IEEE P802.11
Wireless LANs

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| Comment resolutions for miscellaneous 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 (8 CIDs):

* 20247, 20352, 20410, 20443, 20590, 21061, 21062, 21265,

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Incorporated changes received during the conference call. Changes 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** |
| 20247 | Jarkko Kneckt | 37.64 | Broadcast TWT should not be set for a single time, rather it should be set for a set of times. The signalng overhead and delays to arrange a single time instant broadcast TWT are not worth of the effort. Also one-time reservations are not possible to organize with the Broadcast TWT Persistence subfield as described in p.372 26.8.3.2. | Please, change the definition to read: broadcast target wake time (TWT): A set of times broadcast by an access point (AP) to multiple non-AP stations (non-AP STAs) to be awake in order to exchange frames with the AP. | Rejected –The definition is consistent with the use and terminology in 26.8. There are two cases (aperiodic, which is the single schedule) and the periodic (which is the set of schedules). The AP can chose either of the two (with preference on the periodic if overhead becomes an issue). |
| 20352 | Laurent Cariou | 157.32 | Nominal Minimum TWT Wake duration field is 1 byte in length and encoded in units of 256us, which means that the TWT SP duration can no exceed 56 ms. For some use cases, it is helpful to have a longer TWT SP duration. An option with 4x this max duration would be helpful. | Define a new field in TWT element that parametrize the encoding of the Nominal Minimum TWT Wake duration field, so that it can be in units of 256us as today, and in units of 1ms for instance. | Revised –Agree in principle with the comment. Proposed resolution is to use one bit of the TWT element to indicate the unit of the Wake Duration field and clarify that a non-HE STA sets this bit to 0 for backward compatibility.TGax editor to make the changes shown in 11-19/0561r1 under all headings that include CID 20352. |
| 20410 | Liwen Chu | 366.26 | It can help the TWT agreement negotiation if the STA's traffic charteristic is known. | As in comment | Rejected—The comment fails to identify a specific issue to be addressed. It fails to identify changes in sufficient detail so that the specific wording of the changes that will satisfy the commenter can be determined. Please note that in general knowing the STA’s traffic characteristics is beneficial for multiple protocols. In fact, the STA negotiates its TWTs accounting for as much information it has regarding its own traffic characteristics. |
| 20443 | Mark Hamilton | 40.18 | If this is only for a STA that follows the schedule in a broadcast TWT element, what is a STA that follows the schedule in a non-broadcast TWT element? | Delete "broadcast" from this definition. | Revised –STAs that follow schedules in a non-broadcast TWT element are not defined since in the non-broadcast TWT element the terminology of reference is TWT agreement. Proposed resolution here is to explicitly call out that we refer to the broadcast TWT schedule in this definition so that it is not ambiguous as to other potential schedules defined elsewhere.TGax editor to make the changes shown in 11-19/0561r1 under all headings that include CID 20443. |
| 20590 | Mark RISON | 210.08 | "The Negotiation Type subfield is reserved if set to 2." contradicts both the definition of "reserved" and Table 9-297a | Delete the cited text at the referenced location | Revised –Agree in principle with the comment. It is the rest of the TWT Flow field that is reserved not the field value. Propopsed resolution clarifies this aspect by adding a figure for this combination where all the other fields are reserved. Also removed the sentence pointed out by the comment.TGax editor to make the changes shown in 11-19/0561r1 under all headings that include CID 20590. |
| 21061 | Matthew Fischer | 366.37 | The use of "can" in this sentence seems to make the part about "subject to" the additional rules of 26.x not normative. In fact, this entire paragraph is full of "can" and I am not certain that any of it is correct. Next paragraph has some more. | Change "can" to "may" or maybe add a new normative verb in here. Or maybe make all of this stuff declarative, such as "To establish a TWT agreement, an HE STA follows the rules of 10.x and 26.x" | Revised –The referenced subclauses have the appropriate normative behavior for the rules. These two paragraphs are intended to simply cover the referencing of those subclauses, to give the reader a reference as to where and what restrictions are valid for the different cases. This is inline with the new editorial style guide. Agree though to replace them with declarative statements. TGax editor to make the changes shown in 11-19/0561r1 under all headings that include CID 21061. |
| 21062 | Matthew Fischer | 367.05 | Two sentences here both claim to tell an AP how to request that associated STAs use TWT. They cannot both be right. Also, it is not clear whose capability bits are being mentioned those of the AP or those of the associated STAs. | Clarify the language to resolve the highlighted problems. | Revised –Agree in principle with the comment. Proposed resolution clarifies that it is the non-AP STA the one that declares support for TWT by setting the TWT requester support subfield in HE Capabilities IE or in the Extended Capabilities IE and declares support for the role of TWT scheduled STA by setting the Broadcast TWT Support subfield in the HE Caps IE to 1.TGax editor to make the changes shown in 11-19/0561r1 under all headings that include CID 21062. |
| 21265 | Pooya Monajemi |  | TWT is valuable for achieving client power savings and BSS QoS | Mandatory support for TWT by non-AP STAs in 6 GHz | Rejected –This is already achievable with the existing functionalities. The AP can reject the association of STAs that do not support TWT and can set the TWT Required subfield in the HE Operation element to 1 to require the STAs that are associated with the AP to either negotiate individual TWT agreements or to follow broadcast TWT schedules.  |

