IEEE P802.11
Wireless LANs

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| LB200 Proposed Resolutions for Subclause 8.4.2.170j TWT element |
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Abstract

Addressing all CIDs from LB200 which relate to Subclause 8.4.2.170j TWT element, including resolutions for

* CIDs: 1854, 1855, 1856, 1857, 1971, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2193, 2194, NOT 2195, 2299, 2300, 2575, 2702, 2711, 2712, 2713, 2714, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2212, 2382 (40 CIDs)

**REVISION NOTES:**

R0: initial

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

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

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

**CID LIST:**

| **CID** | **Commenter** | **Page** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| --- | --- | --- | --- | --- | --- | --- |
| 1854 | Graham Smith | 119.41 | 8.4.2.170j | "A STA that transmits a TWT element with the TWT Request subfield set to 1 is a TWT requesting STA. A STA that transmits a TWT element with the TWT Request subfield set to 0 is a TWT responding STA." This is redundant it is stated in the preceding para. If you insist on keeping it do not make it a seperate para. | Delete ""A STA that transmits a TWT element with the TWT Request subfield set to 1 is a TWT requesting STA. A STA that transmits a TWT element with the TWT Request subfield set to 0 is a TWT responding STA." | Revise - generally agree with commenter. TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 1854 |
| 1855 | Graham Smith | 119.44 | 8.4.2.170j | "A STA that wakes at TWT to either transmit or receive frames is a TWT STA." Do not think this is correct place for this definition. OK in Clause 9 or if you put it front in 3. | Delete "A STA that wakes at TWT to either transmit or receive frames is a TWT STA". | Revise - generally agree with commenter - and will add a few other defintions to clause 3 as appropriate. TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 1855 |
| 1856 | Graham Smith | 119.60 | 8.4.2.170j | Table 8-191b. The use of "Reserved" in the third column seems strange is it not simply "Not Appropriate" or " N/A"? | replace "Reserved" with "N/A" in the third column. | Revise - generally agree with commenter - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 1856 |
| 1857 | Graham Smith | 121.08 | 8.4.2.170j | "The Wake Interval of the requesting STA is equal to (Wake Interval Mantissa) +∙ 2^(Wake Interval Exponent)." I may be wrong but this is over 38 trillion years! Is TWT really meant to cover such a long term? The TSF time would have gone round several times by then, it is only 584,942 years, in fact the expression 2^(6bits) is 2^64 which is the value of the 64 bit TSF anyway, so why make TWT 65536 times bigger? You could lose the 2 octets for Mantissa completely. What is the practical limit for TWT - 1 day, 1 week, 1 year? Seems to me we could/should save some bits here. Suggest you set the practical limit and then set the parameters and number of bits. This just does not seem right. | Please re-look at the TWT Wake interval as it seems to be way too long. | Revise - generally agree with commenter - if we drop one bit of exponent, leaving 5, we have 2^32 + 16 bits = 48 bits total, giving a maximum time of 9 years. Dropping one more bit gives 2^16 + 16 = 32 bits for a maximum time of just over an hour, which is too short, so we can drop one bit because nine years does seem sufficient. - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 1857 |
| 1971 | Haiguang Wang | 97 | 8.4.2.170j | In table 8-191b--TWT Command Reply field, in the first row, the third column, it says that "TWT requesting STA NULL TWT (TWT value invalid, TWT responding STA Chooses the TWT value)".The description here is unclear, for example, what is meaning of NULL.Suggest replace the above statement with a clearer description. | Suggested resolution"The current TWT value is invalid, and the TWT requesting STA requires the responding STA specifies a TWT value. | Revise - generally agree with commenter - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 1971 |
| 2173 | Lei Wang | 97 | 8.4.2.170j | The description of EID field and Length field should not be in the middle of the Request Type field specification for the TWT element. | on page 97, move the text of line 31 to 35 to line 17. | Revise - generally agree with commenter - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2173 |
| 2174 | Lei Wang | 97 | 8.4.2.170j | The name "TWT Command Reply field" is miss-leading, due to the use of "Reply". There are both requesting and responding Commands as listed in Table 9-191b. | Throughout the 11ah/D1.0 doc, change "TWT command reply" to "TWT command". | Revise - generally agree with commenter - TGah editor to change “TWT command reply” to “TWT setup command” throughout the entire draft. Note that the commenter’s suggestion to use “TWT command” would create confusion between the name of the field and the use of the term “TWT command” which can refer to the interpreted value of the contents of the field. |
