT setup; otherwise the HE STA shall not transmit a TWT Information frame to the peer STA. The HE STA sets the fields of the TWT Information frame as defined in 26.8.4.1 (General).

A TWT requesting STA that receives a TWT Information frame containing a Next TWT subfield follows the rules defined in 10.48.4 (Implicit TWT operation).

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 20229, 20230):***

A TWT requesting STA that receives an acknowledgment in response to a TWT Information frame transmitted by the STA:*(#20229)*

* That does not contain a Next TWT subfield shall consider the corresponding TWT agreement suspended until the TWT session is resumed.*(#20230)*
* That contains a Next TWT subfield shall consider the corresponding TWT agreement suspended and shall resume the TWT agreement starting from the value indicated in the Next TWT subfield of the transmitted TWT Information frame.
* Assumes that any other individual TWT agreements, broadcast TWT schedules (see 26.8.3 (Broadcast TWT operation)), are not affected by the transmission of this frame except when the All TWT subfield of the TWT Information frame is equal to 1. Other default PS procedures are not affected by the transmission of this frame (see 11.2 (Power management)).*(#20230)*

NOTE—The TWT Flow Identifier, together with the MAC addresses of the TWT requesting STA and TWT responding STA identifies the TWT agreement for which the TWT Information frame is sent (see 10.48.1 (TWT overview)).

If the TWT Information frame contains an All TWT subfield equal to 1 then the above rules apply to all individual TWT agreements, except that the resumptions of the respective TWTs shall occur at the first TWT of the respective TWT agreement that occurs not earlier than the Next TWT value contained in the TWT Information frame, regardless of the value of the Flexible TWT Schedule Support field in the HE Capabilities element exchanged between the two STAs.

A TWT requesting STA that is in PS mode and that transmits a TWT Information frame to a TWT responding STA shall suspend the corresponding TWT agreement and may transition to doze state after receiving the acknowledgment even if it has previously transmitted a PS-Poll or U-APSD trigger frame and has not yet received the expected frames from the AP in response and shall resume TWT operation for the corresponding TWT agreement at the specified TWT indicated (if any) in the TWT Information frame. A TWT requesting STA that is in PS mode and that receives a TWT Information frame from a TWT responding STA shall suspend the TWT agreement and may go to doze state after transmitting the acknowledgment even if it has previously transmitted a PS-Poll or U-APSD trigger frame and has not yet received the expected frames from the TWT responding STA in response and shall resume TWT operation for the corresponding TWT agreement at the specified TWT indicated (if any) in the TWT Information frame.

* TWT Information frame exchange for broadcast TWT

An HE STA that is a TWT scheduling AP may transmit a TWT Information frame to any of the members of a broadcast TWT schedule if the member has set the TWT Information Frame Disabled field to 0 in the TWT element sent when joining the broadcast TWT schedule. An HE STA that is a TWT scheduled STA may transmit a TWT Information frame to the TWT scheduling AP corresponding to a broadcast TWT schedule established by that STA if the AP has set the TWT Information Frame Disabled field to 0 in the broadcast TWT element it transmits. The HE STA sets the fields of the TWT Information frame as defined in 26.8.4.1 (General).

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 20232):***

A TWT scheduled STA that receives a TWT Information frame that contains an All TWT subfield equal to 1 follows the rules defined in 26.8.3.3 (Rules for TWT scheduled STA), except that the TWT scheduled STA shall consider all the broadcast TWT schedules as suspended and shall resume eachbroadcast TWT schedule at the first TWT, which occurs not earlier than the Next TWT subfield(#Ed) value contained in the received TWT Information frame.*(#20232)*

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 20229):***

A TWT scheduled STA that receives an acknowledgment in response to a TWT Information frame transmitted by the STA that contains an All TWT subfield equal to 1 and that does not contain a Next TWT subfield(#20333)(#20943) shall consider all broadcast TWT schedules suspended, and can follow the default PS procedure defined in 11.2 (Power management) until the broadcast TWT schedules are resumed.*(#20229)*

A TWT scheduled STA that receives an acknowledgment in response to a TWT Information frame transmitted by the STA that contains an All TWT subfield equal to 1 and that contains a Next TWT subfield shall suspend all broadcast TWT schedules and shall resume the broadcast TWT schedules at the first scheduled TWT for each respective broadcast TWT schedule that occurs not earlier than the value indicated in the Next TWT subfield contained in the transmitted TWT Information frame, regardless of the values of the Flexible TWT Schedule Support field in the HE Capabilities element exchanged between the two STAs.*(#20229)*

NOTE—TWT suspension and resumption as indicated by a TWT Information frame with the All TWT subfield equal to 1 applies to all broadcast TWT schedules of the TWT scheduling AP.

