IEEE P802.11
Wireless LANs

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| --- |
| Comment Collection LB200 MAC for Subclause 8.4.2.170j and 9.41.4 |
| Date: 2014-25-02 |
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Abstract

This document provides resolutions for CIDs: 1423, 1424, 1626, 2139, 2187, 2188, 2189, 2190, 2191, 2192, and 2701 for Subclause 8.4.2.170j and

CIDs 1229, 1230, 1231, 1232, 1233, 1513, 1866, 1867, 1868, 1869, 1870, 1871, 1872, 1873, 2218, 2219, 2220, 2535, 2754, 2864, and 2865 for Subclause 9.41.4

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CID** | **Page** | **Clause** | **Comment** | **Proposed Change** | **Decision** |
| 1423 | 97.08 | 8.4.2.170j  | TWT grouping is an optional feature while it exists by defult in the TWT IE and it is 3 octet. It should be present only if the Grouping is in use. | Make the TWT group Assignment field optionally present | Revised- TGah editor to make changes shown in 11-13/XXXXr0 under the heading for CID 1423, 1424, 1626, 2139, 2187, 2188, 2189, 2190, 2191, 2192, 2701 |
| 1424 | 99.39 | 8.4.2.170j  | There are multiple Group ID defined in the text with different resolutions for example Group ID defined in page 49 line 56 has 6 bits resolution while Group ID defined in page 124 line 21 has 4 bits resolution and Group ID defined in page 99 line 39 has 8 bits resolution. | either use the same definition through the text or use different names for the "Group ID", e.g. "TWT Group ID" | Revised- TGah editor to make changes shown in 11-13/XXXXr0 under the heading for CID 1423, 1424, 1626, 2139, 2187, 2188, 2189, 2190, 2191, 2192, 2701 |
| 1626 | 97 | 8.4.2.170j | The concept of TWT Grouping can be utilized in defining TWTs of STAs with less overhead | Consider defining a method of assigning TWTs using TWT grouping concept | Revised- TGah editor to make changes shown in 11-13/XXXXr0 under the heading for CID 1423, 1424, 1626, 2139, 2187, 2188, 2189, 2190, 2191, 2192, 2701 |
| 2139 | 99.41 | 8.4.2.170j | the TWT Group ID field is not present | change "in the TWT Group ID field" to "in the Group ID field of TWT element" | Revised- TGah editor to make changes shown in 11-13/XXXXr0 under the heading for CID 1423, 1424, 1626, 2139, 2187, 2188, 2189, 2190, 2191, 2192, 2701 |
| 2187 | 99.31 | 8.4.2.170j | Multiple questions regarding the text specifying the TWT Group Assignment field in the paragraph in line 31 page 99, e.g.,1) who assigns the TWT group? only the TWT responding STA?2). If only TWT responding STA assigns, then it should be clearly specified that this field is valid only when sending from TWT responding STA. | Please provide clarification to address the questions asked in this comment. | Revised- TGah editor to make changes shown in 11-13/XXXXr0 under the heading for CID 1423, 1424, 1626, 2139, 2187, 2188, 2189, 2190, 2191, 2192, 2701 |
| 2188 | 99.39 | 8.4.2.170j | Questions about the sentence " The Group ID represents a set of STAs with adjacent TWT values."1). Is the TWT value the only parameter used to group TWTs?2). Actually, what are the members of a Group? A STA? a TWT? If it is TWT, then a STA may have multiple TWTs in the same group? | Please provide clarification to address the questions asked in this comment. | Revised- TGah editor to make changes shown in 11-13/XXXXr0 under the heading for CID 1423, 1424, 1626, 2139, 2187, 2188, 2189, 2190, 2191, 2192, 2701 |
| 2189 | 99.41 | 8.4.2.170j | The value 00000000 seems a binary number in in line 41 page 99. It should use the binary number representation. | In line 41 page 99, change "00000000" to "0b00000000". | Revised- TGah editor to make changes shown in 11-13/XXXXr0 under the heading for CID 1423, 1424, 1626, 2139, 2187, 2188, 2189, 2190, 2191, 2192, 2701 |
| 2190 | 99.40 | 8.4.2.170j | There seems a problem with the sentence in line 40 page 99: if the Groud ID 0000000 means all the STAs in a TWT group, then how to identify the TWT group, i.e., all the STAs in which TWT group? | Please clarify or just delete the sentence. | Revised- TGah editor to make changes shown in 11-13/XXXXr0 under the heading for CID 1423, 1424, 1626, 2139, 2187, 2188, 2189, 2190, 2191, 2192, 2701  |
| 2191 | 99.45 | 8.4.2.170j | Use binary representation for binary numbers. | in line 45 page 99, change "00010100" to "0b00010100" | Revised- TGah editor to make changes shown in 11-13/XXXXr0 under the heading for CID 1423, 1424, 1626, 2139, 2187, 2188, 2189, 2190, 2191, 2192, 2701 |
| 2192 | 99.49 | 8.4.2.170j | There are multiple questions with the paragraph in line 49 page 99, including:1. what is a TWT value? Is it the 8-byte timestamp value given in the Target Wake Time field in the TWT element?2. how a TWT value of 80msec is calculated? The difference between the TWT field and the current TSF timer?3. more importantly, it is wrong the conclusion given by the last sentence of the paragraph, i.e., "this STA concludes that there are at most 6 STAs contending for the channel currently", because this STA only knows how much STAs before him, which does not mean there may be more STAs afer him. For example, the first STA get its TWT as the zero offset, so it concludes that he is the only one. Then the 2nd STA gets its TWT as sero offset plus the incremental value, then it concludes there are "at most" 2 STAs, ..... | Please revise the paragraph in line 49 page 99 at address the questions of this comment or just delete the paragraph. | Revised- TGah editor to make changes shown in 11-13/XXXXr0 under the heading for CID 1423, 1424, 1626, 2139, 2187, 2188, 2189, 2190, 2191, 2192, 2701 |
| 2701 | 99.41 | 8.4.2.170j | If Group ID is 0, then how do the STAs determine which TWT group id the signalling is intended for? | Clarify how the group for singaling is determined when the group id field is 0 | Revised- TGah editor to make changes shown in 11-13/XXXXr0 under the heading for CID 1423, 1424, 1626, 2139, 2187, 2188, 2189, 2190, 2191, 2192, 2701  |