| 2175 | Lei Wang | 97 | 8.4.2.170j | The description for "Request TWT" commond in line 60 page 97 is confusing. | Change the text in the "Description when transmitted by a TWT requesting STA" box in line 60 page 97 to the following:The TWT requesting STA requests the TWT responding STA to choose a TWT value. The TWT value in this TWT element is NULL, i.e., an invalide value. | Revise - generally agree with commenter - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2175 |
| 2176 | Lei Wang | 97 | 8.4.2.170j | What's the differences between Suggested TWT and Demand TWT?Could not find any descriptions about how those two commands are different in subclause 8.4.2.170j and subclause 9.41. | Please clarifiy the difirences between those two TWT Commands, Suggested TWT and Demand TWT, to adjustify why we need both of those TWT Commands. Otherwise, just delete one of them. | Revise - generally agree with commenter - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2176 |
| 2177 | Lei Wang | 98 | 8.4.2.170j | What's the differences between Alternate TWT and Dictate TWT?Similarly, Could not find any descriptions about how those two commands are different in subclause 8.4.2.170j and subclause 9.41. | Please clarifiy the difirences between those two TWT Commands, Alternate TWT and Dictate TWT, to adjustify why we need both of those TWT Commands. Otherwise, just delete one of them. | Revise - generally agree with commenter - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2177 |
| 2178 | Lei Wang | 98 | 8.4.2.170j | What is "TWT SP"? There are 30+ occurences in the 11ah/D1.0, but not defined in Section 3 of the spec. | Please define TWT SP in Section 3. | Revise - generally agree with commenter - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2178 |
| 2179 | Lei Wang | 98 | 8.4.2.170j | The use of plural in "the first frames" in the paragraph in line 30 page 98 causes ambiguity: how many frames we are talking about? Particularly for the case whe Direction equals 0, how many frames at beginning of a TWT SP have to be from the Responding TWT STA to the Requesting? Or just the very first one? | In the paragraph in line 30 page 98, change the two occurrences of "the first frames" to "the first frame". | Revise - generally agree with commenter but direction field deleted in favor of the flow type field - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2179 |
| 2180 | Lei Wang | 98 | 8.4.2.170j | The subfield name "Dirrection" is not about the direction of the frame containing this subfield. Then it needs to be more descriptive, e.g., naming it as "first frame direction". | Change the name of subfield "Direction" in the TWT element's Request Type field to "First Frame Direction", to reflect its meaning. | Revise - generally agree with commenter but direction field deleted in favor of the flow type field - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2180 |
| 2181 | Lei Wang | 98 | 8.4.2.170j | The text from line 36 to 53 on page 98 is very confusing, and badly organized, as it interleaves with two topics:1) the definitions of two types of TWTs, i.e., Implicit TWT and Explicity TWT, which is in the context of AP and STA, not requesting / responsding TWT STAs;2) the settings of the "Implicit" indicator in the Request Type Field of TWT element, which is related to requesting / responding TWT STAs. | Make the following changes:1) re-organize the text in line 36 to 53 on page 98 into two paragraphs: one for the definitons of Implicit / Explicit TWT; and one for the "Implicit" indicator settings;2. place the Implicit / Explicit TWT defintion text before the "Implict" indicator setting text | Revise - generally agree with commenter but the more behavioral sounding text really belongs in clause 9 so it is moved there and the same with the definitions of the types implicit and explicit - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2181 |
| 2182 | Lei Wang | 98 | 8.4.2.170j | What does it mean by "TWT valuses are periodic"? Does it mean the TWT values are used periodically? Or Does it mean the TWT values are the intervals among conesecutive TWTs? | Clarify the sentence in line 45 page 98 about TWT values are periodic. | Reject - the group could not determine a clearer description than the centuries-old and internationally recognized scientific term “periodic” to describe a set of times which is “periodic” but the group does welcome sugestions from the commenter |
| 2183 | Lei Wang | 98 | 8.4.2.170j | Multiple questions for the sentence in line 52 page 98, e.g.,1) What is a periodic TWT value? What is an aperiodic TWT value?2) when saying the TWT values can be either periodic or aperiodic, then the question is that how a STA receiving the TWT element know it is periodic or aperiodic. | Clarify the sentence in line 52 page 98 about TWT values are either periodic or aperiodic. | Revise - “periodic” is a term that has a well-known meaning, repeating at regular intervals, as for the aperiodic part, the STA does not need to know, the responding STA is choosing the TWT SP start times and may make the values a periodic sequence or an aperiodic sequence and does not need to communicate this to the requesting STA - the point is that the values MIGHT NOT be periodic, so if the requesting STA desires a periodic sequence, it should as for an implicit TWT instead. In any case, this text has been moved to clause 9 - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2181 |