A TWT scheduled STA that is in PS mode and that transmits a TWT Information frame to a TWT scheduling AP shall suspend the corresponding broadcast TWT schedule and may transition to doze state after receiving the acknowledgment, even if it has previously transmitted a PS-Poll or U-APSD trigger frame and has not yet received the expected frames from the TWT scheduling AP in response, and shall resume TWT operation for the corresponding broadcast TWT schedule at the specified TWT indicated (if any) in the TWT Information frame. A TWT scheduled STA that is in PS mode and that receives a TWT Information frame from a TWT scheduling AP shall suspend the corresponding broadcast TWT schedule and may transition to doze state after transmitting the acknowledgment, even if it has previously transmitted a PS-Poll or U-APSD trigger frame and has not yet received the expected frames from the TWT scheduling AP in response, and shall resume TWT operation for the corresponding broadcast TWT schedule at the specified TWT indicated (if any) in the TWT Information frame.

* TWT Information frame exchange for flexible wake time

An HE STA may transmit a TWT Information frame that contains a flexible TWT to a peer STA if the peer STA has set the Flexible TWT Schedule Support field of the HE Capabilities it transmits to 1; otherwise the HE STA shall not transmit a TWT Information frame that contains a flexible TWT to the peer STA.

A flexible TWT is a nonzero value indicated in the Next TWT subfield of a TWT Information frame with All TWT subfield equal to 0, which is independent from any existing TWT values of TWT agreements that the HE STA might be following (if any). The HE STA sets the fields of the transmitted TWT Information frame as defined in 26.8.4.1 (General).

NOTE—Flexible TWT support does not depend on the STA's TWT capabilities, i.e., the STA can use flexible TWT without being required to set up an individual TWT agreement or broadcast TWT schedule.

An HE STA that successfully exchanges a TWT Information frame with flexible TWT and that contains a TWT Flow Identifier that identifies an existing individual TWT agreement shall replace the next TWT SP start time for that TWT agreement with the value contained in the Next TWT subfield of the TWT Information frame.

A non-AP HE STA that successfully exchanges a TWT Information frame with flexible TWT and that contains a TWT Flow Identifier that does not identify any existing individual TWT agreement preserves the PM mode from the time the TWT Information frame was sent to the time indicated in the Next TWT subfield of the TWT Information frame as described below.

NOTE—If the TWT Information frame has the All TWT field equal to 1 then the TWTs are suspended and resumed as described in 26.8.4.2 (TWT Information frame exchange for individual TWT) and 26.8.4.3 (TWT Information frame exchange for broadcast TWT).

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 20229):***

A non-AP HE STA that transmits a TWT Information frame that contains a flexible TWT to a peer STA may go to doze state after receiving the acknowledgment sent in response to the TWT Information frame*(#20229)* if it is in PS mode (i.e., the PM subfield of the Frame Control field of the TWT Information frame is 1) and may be unavailable if it is in active mode (i.e., the PM subfield of the Frame Control field of the TWT Information frame is 0) and shall be in the awake state at the time it indicated in the Next TWT subfield of the TWT Information frame and shall be in the PS mode if the PM subfield of the TWT Information frame was 1 and in active mode if the PM subfield of the TWT Information frame was 0. The STA, once in the awake state, shall follow the rules that correspond to the power management mode of the STA, which are defined in 11.2.3 (Power management in a non-DMG infrastructure network) for the Active and PS mode, and in 26.8 (TWT operation) when the STA operates within TWT SPs.

NOTE—An HE AP delivers DL BUs to the STA at or after the flexible TWT indicated in the flexible TWT by following the rules in 11.2.3.6 (AP operation) if the STA does not follow TWT, and by following the rules in 26.8 (TWT operation) if the STA follows TWT and the delivery falls within a TWT SP. The STA is not required to send a frame at or after the flexible TWT to indicate its awake state to the AP. If the STA is following U-APSD then the operation is resumed at a time that occurs at the flexible TWT and if the STA is following an APSD schedule then the operation is resumed at a time that occurs at or after the flexible TWT.

A non-AP HE STA that receives a TWT Information frame that contains a flexible TWT from a peer STA may go to doze state after transmitting the acknowledgment if it is in PS mode and may be unavailable if it is in active mode and shall be in the awake state at the time it indicated in the Next TWT subfield of the TWT Information frame and shall be in the PS mode if the STA was in PS mode when it received the TWT Information frame and in active mode if the STA was in active mode when it received the TWT Information frame. The STA, once in the awake state, shall follow the rules that correspond to the power management mode of the STA, which are defined in 11.2.3 (Power management in a non-DMG infrastructure network) for the Active and PS mode, and in 26.8 (TWT operation) when the STA operates within TWT SPs.

**26.8.3.2 Rules for TWT scheduling AP**

A TWT scheduling AP that sets the TWT Setup Command subfield to Reject TWT shall indicate the TBTT at which the periodic broadcast TWT will be terminated by setting the value of the Broadcast TWT Per­sistence subfield to indicate the number of TBTTs that remain until the broadcast TWT schedule is termi­nated. The broadcast TWT schedule terminates at the next TBTT that follows the TBTT at which the TWT scheduling AP transmits the broadcast TWT element with Broadcast TWT Persistence subfield for that broadcast TWT schedule equal to 0. A TWT scheduling AP may terminate the membership of a TWT sched­uled STA in all broadcast TWTs by transmitting a TWT Teardown frame with the Teardown All TWT field set to 1.