**Discussion: *None.***

* Definitions specific to IEEE 802.11

***TGax Editor: Change the definitions below as follows (#CID 20443):***

**target wake time (TWT) scheduling access point (AP)**: An AP that schedules broadcast TWTs and provides these broadcast TWT schedules*(#20443)* in a broadcast TWT element.

**target wake time (TWT) scheduled STA**: A STA that follows the broadcast TWT schedules*(#20443)* provided in a broadcast TWT element.

* TWT element

***TGax Editor: Change the figure below as follows (#CID 20352):***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | ~~B1~~B0 | ~~B2~~B1 | B2              B3 | B4 | B5 | ~~B3~~B6 ~~B8~~B7 |
|  | NDP Paging Indicator | Responder PM Mode | Negotiation Type | TWT Information Frame Disabled | Wake Duration Unit | Reserved |
| Bits: | 1 | 1 | 2 | 1 | 1 | ~~6~~3 |
| * Control field format*(#20352)*
 |

***TGax Editor: Insert the paragraph below as follows (#CID 20352):***

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

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

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

***TGax Editor: Change the paragraph below (24th paragraph of REVmd D2.0) as follows (#CID 20352):***

The Nominal Minimum TWT Wake Duration field indicates the minimum amount of time, in the unit indicated by the Wake Duration Unit subfield*(#20352)*, that the TWT requesting STA expects that it needs to be awake in order to complete the frame exchanges associated with the TWT flow identifier for the period of TWT wake interval, where TWT wake interval is the average time that the TWT requesting STA expects to elapse between successive TWT SPs.

* TWT Teardown frame format

***TGax Editor: Change the paragraph below as follows (#CID 20590):***

~~The TWT Flow field contains the TWT Flow Identifier field and 5 reserved bits as shown in Figure 9-943 (TWT Flow field format():~~ The format of the TWT Flow field if the Negotiation Type field is 0 or 1 is defined in Figure 9-943 (TWT Flow field format if the Negotiation Type subfield is 0 or 1). The format of the TWT Flow field if the Negotiation Type field is 3 is defined in Figure 9-943a (TWT Flow field format if the Negotiation Type subfield is 3). The format of the TWT Flow field if the Negotiation Type field is 2 is defined in Figure 9-943ab (TWT Flow field format if the Negotiation Type subfield is 2)*(#20590)* (#15041)

Change Figure 9-943 as follows:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B0                   B2 | B3          ~~B7~~ B4 | B5    B6 | B7 |
|  | TWT Flow Identifier | Reserved | Negotiation Type | Teardown All TWT(#16425) |
| Bits: | 3 | ~~5~~ 2 | 2 | 1 |
| * TWT Flow field format if the Negotiation Type subfield is 0 or 1
 |

***TGax Editor: Insert a new figure as follows (#CID 20590):***

|  |  |  |  |
| --- | --- | --- | --- |
|  | B0                    B4 | B5                      B6 | B7 |
|  | Reserved | Negotiation Type | Reserved(#16425) |
| Bits: | 5 | 2 | 1 |
| Figure 9-943abTWT Flow field format if the Negotiation Type subfield is 2*(#20590)* |

|  |  |  |  |
| --- | --- | --- | --- |
|  | B0                    B4 | B5                      B6 | B7 |
|  | Broadcast TWT ID | Negotiation Type | Teardown All TWT(#16425) |
| Bits: | 5 | 2 | 1 |
| * TWT Flow field format if the Negotiation Type subfield is 3
 |