| 2184 | Lei Wang | 98 | 8.4.2.170j | What is a trigger frame? Is a PS-Poll a trigger frame too? | Clarify what a trigger frame is, for the sentence in line 58 page 98. | Revise - The trigger frame mentioned is the APSD trigger frame. Group agrees to add a forward reference, since the trigger frame is defined in clause 10 of the baseline. See 10.2.2.5 Power Management with APSD. A PS-Poll is not a trigger frame. - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2184 |
| 2185 | Lei Wang | 99 | 8.4.2.170j | With the TWT flow identifier, the TWT is per-flow. Then the questions are: how are the per-flow TWT parameters enforced / used? What happens if a STA sends data during another flow's TWT duration? Or even whether or not is the TWT flows related to the Traffic flows of the STA? | Please clarify wheither or not the TWT flow corresponds to STA's traffic flow. If so, plese clarify the per-flow TWT processing. | Reject - in the uplink direction, a requester knows its traffic expectations and knows what TWT agreements it has setup and knows why it set them up and therefore can easily match TWTs to uplink traffic without having any explicit matching between traffic flows and specific TWTs. The downlink case is a bit more difficult but because the TWT SP is quite flexible, it probably does not matter - that is, the AP can use existing signaling to tell a STA to remain awake because there is more data and the AP can discern the best TWT SP to use for specific traffic based on the parameters of the TWT agreement although some learning might be involved. In general, the TWT was initially designed for STA with low bandwidth requirements. The existing language sufficiently indicates that there are no restrictions on what frames can be included in any TWT SP. |
| 2186 | Lei Wang | 99 | 8.4.2.170j | There are multiple issues with the sentence in line 15 page 99, e.g.,1). TSF time value 0 is actually a valid value, based on Section 10.1;2). The case of letting the TWT responding STA to decide the TWT value is indicated by the TWT Command subfield, so no need to have another indicator. | Delete the sentence in line 15 page 99, i.e., delete the following sentence:A TWT-requesting STA uses the value of 0 in the Target Wake Time field to indicate that the TWT responding STA determines the TWT. | Revise - while TSF value 0 is a valid value, it is useless as a TWT SP start time, because TSF value 0 is defined as the TSF at the start of a BSS, and therefore TSF=0 is always in the past and useless as a TWT SP start time, otherwise, generally agree with commenter, but still need to mention that field is filled with zeros for that case - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2186 |
| 2193 | Lei Wang | 97 | 8.4.2.170j | The size of the TWT Channel field, 1-byte, is too small to accommodate some cases of the 11ah channelization. Based on the 11ah framework specficiation doc 11/1137r15, there are multiple cases that a band have more than 8 channels. | Change the size of the TWT Channel field to 2 octets. | Reject - the channel field is not indicating a channel number, but only a channel bitmap of the channels for which operation is permitted. No TGah BSS is permitted to operate on more than 8 channels at one time. |
| 2194 | Lei Wang | 100 | 8.4.2.170j | There are multiple issues with Figure 8-401dd -- Control field format, including:1). No text to describe it;2). Not in the right location, due to the order of the Control field in the TWT element. | Make the following changes:1). Move the Figure about control field format to the location right after the paragraph describing the Length field in the TWT element;2). Add the following text before the Control field format figure:The format of the Control field is shown in Figure 8-401dd.3). add the follow text right after Control field format figure:The Control field consists of a 1-bit NDP Paging Indicator subfield, 1-bit Responder PM Mode subfield, and 6 reserved bits.4). move the text in line 38 to 42 on page 100 to the location right after the newly added text proposed by 3) above. | Revise - generally agree with commenter, slight mods to proposed changes - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2194 |
| 2195 | Lei Wang | 101 | 8.4.2.170j | Have a question about the Action subfield in the NDP Paging field of the TWT element: This Action is per Paging setup (agreement), i.e., including all the instances after receivign a NDP Paging frame. This assumes all the pagings are for the same purpose. However, in real life, the paging may be triggered by different reasons, e.g., bufferred data, critical changes in Beacon, etc.Then, the question is: Why not allow Actions per Paging, i.e., including the Action field in the Paging frame, not the Page setup frame? Also, note that there are some reserved bits in NDP paging frame, which means the possibility of designing a per paging Action indication. | Suggest moving the Action field from NDP Paging setup in TWT element to NDP Paging frame. | REASSIGN TO AMIN |