**CIDs 1423, 1424, 1626, 2139, 2187, 2188, 2189, 2190, 2191, 2192, and 2701:**

**Discussion:**

***Please modify Table 8-191b in Page 97 / Line 52 as follows:***

Table 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  |

|  |
| --- |
| TWT requesting STA NULL TWT (TWT value invalid, TWT respond­ing STA chooses the TWT value) |

 | Reserved |
| 001b | Suggest TWT | STA suggested TWT value | Reserved |
| 010b | Demand TWT  | TWT requesting STA demanded TWT value | Reserved |
| 011b | ~~N/A~~TWT Grouping | Reserved | ~~Reserved~~ TWT responding STA suggests TWT Group parameters that are different from the suggested or demanded TWT parameters of TWT requesting STA  |

***Please modify Figure8-401da in P97/L8 as follows and by removing the Target Wake Time field*:**

TWT Channel

TWT Group Assignment

Nominal Minimum Wake Duration

Wake Interval Mantissa

NDP Paging

(optional)

Target Wake Time

Request Type

Control

Length

Element ID

Octets 1 1 2 8 or 0 9 or 3 or 0 1 2 1 4

**Figure 8-401da – TWT element format**

***Please modify Figure8-401dc in P99/L23 as follows*:**

Zero Offset Present

Zero Offset of Group

(optional)

TWT Unit

TWT Offset

TWT Group ID

Bits ~~8~~7 1 48 ~~3~~ 4 ~~6~~12

**Figure 8-401dc – TWT Group Assignment field format**

***Please modify the paragraphs starting from P99/L11 as follows*:**

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. When a TWT responding STA with dot11TWTGroupingSupport set to 0 transmits the TWT element to the TWT requesting STA, ~~When transmitted by a TWT responding STA,~~ the TWT element contains the Target Wake Time field ~~contains a positive integer~~ 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. 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.

When a TWT responding STA with dot11TWTGroupingSupport set to 1 transmits the TWT element to the TWT requesting STA from which it received a frame containing an S1G Capabilities element with the TWT Grouping Support subfield set to 1, the TWT element does not contains the Target Wake Time field and it contains the TWT Group Assignment field in order to indicate the TWT Group of the requesting STA and the assigned TWT value. The presence of the TWT Group Assignment field is indicated by a TWT responding STA by using the TWT Grouping command in the TWT Command Reply field (see Table 8-191b – TWT Command Reply field values) within the TWT element.

