IEEE P802.11
Wireless LANs

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| Doze Transition Signaling |
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Abstract

Proposed language to create a mechanism to signal PS State change using A-control Control subfield CAS.

The proposed changes address CID 15757 of LB233 on TGax D3.0.

Changes are referenced to TGax D3.1.

**REVISION NOTES:**

**R0**:

initial

**R1**:

27.7.5 – slight modification to the wording of the TWT SP termination condition to make it match the style of the other conditions

**R2**:

Change several editor instruction references to TGax D3.0 to TGax D3.1

**R3**:

Change the name of the field from Doze to Doze Transition

Add a qualifier to allow only a PS STA to set the Doze Transition subfield to 1

Removed the requirement that no other condition requires the STA to remain in the AWAKE state when the Doze Transition is set to 1. This means that the Doze Transition subfield has priority over other requirements, that is, acts an early termination event for any wake condition for a PS STA.

Add several subclauses relating to several baseline power save operations, with proposed text changes to modify the state transition behaviour in each of those cases to allow the Doze Transition subfield to be transmitted and acknowledged and then for the STA to be allowed to enter Doze state.

Update doc references.

**END OF REVISION NOTES**

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGax Draft. This introduction is not part of the adopted material.

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

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

**CIDs**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 15757 | Jarkko Knecht | 27.7.4 | 326.20 | The TWT Information frame is a management frame which handling/reception/parsing the content in the receiving STA takes time. A STA may transmit a TWT Information frame to teminate an ongoing TWT SP. For the receiving device the processing time of the TWT Information frame may be too long for immediate TWT SP termination. The immediate SP termination would be better to do through EOSP or more data bits which handling time is much shorter. | Please change that EOSP (or PM) bit controls the termination of the currently ongoing TWT SP and the TWT Information frame controls the future TWT SPs, i.e. whether the STA be available at future TWT SP. Please allow a STA to terminate the ongoing SP without a transmission of the TWT Information frame. | Revise - TGax editor to make changes as shown in 11-18/1432r3 that are marked with CID 15757 which create a new bit in the CAS Control to signal a transition to Doze state. TWT information behavior is unaltered, and still may be used in the original context as another method for TWT SP termination in addition to the requested use of indicating suspend and resume. |

**Discussion:**

The existing TWT SP early termination by a non-AP STA uses the management action frame TWT Information. The mechanism has more overhead than is preferred and the information is located within the body of the frame. Management frames are typically processed by higher layers of a MAC implementation, and therefore have a longer time to take effect.

The proposed mechanism using a CAS control field subfield of the A-control field can be piggybacked onto other frames, including a DATA frame, so that overhead is reduced.

The A-control field is parsed as part of normal lower-MAC operations and therefore, is conveniently and quickly processed along with other such indications.

**Proposed Changes to TGax D3.1:**

**9.4.2.27 Extended Capabilities element**

***TGax editor: within TGax D3.1, add another row to Table 9-135 – Extended Capabilities field as shown:***

**Table 9-153—Extended Capabilities field**

|  |  |  |
| --- | --- | --- |
| **Bit** | **Information** | **Notes** |
| 77 | TWT Requester Support | A STA sets the TWT Requester Support field to 1 when dot11TWTOptionActivated is true, dot11HEOptionImplemented is true and TWT requester functionality is supported. Otherwise, the STA sets the TWT Requester Support field to 0. See 10.43 (Target wake time (TWT)). |
| 78 | TWT Responder Support | A STA sets the TWT Responder Support field to 1 when dot11TWTOptionActivated is true, dot11HEOptionImplemented is true and TWT responder functionality is supported. Otherwise, the STA sets the TWT Responder Support field to 0. See 10.43 (Target wake time (TWT)). |
| 79 | OBSS Narrow Bandwidth RU In OFDMA Tolerance Support | An AP STA sets the OBSS Narrow Bandwidth RU In OFDMA Toler-ance Support field to 1 if dot11OBSSNarrowBWRUinOFDMAToler-ated is true, and sets it to 0 otherwise.A non-AP STA sets the OBSS Narrow Bandwidth RU In OFDMA Tolerance Support field to 0. |
| <ANA> | Doze Transition Signalling Support | An HE STA sets the Doze Transition Signalling Support field to 1 if dot11DozeTransitionSignalingActivated is true and sets it to 0 otherwise. **(#15757)** |

