IEEE P802.11
Wireless LANs

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| Comment resolutions for Individual TWT |
| Date: 2019-05-01 |
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Abstract

This submission proposes resolutions for multiple comments related to TGax D4.0 with the following CIDs (19 CIDs):

* 20119, 20124, 20262, 20263, 20380, 20383, 20399, 20680, 20702, 20819,
* 20837, 20844, 21063, 21064, 21070, 21071, 21072, 21073, 21074

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Revised document that incorporates changes as per discussions during the presentation at the ad-hoc meeting. One of the CIDs is deferred and not addressed in this document (i.e., 20837). Changes are highlighted in green.

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.***

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| **CID** | **Commenter** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 20119 | Alfred Asterjadhi | 369.59 | The indication sent "previous to the TWT SP" is an indication that is certainly sent after the last TWT SP. Please clarify so that it is clear. Also specify (perhaps in a note) that delivery of DL BU frames outside of TWT SPs follow baseline rules, not only for the AM but also for the PS. This last note perhaps at the end of the subclause. Apply to broadcast TWT as well for consistency. | As in comment. | Revised –Agree in principle with the comment. Proposed resolution clarifies that the indication is sent previous to the start of the TWT SP but after the end of the most recent TWT SP. Also added a sentence clarifying that DL BU delivery outside of TWT SPs follows baseline rules.TGax editor to make the changes shown in 11-19/0725r1 under all headings that include CID 20019. |
| 20124 | Alfred Asterjadhi | 369.22 | Proposed resolution for CID 16453 seems to not be fully incorporated. Please refer to 11-18/1474r2. | As in comment. | Revised –Agree in principle with the comment. Proposed resolution incorporates the changes that were approved for CID 16453 in 11-18/1474r2 in this document. Proposed resolution also harmonizes the language used in individual and broadcast TWT paragraphs on the same description.TGax editor to make the changes shown in 11-19/0725r1 under all headings that include CID 20124. |
| 20262 | Jarkko Kneckt | 369.60 | In triggered announced TWT SP any UL frame that a STA includes to a HE TB PPDU should be considered as an indication that a STA is awake for the TWT SP duration. There is no need to require that such a frame is U-APSD trigger frame or to transmit a PS-Poll frame. | Please change the text to read: " ... shall include a PS-Poll, management or a data frame in the HE TB PPDU which inclusion is not prohibited by other rules, see not prohibit their inclusion, see 26.5.3 (UL MU operation).In general change U-APSD trigger frame to a frame that indicates the STA to be available in TWT SP. | Revised –The frame can be any type of frame as long as the frame does solicit an immediate response from the AP and provides PM bit functionality, since the absence of an immediate response allows the STA to maintain its aggressiveness in contending for the medium increasing the likelihood of collisions. Hence, the proposed resolution is to clarify that the indication can be any frame that solicits an immediate response. Similar changes applied to broadcast TWT counterpart.TGax editor to make the changes shown in 11-19/0725r1 under all headings that include CID 20262. |
| 20263 | Jarkko Kneckt | 369.60 | In announced TWT SP any UL frame that is received during the TWT SP should be considered as an indication that a STA is awake, there is no need to:1. couple APSD and TWT together and require that only APSD trigger frame allows AP to transmit frames to the STA2. require that STA transmits PS-Poll. PS-Poll frame adds transmission overheads. | Please allow an announced TWT SP to start with a control, data or a management frame that is addressed to the AP and transmitted by the non-AP STA to which the SP is initiated in the beginning of the TWT SP. | Revised –The frame can be any type of frame as long as the frame does solicit an immediate response from the AP and provides PM bit functionality, since the absence of an immediate response allows the STA to maintain its aggressiveness in contending for the medium increasing the likelihood of collisions. Hence, the proposed resolution is to clarify that the indication can be any frame that solicits an immediate response. Similar changes applied to broadcast TWT counterpart.TGax editor to make the changes shown in 11-19/0725r1 under all headings that include CID 20263. |
| 20380 | Laurent Cariou | 370.19 | AP isn't able to always predict if the current TF transmission is the last TF in the Individual TWT SP because the medium might be shared with other BSSs which will prevent additional transmissions | Replace the original sentence with the following 2 sentences: The TWT responding STA may set the More TF subfield to 0 when the Trigger frame is the last Trigger frame of the TWT SP. The TWT responding STA shall set the More TF subfield to 0 when the Trigger frame is sent outside of a TWT SP | Revised –Agree in principle with the comment. Proposed resolution is to specify that the Trigger frame is the last scheduled Trigger frame rather than the last transmitted Trigger frame. Also added in the note that the AP can cancel the transmission of a scheduled Trigger frame if the AP gains access to the wireless medium outside of the TWT SP.TGax editor to make the changes shown in 11-19/0725r1 under all headings that include CID 20380. |
| 20383 | Laurent Cariou | 370.10 | AP might not be able to send Trigger Frame to STAs in each TWT SP due to medium busy or internal decision to serve specific STAs | Clarify that "schedule for transmission" means that the AP is doing its best to send it but may not do it because of busy medium, or internal queues | Revised –The commenter is right that there are cases where due to busy medium the STA may not be able to access the medium in time for sending the Trigger frame. This is the reason why the statement refers to the schedule for transmission rather than transmit. In order to clarify that the STA might not be able to transmit due to wireless medium conditions we add a note to specify that the STA might cancel the transmission if the STA gains access to the medium after the TWT SP. Internal queues are not an issue because the STA is in charge of managing its internal queues.TGax editor to make the changes shown in 11-19/0725r1 under all headings that include CID 20383. |
