IEEE P802.11
Wireless LANs

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| LB203 Proposed Resolutions for Subclause 8.4.2.170i TWT element |
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|  |  |  |  |  |

Abstract

Addressing some CIDs from LB203 which relate to Subclause 8.4.2.170i TWT element, including resolutions for CIDs:

 3021, 3263, 3514, 3517, 3642, 3643, 3644 - (7 CIDs total)

**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** |
| --- | --- | --- | --- | --- | --- | --- |
| 3021 | Adrian Stephens | 136.52 | 8.4.2.170i | "The Control field comprises a 1-bit NDP Paging Indicator subfield, 1-bit Responder PM Mode subfield, and 6 reserved bits."This is unnecessary and creates duplicate normative specification. | Delete cited text. | Accept |
| 3263 | Alfred Asterjadhi | 140.46 | 8.4.2.170i | What's the value of "minimum width channel"? Make sure it is consistent with SST procedure where the SST Operation element provides the unit. | clarify in text. | Revise - generally agree with commenter, TGah editor to execute proposed changes from 11-14-1139r0 found under all headings which include CID3263 |
| 3514 | Dorothy Stanley | 140.42 | 8.4.2.170i | Use of "desires" is not desired, conflicts with direction of 11mc, see changes as shown in 11-14/207r5 for 11mc CID 2051. | Change from "indicating which channel the STA desires to use as a temporary primary channel" to "indicating which channel the STA requests to use as a temporary primary channel" | Revise - generally agree with commenter, although the group’s proposed resolution is different from the commenter’s proposed resolution because two occurrences of “want” which appear several paragraphs earlier are also changed to “requests” - TGah editor to execute proposed changes from 11-14-1139r0 found under all headings which include CID3514 |
| 3515 | Dorothy Stanley | 140.50 | 8.4.2.170i | Use of "desires" is not desired, conflicts with direction of 11mc, see changes as shown in 11-14/207r5 for 11mc CID 2051. | Change from "desired" to "requested". Similar changes at 158.16, 158.19, 217.28, 218.21, 274.57, 276.3,276.7, 276.12, 376.34, 376.57, 377.33, 377.57, 378.22, 379.6, 379.38, 380.2, 380.44, 381.9, 381.42, 382.6, 382.46, 383.11, 384.6, 384.63, 385.39, 386.11, 386.58, 453.5, 453.7, 453.9, 454.5, 454.8, 454.11, | Accept |
| 3517 | Dorothy Stanley | 139.41 | 8.4.2.170i | Use of normative verbs such as "may" or "shall" is avoided in clause 8, the single shall statement at the beginning of Clause 8 (see 548.15 in P802.11REVmc D3.0). | Change from "field may not include" to "field does not include" | Accept - see CID 3472 which requests the same change. |
| 3642 | kaiying Lv | 139.36 | 8.4.2.170i | This subfield is always of six octets. Why need this condition "When the Zero Offset of Group subfield is six octets" . | Please delete the condition. | Revise - generally agree with commenter, TGah editor to execute proposed changes from 11-14-1139r0 found under all headings which include CID3642 |
| 3643 | kaiying Lv | 139.38 | 8.4.2.170i | "...when a STA requests multiple TWT flows with the common value of the zero offset of the TWT group,..." How to know that a STA requests multiple TWT flows with the common value of the zero offset? | Please clarify it. | Revise - generally agree with commenter, TGah editor to execute proposed changes from 11-14-1139r0 found under all headings which include CID3643 |
| 3644 | kaiying Lv | 140.55 | 8.4.2.170i | There is no "Protection Indicator"subfield in the control field of TWT element | Please add the subfield in the TWT element format | Revise - generally agree with commenter, also clarifying much fo the text for this bit in the proposed resolution - TGah editor to execute proposed changes from 11-14-1139r0 found under all headings which include CID3644 |
| 3469 | David Hunter | 138.11 | 8.4.2.170 | "Nominal Minimum Wake Duration", "Wake Interval" and "TWT Channel" are listed here as TWT parameters, but are not defined (neither their values nor the explicit meanings of those values are defined). | Define those parameters. Are these really parameters? Sometimes they appear to be treated as set (but still undefined) values. | Revise - generally agree with commenter, TGah editor to execute proposed changes from 11-14-1139r0 found under all headings which include CID3469 |
| 3470 | David Hunter | 138.37 | 8.4.2.170 | "the value of the exponent of the TWT Wake Interval value in microseconds, base 2.": where is the "TWT Wake Interval" field defined? | If the TWT Wake Interval is not a field, subfield, etc., then replace "TWT Wake Interval" with "TWT wake interval" throughout the draft. The same appears to be needed for "Wake Interval" when it is not part of the name of a field (such as "Wake Interval Exponent subfield". (The concept of the "wake interval" still needs to be defined -- for instance, from what point in time to what other point in time?) | Revise - generally agree with commenter, TGah editor to execute proposed changes from 11-14-1139r0 found under all headings which include CID3470 |

**Discussion**

Note that the Draft P802.11ah\_D2.0.pdf has the TWT IE subclause numbered as 8.4.2.170i but the Draft P802.11ah\_D2.1.pdf has the TWT IE subclause numbered as 8.4.2.170j. LB203 comments refer to the D2.0 subclause numbering but the TGah editing instructions in this document refer to the D2.1 numbering.

