IEEE P802.11
Wireless LANs

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| 11be Spec text for motion 137, SP244 related to WNM Sleep Procedure |
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Abstract

We propose the draft text related to a motion related to power-save (Motion 137, #SP244) to help the creation of TGbe draft D0.3.

Revisions:

* Rev 0: Initial version of the document.

**The proposed texts is based on the following motion:**

In R1, the WNM sleep interval of a non-AP MLD is applied at the MLD level and not at the link level.

**[Motion 137, #SP244]**

**Proposed spec text:**

The baseline for this text is 802.11 REVmd draft D5.0 and 802.11be D0.2.

* Definitions specific to IEEE Std 802.11

***TGbe editor: please add a NOTE after the following definition in this subclause as shown below:***

**wireless network management (WNM) sleep mode:** An extended power save mode for non-access-point (non-AP) stations (STAs) and non-AP multi-link devices (MLDs) whereby a non-AP STA or the non-AP MLD need not listen for every delivery traffic indication map (DTIM) Beacon frame and does not perform group temporal key/integrity group temporal key/beacon integrity group temporal key (GTK/IGTK/BIGTK) updates.

* WNM sleep mode

***TGbe editor: please update the following paragraph in this subclause as shown below:***

WNM sleep mode is an extended power save mode in which a non-AP STA or a non-AP MLD need not listen for every DTIM Beacon frame, and need not perform GTK/IGTK/BIGTK updates. WNM sleep mode enables a non-AP STA or a non-AP MLD to signal to an AP that it might sleep for a specified length of time. This enables a non-AP STA or a non-AP MLD to reduce power consumption and remain associated while the non-AP STA or non-AP MLD has no traffic to send to or receive from the AP or AP MLD.

* WNM Sleep Mode Response frame format

***TGbe editor: please update Figure 9-938 as shown below:***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Category | WNM Action | Dialog Token | Key Data Length  | Key Data  |
| Octets: | 1 | 1 | 1 | 2 | variable |
|  |  | one or more TFS Response elements |  |  |  |
|  | WNM Sleep Mode Element | TFS Response Elements  | OCI Element (optional) | Multi-link element(optional) |  |
| Octets: | variable | variable | 0 or 6 | variable |  |
| * **WNM Sleep Mode Response frame Action field format**
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***TGbe editor: please add a new paragraph at the end of this subclause as shown below:***

The Multi-Link field is optionally present and contains the WNM Sleep Response variant of the Multi-Link element as defined in 9.4.2.247b (Multi-Link element).

* **Multi-Link element**
* **General**

***TGbe editor: please add a new row to Table 9-332j (Type subfield encoding) as shown below:***

|  |
| --- |
| **9-332j – Type subfield encoding** |
| **Type subfield value** | **Multi-Link element variant name** |
| 0 | Basic |
| 1 | Probe Request |
| 2 | WNM Sleep Response |
| TBD | Reserved |

***TGbe editor: please add a new subclause as shown below:***

9.4.2.247b.4 WNM Sleep Response variant Multi-Link element

An AP of an AP MLD includes a WNM Sleep Response variant of the Multi-link element in a WNM Sleep Response frame to carry GTK/IGTK/BIGTK information for all other link(s), that are part of the multi-link setup, other than the one where the frame was transmitted.

All subfield of the Multi-Link Control field other than the Type subfield are reserved for WNM Sleep Response variant of Multi-Link element.

The Common Info field is absent in the WNM Sleep Response variant of Multi-Link element.

The format of the Link Info field of the WNM Sleep Response variant of Multi-Link element is defined in Figure 9-788as (Link Info field of the WNM Sleep Response variant of Multi-Link element format).

|  |  |
| --- | --- |
|  | Per-AP Profile Subelements |
| Octets: | variable |
| Figure 9-788as – Link Info field of the WNM Sleep Response variant of Multi-Link element format |

The Per-AP Profile Subelements field contains one or more per-AP profile subelements.