| 20399 | Liwen Chu | 370.08 | Add a note that TWT responding STA can transmit multiple PPDUs within the TWT SP to a TWT request STA once a PS Poll or u-apsd trigger is received from the TAT request STA. | As in comment | Revised –Since these are service periods then multiple PPDUs can be sent. However, agree in principle to add it as part of a note. Instead of adding another note the resoluton is to clarify this aspect in the note following the subsequent paragraph since it covers both cases, unannounced and announced. Similar changes applied to the broadcast TWT counterpart.TGax editor to make the changes shown in 11-19/0725r1 under all headings that include CID 20399. |
| 20680 | Mark RISON | 370.08 | "A TWT responding STA that receives a PS-Poll frame or a U-APSD trigger frame or any other indicationfrom a TWT requesting STA that is in PS mode during or before an announced TWT SP that the STA is inthe awake state during the TWT SP shall follow the rules defined in 11.2.3.6 (AP operation during the CP) " -- since TWT SPs are periodic, "during or before" is the same thing as "at any time" | Change to "A TWT responding STA that receives from a STA in PS mode a PS-Poll frame or a U-APSD trigger frame or any other indicationfrom a TWT requesting STA that the STA is inthe awake state during the TWT SP shall follow the rules defined in 11.2.3.6 (AP operation during the CP) " | Revised –Agree in principle with the comment that this sentence can be clearer. Since the STA may go to doze state after the end of the previous TWT SP and as such it may send an indication that it is again in the awake state prior to the start of the subsequent TWT SP, it is beneficial to specify that the indication is received after the most recent TWT SP but before the current TWT SP.TGax editor to make the changes shown in 11-19/0725r1 under all headings that include CID 20680. |
| 20702 | Mark RISON | 369.22 | Trigger-based unannounced mode is pointless. The AP can just transmit DL data to the STA and the STA can just transmit using EDCA to the AP. The "should not transmit frames that are not contained within HE TB PPDUs to the TWT responding STA within trigger-enabled TWT SPs" is just a should so not sufficient justification | Add a para at the end of the referenced subclause: "An HE STA shall not use trigger-based unannounced TWT." | Rejected –The comment fails to identify a technical issue.Please note that the paragraph has nothing to do with the fact that the TWT may or may not be announced or unannounced. Additionally, trigger-based unannounced mode is beneficial for those type of traffic patterns where the AP first transmits DL data to the STA (without polling the STA if awake) and subsequently (or within the PPDU) it includes a Trigger frame so that the STA delivers the acknowledgment and additionally if it has buffered traffic in the UL. Having the STA contend using EDCA while the AP is attempting to deliver DL data increases the likelihood of collisions between the two. |
| 20819 | Mark RISON | 370.08 | "A TWT responding STA that receives a PS-Poll frame or a U-APSD trigger frame or any other indicationfrom a TWT requesting STA that is in PS mode during or before an announced TWT SP that the STA is inthe awake state during the TWT SP shall" -- a PS-Poll or U-APSD trigger frame only indicates the STA is awake to the extent that it has not received a response to the poll/trigger and has not timed out (also not clear which STA is being referred to at the end) | Change the cited text at the referenced location to "A TWT responding STA that receives an indicationfrom a TWT requesting STA that is in PS mode during or before an announced TWT SP that the TWT requesting STA is inthe awake state during the TWT SP shall" and after the para this appears add a "NOTE---This indication might be a PS-Poll frame or a U-APSD trigger frame for which the corresponding response has not completed." | Revised –Agree in principle with the comment. Proposed resolution accounts for the suggested change, however not as suggested “for which the corresponding response has not completed” since it is not clear what completion means. Used “for which the immediate control response frame is not received” instead. Similar changes were applied to the broadcast TWT counterpart.TGax editor to make the changes shown in 11-19/0725r1 under all headings that include CID 20819. |
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| r120844 | Mark RISON | 369.44 | "The TWT responding STA does not intend to schedule for transmission of a Trigger frame for the TWTrequesting STA" -- it is not clear what intending to schedule for transmission entails | Clarify | Revised –Agree in principle with the comment that there is ambiguity in the intention. Proposed resolution is to remove “intend to” so that it is clear that the action is the not scheduling of the Trigger frame.TGax editor to make the changes shown in 11-19/0725r1 under all headings that include CID 20844. |
| 21063 | Matthew Fischer | 367.55 | The reference needs to be broadened. It says "in this subclause" but we are in 26.8.2 and I think that the reference really wants to be to 26.8 | change "in this subclause" to "in 26.8 (TWT operation)" | Accepted |
| 21064 | Matthew Fischer | 367.59 | Can a TWT be both implict and trigger enabled? If so, what is it called? Is it both an implicit TWT and a trigger enabled TWT? Do we need to say this? | Clarify. | Rejected –The comment fails to identify a technical issue and is asking questions.Please note that all TWTs in 11ax are implicit TWTs. Quoting bullet in P367L34:“Shall set the Implicit subfield to 1 and the NDP Paging Indicator subfield to 0 in all TWT elements that it transmits during the TWT setup.” |
| 21070 | Matthew Fischer | 369.23 | The two instances of "for that TWT agreement" both seem superfluous and in fact, confusing, misleading and incorrect. A requesting STA might have more than one TWT agreement. | Remove the two instances of "for that TWT agreement" | Accepted |
| 21071 | Matthew Fischer | 369.31 | Extra word | Remove "of" from "schedule for transmission of a Trigger frame" also at P369L44 | Accepted |
| 21072 | Matthew Fischer | 370.12 | missing word | change "as available" to "as are available" | AcceptedNote to the TGax editor —Similar changes to be applied to the broadcast TWT counterpart. |
| 21073 | Matthew Fischer | 370.14 | The infinitive is probably incorrect here. | change "to be" to "that it is" | AcceptedNote to the TGax editor —Similar changes to be applied to the broadcast TWT counterpart. |
| 21074 | Matthew Fischer | 370.22 | missing words | change "available" to "as are available" | AcceptedNote to the TGax editor —Similar changes to be applied to the broadcast TWT counterpart. |