| 2299 | Liwen Chu | 97 | 8.4.2.170j | "STA suggested TWT value"Which STA suggest TWT value, requesting or responding STA? | Clarify it. | Revise - generally agree with commenter - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2299 |
| 2300 | Liwen Chu | 98 | 8.4.2.170j | the first frame? | As proposed. | Revise - generally agree with commenter - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2300 |
| 2575 | Mitsuru Iwaoka | 100 | 8.4.2.170j | The R.4.2.D.2 of SFD (11-11/1137r15) specifies that a channel indication in TWT setup shall be defined according to 11-13/0071r0. The 11-13/0071r0 slide 9 and 10 specifies proposal to add to the RAW/TWT definition of an indication of the channel to be used as 'temporary primary channel'.Though, there is no specification about temporary primary channel in a TWT. | [Resolution #1]1) Change the 10th last paragraph of 8.4.2.170j as follows:---When transmitted by a TWT requesting STA, the TWT Channel field contains a channel number indicating on which channel the STA desires to use as a temporary primary channel during a TWT SP. When transmitted by a TWT responding STA, the TWT Channel field contains a channel number indicating on which channel the TWT requesting STA use as a temporary primary channel during the TWT SP.2) Insert the following paragraphs at the end of subclause 9.41.1 (TWT overview):---A TWT responding STA may further indicate on which channel the TWT requesting STA desires to use as primary channel during a TWT SP, through the TWT Channel field (see 8.4.2.170j). Access to the channel during a TWT SP shall be performed according to the procedure described in 9.46 (Subchannel Selective Transmission (SST)) assuming the primary channel is a channel identified by the TWT Channel field.[Resolution #2]1) Update the SFD to change the channel indication in TWT setup to specify SST information for the STAs indicated in the RAW.2) Replace the TWT Channel field by the Subchannel Indication field which is proposed in another comment to 9.46. | Revise - generally agree with commenter - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2575 |
| 2702 | Santosh Ghanshyam Pandey | 97 | 8.4.2.170j | There seem to be too many states that the TWT request/response can have. It may be easier if the non-AP STA just has one command "Request" and the AP has 2 commands "Accept" and "Reject". The AP may send a TWT schedule different than one requested by the request in the "Accept" and the STA will have to accept this TWT. The AP should always be the source of TWT schedule to its associated STAs and hand the schedule to them - not negotiate over multiple messages. | Simplify behavior as per the comment by reducing the number of commands | Reject - the intent of the multiple commands is to satisfy the following cases: 1) requester knows exactly what he wants temporarily in order to line up TWT SP with packet generation to minimize latency - he needs “demand” 2) requester is flexible because latency is not a serious concern - he uses “suggest”, or the requester started with a demand and the responder could not satisfy the demand, so the requester relents to “suggest” 3) requester is flexible because latency is not a problem and requester is not sophisticated enough to determine a TWT - he uses “request” 4) responder has limited capability to create TWT SP schedules, say that he can maintain four schedules, so he always wants to respond with dictate after finding the best fit with the request 5) responder has large capacity to support multiple disjoint TWT schedules and can therefore give requesters whatever they want, so it uses a response of alternate |
| 2711 | Santosh Ghanshyam Pandey | 99 | 8.4.2.170j | Wake Interval definition seems to be missing. There are text indicating that "Tocalculate the next TWT, the TWT STA adds the value of Wake Interval indicated in the element to the current TWT value." However this just tells Wake Interval is used in determining the next TWT but not what the Wake Interval acutally is. | Add a definition of Wake Interval | Reject - wake interval is used in the behavioral section, i.e. clause 9.41. |
| 2712 | Santosh Ghanshyam Pandey | 97 | 8.4.2.170j | The order of field definitions do not match the fileds in the figure. | Move the definition of Control field from page 100 line 38 to page 97 line 36. Also move the Element ID and and length subfield definition to line 18. | Revise - generally agree with commenter - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2712 |
| 2713 | Santosh Ghanshyam Pandey | 97.41 | 8.4.2.170j | Redundant paragraph given paragraph in page 97.36. They are stating the same idea | Remove one of the paragraph | Revise - generally agree with commenter - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2713 |
| 2714 | Santosh Ghanshyam Pandey | 98.30 | 8.4.2.170j | Not quite sure why there is a Direction subfield, the request should always be sent by non-AP STA to an AP STA. | Remove the Direction subfield and state that the request is always from non-AP STA and response is always from AP | Revise - generally agree with commenter - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2714 |
