IEEE P802.11  
Wireless LANs

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| CC9 Resolutions for 8-4-2-170j 4-11c 4-11d and others | | | | |
| Date: 2013-08-08 | | | | |
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|  |  |  |  |  |

Abstract

Addressing CIDs regarding the Target Wake Time Information Element of TGah Call for Comments 9.

**Revision Notes**

**R1:**

CID xx Changed xxxx.

**R0:**

Initial

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter Name** | **P.L** | **SC** | **Comment** | **Proposed Change** | **Resolution** |
| 521 | Mitsuru Iwaoka | 4.42 | 4.11c | Throughout the document, "Target Wake Time" and its acronym "TWT" are used inconsistently. It is better to use "TWT" instead of "Target Wake Time". | Replace "Target Wake Time" by "TWT" if appropriate. | Accept – Tgah editor to make the change as suggested by the commenter. |
| 565 | Mitsuru Iwaoka | 4.57 | 4.11d | Speed Frame Exchange (4.11d / 9.32i) provide same functionality as Reverse direction (RD) protocol (9.26 / annex S.3). Specification of Speed Frame Exchange shall be re-organized as amendment of Reverse direction protocol. | 1) Remove 4.11d and describe about support of RD (Speed Frame Exchange) in 4.3.10c which is proposed to add in previous comment.  2) Replace "Speed Frame Exchange" by "Reverse direction protocol for S1G STAs" throughout the document.  3) Move contents of 9.32i to 9.26 with proper modification, and remove 9.32i. Details are TBD. | Reject – RD protocol can only be signaled using the HT control field – the SF exchange uses bits in the short header and the PHY header to provide a more thorough negotiation of the exchange which also allows the setting of phy header protection bits without the exchange of a full duration field. The SF exchange also allows multiple sequential transmissions by the same STA. |

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| **CID** | **Commenter Name** | **P.L** | **SC** | **Comment** | **Proposed Change** | **Resolution** |
| 410 | Minho Cheong | 89.12 | 8.4.2.170j | Zero Phase Offset' is not defined in the draft. It seems that it is another field name of 'Zero Offset of Grop' | Change 'Zero Phase Offset' to 'Zero Offset of Group' | Accept – TGah editor to make changes shown to 8.4.2.170j in 11-13-1145r0 |
| 411 | Minho Cheong | 89.14 | 8.4.2.170j | Zero Phase Offset' is not defined in the draft. It seems that it is another field name of 'Zero Offset of Grop' | Change 'Zero Phase Offset' to 'Zero Offset of Group' | Accept |

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| 114 | Anna Pantelidou | 88.02 | 8.4.2.170j | Sentence "When transmitted by a TWT responding STA, the Implicit subfield is set to 1 to indicate that the TWT is an Implicit TWT in which case the AP is not be required to transmit a next TWT value to the TWT STA for the..." | Remove "be" | Accept |

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| 645 | Ronald Murias | 86.45 | 8.4.2.170j | The NDP Paging field is an optional field, as its presence is indicated by a control bit in the control field. Therefore, it should be properly marked in Figure 8-401da. | Change the text in the last field in Figure 8-401da to the following: NDP Paging (optional). | Accept |
| 651 | Ronald Murias | 89.32 | 8.4.2.170j | In 802.11 systems, the wake up time in unit of microsecond is way too much granularity, which in return results in unnecessarily large size in Wake Duration field. In addition, 11ah attempts to have more efficient encoding efficiency due to smaller channel bandwidth than exisiting dot11 systems.  Therefore, suggest to change the unit of the "Nominal Minimum Wake Duration" field from microseconds to a large value, e.g., 200 Microseconds, or 250 Microseconds, or 1ms, etc. then the Wake Duration field size can be changed from 2 bytes to 1 byte. | Make the following changes: 1). In Figure 8-401da, change the size of the "Nominal Minimum Wake Duration" field from 2 to 1; 2). Change the last sentence in the paragraph in line 32 page 89 to the following: The unit of the Nominal Minimum Wake Duration field is 250 microseconds. | Revise – TGah editor to make changes shown to 8.4.2.170j in 11-13-1145r0 which changes the resolution to 256 microseconds. |
| 649 | Ronald Murias | 89.24 | 8.4.2.170j | How does the clock drift is hanlded when the TWT Unit is fairly large, e.g., in hour or in day? particularly in an Unannounced TWT?  For example, for a clock with +-20ppm drift, there is about 2 seconds drift per day, i.e., 83.3ms per hour, which is very significant relatively to the regular 100ms Beacon interval. | provide clarification to address clock drift issue when the TWT unit is fairly large, e.g., in hours or in days. | Reject – clock drift will happen if a STA is asleep for long enough – a STA should plan to wake to account for clock drift and re-orient itself before attempting to transmit – this is easily done by finding a beacon to use to resynchronize – it is not clear that the description of this process is needed, nor is it clear whether such a process should be mandated |
| 648 | Ronald Murias | 89.09 | 8.4.2.170j | Is the sentence in line 9 page 89 just an example for the Zero Offset of the Group?  If not, then why not just standardize the value 20, instead of using a 8-bit field? | Change the sentence in line 9 page 89 to the following: 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. | Revise – TGah editor to make changes shown to 8.4.2.170j in 11-13-1145r0 which just adds “for example” to precede the example and clarify that it is only an example. |
| 646 | Ronald Murias | 86.48 | 8.4.2.170j | missing description for the EID field and the Length field for Figure 8-401da. | Insert the following text lin line 48 page 86: The Element ID is equal to the Target Wake Time element value in Table 8-55 (Element IDs).  The value of the Length field is the length of the element. It is set to 19 when NDP Paging field is not present, and it is set to 23 when NDP Paging field is present. | Revise – TGah editor to make changes shown to 8.4.2.170j in 11-13-1145r0 which changes the resolution – note that no specific numbers should be given for the length value, since the element is extensible – or it is now, anyway, as one of the changes that is generated in response to this comment is to make the IE extensible. |