**Discussion: *None.***

* Individual TWT agreements

An HE STA may negotiate individual TWT agreements with another HE STA as defined in 10.43.1 (TWT overview), except that the STA:

* May set the Responder PM Mode subfield to 1 if it is a TWT responding STA that intends to go to doze state outside of TWT SPs.
* If the TWT responding STA is an AP then it may set the Responder PM Mode subfield to 1 only if all non-AP STAs that are associated to it indicate support of TWT and the AP has set the TWT Required subfield to 1 in the HE Operation element it transmits; otherwise it shall set the Responder PM Mode subfield to 0.
* An AP that sets the Responder PM Mode subfield to 1 follows the rules defined in 10.43.7 (TWT Sleep Setup).
* Shall set the Implicit subfield to 1 and the NDP Paging Indicator subfield to 0 in all TWT elements that it transmits during the TWT setup.
* May set the Trigger subfield to 1 in the TWT element it transmits during the TWT setup to negotiate a trigger-enabled TWT.
* A successful TWT agreement whose Trigger subfield in the TWT response sent by the AP is 1 is a trigger-enabled TWT; otherwise it is not a trigger-enabled TWT.
* Shall set the TWT Channel subfield in the TWT element it transmits to 0 unless(#15368) the HE STA sets up a subchannel selective transmission operation as defined in 26.8.7 (HE subchannel selective transmission).
* 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.
* An HE STA shall not use the RAW mechanism for protection of TWT SPs.