***TGax Editor: Change the paragraph below as follows (#CID 20590):***

The Negotiation Type field indicates the type of negotiation that is subject to the teardown request and is set as defined in Table 9-297a (Interpretation of Negotiation Type subfield, Target Wake Time, TWT Wake Interval Mantissa and TWT Wake Interval Exponent fields). An S1G STA sets the Negotiation Type field to 0.  *(#20590)* (#15043) The Negotiation Type field is reserved if the Teardown All TWT field is 1.(#16425)

* TWT operation
* General

Target wake time (TWT) allows an AP to manage activity in the BSS in order to minimize contention between STAs and to reduce the required amount of time that a STA in PS mode needs to be awake. This is achieved by allocating STAs to operate at non-overlapping times and/or frequencies, and concentrate the frame exchanges in predefined service periods.

***TGax Editor: Change the paragraph below as follows (#CID 21061):***

An HE STA negotiates individual TWT agreements, as defined in 10.48 (Target wake time (TWT)), subject to the additional rules and restrictions that are defined in 26.8.2 (Individual TWT agreements) and 26.8.7 (HE subchannel selective transmission). A non-AP HE STA establishes membership in broadcast TWT schedules, as defined in 26.8.3 (Broadcast TWT operation), which are used as defined in 26.8.3.3 (Rules for TWT scheduled STA), 26.14.2 (Power save with UORA and TWT), and 26.14.3 (Opportunistic power save). An HE AP delivers broadcast TWT parameter sets to non-AP HE STAs as described in 26.8.3.2 (Rules for TWT scheduling AP), 26.14.2 (Power save with UORA and TWT) and 26.14.3 (Opportunistic power save).

A STA does not need to be aware of the values of TWT parameters of the TWT agreements of other STAs in the BSS of the STA or of TWT agreements of STAs in other BSSs. A STA does not need to be aware that a TWT service period (SP) is used to exchange frames with other STAs. Frames transmitted during a TWT SP are carried in any PPDU format supported by the pair of STAs that have established the TWT agreement corresponding to that TWT SP, including HE MU PPDU, HE TB PPDU, etc.*(#21061)*

An HE STA with dot11TWTOptionImplemented equal to true shall set:

* The TWT Requester Support subfield to 1 in the HE Capabilities element that it transmits if it supports operating in the role of a TWT requesting STA; otherwise set to 0.
* The TWT Responder Support subfield to 1 in the HE Capabilities elements that it transmits if it supports operating in the role of a TWT responding STA; otherwise set to 0.
* The Broadcast TWT Support subfield to 1 in the HE Capabilities element that it transmits if it supports operating in the role of a TWT scheduled STA or in the role of a TWT scheduling AP; otherwise set to 0.

An HE AP shall set the TWT Responder Support subfield of the Extended Capabilities element and HE Capabilities element to 1.

***TGax Editor: Change the paragraph below as follows (#CID 21062):***

An HE AP may request TWT participation by all associated STAs that have declared support for TWT. A non-AP STA declares support for the role of TWT requester by setting the TWT Requester Support subfield in the Extended Capabilities element or in the HE Capabilities element*(#21062)* to 1 and declares support for the role of TWT scheduled STA by setting the Broadcast TWT Support subfield in the HE Capabilities element to 1. The HE AP makes the request for TWT participation by setting the TWT Required subfield to 1 in HE Operation elements it transmits. A STA that supports TWT and that has received an HE Operation element with the TWT Required subfield equal to 1 from the HE AP with which it is associated, shall either negotiate individual TWT agreements, as defined in 26.8.2 (Individual TWT agreements), or participate in broadcast TWT operation, as defined in 26.8.3 (Broadcast TWT operation).

NOTE—The AP sets the TWT Required subfield to 1 if it is not available outside TWT SPs (see 26.8.2 (Individual TWT agreements) and 26.8.3 (Broadcast TWT operation)). The AP might not be available outside TWT SPs if it sets the Responder PM Mode subfield to 1 (see 10.43.7 (TWT Sleep Setup)).