IEEE P802.11
Wireless LANs

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| Comment resolution for 27.7.3.1 (Block 2) |
| Date: 2017-05-01 |
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Abstract

This submission proposes resolutions for multiple comments related to TGax D1.0 with the following CIDs (19 CIDs):

* 4843, 4844, 5065, 5662, 5964, 6954, 7397, 7401, 7402, 7627, 7628, 8108, 8143, 8153, 8225, 8226, 8594, 9659, 6748

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.***

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| **CID** | **Commenter** | **P** | **L** | **Comment** | **Proposed Change** | **Resolution** |
| 4843 | Alfred Asterjadhi | 182 | 44 | The STA can also negotiate the Broadcast ID. This needs to be stated here for completeness. Also please add references to the normative behaviors for the different features, from TWT scheduled STA perspective (TFRs, power save for congested nets and so on.) | As in comment. | Revised –Agree in principle with the comment. The negotiation of the broadcast IDs is defined in this subclause so no need to state it again. Proposed resolution is to add references to the other subclauses for the TFRs, and congested nets.TGax editor to make the changes shown in 11-17/0296r0 under all headings that include CID 4843. |
| 4844 | Alfred Asterjadhi | 183 | 28 | It needs to be clear that these TWT elements in this perspective are "TWT Setup" frames rather than broadcast TWT. Also to avoid confusion please clarify setup in a clear way for both wake TBTT and broadcast IDs in one place so that it is easier to interpret. | As in comment. | Revised –Agree in principle with the comment. Proposed resolution adds a note to specify what types of MGMT frames can carry these TWT elements, depending on which STA sends them and for what purpose. TGax editor to make the changes shown in 11-17/0296r0 under all headings that include CID 4844. |
| 5065 | Dengyu Qiao | 183 | 9 | In Figure 27-5, AP uses M-BA to acknowledge multiple PS-Poll frames. The current M-BA mechanism cannot support it. | please correct it | Revised –Agree in principle with the comment. This issue was solved during the last F2F where the Ack Type subfield eq 1 and TID =15 was assigned to also acknowledge the PS-Poll. As such this item is resolved, i.e., the M-BA can be used for acking PS-Poll frames. The only part that is missing is to add the respective line in the A-MPDU context table. Proposed resolution adds it to the table.TGax editor to make the changes shown in 11-17/0296r0 under all headings that include CID 5065. |
| 5662 | Guoqing Li | 182 | 39 | This sentence implies that a STA cannot use broadcast TWT if it has indivitual TWT. However, I don't think this is reasonable. A STA may use individual TWT to transfer periodic regular data which is predicable and use broadcast TWT for any other data that is less predictable and bursty. | remove this sentence | Accepted |
| 5964 | Jarkko Kneckt | 182 | 31 | The broadcast TWT element may be present in the TIM frame and in FILS Discovery frame, not only in the Beacon and Probe response. The individually addressed and broadcast addressed probe response frames have the same alternatives for the transmission payload. It is not clear why the TWT element cannot be transmitted in the individually addressed probe response. In many cases the scanning STAs receive both broadcast and individually addressed probe responses. | Please change the text: "... broadcast TWT element in TIM frame, FILS Discovery frame, and in Probe Response frame." | Rejected –The comment fails to identify a technical issue. Adding the TWT element to more frames would increase complexity without compelling benefits. TIM frame does not have space for another element. And AP can already decide to send a broadcast Probe Response instead of a FILS Discovery frame which can include the TWT element to achieve the same end result. |
| 6954 | Joseph Levy | 182 | 28 | Saying that: A TWT scheduling STA is an HE AP, is very confusing. An AP is an entity that contains one STA and provides access to the DS via the wireless medium for associated STAs. An AP comprises a STA and a distribution DSAF. So how can a STA be an HE AP. | Rewrite this section and all related sections containing the TWT scheduling STA so that it is clear that this type of STA can only exist in an HE AP or rename the TWT scheduling STA to be a TWT scheduling HE AP or a TWT scheduling AP. | Revised –Agree in principle. TGax editor: Replace “TWT scheduling STA” with “TWT scheduling AP” throughout the draft. |