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 21063):***

An HE STA that successfully sets up a TWT agreement with another HE STA shall follow the rules defined in 10.43.1 (TWT overview) and 10.43.4 (Implicit TWT operation), except that all the additional rules defined in 26.8 (TWT operation) supersede all the respective rules defined in 10.43.1 (TWT overview) and 10.43.4 (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 10.43.1 (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.*(#21063)*

An HE STA may execute the individual TWT setup exchanges defined in Table 26-5 (TWT setup exchange for unsolicited TWT and recommended broadcast TWT switch) in addition to the exchanges defined in 10.48 (Target wake time (TWT)). An HE STA that intends to set up an individual TWT shall set the Negotiation Type subfield to 0 as defined in 10.48 (Target wake time (TWT)) or as defined in Table 26-5 (TWT setup exchange for unsolicited TWT and recommended broadcast TWT switch). The HE STA may respond to the TWT request with a TWT response that has the Negotiation Type subfield equal to 3 as indicated in Table 26-5 (TWT setup exchange for unsolicited TWT and recommended broadcast TWT switch) to provide recommended broadcast TWT schedules for the requesting STA.

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| * TWT setup exchange for unsolicited TWT and recommended broadcast TWT switch
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| TWT Setup Command field in an initiating frame | TWT Setup Command field in a response frame | TWT condition after the completion of the exchange |
| Request TWT or Suggest TWT or Demand TWT with Broadcast subfield = 0 | Accept TWT with Broadcast subfield = 1 | This response is not allowed. |
| Request TWT, Suggest TWT or Demand TWT with Broadcast subfield = 0 | Dictate TWT with Broadcast subfield = 1 | No individual TWT agreement exists with the associated TWT Flow identifier. One or more broadcast TWT schedule exists that uses the TWT parameters identified in the response frame including a Broadcast TWT IDs. The broadcast TWT schedules are not necessarily newly created. The responding STA will not create any new individual TWT agreement with the requester at this time. The STA transmitting the initiating frame is not a member of the broadcast TWT, however the STA is recommended to join any of the broadcast TWT schedules. |
| Accept TWT with Broadcast subfield set to 0 | No frame transmitted | The STA receiving this frame now has an individual TWT agreement with the transmitter of the frame where the parameters of the individual TWT agreement are identified by the initiating frame. |
| Alternate TWT or Dictate TWT with Broadcast subfield = 0 | No frame transmitted | The STA receiving this frame is not, through the receipt of this frame, a member of the TWT identified by the initiating frame but can use the information provided to create a request to set up a TWT in a subsequent initiating frame that it transmits. |
| NOTE 1—The Negotiation Type field in the TWT element contained in these frames is 0 if the Broadcast subfield is 0 and is 3 if the Broadcast subfield is 1.NOTE 2—The initiating frame and response frame settings not listed in the tables in 10.48 (Target wake time (TWT)) or 26.8 (TWT operation) are not allowed. The initiating frame is a TWT request if the TWT element carried in the frame has the TWT Request field set to 1; otherwise it is a TWT response (see Table 9-298 (TWT Setup Command field values)). The response frame is a TWT response if the TWT element contained in the frame has the TWT Request field equal to 0. |

**TGax Editor: *Please ignore the proposed changes below (#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. The TWT responding STA should inform the TWT requesting STA of any critical update that occurs to any of the elements inside the Beacon frame by sending a Management frame, containing the updated elements, when the TWT requesting STA is in the awake state.*(#20837)*

An HE STA may tear down an individual TWT agreement by sending a TWT Teardown frame with the Negotiation Type field set to 0. An HE STA may tear down all individual TWT agreements by sending a TWT Teardown frame with the Teardown All TWT field set to 1.(#16425)

An HE AP may send an unsolicited TWT response with the Trigger subfield equal to 1 to a non-AP HE STA that has set the TWT Requester Support subfield to 1 in the HE Capabilities elements that it transmits to the AP. The TWT response shall have one of these values in the TWT Command field: Accept TWT, Alternate TWT or Dictate TWT. An unsolicited TWT response with TWT Command of Alternate TWT or Dictate TWT contains an advisory notification to the recipient of TWT parameters that are likely to be accepted by the AP if the recipient transmits a subsequent TWT request to the AP that includes those TWT parameters. An unsolicited TWT response with the TWT Command of Accept TWT creates a TWT agreement between the two STAs. A STA that received an unsolicited TWT response with the TWT Command of Accept TWT may transmit a TWT Teardown frame to delete the unsolicited individual TWT agreement.