~~The TWT Group Assignment field indicates the assignment of STAs to predefined TWT groups based on their requested TWTs.~~ The TWT Group Assignment field provides information to a requesting STA about the ~~assigned~~ TWT group to which the STA is assigned. ~~and t~~This field contains the TWT Group ID, Zero Offset of Group (optional), TWT Unit, and TWT Offset ~~Increment Within Group~~ subfields. The TWT Group Assignment field and the corresponding subfields are depicted in Figure 8-401dc ~~(~~TWT Group Assignment field format~~)~~.

The TWT Group ID subfield is a 7~~8~~-bit unsigned integer and indicates the identifier of the TWT group to which the requesting STA is assigned. ~~The~~A TWT Group ~~ID~~ ~~represents~~ is a group of STAs that have TWT values that lie within a specific interval of TSF values. ~~set of STAs with~~ ~~adjacent TWT values~~. ~~For group addressed traffic, a~~ A value of 0x00~~00000000~~ in the TWT Group ID subfield is used ~~for signaling~~ to indicate the unique TWT Group which contains all STAs in the BSS~~a TWT group instead of using individual AIDs~~.

The value in the Zero Offset Present subfield indicates whether the following Zero Offset of Group subfield is included in the TWT Group Assignment field of the TWT element. A value of 0 in the Zero Offset Present subfield indicates that the Zero Offset of the Group subfield is not included in the TWT Group Assignment field.

The Zero Offset of Group subfield indicates the initial TWT value for the TWT group identified by the TWT Group ID. The Zero Offset of Group subfield is six octets in length and contains the initial TWT value for the TWT Group with the given TWT Group ID. When the Zero Offset of Group subfield is six octets in length, it contains the lowest six bytes of the TSF time corresponding to the TWT Group offset time. ~~within the range of TWT values within a~~ ~~TWT Group~~. ~~For example,~~ ~~a Zero Offset of Group of value 00010100 indicates the first TWT value of the assigned group is 20, where the unit of the Offset is given in the TWT Unit subfield.~~ The Zero Offset of Group subfield is optional present in the TWT Group Assignment field and when a STA requests multiple TWT flows with the common value of the zero offset of the TWT group, the next TWT Group Assignment field may not include the Zero Offset of the Group subfield.

***Note that the position of the next two paragraphs has been exchanged:***

The TWT Unit subfield indicates the unit of increment of the TWT values within the TWT group identified by the TWT Group ID. ~~The TWT Unit subfield is of length 3 bits.~~ The TWT Unit value encoding is shown in Table 8-TWT Unit subfield encoding. ~~of 0 indicates millisecond, 1 indicates second, 2 indicates minute, 3 indicates hour, 4 indicates day, and the other values are reserved for future use.~~

***Please insert the following table:***

|  |  |
| --- | --- |
| **TWT Unit subfield value** | **TWT Unit time value** |
| 0000b | 32 usec |
| 0001b | 256 usec |
| 0010b | 1024 usec |
| 0011b | 8.192 msec |
| 0100b | 32.768 msec |
| 0101b | 262.144 msec |
| 0110b | 1.048576 sec |
| 0111b | 8.388608 sec |
| 1000b | 33.554432 sec |
| 1001b | 268.435456 sec |
| 1010b | 1073.741824 sec |
| 1011b | 8589.934592 sec |
| 1100b – 1111b | Reserved |

**Table 8-401 - TWT Unit subfield encoding**

The TWT Offset subfield indicates the position within the indicated group, of the STA corresponding to the RA of the frame containing the TWT element.

A non-AP STA uses the TWT Group ID, Zero Offset of Group, TWT Unit, and TWT Offset ~~Increment within Group~~ values to compute its TWT value ~~location~~ within the TWT Group. A STA’s TWT value is equal to the value of the Zero Offset of Group plus TWT Offset times the value of TWT Unit. ~~Based on the assigned TWT value, a STA computes the difference between its TWT value and the Zero Offset of Group value. If a TWT value is assigned to a single STA only, the computed difference and the value in Increment within Group subfield provides an estimate of the number of STAs already contending for the medium. For example, if the value in Zero Offset of Group subfield for a TWT Group is "20" with TWT Unit subfield indicating "msec," and a STA's assigned TWT is 80msec, then the difference between its assigned TWT and first TWT of the Group is 60msec. If the value in Increment within Group subfield is 10msec, then this STA concludes that there are at most 6 STAs contending for the channel currently.~~