| 7397 | Laurent Cariou | 182 | 34 | A STA should be a TWT scheduled STA only if it negotiated a Broadcast TWT with the AP. The rules apply only to those who negotiated. | Same as comment | Rejected –Negotiation of broadcast TWT ID is only one case of the TWT scheduled STA functionality. In general, any STA that sets the Broadcast TWT Support field to 1 and receives a broadcast TWT element is a TWT scheduled STA. |
| 7401 | Laurent Cariou | 182 | 28 | Broadcast TWT is currently also used just to indicate to any STAs the point in time at which some frames will be transmitted. This is the case for the transmission of trigger frames with OFDMA random access, for the transmission of TIM elements for opportunistic power save. This should be described | Provide description for it | Revised –Agree in principle with the comment. The normative behavior for those two cases is already covered. The proposed resolution is to add references that point to those subclasues in this subclause. TGax editor to make the changes shown in 11-17/0296r0 under all headings that include CID 7401. |
| 7402 | Laurent Cariou | 182 | 28 | Broadcast TWT has 2 modes of operation, one which requires negotiation (ID non equal to 0) and one which does not require negotiation (ID equal 0). This should be described. Operation with ID=0 does not require the STA to be a scheduled STA, as it is open to all associated STAs. | Provide clarification for it in this section | Revised –Agree in principle with the comment. Proposed resolution accounts for the suggested changes.TGax editor to make the changes shown in 11-17/0296r0 under all headings that include CID 7402. |
| 7627 | Liwen Chu | 182 | 28 | Change to "A TWT scheduling STA is an HE AP with dot11TWTOptionActivated equal to true that includes Broadcast TWT Support being set to 1 in HE Capabilities element and optionally a broadcast TWT element in the Beacon frame, and follows the rules described in 27.7.3.2 (Rules for TWT scheduling STA).". The reason for this is that since STA and AP can negotiate broadcast TWT. At the begining of BSS operation, the AP may not include broadcast TWT in Beacon. | As in comment | Revised –Agree in principle. Proposed resolution accounts for the suggested change, while organizing the sentence as an itemize list, like the TWT scheduled STA sentence.TGax editor to make the changes shown in 11-17/0296r0 under all headings that include CID 7627. |
| 7628 | Liwen Chu | 182 | 39 | A STA can both have individual TWT and broadcast TWT. So the following bullet should be deleted:"Has not negotiated any implicit TWT agreement with the HE AP as described in 27.7.2 (IndividualTWT agreements)." | As in comment | Accepted |
| 8108 | Matthew Fischer | 182 | 27 | Broadcast TWT - a non-AP STA that is participating in Broadcast TWT will wake for TWT SPs and then check trigger frames to see if the STA is identified in a trigger. If there is more than one trigger for an SP, the STA will wake for multiple triggers and by the end of the SP, it is possible that the STA has not been identified and therefore, has wasted power checking each trigger. It would be more efficient for power consumption if the STA had a clue as to whether any trigger in the SP was going to identify it. | Add a TIM of some sort to be associated with each Broadcast TWT so that a participating STA can wake at the beacon and read the TWT-TIM to see if it should be waking for any of the triggers associated with this broadcast TWT within this beacon interval. The TIM could also be included at the start of each TWT SP, say, within a beacon-like frame, e.g. measurement pilot frame or something else. |  Rejected –There is already a TIM + TWT element signaling in the Beacon frame that provides this type of signaling. In addition, there is another mechanism where the AP starts the TWT SPs with a TIM frame, or FILS Discovery frame that specifies the list of STAs to be scheduled during the SP. |