NOTE—The HE AP might send an unsolicited TWT response to a non-AP HE STA with a TWT Flow Identifier that corresponds to an existing TWT agreement. The unsolicited TWT response with TWT Command of Accept TWT will indicate new TWT parameters that are different from the previously negotiated TWT parameters for that TWT agreement.

An HE STA shall not transmit BAT, TACK, or STACK frames, which are allowed in 10.43.2 (TWT acknowledgment procedure)).

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 21070, 20124):***

A TWT requesting STA should not transmit frames to the TWT responding STA outside of negotiated TWT SPs and should not transmit frames that are not contained within HE TB PPDUs to the TWT responding STA within trigger-enabled TWT SPs.*(#21070)*

NOTE—The TWT requesting STA decides which frames to transmit within or outside a TWT SP and while it is recommended that the TWT requesting STA not transmit using EDCA within or outside TWT SPs, the TWT requesting STA is still permitted to do so. If the STA decides to transmit then the STA might contend for access to the medium as defined in 10.24.2 (HCF contention based channel access (EDCA)) and in 26.2.7 (EDCA operation using MU EDCA parameters).*(#20124)* (#16453)

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 20380, 20383, 20844, 21071):***

The TWT responding STA of a trigger-enabled TWT agreement shall schedule for transmission 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. The TWT responding STA should solicit buffer status reports from the TWT requesting STA at the start of the TWT SP following the procedure described in 26.5.3.6 (HE buffer status feedback operation for UL MU) or as described in 26.5.6 (NDP feedback report procedure). The TWT responding STA that intends to schedule for transmission additional Trigger frames during a trigger-enabled TWT SP shall set the More TF subfield in the Common Info field of the Trigger frame to 1 to indicate that it will schedule for transmission another Trigger frame within the same TWT SP. The TWT responding STA shall set the More TF subfield to 0 when the Trigger frame is the last scheduled Trigger frame of the TWT SP or when the Trigger frame is scheduled for transmission outside of a TWT SP.

NOTE 1—The TWT responding STA can cancel the transmission of a scheduled Trigger frame if the STA gains access to the wireless medium outside of the TWT SP. The TWT responding STA does not schedule for transmission a Trigger frame for the TWT requesting STA when the TWT agreement is not a trigger-enabled TWT agreement or when the TWT requesting STA has sent an OM Control subfield that has the UL MU Disable subfield equal to 1 (see 26.9 (Operating mode indication).*(#20381, 20383, 20844, 21071)*

NOTE 2—The Trigger frame can also be a TRS Control subfield contained in an MPDU carried in a DL MU PPDU, provided that the AP allocates enough resources in the HE TB PPDU for the STA to at least deliver its BSRs in response to the soliciting DL MU PPDU, and is recommended to allocate enough resources in subsequent Trigger frames sent during the TWT SP so that the STA can send as much as possible of the data reported in the BSR.(#16962)

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 20119):***

A TWT requesting STA transmits an HE TB PPDU as a response to a Trigger frame that is addressed to(#16149) it and is sent during a trigger-enabled TWT SP (see 26.5.3 (UL MU operation)). A TWT requesting STA that is in PS mode and is awake shall include a PS-Poll frame or a U-APSD trigger frame in the HE TB PPDU if the TWT is an announced TWT unless the STA has already transmitted a PS-Poll or U-APSD trigger frame or transmitted any other indication that the STA is in the awake state within that TWT SP or has, previous to the start of the TWT SP but after the end of the most recent TWT SP, indicated to the AP that it is currently in the awake state. The STA may include other frames in the HE TB PPDU when other rules do not prohibit their inclusion, see 26.5.3 (UL MU operation).*(#20119)*

NOTE 1–A Trigger frame is addressed to(#16149) a TWT requesting STA if it is sent by the AP with which the STA is associated and the frame contains the 12 LSBs of the STA’s AID in any of its User Info fields. The Trigger frame can have multiple recipients, each of which is identified by the presence of the 12 LSBs of the recipient’s AID in any of its User Info fields (see 26.5.3 (UL MU operation)), and can have in the TA field the MAC address of the AP or the transmitted BSSID under the conditions defined in 26.5.3.2.4 (Allowed settings of the Trigger frame fields and TRS Control subfield).