**Proposed changes**

**CID 3021, 3263, 3514, 3517, 3642, 3643, 3644, 3469, 3470**

***TGah editor: modify subclause 8.4.2.170j TWT element of TGah Draft 2.1 as shown:***

* TWT element

The TWT element is shown in Figure 8-575a19 (TWT element format(#3022)).

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |
|  | Element ID | Length | Control | RequestType | TargetWake Time | TWT Group Assignment | Nominal Minimum Wake Duration | TWT Wake Interval Mantissa | TWT Channel | NDP Paging(optional) |
| Octets:  | 1 | 1 | 1 | 2 | 8 or 0 | 9 or 3 or 0 | 1 | 2 | 1 | 0 or 4 |
| * TWT element format(#3022)
 |

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).

|  |  |  |  |
| --- | --- | --- | --- |
|  | B1 | B2 | B3      B8 |
|  | NDP Paging Indicator | Responder PM Mode | Reserved |
| Bits: | 1 | 1 | 6 |
| * Control field format(#3930)
 |

(#3021)The NDP Paging field is present if the NDP Paging Indicator subfield(#3641) is set to 1; otherwise the NDP Paging field is not present.

The Responder PM Mode subfield(#3641) indicates the Power Management mode as defined in 10.2 (Power management).

The format of the Request Type field is shown in Figure 8-575a21 (Request Type field format).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 | B1 B3 | B4 | B5 | B6 | B7 B9 | B10   B14 | B15 |
|  | TWT Request | TWT Setup Command | Reserved | Implicit | Flow Type | TWT Flow Identifier | TWT Wake Interval Exponent | TWT Protection (#3644) |
| Bits:  | 1 | 3 | 1 | 1 | 1 | 3 | 5 | 1 |
| * Request Type field format
 |

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

The TWT Setup Command subfield(#3641) values indicate the type of TWT command, as shown in Table 8-258a2 (TWT Setup Command field values).

|  |
| --- |
| * TWT Setup Command field values
 |
| TWT Setup Command 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(#3493) 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 suggested or demanded TWT 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, Nominal Minimum Wake Duration, TWT Wake Interval and TWT Channel subfield values indicated in the element. (#3469) |

When transmitted by a TWT requesting STA, the Implicit subfield is set to 1 to request an implicit(#3471) TWT.

When transmitted by a TWT requesting STA, the Implicit subfield is set to 0 to request an explicit(#3471) TWT.

The Flow Type subfield(#3641) 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 subfield(#3641) 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 subfield(#3641) 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 an APSD trigger frame from the TWT requesting STA.

The TWT Flow Identifier subfield(#3641) 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.

In a TWT element transmitted by a TWT requesting STA, the TWT Wake Interval is equal to the average time that the TWT-requesting STA expects to elapse between successive TWT SPs. In a TWT element transmitted by a TWT responding STA, the TWT Wake Interval is equal to the average time that the TWT-responding STA expects to elapse between successive TWT SPs. (#3470) The TWT Wake Interval Exponent subfield is set to the value of the exponent of the TWT Wake Interval value in microseconds, base 2. The TWT Wake Interval of the requesting STA is equal to (TWT Wake Interval Mantissa) × 2(TWT 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 requests (#3514) to wake, or a value of zero when the TWT Setup Command subfield(#3641) contains the value corresponding to the command “Request TWT”. When a TWT responding STA with dot11TWTGroupingSupport equal to 0 transmits the TWT element to a (#3643) TWT requesting STA, the TWT element contains a value in (#3643) the Target Wake Time field which corresponds to a TSF time at which the TWT responding STA requests (#3514) the (#3643) TWT-requesting STA to wake and it does not contain the TWT Group Assignment field.