| 8143 | Matthew Fischer | 182 | 39 | Currently, a STA that signs up for individual TWT is no longer considered a participant in any broadcast TWT. Think about the possibility of changing this now that a STA can perform an explicit sign up for Broadcast TWT. I.e. before the ability to sign up for BTWT existed, a STA that signed up for iTWT was assumed to no longer participate in bTWT, but if a STA can sign up for bTWT, then there is no reason to not allow it to do so. | Modify the cited sentence to state that a STA that has at least one active iTWT is automatically excluded from all bTWT except for those bTWT for which the STA explicitly signs up to participate. Also note that if the STA reverts to no iTWT any longer, then it is again automatically assumed to participate in all broadcast TWT - or maybe, if it has signed up for at least one bTWT, then it forsakes all others not explicitly signed up for which it is | Revised –Removing that constraint as suggested by couple other CIDs. TGax editor to make the changes shown in 11-17/0296r0 under all headings that include CID 8143. |
| 8153 | Michael Montemurro | 183 | 25 | The overall procedure shown in Figure 27-5 is not really described very well. Its not clear to the reader. | Add an explanation in the paragraphe that introduces Figure 27-5 | Revised –Agree in principle with the comment. Proposed resolution is to expand the paragraph to explain the concepts illustrated in the figure. TGax editor to make the changes shown in 11-17/0296r0 under all headings that include CID 8153. |
| 8225 | Osama Aboulmagd | 183 | 7 | Figure 27-5 is supposed to describe the broadcast TWT operation. However I cannot see the word broadcast any where in the Figure. What exactly "broadcast: mean relative to the Figure. Is this a case of choosing a bad name for a bad protocol? | Clarify why the name "broadcast" was assigned to this procedure | Revised –Agree in principle with the comment. Proposed resolution is to add the broadcast classifier as appropriate.TGax editor: Replace “TWT IE” with “broadcast TWT IE”, “TWT 1” with “broadcast TWT 1”, and “TWT 2” with “broadcast TWT 2” in Figure 27-5. |
| 8226 | Osama Aboulmagd | 183 | 7 | From Figure 27-5, it is clear that there is significant overhead associated with Broadcast TWT. Only one MU PPDU was sent after the transmission of many overhead frames. The Figure speaks for itself. Adding TWT with its heavy protocol machinery is a source of significant overhead for a sunction that can be achieved in a simple way | Quantify the overhead involved in this figure. Better yet, just delete TWT and all its related items from the draft. Actually the whole first paragraph is speculative and maybe it is better to delete it. | Rejected –The frame exchanges listed in the Figure are part of the BSS operation (e.g., exchange in first TWT SP is an UL MU exchange), the second exchange is a DL MU exchange). The only signaling that is due to TWT is incorporating a TWT element in (e.g., optionally in Assoc Req, Response frames) to indicate the first TBTT and wake interval and a broadcast TWT element in the Beacon (optional). The overhead calcualtions would depend on many parameters, MCS, frequency of generated frames etc. As a simple example one could have approx. 32 Bytes of TWT element optionally exchanged during association], (say 40 us at 6Mbps per association)), and a broadcast TWT element in the beacon (approx. 16 Bytes, say 18 us at 6Mbps per beacon x 100ms of beacon interval, say 0.18% of overhead?). |
| 8594 | Sheng Sun | 183 | 31 | I thnik it would be much easire by explicitly specify the MMPDU that contains the TWT element, whether it is the TWT Req or the TWT Resp. | as in comment | Revised –Partially agree with comment in the sense that the precise MMPDU type that contains this TWT element is provided in the subsequent subclauses. To provide some clarifications in this generic subclause the proposed resolution is to add a note that gives a generic list of the MMPDU types that can include this element.TGax editor to make the changes shown in 11-17/0296r0 under all headings that include CID 8594. |
| 9659 | Yongho Seok | 182 | 31 | "The TWT scheduling STA may also include the broadcast TWT element in broadcast Probe Response frames."The broadcast Probe Response frames are allowed only when the TWT scheduling STA has dot11FILSOmitReplicateProbeResponses set to true.Please insert this constraint. | As per comment. | Revised –Partially agree with comment in the sense that the MIB variable governs the generation of the broadcast Probe Response frame rather than its content. However, it does not hurt to add this clarification.TGax editor to make the changes shown in 11-17/0296r0 under all headings that include CID 9659. |
| 6748 | John Coffey | 182 | 35 | Inconsistent usage: here we have "non-AP HE STA", whereas almost everywhere else in the draft we have "HE non-AP STA". | Change to "HE non-AP STA". | Accepted  |