| 2131 | kaiying Lv | 97.45 | 8.4.2.170j TWT element | add "a" before "TWT" | add "a" before "TWT" | Revise - generally agree with commenter, but the draft is better with the text deleted because the terms created and used within 9.41 are TWT STA and TWT peer STA and the TWT STA of 9.41 does not match the definition here and the term TWT STA is not used in 8.4.2.170j - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2131 |
| 2132 | kaiying Lv | 98 | 8.4.2.170j TWT element | Change "an Implicit TWTs" to "an Implicit TWT" | as comment suggests. | Revise - generally agree with commenter, but instead of making the commenter’s change, the text is deleted because it is overlapping with text in 9.41 which is where the behavioral description should appear anyway - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2132 |
| 2133 | kaiying Lv | 98 | 8.4.2.170j TWT element | The term "AP" are not in consistance with the description in other place in the same seciton. | change "AP" to "TWT responding STA" | Revise - generally agree with commenter, but instead of making the commenter’s change, the text is deleted because it is overlapping with text in 9.41 which is where the behavioral description should appear anyway, note that in 9.41 the commenter’s suggested change has been made - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2133 |
| 2134 | kaiying Lv | 97 | 8.4.2.170j TWT element | The definition of TWT STA is unclear. The clear dfinition of TWT STA is provided in 9.41.1 pg 181/ln20 | Replace the definition of TWT STA with the description in 9.41.1 pg181/ln20. Or modify the statement to " A STA that wakes at TWT to either transmit or receive frames is a TWT STA as defined in sub-clause 9.41.1" | Revise - generally agree with commenter, but instead of making the commenter’s change, the text is deleted because it is overlapping with text in 9.41 which is where the behavioral description should appear anyway - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2134 |
| 2135 | kaiying Lv | 98.31 | 8.4.2.170j TWT element | The term "TWT responding STA" should be replaced with "TWT STA". Same comment for the rest part of this page. | as comment suggests. | Revise - generally agree with commenter, but the text is deleted because of the acceptance of another comment from the same commenter to delete the text (CID 2136) - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2135 |
| 2136 | kaiying Lv | 98 | 8.4.2.170j TWT element | The function of "Direction field" is covered by the "Flow type field" | Clarify the difference between these two fields. | Revise - generally agree with commenter - direction field deleted in favor of the flow type field - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2136 |
| 2137 | kaiying Lv | 98 | 8.4.2.170j TWT element | "Announced TWT" and "Unannounced TWT" are not referred anywhere else. To keep the spec simple, it's not necessary to create these two special terms. | remove these two terms and make necessary changes. | Revise - generally agree with commenter but instead of deleting the terms, behavioral language using these terms has been created for 9.41 - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2137 |
| 2138 | kaiying Lv | 99.15 | 8.4.2.170j TWT element | change" TWT-requesting " to "TWT requesting"┤+εchange "TWT-responding" to "TWT responding" | change" TWT-requesting " to "TWT requesting"┤+εchange "TWT-responding" to "TWT responding" | Revise - generally agree with commenter - TGah editor to execute proposed changes from 11-14-0608r0 found under all headings which include CID 2138 |
| 2212 | Lei Wang | 40 | 8.3.1.21 | Based on the paragraph in line 48 page 40, the Next TWT field contains a TSF timer value for the next TWT SP. Then it should be 8 bytes in size. However, it is inconsistent with the size of the Next TWT field in Figure 8-29m--TACK frame format. | Please clarify the size of the Next TWT field in the TACK frame, is it 8 bytes or 6 bytes? | Revise - generally agree with commenter - name of field is changed to reflect actual contents because of changes implemented for CID 2205 which add the TWT identifier to this field and further define the contents so that it does not say that the Next TWT field contains a TSF, but only a portion of a TSF - no additional changes to the draft are needed based on CID 2212 after accounting for the changes made by CID 2205. TGah editor to do nothing for CID 2212. |
| 2382 | Mark RISON | 40 | 8.3.1.21 | "The Next TWT field is optionally present if the Next TWT Present field is set to 1 in the FC field." -- do you really mean that if the NTP field is set to 1 the sender can decide whether to include a NT field? This seems very strange | Delete "optionally" (or get rid of the NTP field in the FC) | Revise - generally agree with commenter - changes implemented for CID 1511 end up modifying the text which is the subject of this comment and those changes should effectively satisfy the desires of the commenter so that no additional changes to the draft are needed based on CID 2382 after accounting for the changes made by CID 1511. TGah editor to do nothing for CID 2282 |