**9.2.4.6a.7 CAS Control**

***TGax editor: within TGax D3.1, in Figure 9-15j – Control Information subfield for CAS Control, change bit B3 from reserved to Doze as shown:***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 | B3 | B4 B7 |
|  | AC Constraint | RDG/More PPDU | SR PPDU | Doze Transition | Reserved |
| Bits: | 1 | 1 | 1 | 1 | 4 |

**Figure 9-15j—Control Information subfield for CAS Control (#15757)**

***TGax editor: within TGax D3.1, in an appropriate location within 9.2.4.6a.7 CAS Control, insert the following paragraph:***

The Doze Transition subfield is set to 1 to indicate that the STA transmitting the frame containing this subfield will enter the Doze state following the receipt of the acknowledgement for the frame. No information is conveyed to the recipient when the Doze Transition subfield has the value of 0. **(#15757)**

***TGax editor: within TGax D3.1, modify the following text:***

**11.2.3.5.1 Power management with APSD procedures**

When the GCR-A delivery method is used, the scheduled Service Interval field is 0. If a STA has a GCR agreement with an AP for a group address using the GCR-A delivery method, there is no defined end of the scheduled SP. The STA in PS mode shall enter the awake state and shall remain awake in order to receive the buffered group addressed BUs until the AP changes the delivery method of the stream to a method other than GCR-A or until the GCR agreement is canceled or until a Doze Transition subfield with a value of 1 is successfully acknowledged. **(#15757)**

**11.2.3.6 AP operation**

***TGax editor: within TGax D3.1, add the following text to the itemized list as item m):***

m) If an MPDU that contains a Doze Transition subfield equal to 1 is received from a PS STA then after acknowledgement of the receipt of the MPDU, the AP shall assume that the STA has transitioned to the doze state and shall cease delivery of any frames to the STA **(#15757)**

**11.2.3.7 Receive operation for STAs in PS mode**

***TGax editor: within TGax D3.1, add the following text at the end of the subclause:***

A DTS STA may set the Doze Transistion subfield to 1 to signal a transition to the doze state as described in 11.2.3.19a Doze Transition Signaling. **(#15757)**

**11.2.3.8 Receive operation using APSD**

***TGax editor: within TGax D3.1, modify the text as shown:***

c) The STA shall remain awake until it receives a QoS Data frame or QoS Null frame addressed to it, with the EOSP subfield equal to 1 or until it receives an acknowledgement to the transmission of a Doze Transition subfield with a value of 1.

**11.2.3.12 TDLS peer power save mode**

***TGax editor: within TGax D3.1, modify the text as shown:***

A STA transmitting a TDLS Peer PSM Request frame shall remain in the awake state until it received the corresponding TDLS Peer PSM Response frame or until it receives an acknowledgement to the transmission of a Doze Transition subfield with a value of 1. A TDLS Peer PSM Request frame may be transmitted via the AP path or via the direct path (which is up to the implementer to decide). A TDLS Peer PSM Response frame shall be transmitted over the direct path.

If a TDLS peer STA enters power save mode when a Wakeup Schedule is active, it shall be awake at the beginning of each scheduled periodic Awake Window, and stay awake for the duration of the Awake Window or until the end of a TDLS peer PSM service period or until it receives an acknowledgement to the transmission of a Doze Transition subfield with a value of 1. Otherwise, it may enter a doze state, depending on the current requirements to be awake, imposed by other links. A TDLS peer STA that did not enter power save mode shall remain in the awake state.