**CID 410, 411, 651, 646, 114, 645, 648**

**Discussion:**

The following diagrams are included only for reference:



**Proposed changes:**

**8.4.2.1 General**

***TGah editor: Please enter the value “yes” in the column labelled “extensible” in the row that contains “Target Wake Time” in the column labelled “Element”.***

**8.4.2.170j Target Wake Time element**

***TGah editor: Please modify 8.4.2.170j Target Wake Time element as shown, including modifications to the figures*:**

The Target Wake Time element is shown in Figure 8-401da (Target Wake Time 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 | 1 |

**Figure 8-401da – Target Wake Time element format**

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

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | B0 | B1 B3 | B4 | B5 | B6 | B7 B9 | B10 B15 |
|  | TWT Request | TWT Command Reply | Direction | Implicit | Flow Type | TWT Flow Identifier | Wake Interval Exponent |
| Bits: | 1 | 3 | 1 | 1 | 1 | 3 | 6 |

**Figure 8-401db – Request Type field format**

The Element ID value is equal to the Target Wake Time element value found in Table 8-55 (Element IDs).

The value of the Length field is the length of the element.

The TWT Request subfield is set to 1 to indicate that the TWT element is being sent from a TWT requesting STA to a TWT responding STA. The TWT Request subfield is set to 0 to indicate that the TWT element is from a TWT responding STA to a TWT requesting STA.

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.

A STA that wakes at TWT to either transmit or receive frames is a TWT STA.

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

The Direction subfield is set to 0 to indicate that the first frames to be transmitted in the TWT SP are from the TWT responding STA to the TWT requesting STA. The Direction subfield is set to 1 to indicate that the first frames to be transmitted in the TWT SP are transmitted either from the TWT responding STA to the TWT requesting STA or from the TWT requesting STA to the TWT responding STA.

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

When transmitted by a TWT responding STA, the Implicit subfield is set to 1 to indicate that the TWT is an Implicit TWT in which case the AP is not required to transmit a next TWT value to the TWT STA for the TWTs associated with the flow identifier of the TWT element because the TWT STA will calculate the next TWT based on the parameters received in the TWT element with a TWT command code of Accept TWT. To calculate the next TWT, the TWT STA adds the value of Wake Interval indicated in the element to the current TWT value. The TWT values for an Implicit TWTs are periodic.

When transmitted by a TWT requesting STA, the Implicit subfield is set to 0 to request an Explicit TWT. When transmitted by a TWT responding STA, the Implicit subfield is set to 0 to indicate that the TWT is an Explicit TWT in which case the AP transmits a next TWT value to the TWT STA for each of the TWTs associated with the flow identifier of the TWT element. The TWT values for an Explicit flow can be either periodic or aperiodic.

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 a trigger frame 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 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. When transmitted by a TWT responding STA, 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. 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.

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 and this field contains Group ID, Zero Offset of Group, TWT Unit, and Increment Within Group subfields. The field and the corresponding subfields are depicted in Figure 8-401dc (TWT Group Assignment field format).

The Group ID subfield is 8-bit unsigned integer and indicates the identifier of the TWT group to which the requesting STA is assigned. The Group ID represents a set of STAs with adjacent TWT values. For group addressed traffic, a value of 00000000 in the TWT Group ID field is used for signaling all STAs in a TWT group instead of using individual AIDs.

The Zero Offset of Group subfield indicates the initial TWT value 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.

A non-AP STA uses the Zero Phase Offset, TWT Unit, and Increment within Group values to compute its location in the TWT Group. Based on the assigned TWT value, a STA computes the difference between its TWT value and the Zero Phase Offset 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 TWT Unit subfield indicates the unit of the TWT values within the TWT group. The TWT Unit subfield is of length 3 bits. The TWT Unit value 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.

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.

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 on which channels the STA desires to transmit during a TWT SP. When transmitted by a TWT responding STA, the TWT Channel field contains a bitmap indicating on which channels the TWT requesting STA is allowed to operate during the TWT SP. Each bit in the bitmap corresponds to one minimum width channel for the band of operation with the least significant bit corresponding to the lowest numbered channel of the BSS. A value of 1 in a bit position in the bitmap transmitted by a TWT requesting STA means that operation on that 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 on that channel is allowed during the TWT SP.

The NDP Paging field is present if the NDP Paging Indicator is set to 1; otherwise the NDP Paging field is not present.

The Responder PM Mode field indicates the Power Management mode as defined in 9.35.

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

The P-ID field is the identifier of the paged STA, as described in section 9.32f.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 9.32f.5.

The Action field indicates what action shall be taken by the STA upon reception of an NDP Paging Frame with matching P-ID field as defined in 9.32f.5 NDP Paging Setup. The content of the Action field is 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.

**References:**