**Discussion**

**Proposed changes**

**CID 1854, 1855, 1856, 1857, 1971, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2136, 2181, 2186, 2194, 2299, 2575, 2712, 2713, 2714, 2131, 2132, 2133, 2134, 2135, 2137, 2138**

3.2 Definitions specific to IEEE 802.11

***TGah editor: Insert the definitions shown into 3.2 Definitions specific to IEEE 802.11:***

**target wake time service period (TWT SP)**: A period of time during which a TWT STA is awake to transmit and/or receive frames.

**target wake time service period start time (TWT SP start time)**: The value of the TSF at the beginning of a TWT SP.

**target wake time STA (TWT STA)**: A STA that has had a requested TWT agreement accepted by another STA and that receives TWT SP start times from that STA.

**target wake time peer STA (TWT peer STA)**: A STA that has accepted a TWT agreement that was requested by another STA and that assigns TWT SP start times to the requesting STA.

**8.4.2.170j TWT element**

***TGah editor: Modify the initial paragraphs of subclause 8.4.2.170j TWT element that are shown below as indicated:***

The TWT element is shown in Figure 8-401da (TWT element format).

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Element ID** | **Length** | **Control** | **Request Type** | **Target Wake Time** | **TWT Group Assignment** | **Nominal Minimum Wake Duration** | **Wake Interval Mantissa** | **TWT Channel** | **NDP Paging (optional)** |
| Octets: | 1 | 1 | 1 | 2 | 8 | 3 | 1 | 2 | 1 | 4 |

Figure 8-401da—TWT element format

The Element ID and Length fields are defined in 8.4.2.1 (General).

The format of the Control field is shown in Figure 8-401dd (Control field format).

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
|  |  |  |  |

The Control field comprises a 1-bit NDP Paging Indicator subfield, 1-bit Responder PM Mode subfield, and 6 reserved bits.

10.2. (Power management).

The format of the Request Type field is shown in Figure 8-401db (Request Type field format).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **TWT Request** | **TWT Command Reply** | **Reserved** | **Implicit** | **Flow Type** | **TWT Flow Identifier** | **Wake Interval Exponent** | **Reserved** |
| Bits: | 1 | 3 | 1 | 1 | 1 | 3 | 5 | 1 |

Figure 8-401db— Request Type field format

A STA that transmits a TWT element with the TWT Request subfield set to 1 is a TWT requesting STA. A STA that transmits a TWT element with the TWT Request subfield set to 0 is a TWT responding STA.

The TWT Command Reply field values indicate the type of TWT command, as shown in Table 8-191b (TWT Command Reply field values).

Figure 8-191b— TWT Command Reply field values

|  |  |  |  |
| --- | --- | --- | --- |
| **TWT Command Reply field value** | **Command name** | **Description when transmitted by a TWT requesting STA** | **Description when transmitted by a TWT responding STA** |
| 000b | Request TWT | The TWT field of the TWT element contains zeros as the TWT responding STA specifies the TWT value for this case | N/A |
| 001b | Suggest TWT | TWT requesting STA suggested TWT value | N/A |
| 010b | Demand TWT | TWT requesting STA demanded TWT value | N/A |
| 011b | TWT Grouping | N/A | TWT responding STA suggests TWT Group parameters that are different from the suggested or demanded TWT parameters of the TWT requesting STA |
| 100b | Accept TWT | N/A | TWT responding STA accepts the TWT request with the TWT parameters\* indicated |
| 101b | Alternate TWT | N/A | TWT responding STA suggests TWT parameters that are different from TWT requesting STA TWT suggested or demanded parameters |
| 110b | Dictate TWT | N/A | TWT responding STA demands TWT parameters that are different from TWT requesting STA TWT suggested or demanded parameters |
| 111b | Reject TWT | N/A | TWT responding STA rejects TWT setup |
| \*TWT Parameters are: TWT value, Nominal Minimum Wake Duration, Wake Interval and TWT Channel |

When transmitted by a TWT requesting STA, the Implicit subfield is set to 1 to request an Implicit TWT.