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 20400):***

A TWT scheduling AP that sets the TWT Setup Command subfield to Alternate TWT shall indicate the TBTT at which the periodic broadcast TWT parameter set will be modified by setting the Broadcast TWT Persistence subfield to indicate the number of TBTTs that remain until the broadcast TWT schedule is mod­ified. The broadcast TWT schedule will be modified at the next TBTT, which follows the TBTT at which the TWT scheduling AP transmits the broadcast TWT element with Broadcast TWT Persistence subfield for that broadcast TWT schedule equal to 0. The AP shall include in the broadcast TWT element the future broadcast TWT parameter set that will take effect at that TBTT. The future broadcast TWT parameter set shall have the same values in the TWT Setup Command and Broadcast TWT ID subfields as the current broadcast TWT parameter set that is being modified and switch the TWT Setup Command subfield from Alternate TWT to Accept TWT at that TBTT. The future broadcast TWT parameter set shall be in a Broad­cast TWT Parameter Set field that is located after the Broadcast TWT Parameter Set field that contains the current broadcast TWT parameter set.

NOTE—TWT scheduled STAs follow the broadcast TWT parameters that are included in the current broadcast TWT parameter set and only switch to following the broadcast TWT parameters in the future broadcast TWT parameter set when the TWT Setup Command field is equal to Accept TWT in the Broadcast TWT Parameter Set field that contains the future broadcast TWT parameter set.*(#20400)*

A TWT scheduling AP should indicate Alternate TWT or Reject TWT in the TWT Setup Command(19/724r3) field of the broadcast TWT element for as many TBTTs as needed to exceed the longest interval any STA is expected to not receive Beacon frames either when the TWT parameters of a periodic TWT will change, or when the periodic TWT specified by that TWT parameter set will be terminated.

**26.8.3.3 Rules for TWT scheduled STA**

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 20400):***

A TWT scheduled STA may request to become a member of a broadcast TWT by transmitting a frame to its associated AP that contains a TWT element with the Negotiation Type subfield set to 3 and the TWT Setup Com­mand*(#20400)* field set to Request TWT or Suggest TWT or Demand TWT. The TWT Parameter set indicates the Broadcast TWT ID of the broadcast TWT that the STA is requesting to join. See Table 26-7 (Broadcast TWT membership exchanges).

**26.8.2 Individual TWT agreements**

An HE STA that successfully sets up a TWT agreement with another HE STA shall follow the rules defined in 10.48.1 (TWT overview) and 10.48.4 (Implicit TWT operation), except that all the additional rules defined in 26.8 (TWT operation) supersede all the respective rules defined in 10.48.1 (TWT over­view) and 10.48.4 (Implicit TWT operation). A TWT or TWT SP that is set up under an implicit TWT agreement is an implicit TWT or implicit TWT SP, respectively (see 10.48.1 (TWT overview)). A TWT or TWT SP that is set up under a trigger-enabled TWT agreement is a trigger-enabled TWT or trigger-enabled TWT SP, respectively.

**TGax Editor: *Insert a new paragraph and Figure below in this subclause as follows (#CID 20543):***

An example of individual TWT operation is shown in Figure 26-8a (Example of individual TWT operation), where the AP is the TWT responding STA and STA 1 and STA 2 are the TWT requesting STAs.



**Figure 26-8a—Example of individual TWT operation**

STA 1 sends a TWT request to the TWT responding STA to setup a trigger-enabled TWT agreement. The TWT responding STA accepts the TWT agreement with STA 1 and confirms the acceptance in the TWT response sent to STA 1. Subsequently, the TWT responding STA sends an unsolicited TWT response to STA 2 to setup a trigger-enabled TWT agreement with STA 2. Both these TWT agreements are setup as announced TWTs. During the trigger-enabled TWT SP, the TWT responding STA sends a Trigger frame to which the TWT requesting STAs indicate that they are awake during the TWT SP. STA 1 indicates that it is awake by sending a PS-Poll frame and STA 2 indicates that it is awake by sending a QoS Null frame in response to the Trigger frame. STA 1 and STA 2 receive their DL BUs in a subsequent exchange with the TWT responding STA and go to doze state outside of this TWT SP.*(#20543)*

**9.4.2.199 TWT element**

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 20847):***

The Flow Type subfield indicates the type of interaction between the TWT requesting STA and the TWT responding STA at a TWT. Setting the Flow Type subfield to 0 indicates an announced TWT in which the TWT requesting 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 before a frame, which is not a Trigger frame,*(#20847)* is sent from the TWT responding STA to the TWT requesting STA. Setting the Flow Type subfield to 1 indicates an unannounced TWT in which the TWT responding STA will send a frame to the TWT requesting STA at TWT without waiting to receive a PS-Poll or an APSD trigger frame from the TWT requesting STA.NOTE—The TWT requesting 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.*(#20847)*