NOTE 2—Other indications that the STA is in the awake state are the transmission of an HE TB feedback NDP(#15768) in response to an NFRP Trigger frame (see 26.5.6 (NDP feedback report procedure)) or the transmission of a frame that indicates that the STA is in active mode (see 11.2.3.2 (STA power management modes)).

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 20819, 21072, 21073, 20262, 20263, 20680):***

A TWT responding STA that receives a PS-Poll frame or a U-APSD trigger frame or any other indication from a TWT requesting STA that is in PS mode, during or before an announced TWT SP but after the end of the most recent TWT SP, that the TWT requesting STA is in the awake state during the TWT SP shall follow the rules defined in 11.2.3.6 (AP operation during the CP) except that the TWT responding STA should deliver to the TWT requesting STA as many buffered BUs as are available at the TWT responding STA, provided that the BU delivery does not exceed the duration of the TWT SP, the TWT requesting STA has indicated that it is in the awake state for that TWT SP and as long as the TWT requesting STA has not entered the doze state (see 26.8.4.2 (TWT information for individual TWT) and 26.8.5 (Power save operation during TWT SPs)).

NOTE—The indication that the TWT requesting STA is in the awake state for that TWT SP might be a PS-Poll, U-APSD trigger frame, or any frame for which an immediate response is solicited and that follows the rules in 11.2.3.2(Non-AP STA power management modes) but the corresponding immediate response frame is not received by the TWT requesting STA. Other indications that the STA is in the awake state are the transmission of an HE TB NDP PPDU in response to an NFRP Trigger frame (see 26.5.6 (NDP feedback report procedure)) or the transmission of a frame that indicates that the STA is in active mode (see 11.2.3.2 (Non-AP STA power management modes)).*(#20819, 21072, 21073, 20262, 20263, 20680)*

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 21074):***

A TWT responding STA that sends frames to a TWT requesting STA that is in PS mode during an unannounced TWT SP shall follow the rules defined in 11.2.3.6 (AP operation during the CP) except that the TWT responding STA should deliver to the TWT requesting STA as many buffered BUs as are available at the TWT responding STA, provided that the BU delivery does not exceed the duration of the TWT SP and as long as the TWT requesting STA has not entered the doze state (see 26.8.4.2 (TWT information for individual TWT) and 26.8.5 (Power save operation during TWT SPs)).*(#21074)*

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 20399):*** (#16424)

NOTE—The TWT responding STA can deliver the buffered BUs in A-MPDU(s) sent under a block ack agreement if the TWT is an announced TWT and the TWT requesting STA is awake for that TWT SP, or if the TWT is an unannounced TWT (at the start of which the TWT requesting STA is assumed to already be awake). The buffered BUs can be delivered in multiple PPDUs transmitted within the TWT SP. The TWT responding STA can transmit frames to TWT requesting STA after the end of the TWT SP if the STA is in Active mode.*(#20399)*

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 20119):***

A TWT responding STA may transmit to a TWT requesting STA that is in Active mode at any time (see 11.2.3.2 (STA power management modes)). A TWT responding STA may transmit to a TWT requesting STA that is in PS mode and awake outside of a TWT SP following the rules in 11.2.3.6 (AP operation during the CP).*(#20119)*

**26.8.3.2 Rules for TWT scheduling AP**

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 20819, 21072, 21073, 20262):***

A TWT scheduling AP that receives a PS-Poll or a U-APSD trigger frame or any other indication from a TWT scheduled STA that is in PS mode, duringor before an announced TWT SP but after the end of the most recent TWT SP, that the TWT scheduled STA is in the awake state during the TWT SP shall follow the rules defined in 11.2.3.6 (AP operation) except that the AP should deliver to the TWT scheduled STA as many buffered BUs as are available at the AP, provided that the BU delivery does not exceed the duration of the TWT SP, the TWT scheduled STA has indicated that it is in the awake state for that TWT SP and as long as the TWT scheduled STA has not entered the doze state (see 26.8.4.3 (TWT information for broadcast TWT) and 26.8.5 (Power save operation during TWT SPs)).