When a TWT responding STA with dot11TWTGroupingSupport equal 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 equal to 1, the TWT element does not contain the Target Wake Time field and it does contain (#3643) the TWT Group Assignment field in order to indicate the TWT group(#3493) 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 Setup Command subfield(#3641) (see Table 8-258a2 (TWT Setup Command field values)) within the TWT element.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | B0        B6 | B7 | B8           B55 | B56     B59 | B60     B71 |
|  | TWT Group ID | Zero Offset Present | Zero Offset of Group (optional) | TWT Unit | TWT Offset |
| Bits:  | 7 | 1 | 48 | 4 | 12 |
| * TWT Group Assignment field format(#3930)
 |

The TWT Group Assignment field provides information to a requesting STA about the TWT group to which the STA is assigned. This field contains the TWT Group ID, Zero Offset of Group (optional), TWT Unit, and TWT Offset subfields. The TWT Group Assignment field(#Ed) and the corresponding subfields are depicted in Figure 8-575a22 (TWT Group Assignment field format(#3930)).

The TWT Group ID subfield is a 7-bit unsigned integer and indicates the identifier of the TWT group to which the requesting STA is assigned. A TWT group(#3493) is a group of STAs that have TWT values that lie within a specific interval of TSF values. A value of 0x00 in the TWT Group ID subfield is used to indicate the unique TWT group(#3493) which contains all STAs in the BSS.

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(#3493) ID. The Zero Offset of Group subfield is six octets and contains the initial TWT value for the TWT group(#3493) with the given TWT group(#3493) ID. When the Zero Offset of Group subfield is present, (#3642) it contains the lowest six octets of the TSF time corresponding to the TWT group(#3493) offset time. The Zero Offset of Group subfield is optionally (#3642) present in the TWT Group Assignment field and when a STA transmits multiple TWT (#3643) requests for (#3643) multiple TWT flows, (#3643)the next TWT Group Assignment field might(#3472) not include the Zero Offset of the Group subfield implying that the Zero Offset of the Group subfield is the same for each of the TWT flows (#3643).

The TWT Unit subfield indicates the unit of increment of the TWT values within the TWT group identified by the TWT group(#3493) ID. The TWT Unit value encoding is shown in Table 8-258a3 (TWT Unit subfield encoding).

|  |
| --- |
| * TWT Unit subfield encoding
 |
| TWT Unit subfield value | TWT Unit time value |
| 0000b | 32 sec |
| 0001b | 256 sec |
| 0010b | 1024 sec |
| 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 |

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 subfield(#3641) values to compute its TWT value within the TWT group(#3493). A STA's TWT value is equal to the value of the Zero Offset of Group subfield(#3641) plus TWT Offset subfield(#3641) times the value of TWT Unit subfield(#3641).

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 TWT (#3470) Wake Interval, where TWT Wake Interval is the average time that the TWT-requesting STA expects to elapse between successive TWT SPs (#3470). The least significant bit of the field corresponds to 256 microseconds.

The TWT 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 requests (#3514) 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 channel during the TWT SP. Each bit in the bitmap corresponds to one minimum channel width (see 8.4.2.170l Subchannel Selective Transmission (SST) Operation element) (#3263) 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.

A TWT requesting (#3644) STA sets the TWT Protection subfield to 1 to request the TWT responding STA to provide protection of the set of TWT SPs corresponding to the requested TWT ID by allocating RAW(s) that restrict access to the medium during the TWT SP(s) for that(those) TWTs. A TWT requesting STA sets the TWT Protection subfield to 0 to if TWT protection by RAW allocation is not requested for the corresponding TWT(s). (#3644)

When transmitted by a TWT responding STA, the TWT Protection subfield indicates whether the TWT SP(s) identified in the TWT element will be protected. A TWT responding STA sets the value of the TWT Protection subfield to 1 to indicate that the TWT SP(s) corresponding to the TWT ID(s) of the TWT element will be protected by allocating RAW(s) that restrict access to the medium during the TWT SP(s) for that(those) TWT(s). A TWT responding STA sets the value of the TWT Protection subfield to 0 to indicate that the TWT SP(s) identified in the TWT element might not be protected from TIM STAs by allocating RAW(s). (#3644)

The format of the NDP Paging field is defined in Figure 8-575a23 (NDP Paging field format).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | B0 B8 | B9 B16 | B17 B20 | B21 B23 | B24 B29 | B30 B31 |
|  | P-ID | Max NDP Paging Period | Partial TSF Offset | Action | Min Sleep Duration | Reserved |
| Bits:  | 9 | 8 | 4 | 3 | 6 | 2 |
| * NDP Paging field format
 |

The P-ID field is the identifier of the paged STA, as described in 9.42a.6 (NDP Paging Setup).

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 9.42a.6 (NDP Paging Setup).

Upon reception of an NDP Paging frame with matching P-ID field as defined in 9.42a.6 (NDP Paging Setup), the TWT STA that is an NDP Paging requester takes an action indicated by the Action field as described in Table 8-258a4 (Action field).

|  |
| --- |
| * 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 |

The Min(#3645) 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.

**References:**