~~The Increment Within Group subfield is 5-bit unsigned integer and indicates the difference between any two~~

~~adjacent TWT values in the group. This difference is constant within the TWT group.~~

**8.4.2.170k S1G Capabilities element**

***Please include the following row in Table 8-191d in Page 103 / Line 19:***

|  |  |  |
| --- | --- | --- |
| **Subfield** | **Definition** | **Encoding** |
| TWT Grouping Support | This bit indicates support of TWT Grouping described in 9.41.4 (TWT Grouping)             | Set to 0 if not supportedSet to 1 if supported |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| C**ID** | **Clause** | **Page** | **Line** | **Comment** | **Proposed Change** | **Resolution** |
| 1229 | 9.41.4 | 183 | 11 | There's some spurious underlining in this para. | Remove it. | RejectedComment: The text under discussions is deleted  |
| 1230 | 9.41.4 | 183 | 23 | For consistency, please use Arial font for all text in the figure. | As in comment | RejectedComment: The figure is deleted |
| 1231 | 9.41.4 | 183 | 59 | " set the Increment within Group value" -- Please avoid using the name of a field for any other purpose than preceding the word "field". Also use initial caps for the name of the field consistently. | Replace with "set the value of the Increment Within Group field" | RejectedComment: The text under discussions is deleted |
| 1232 | 9.41.4 | 184 | 02 | "perform either ofthe following steps:""either" is specific to a choice between two.But the list doesn't read as a list of alternatives.I really don't understand what's intended here. | Please clarify if this is a sequence of steps, or a list of alternatives and adjust language accordingly. | RejectedComment: The text under discussions is deleted  |
| 1233 | 9.41.4 | 184 | 04 | "STA wakes up " -- missing article | "The STA wakes up " | RejectedComment: The text under discussions is deleted  |
| 1513 | 9.41.4 | 183 | 01 | TWT grouping does not define any meaningful operation | Either change it to define a useful operation or remove the subclause | Revised- TGah editor to make changes shown in 11-13/XXXXr0 under the heading for CID 1513, 2535, 2864, and 2865. |
| 1866 | 9.41.4 | 205 | 03 | "...the AP can protect this period from TIM STAs..." You define "non TIM STA" as "an S1G STA that does not listen to the beacon". I don't think you define TIM STA. For example is a TIM STA also a S1G STA or is it any STA that is not a 'non TIM STA'? Is a TIM STA any STA that is listening to beacons? | Replace "the AP can protect this period from TIM STA", with" the AP can protect this period from STAs that are listening to the beacon, TIM STAs, ..." | RejectedComment: The text under discussions is deleted  |
| 1867 | 9.41.4 | 205 | 09 | "This TWT group may be represented by a Group ID..." Is this really a 'may'? The Group ID is specific and can be for "all" but is not the intention that in the examples given in Fig 9.86 the Group ID is specific? | Replace with "This TWT group is represented by a Group ID..." | RejectedComment: The text under discussions is deleted |
| 1868 | 9.41.4 | 205 | 11 | "..termed as Zero Offset of Group.." Needs a 'the' | Replace with "termed as the Zero Offset of Group" | RejectedComment: The text under discussions is deleted  |
| 1869 | 9.41.4 | 205 | 14 | "The AP should define all TWT groups," should this be a 'shall'? | Replace with "The AP shall define all TWT groups," | RejectedComment: The text under discussions is deleted  |
| 1870 | 9.41.4 | 205 | 15 | "...each group identified by its Group ID, Zero Offset of Group, TWT Unit, and Increment within Group (see 8.4.2.170j)." Needs an 'is'. | ...each group is identified by its Group ID, Zero Offset of Group, TWT Unit, and Increment within Group (see 8.4.2.170j). | RejectedComment: The text under discussions is deleted |
| 1871 | 9.41.4 | 205 | 22 | Fig 9-86. Could we have an alternative to "Increment within Group of 2" so as to be more explicit? | Replace one or more of the Groups with an "Increment within Group" of a value other than 2. | RejectedComment: The text under discussions is deleted |
| 1872 | 9.41.4 | 205 | 22 | Fig 9-86. Unclear as to the start times and end times. Does this Figure need more information as to what the squares are? Does each square refer to a TWT STA (within the Group)? Please work a little on this to make it clear. | Please add further info to Fig 9-86 to make clearer | RejectedComment: The text under discussions is deleted |