When transmitted by a TWT requesting STA, the Implicit subfield is set to 0 to request an Explicit TWT.

The Flow Type field indicates the type of interaction between the TWT requesting STA and the TWT responding STA at a TWT. A value of 0 in the Flow Type field indicates an Announced TWT in which the TWT requesting STA will send a PS-Poll or an APSD trigger frame (See 10.2.2.5 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. A value of 1 in the Flow Type field 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 APSD trigger frame from the TWT requesting STA.

The TWT Flow Identifier field contains a 3-bit value which identifies the specific information for this TWT request uniquely from other requests made between the same TWT requesting STA and TWT responding STA pair.

The Wake Interval Exponent subfield is set to the value of the exponent of the TWT Wake Interval value in microseconds, base 2. The Wake Interval of the requesting STA is equal to (Wake Interval Mantissa) ×2(Wake Interval Exponent).

When transmitted by a TWT requesting STA, the Target Wake Time field contains a positive integer which corresponds to a TSF time at which the STA wants to wake, or a value of zero when the TWT command Reply field contains the value corresponding to the command “Request TWT”. When a TWT responding STA with dot11TWTGroupingSupport equal to 0 transmits the TWT element to the TWT requesting STA, the TWT elemen contains the Target Wake Time field which corresponds to a TSF time at which the TWT responding STA wants a TWT requesting STA to wake and it does not contain the TWT Group Assignment field.

***TGah editor: Modify the additional paragraphs of subclause 8.4.2.170j TWT element that are shown below as indicated:***

The Nominal Minimum Wake Duration field contains the minimum amount of time that the TWT-requesting STA expects that it needs to be awake in order to complete the frame exchanges associated with the Flow Identifier for the period of Wake Interval. The least significant bit of the field corresponds to 256 microseconds.

The Wake Interval Mantissa subfield is set to the value of the mantissa of the TWT Wake Interval value in microseconds, base 2.

When transmitted by a TWT requesting STA, the TWT Channel field contains a bitmap indicating which channel the STA desires to use as a temporary primary channel during a TWT SP. When transmitted by a TWT responding STA, the TWT Channel field contains a bitmap indicating which channel the TWT requesting STA is allowed to use as a temporary primary channel during the TWT SP. Each bit in the bitmap corresponds to one minimum width channel for the band in which the TWT responding STA’s associated BSS is currently operating, with the least significant bit corresponding to the lowest numbered channel of the operating channels of the BSS. A value of 1 in a bit position in the bitmap transmitted by a TWT requesting STA means that operation with that channel as the primary channel is desired during a TWT SP. A value of 1 in a bit position in the bitmap transmitted by a TWT responding STA means that operation with that channel as the primary channel is allowed during the TWT SP.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
|  |  |  |  |

The format of the NDP Paging field is defined in Figure 8-401de (NDP Paging field format).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **P-ID** | **Max NDP Paging Period** | **Partial TSF Offset** |  **Action** | **Min Sleep Duration** | **Reserved** |
| Bits: | 9 | 8 | 4 | 3 | 6 | 2 |

Figure 8-401de— NDP Paging field format

The P-ID field is the identifier of the paged STA, as described in subclause 9.41.5.

The Max NDP Paging period indicates the maximum number of TWT intervals between two NDP Paging frames.

The Partial TSF Offset field includes timing indications, as described in section 9.41.5.

Upon reception of an NDP Paging Frame with matching P-ID field as defined in 9.41.5 NDP Paging Setup, the TWT STA that is an NDP Paging requester takes an action indicated by the Action field as described in Table 8-191c (Action field).

The Minimum Sleep Duration field in the NDP Paging Request indicates in units of SIFS the minimum duration that STA will be in the sleep mode after receiving an NDP Paging with matching P-ID.

Bits 30-31 of the NDP Paging field are reserved.