Each per-AP profile subelement starts with a Per-AP Control field followed by Key Information field

The format of the Per-AP Control field is defined in Figure 9-788at (Per-AP Control field format).

|  |  |  |
| --- | --- | --- |
|  |  B0 B3 |  B5 B7 |
|  | Link ID | Reserved |
| Bits: | 4 | 4 |
| Figure 9-788at – Per-AP Control field format |

 The Link ID subfield specifies a value that uniquely identifies the link where the reported AP is operating on.

The Key Info field provide the GTK, IGTK and BIGTK for the reported AP of the transmitted AP’s AP MLD. The format of the Key Info field is defined in Figure 9-788au (Key Info field format)

|  |  |  |
| --- | --- | --- |
|  | Key Data Length | Key Data |
| Octets: | 2 | Variable |
| Figure 9-788au – Key Info field format |

They Key Data Length and Key Data fields are as defined in 9.6.13.20 (WNM Sleep Mode Response frame format).

Figure 9-788av (WNM Sleep Response variant of Multi-link element) shows the structure of the WNM Sleep Response variant of Multi-Link element.



|  |
| --- |
| Figure 9-788av – WNM Sleep Response variant of Multi-Link element |

***TGbe editor: doc 11-21/0063r0 provides the Visio file for the above Figure 9-788av***

* Multi-link power management

***TGbe editor: please add a new subclause under this clause as shown below:***

* + - 1. WNM sleep mode of a non-AP MLD

An MLD that implements WNM sleep mode shall indicate its capability by setting the WNM Sleep Mode field to 1 in the Extended Capabilities element that it transmits.

A STA of a non-AP MLD may transmit a WNM Sleep Mode Request frame (see 9.6.13.19 (WNM Sleep Mode Request frame format)) to an AP of an AP MLD that has indicated support for WNM sleep mode capability.

An AP of an AP MLD shall send WNM Sleep Mode Response frame response to a WNM Sleep Mode Request frame received from a STA of a non-AP MLD. An AP of an AP MLD may send this frame without solicitation upon the AP MLD’s deletion of all traffic filter sets established according to the traffic filtering agreement between the AP MLD and the non-AP MLD (see 9.6.13.20 (WNM Sleep Mode Response frame format)).

The WMN sleep mode procedures defined in 11.2.3 (Power management in a non-DMG infrastructure network) and 11.2.3.16 (WNM sleep mode) are performed at the MLD level.

* Power management in a non-DMG infrastructure network
* General

***TGbe editor: Please update the following paragraph in this subclause as follows:***

WNM sleep mode enables an extended power save mode in which a non-AP STA need not listen for every DTIM Beacon frame, and need not perform GTK/IGTK/BIGTK updates. A STA in WNM sleep mode can wake up as infrequently as once every WNM sleep interval to check whether the corresponding TIM bit is set or group addressed traffic is pending. The WNM sleep interval advertised by a STA of a non-AP MLD is applied at the MLD level and the WNM procedures, described in this subclause and in clause 11.2.3.16 (WNM sleep mode), are performed at the MLD level.

NOTE—A STA may use both WNM sleep mode and PS mode simultaneously.

* WNM sleep mode AP operation

***TGbe editor: Please update the following paragraph in this subclause as follows:***

If RSN is used with management frame protection and a valid PTK is configured for the STA, the current GTK, IGTK, and BIGTK shall be included in the WNM Sleep Mode Response frame. If a GTK/IGTK/BIGTK update is in progress, the pending GTK, IGTK, and BIGTK shall be included in the WNM Sleep Mode Response frame. If RSN is used without management frame protection and a valid PTK is configured for the STA, the current GTK shall be sent to the STA using a group key handshake (see 12.7.7 (Group key handshake)) immediately following the WNM Sleep Mode Response frame. An AP of an AP MLD includes the WNM Sleep Response variant of Multi-Link element in the WNM Sleep Mode Response frame to provide the GTK/IGTK/BIGTK information for link(s), that are part of the multi-link setup, other than the one where the frame was transmitted.