| 1873 | 9.41.4 | 206 | 02 | "...can perform either of the following steps:" this seems in indacate two alternative steps but we have 5 steps. "Either" is the wrong term. Furthermore the steps do not seem to offer an alternative they seem to indicate a recommended procedure | Replace "can perform either of the following steps:" with "can carry out the following steps:" | RejectedComment: The text under discussions is deleted |
| 2218 | 9.41.4 | 183 | 11 | why some words are underlined in the paragraph in line 11 page 183? | remove the "underline" in the paragraph in line 11 page 183. | RejectedComment: The text under discussions is deleted  |
| 2219 | 9.41.4 | 183 | 48 | Couple of questions to the sentence in line 48 page 183, including:1) When the TWT grouping is used, do all the TWT STAs have to belong to a TWT group?2). Does a TWT group has to be predefined? How to pre-define a TWT group? | Clarify the text in line 48 page 183 to address the questions asked by this comment. Or, change the sentence in line 48 page 183 to the following:Based on the requested or demanded TWT value from a STA, an AP may assign it to one of the TWT Groups. | RejectedComment: The text under discussions is deleted  |
| 2220 | 9.41.4 | 183 | 56 | Don't think the text in the paragraph in line 56 page 183 is technically correct regarding the correspondence between TXOP duration and the Increment within a TWT group, particularly to those high values of Increments, e.g., minutes or hours. In 802.11, do we have TXOP durations up to hours? | Please clarify the text in the paragraph in line 56 page 183 to address the issues identified by the comment, Or, just delete the paragraph in line 56 page 183. | RejectedComment: The text under discussions is deleted |
| 2535 | 9.41.4 | 180 | 01 | The purpose of the TWT grouping is unclear compared to the procedure that assigns a TWT value during the TWT setup and through following frame exchanges during TWT SPs based on the procedure defined in 9.41.1, 9.41.2, and 9.41.3. Since an AP can decide which TWT value to include in a TWT response to the TWT requesting STA, how the AP does the grouping is implementation dependent and the AP can have the grouping information internally and do not need to communicate to non-AP STAs. | Delete the subclause 9.41.4 TWT Grouping. | Revised- TGah editor to make changes shown in 11-13/XXXXr0 under the heading for CID 1513, 2535, 2864, and 2865 |
| 2754 | 9.41.4 | 186 | 01 | Change "TSBTT" to "T(S)BTT". Need to have a simple statement somewhere in the draft/footnote as follows: Unless stated otherwise, TBTT may refer to TB(S)TT for S1G STA where TBSTT may be used. | as commented | RejectedComment: The text under discussions is deleted  |
| 2864 | 9.41.4 | 183 | 01 | The purpose of the TWT grouping is unclear compared to the procedure that assigns a TWT value during the TWT setup and through following frame exchanges during TWT SPs based on the procedure defined in 9.41.1, 9.41.2, and 9.41.3. Since an AP can decide which TWT value to include in a TWT response to the TWT requesting STA, how the AP does the grouping is implementation dependent and the AP can have the grouping information internally and do not need to communicate to non-AP STAs. | Delete subclause 9.41.4 TWT Grouping. | Revised- TGah editor to make changes shown in 11-13/XXXXr0 under the heading for CID 1513, 2535, 2864, and 2865 |
| 2865 | 9.41.4 | 183 | 01 | TWT Grouping has the following granularity for TWT.0-255 ms, 0-255 sec, 0-255 min, 0-255 hr, 0-255 dayThe following TWT can not be assigned to TWT STA.256 - 999 ms, 1001 - 1999 ms, 2001 - 2999 ms...256 - 299 sec, 301 - 359 sec, 361 - 419 sec...256 - 299 min, 301 - 359 min, 361 - 419 min...TWT Grouping field of 3 octets gives a TWT STA a serious constraint.The size of TWT Grouping field should be increased. But, in that case, the benifit of TWT Grouping is lost.If TWT Grouping can not support the granularity of 0-2^64 (ms), remove TWT Grouping. | Delete subclause 9.41.4 TWT Grouping. | Revised- TGah editor to make changes shown in 11-13/XXXXr0 under the heading for CID 1513, 2535, 2864, and 2865 |

**CIDs 1513, 2535, 2864, and 2865**

**9.41.4 TWT Grouping**

***Please include the following paragraphs in Page 183/ Line 44:***

An AP may include an S1G STA with dot11TWTOptionActivated set to true as a member of a TWT group and signal TWT times to that STA using the TWT Group Assignment field of the TWT element.