**Discussion: *None.***

* Broadcast TWT operation

**27.7.3.1 General**

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 7627, 7401):***

A TWT scheduling AP is an HE AP with dot11TWTOptionActivated equal to true that:

* Sets the Broadcast TWT Support field of the HE Capabilities element it transmits to 1
* May include a broadcast TWT element in the Beacon frame, and
* Follows the rules described in 27.7.3.2 (Rules for TWT scheduling AP), (27.14.2 Power save with UL OFDMA-based random access), and 27.14.3 Opportunistic power save in congested environment.*(#7627, 7401)*

**TGax Editor: *Change the paragraph (and split it from the previous sentence) below as follows (#CID 9659):***

A TWT scheduling AP may also include the broadcast TWT element in broadcast Probe Response frames that are sent when the STA’s dot11FILSOmitReplicateProbeResponses is equal to true*(#9659)*.

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 6748, 5662, 7628):***

A TWT scheduled STA is an HE non-AP*(#6748)* STA that:

* Sets the Broadcast TWT Support field of the HE Capabilities element it transmits to 1 and
* Receives a broadcast TWT element transmitted by an HE AP that is a TWT scheduling AP.
* *(#5662, 7628)*

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 4843):***

A TWT scheduled STA follows the schedule provided by the TWT scheduling AP as described in 27.7.3.3 (Rules for TWT scheduled STA), 27.14.2 (Power save with UL OFDMA-based random access), and 27.14.3 (Opportunistic power save in congested environment)*(#4843)*. A TWT scheduled STA can negotiate the wake TBTT and listen interval for Beacon frames it intends to receive as described in 27.7.3.3 (Rules for TWT scheduled STA), or can join a particular broadcast TWT as described below*(#4843)*.

**TGax Editor: *Change the paragraph below of this subclause as follows (#CID 8153):***

An example of broadcast TWT operation is shown in Figure 27-5 (Example of broadcast TWT operation), where the AP is the TWT scheduling AP and STA 1 and STA 2 are the TWT scheduled STAs. The AP includes a broadcast TWT element in the Beacon frame that indicates a first TWT at or after which the AP intends to send a Trigger frame, and a second TWT at which the AP intends to schedule DL transmissions. STA1, and STA 2 wake to receive the Beacon and determine that AP has DL BUs intended to them (in the TIM element) and determine the TWTs at which to wake for sending their polls (during the trigger-enabled TWT SP the polls can be sent as a response to the Trigger frame), and for receiving their DL BUs (during the unannounced TWT SP (the AP delivers the DL BUs to the STAs within a DL MU PPDU). The STAs can stay in doze state outside of these TWT SPs.*(#8153)*

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| * Example of broadcast TWT operation
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Each broadcast TWT is uniquely identified by the <broadcast TWT ID, MAC address> tuple, where the broadcast TWT ID is the value of the Broadcast TWT ID subfield of a TWT parameter set from the broadcast TWT element that describes the broadcast TWT and the MAC address is one of the following:

* The TA of the MMPDU that contains the TWT element if the TWT command value is Accept, Alternate or Dictate
* The RA of the MMPDU that contains the TWT element if the TWT command value is Request, Suggest or Demand

When the TWT command value is Reject, the broadcast TWT is identified by the Broadcast TWT ID subfield and the TA of the MMPDU that contains the TWT element if the Wake TBTT Negotiation subfield is 0 and by the RA of the MPDU that contains the TWT element if the Wake TBTT Negotiation subfield is 1.

**TGax Editor: *Insert the note below at the end of this subclause as follows (#CID 8594, 4844, 7402):***

NOTE 1 -- MMPDUs that contain a broadcast TWT element generated by a TWT scheduling AP can be Probe Response, Beacon, (Re-) Association Response, and TWT Setup frames with TWT Request field equal to 0. The Wake TBTT Negotiation subfield is 0 if the TWT element is carried in a broadcast MMPDU and is 1 if the TWT element is carried in an individually addressed MMPDU. The TWT scheduling AP can include a TWT parameter set with Broadcast TWT ID value 0 to indicate a TWT allocated for all STAs, and Broadcast TWT ID greater than 0 to indicate a TWT intended to TWT scheduled STAs that are members of that broadcast TWT.*(#7402)*

NOTE 2 -- MMPDUs that contain a broadcast TWT element generated by a TWT scheduled STA can be (Re-) Association Request, and TWT Setup frames with TWT Request field equal to 1. The TWT element has a Wake TBTT Negotiation subfield equal to 1 and the Broadcast TWT ID(s) that the STA intends to join or withdraw. *(#8594, 4844, 7402)*

**TGax Editor: *Change Table 9-425 (A-MPDU contents in the data enabled immediate response context) as follows (#CID 5065):***