NOTE—The indication that the TWT scheduled STA is in the awake state for that TWT SP might be a PS-Poll, U-APSD trigger frame, or any frame for which an immediate response is solicited and that follows the rules in 11.2.3.2(Non-AP STA power management modes) but the corresponding immediate response frame is not received by the TWT scheduled STA. Other indications that the STA is in the awake state are the transmission of an HE TB NDP PPDU in response to an NFRP Trigger frame (see 26.5.6 (NDP feedback report procedure)) or the transmission of a frame that indicates that the STA is in active mode (see 11.2.3.2 (Non-AP STA power management modes)).*(#20819, 21072, 21073, 20262, 20680)*

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 21074):***

A TWT scheduling AP that sends frames to a TWT scheduled STA that is in PS mode during an unannounced TWT SP shall follow the rules defined in 11.2.3.6 (AP operation) except that the AP should deliver to the TWT scheduled STA as many buffered BUs as are available at the AP, provided that the BU delivery does not exceed the duration of the TWT SP and as long as the TWT scheduled STA has not entered the doze state (see 26.8.4.3 (TWT information for broadcast TWT) and 26.8.5 (Power save operation during TWT SPs). *(#21074)*

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 20399):*** (#16424)

NOTE—The TWT scheduling AP can deliver the buffered BUs in A-MPDU(s) sent under a BlockAck agreement if the TWT is an announced TWT and the TWT scheduled STA is awake for that TWT SP, or if the TWT is an unannounced TWT (at the start of which the TWT scheduled STA is assumed to already be awake). The buffered BUs can be delivered in multiple PPDUs transmitted within the TWT SP. The TWT scheduling AP can exceed the duration of the TWT SP if the TWT scheduled STA is in Active mode.*(#20399)*

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 20119):***

A TWT scheduling AP may transmit to a TWT scheduled STA that is in Active mode at any time (see 11.2.3.2 (STA power management modes). A TWT scheduling AP may transmit to a TWT scheduled STA that is in PS mode and awake outside of a TWT SP following the rules in 11.2.3.6 (AP operation during the CP).*(#20119)*

**26.8.3.3 Rules for TWT scheduled STA**

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 20124):***

A TWT scheduled STA should not transmit frames to the TWT scheduling AP outside of broadcast TWT SPs and should not transmit frames that are not contained within HE TB PPDUs to the TWT scheduling AP within trigger-enabled broadcast TWT SPs, except that the STA can transmit frames within negotiated individual TWT SPs as defined in 26.8.2 (Individual TWT agreements).

NOTE—The TWT scheduled STA decides which frames to transmit within or outside a TWT SP and while it is recommended that the TWT scheduled STA not transmit using EDCA within or outside TWT SPs, the TWT scheduled STA is still permitted to do so(#20228). If the STA decides to transmit then the STA might contend for accessing the medium as defined in 10.24.2 (HCF contention based channel access (EDCA)) and in 26.2.7 (EDCA operation using MU EDCA parameters).*(#20124)*

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 20119):***

A TWT scheduled STA transmits an HE TB PPDU as a response to a Trigger frame that is addressed to it and is sent during a trigger-enabled TWT SP (see 26.5.3 (UL MU operation)). A TWT scheduled STA that is in PS mode and is awake during an announced TWT SP shall include a PS-Poll frame or a U-APSD trigger frame in the HE TB PPDU if it intends to solicit buffered BUs from the TWT scheduling AP (see 11.2.2.8 (Receive operation for STAs in PS mode during the CP)) unless the STA has already transmitted within that TWT SP a PS-Poll or U-APSD trigger frame or has transmitted any other indication that the STA is in the awake state within that TWT SP, or has, previous to the start of the TWT SP but after the end of the most recent TWT SP, indicated to the AP that it is currently in the awake state. A TWT scheduled STA that is in PS mode shall transition to the awake state at the start of an unannounced TWT SP of which it is a member. The STA may include other frames in the HE TB PPDU when other rules do not prohibit their inclusion (see 26.5.3 (UL MU operation)).*(#20119)*

NOTE 1—A TWT scheduling AP sets the bit in the TIM element of the Beacon frame that corresponds to the AID of the TWT scheduled STA to 1 to indicate that it expects the TWT scheduled STA to solicit available buffered BUs (see 11.2.2.8 (Receive operation for STAs in PS mode during the CP)).

NOTE 2—Other indications that the STA is in the awake state are the transmission of an HE TB NDP PPDU in response to an NFRP Trigger frame (see 26.5.6 (NDP feedback report procedure)) or the transmission of a frame that indicates that the STA is in active mode (see 11.2.3.2 (Non-AP STA power management modes)).