***TGax editor: within TGax D3.1, insert the following editing instruction and new subclause:***

***Insert a new subclause at the end of 11.2.3.19:***

**11.2.3.19a Doze Transition Signaling (#15757)**

An HE STA with dot11DozeTransitionSignalingActivated equal to true supports Doze Transition signalling using the A-Control CAS Control subfield and shall set the Doze Transition Signaling Support subfield to 1 in transmitted Extended Capability elements and is called a DTS STA.

A DTS STA that is a PS STA may set the Doze Transition subfield to 1 in CAS Control fields transmitted to a STA from which it has received an Extended Capability element with the value 1 in the Doze Transition Signaling Support subfield.

A DTS STA that transmits a value of 1 in the Doze Transition subfield of a CAS Control field may transition to Doze state immediately following the receipt of the acknowledgement of the frame that contained the CAS Control field.

**11.2.4.4 STA power state transitions**

c) If a STA receives at least one individually addressed ATIM frame containing the STA’s individual address in the RA field during the ATIM window then the STA shall remain in the awake state at least until the earlier of the completion of the successful transmission to and reception from the source STA of each received ATIM frame, a frame with the EOSP subfield equal to 1, the receipt of an acknowledgement to the transmission of a Doze Transition subfield with a value of 1, and the end of the next ATIM window.

**27.7.5 Power save operation during TWT SPs**

***TGax editor: within TGax D3.1, in subclause 27.7.5 Power save operation during TWT SPs, modify the text as shown:***

A TWT requesting STA or a TWT scheduled STA shall classify any of the following events as a TWT SP termination event:

1) The successful exchange of a TWT Information frame with the TWT responding STA or the TWT scheduling AP (see 27.7.4 (Use of TWT Information frames)).

2) The transmission by the TWT requesting STA or TWT scheduled STA of an acknowledgment in response to an individually addressed QoS Data or QoS Null frame sent by the TWT responding STA or TWT scheduling AP, respectively, that had the EOSP subfield equal to 1.

3) The transmission by the TWT requesting STA or TWT scheduled STA of an acknowledgment in response to an individually addressed frame that is neither a QoS Data frame nor a QoS Null frame, sent by the TWT responding STA or TWT scheduling AP, respectively, with the More Data field equal to 0.

4) The reception of an individually addressed or broadcast QoS Data or QoS Null frame sent by the TWT responding STA or TWT scheduling AP, that does not solicit an immediate response and with the EOSP subfield equal to 1.

5) The reception of an individually addressed frame that is neither a QoS Data frame nor a QoS Null frame, sent by the TWT responding STA or TWT scheduling AP, that does not solicit an immediate response and with the More Data field equal to 0.

6) The reception of a Trigger frame sent by the TWT responding STA or TWT scheduling AP that has the More TF field equal to 0 and is not intended for the TWT requesting STA or TWT scheduled STA provided that the TWT requesting STA or TWT scheduled STA is either awake for an announced trigger-enabled TWT SP but did not transmit an indication that it is in the awake state to the TWT responding STA or TWT scheduling AP or is awake for an unannounced trigger-enabled TWT SP.

7) The successful acknowledgement from the TWT scheduling STA or the TWT responding STA of the reception of a frame transmitted by the TWT scheduled STA or the TWT requesting STA, respectively, that contains a CAS Control field with the Doze Transition subfield set to 1. **(#15757)**

**TGax Editor: *Add a new MIB variable in C.3 MIB Detail within the dot11StationConfigEntry group as shown:***

**C.3 MIB Detail**

dot11DozeTransitionSignalingActivated OBJECT-TYPE **(#15757)**

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This is a capability variable. Its value is determined by device capabilities.

This attribute, when true, indicates that the STA implementation is capable of signalling a transition to the Doze state through the A-Control CAS Control subfield and capable of interpreting the signalling of a transition to Doze state using the same subfield. The capability is disabled, otherwise."

DEFVAL { false }

::= { dot11StationConfigEntry <XX>}

**End of proposed changes.**