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| * A-MPDU contents in the data enabled immediate response context
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| MPDU Description | Conditions |
| Ack | If the preceding PPDU contains an MPDU that requires an Ack frame response, a single Ack frame at the start of the A‑MPDU. | In a non-DMG STA other than an HE STA: at most one of ~~these~~ Ack and HT-immediate BlockAck MPDUs is present.In an HE STA: at most one of these MPDUs is present.In a DMG STA: at most one Ack frame is present, and zero or more HT-immediate BlockAck frames are present. |
| HT-immediate BlockAck | In a non-DMG STA: if the preceding PPDU contains an implicit or explicit block ack request for a TID for which an HT-immediate block ack agreement exists, at most one BlockAck frame for this TID, in which case it occurs at the start of the A-MPDU.In a DMG STA: if the preceding PPDU contains an implicit or explicit block ack request for a TID for which an HT-immediate block ack agreement exists, one or more copies of the same BlockAck for this TID. |
| Multi-STA BlockAck | In an HE STA: If the preceding PPDU that carried a multiple-TID A-MPDU contains implicit or explicit block ack requests for multiple TIDs for which HT-immediate block ack agreement exist, at most one Multi-STA BA frame, in which case it occurs at the start of the A-MPDU. |
| Delayed BlockAcks | BlockAck frames with the BA Ack Policy subfield equal to No Acknowledgment with a TID for which an HT-delayed block ack agreement exists. |
| Delayed block ack data | QoS Data frames with a TID that corresponds to a Delayed or HT-delayed block ack agreement.These have the Ack Policy field equal to Block Ack. |
| Action No Ack | Action No Ack frames. |
| Delayed BlockAckReqs | BlockAckReq frames with a TID that corresponds to an HT-delayed block ack agreement in which the BA Ack Policy subfield is equal to No Acknowledgment. |
| Data frames without HT-immediate block ack agreement | QoS Data frames with multiple TIDs which have no HT-immediate block ack agreement See NOTE 1. | Of these, at most one of the following is present in a non-DMG BSS except HE BSS:* One or more QoS Data frames with the Ack Policy field equal to Implicit Block Ack Request
* A BlockAckReq frame

Of these, at most one of the following is present in a DMG BSS:* One or more QoS Data frames with the Ack Policy field equal to Implicit Block Ack Request
* QoS Null MPDU with Ack Policy set to No Ack
* A BlockAckReq frame with an optional QoS Null MPDU with Ack Policy set to No Ack

Of these, at most one of the following is present between two HE STAs:* One or more QoS Data frames from multiple TIDs with the Ack Policy field equal to Implicit Block Ack Request, HTP Ack(#4723) or Ack Request(#Ed), at most one Action or PS-Poll*(#5065)*, optional QoS Null with Ack Policy set to No Ack, Basic Trigger frame or BSRP Trigger frame only when AP transmits the A-MPDU
* QoS Null MPDU with Ack Policy set to No Ack
* One of BolckAckReq and Multi-TID BlockAckReq frame
* Basic Trigger frame or BSRP Trigger frame only when AP transmits the A-MPDU
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| Data frames sent under an HT-immediate block ack agreement  | QoS Data frames with the same TID, which corresponds to an HT-immediate block ack agreement.QoS Data frames with multiple TIDs, which correspond to multiple HT-immediate block ack agreements.See NOTE 1. |
| QoS Null MPDUs with Ack Policy set to No Ack | In a DMG BSS, QoS Null MPDUs with Ack Policy set to No Ack.In an HE BSS, QoS Null MPDUs with Ack Policy set to No Ack. |
| Immediate BlockAckReq | At most one BlockAckReq frame with a TID that corresponds to an HT-immediate block ack agreement.This is the last MPDU in the A-MPDU.It is not present if any QoS Data frames for that TID are present.At most one of the following cases:* Multi-TID BlockAckReq frame with TIDs that correspond to an HT-immediate block ack agreement. This is after data and management frames in the A-MPDU.
* This is the last MPDU in the A-MPDU
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| Action or PS-Poll | At most one of an Action frame or PS-Poll frame.A PS-Poll frame can only be included by a PS STA.*(#5065)* |
| Trigger | One or more Trigger frames where the Trigger Type field is Basic Trigger, MU-BAR, or BSRP. See NOTE 2 |
| NOTE 1—~~These~~ The MPDUs from the same TID all have the Ack Policy field equal to the same value, which is either Implicit Block Ack Request (Ack Request), HTP Ack(#4723) or Block Ack.NOTE 2—An AP including a Trigger frame and BlockAck frame is not required to include QoS Data in that A-MPDU |