Table 8-191c— Action field

|  |  |
| --- | --- |
| **Action** | **Options** |
| 0 | Send a PS-Poll or uplink trigger frame |
| 1 | Wake up at the time indicated by Min Sleep Duration |
| 2 | STA to receive the Beacon |
| 3 | STA to receive the DTIM Beacon |
| 4 | Wakeup at the time indicated by Min Sleep Duration and the 8 MSB of APDI field of the NDP Paging frame |
| 5-7 | Reserved |

**9.42.1 TWT overview**

***TGah editor: Modify the fourth paragraph of subclause 9.42.1 TWT overview as shown:***

An AP with dot11TWTOptionActivated set to true shall transmit a TWT element to a STA with which it is associated and from which it received a frame containing a TWT element that contained a value of Request TWT, Suggest TWT or Demand TWT in the TWT Command field and a value of 1 in the TWT Request field. The transmitted TWT element shall be included in the frame that is the appropriate response frame to the received frame. The AP shall include a value of Accept TWT, Alternate TWT, Dictate TWT or Reject TWT in the TWT Command field of the response and shall set the TWT Request field to 0. If the AP response’s TWT Command field includes anything other than Accept TWT or Reject TWT, the STA should send a new request for a TWT value by sending another frame that contains a TWT element, modifying the parameters of the request to for example, indicate an acceptance of a proposed alternate TWT or dictated TWT value. If the STA receives a TWT response to a TWT request with the TWT Command value of Accept TWT, then the STA has successfully completed a TWT setup with that STA for the TWT Flow Identifier indicated in the TWT response and the STA becomes a TWT STA and the STA may sleep until the TSF matches the next TWT value of the STA, provided that the STA has indicated that it is in a power save mode and no other condition requires the STA to remain awake. The AP becomes a TWT peer STA of the TWT STA. The receipt of a TWT command value of Suggest TWT implies that the STA sending the command will consider accepting a proposed TWT that differs from the value found in the TWT field of the element. The receipt of a TWT command value of Demand TWT implies that the STA sending the command will not consider accepting a proposed TWT that differs from the value found in the TWT field of the element. The receipt of a TWT command value of Alternate TWT implies that the STA sending the command will consider accepting a proposed TWT that differs from the value found in the TWT field of the element. The receipt of a TWT command value of Dictate TWT implies that the STA sending the command will not consider accepting a proposed TWT that differs from the value found in the TWT field of the element.

***TGah editor: Change the eleventh paragraph of subclause 9.42.1 TWT overview as shown:***

STA shall be in the awake state following each TWT start time associated with each TWT agreement for at least the Adjusted Nominal Minimum Wake Duration time associated with that TWT agreement even if no PS-Poll or U-APSD trigger frame has been transmitted by the STA. If the Implicit bit is equal to 1 in the TWT response for a TWT agreement, the TWT associated with that TWT agreement is an Implicit TWT and the TWT SP associated with that TWT is an Implicit TWT SP. A TWT SP that is not an Implicit TWT is an Explicit TWT SP. If the NDP Paging field was present in the TWT response, the TWT STA shall follow the operational rules defined in 9.42.6 (NDP Paging Setup).(#

***TGah editor: Add the following paragraphs to the end of subclause 9.42.1 TWT overview as shown:***

The Flow Type field in the TWT response that successfully set up a TWT agreement indicates the type of interaction between the TWT requesting STA and the TWT responding STA within each TWT SP for that TWT agreement. A value of 0 in the Flow Type field indicates an Announced TWT. The TWT responding STA of an Announced TWT agreement shall not transmit a frame to the TWT requesting STA within a TWT SP until it has successfully received a PS-Poll or APSD trigger frame (see 10.2.2.5 Power management with APSD) from the TWT requesting STA. A value of 1 in the Flow Type field indicates an Unannounced TWT. The TWT responding STA of an Unannounced TWT agreement may transmit a frame to the TWT requesting STA within a TWT SP before it has successfully received a frame from the TWT requesting STA.

A TWT requesting STA indicates which single channel it desires to use as a temporary primary channel during a TWT SP by setting a single bit to 1 within the TWT Channel field of the TWT element, according to the mapping described for that field. A TWT responding STA indicates which single channel the TWT requesting STA is permitted to use as a temporary primary channel during a TWT SP by setting a single bit to 1 within the TWT Channel field of the TWT element, according to the mapping described for that field. During a TWT SP, access to a channel which is not the primary channel of the BSS shall be performed according to the procedure described in 9.46 (Subchannel Selective Transmission (SST)).

**9.42.3 Explicit TWT operation**

***TGah editor: Add the following paragraph to become the first paragraph of subclause 9.42.3 Explicit TWT operation as shown:***

Each TWT SP start value for an Explicit TWT is transmitted by the TWT responding STA to the TWT requesting STA in the Next TWT Info/Suspend Duration field of a frame that can contain the field as described in this subclause. The TWT responding STA for an Explicit TWT may provide TWT SP start times that are related to one another in a periodic or aperiodic manner.

**References:**