An AP shall not include a non-S1G STA within a TWT Group.

When dot11TWTGroupingSupport is set to true, the AP shall only assign a TWT group ID to a TWT requesting STA when the TWT Grouping Support subfield of the most recent S1G Capabilities element received from that STA contained a value of 1. The AP indicates the TWT value for a TWT requesting STA from which it received a frame containing an S1G Capabilities element with the TWT Grouping Support subfield set to 1 that is the intended recipient of the frame containing the TWT element by including the value of the assigned group ID in the TWT Group ID subfield, the lower 48 bits of a TSF value in the Zero Offset of Group subfield to indicate the TWT value corresponding to the first member of the TWT Group that is identified by the TWT Group ID, a TWT unit value in the TWT Unit (8.4.2.170j) subfield, and a positive offset value indicated in the TWT Offset (8.4.2.170j) subfield. The allowed values in the TWT Unit subfield are given in Table 8 - TWT Unit subfield encoding.

The intended recipient of the frame containing the TWT element calculates its TWT from the TWT Group Assignment field by multiplying the TWT Unit interpretation value with the value indicated in the TWT Offset subfield and adding the result to the value in the Zero Offset of Group field corresponding to the TWT Group ID subfield in the TWT Group Assignment field of the TWT element.

~~When a TWT STA transmits within its TWT SP, the AP can protect this period from TIM STAs using mechanisms like NAV-setting frame exchanges and RAW scheduling. Information of these protected periods are to be broadcasted to TIM STAs for NAV setting or prohibiting TIM STAs from uplink transmissions.~~

~~Alternatively, an AP may have a predefined range of TWT groups as in Figure 9-86 (TWT grouping assignment). This TWT group may be represented by a Group ID (see 8.4.2.170j). The first TWT value of a TWT group is termed as Zero Offset of Group (see 8.4.2.170j). The value in Zero Offset of Group subfieldcorresponds to the value of the Target Wake Time field in the TWT element that contains the corresponding TWT Assignment. Examples of grouping assignments are depicted in Figure 9-86 (TWT grouping assignment). The AP should define all TWT groups, each group identified by its Group ID, Zero Offset of Group, TWT Unit, and Increment within Group (see 8.4.2.170j).~~

***Please delete Figure 9-86 – TWT grouping assignment in Page 184/ Line 26:***

***Please delete the following paragraphs in Page 184/ Line 28:***

~~A TWT STA suggests or demands a TWT value using either Suggest TWT or Demand TWT Command~~ ~~in the Request Type field (see Figure 8-401db (Request Type field format)) within a TWT element (see Figure 8-401da (TWT element format)). Based on the requested or demanded TWT value from a STA, an AP assigns it to one of the predefined TWT Groups. If the requested TWT does not belong to any of the TWT Groups, the AP may assign a modified TWT value. The AP sends the Group ID and Zero Offset of Group values within the TWT element to a requested STA (TWT Request bit set to 0) in order to indicate its TWT Group and the modified TWT value by using the Alternate TWT Command (see Figure 8-401da (TWT element format)).~~

~~An AP may use the Increment within Group subfield to spread the contention among TWT STAs. Based on the type of access categories of STAs within a TWT group, an AP may estimate their typical TXOP durations and set the Increment within Group value accordingly. For instance, higher the TXOP durations, higher the value indicated in Increment within Group subfield and vice versa.~~

~~The TWT grouping information may be beneficial when STAs already have their TWT values. The value in the TWT field of the TWT element provides the wake-up time for a STA. Other STAs that are members of the same TWT group wake at their assigned TWT times. In order to reduce contention among the waking STAs with closer TWT values, each waking STA can perform either of the following steps:~~

~~1)STA wakes up at its assigned TWT;~~

~~2)It computes the difference between its assigned TWT value and the Zero Offset of the Group;~~

~~3)Based on the difference and value in Increment within Group subfield, it estimates the number of STAs already contending for the medium;~~

~~4)For large number of contending STAs , it may use a large back-off counter value; and~~

~~5)If the difference is equal to 0, this STA is the only one contending for medium because the STA is the first of the TWT group with its TWT value being identical to the value in the Zero Offset of group field.~~