IEEE P802.11
Wireless LANs

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| 11-12-0048-01-00ad-Wakeup-Schedule-Element |
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Abstract

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To successfully track the Awake/Doze BIs of a peer non-PCP/non-AP STA as well as a PCP/AP, local MAC needs to know the start time of the next Awake/Doze BI and the sleep interval. The start time needs to be expressed in terms of a common clock readily available to all STAs, i.e., the TSF timer. Using TSF is consistent with other similar MAC mechanisms that involve time. It is also absolute: Repeating or retransmitting the Wakeup Schedule element for example can send the same start time value if it is expressed in TSF as opposed to the current relative “remaining time”.

Another improvement is increased flexibility in duty cycle patterns, specifically, to allow an (Awake BI / (Awake BI + Doze BI)) ratio of M/2N for non-PCP STAs and M/N for PCP, with M>=1, and also to allow up to 8 explicit awake periods within each BI.

Finally, the meanings of Awake Start Time and Awake Duration parameters have been clarified and extended to make them relative to BI start and hence improve the time management.

#### **Wakeup Schedule element**

The Wakeup Schedule element is defined in Figure 8-401z.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Element ID | Length | BI Start Time | Sleep Cycle | Number of Awake/Doze BIs | Number of Explicit Awake Periods | Explicit Awake Period 1 | ... | Explicit Awake Period N |
| Octets: | 1 | 1 | 4 | 2 | 2 | 1 | 6 |  | 6 |

Figure 8-401z - Wakeup Schedule element format

The Element ID field is equal to the value for the Wakeup Schedule, specified in Table 8-54 (Element IDs).

The element is set differently for non-PCP and PCP power management, as described below.

For non-PCP STA power management, the fields are set as follows:

* The Length field is set to 9+6\*N, where 0≤N≤ aMaxExplicitAwakeSchedule is the number of Explicit Awake Period fields.
* The BI Start Time field indicates the lower order 4 octets of the TSF timer at the start of the next Awake BI.
* The Sleep Cycle field indicates the non-PCP STA sleep cycle duration in BIs, i.e., the sum of Awake BIs and Doze BIs that make up the sleep cycle. The Sleep Cycle field value can only be a power of two. Other values are reserved.
* The Number of Awake/Doze BIs field indicates the number of Awake BIs at the beginning of each sleep cycle. The Awake Start Time and Awake Duration fields define an explicit awake period within each Awake BI during which the STA shall be awake.
* The Number of Explicit Awake Periods field indicates the number of Explicit Awake Period fields, with a minimum of 0 and a maximum of 8.

The Explicit Awake Period field is illustrated in Figure XX. The Awake Start Time field indicates the start of the explicit awake period relative to the beginning of the Awake BI (10.2.5), in microseconds. The Awake Duration field indicates the duration of the explicit awake period in microseconds. Up to aMaxExplicitAwakeSchedule explicit awake periods can be present within an Awake BI.

|  |  |  |
| --- | --- | --- |
|  | Awake Start Time | Awake Duration |
| Octets: | 3 | 3 |

Figure XX Explicit Awake Period field

For PCP power management, all fields are set as follows:

* The Length field is set to 9.
* The BI Start Time field indicates the lower order 4 octets of the TSF timer at the start of the next Doze BI.
* The Sleep Cycle field indicates the PCP sleep cycle duration in BIs, i.e., the sum of Doze BIs and Awake BIs that make up the sleep cycle. The Sleep Cycle field can assume any value greater than or equal to two.
* The Number of Awake/Doze BIs indicates the number of Doze BIs at the beginning of each sleep cycle.
* The Number of Explicit Awake Periods field is set to zero.

There is no Explicit Awake Period defined for PCP power management.

**10.2.5.2.3 Power management mode operation of a non-PCP/non-AP STA with a wakeup schedule**

*802.11ad editor: Change the second paragraph as follows:*

If a non-PCP/non-AP STA has not established a pseudo-static SP with the PCP/AP, a WS element shall be included in any PSC-REQ frame that the STA transmits to the PCP/AP as an explicit request for a wakeup schedule. If the PCP/AP accepts the proposed WS, it shall reply with a PSC-RSP frame indicating a status code of SUCCESS. Otherwise it shall respond with a PSC-RSP frame with a non-zero status code indicating the reason for rejecting the request. The PCP/AP may suggest an alternative schedule in the PSC-RSP frame and set the status code to REJECT\_WITH\_SCHEDULE. If the STA accepts the alternative schedule, it shall include this WS in a subsequently transmitted PSC-REQ frame. If the non-PCP/non-AP STA does not accept the alternative schedule, it shall not send a PSC-REQ frame for dot11PSRequestSuspensionInterval BIs following the receipt of the PSC-RSP frame.

*802.11ad editor: Change the fifth and sixth paragraphs as follows:*

A non-PCP/non-AP STA may transition to PS mode only after first receiving a PSC-RSP with a status code of SUCCESS and then successfully transmitting a frame that includes a value of one in the PM field, and receiving an acknowledgement for that transmission, as described in Annex G. The BI Start Time field in the PSC-RSP frame points to the beginning of the first Awake BI in PS mode.

If a non-PCP/non-AP STA has explicitly established a WS with the PCP/AP and the non-PCP/non-AP STA is in PS mode, it shall have m successive Awake BIs repeating every n BIs, where n is the value of the Sleep Cycle field of the WS element contained in the PSC-RSP frame received from the PCP/AP during the frame exchange that established the WS, and m is the value of the Number of Awake/Doze BIs field in that PSC-RSP frame. The non-PCP/non-AP STA shall be awake during allocated SPs in which it is either the source or destination DBand STA during each Awake BI. In addition, the non-PCP/non-AP STA may ask for and receive up to aMaxExplicitAwakeSchedule explicit non-overlapping awake periods within each Awake BI, defined by the Explicit Awake Period fields in the PSC-RSP frame received from the PCP/AP during the frame exchange that established the WS. Outside explicit awake periods, the non-PCP/non-AP STA follows the power management rules in Section 10.2.5.

**10.35 DBand MAC sublayer parameters**

*802.11ad editor: Add a new line to the Table 10-18 MAC sublayer parameters*

|  |  |
| --- | --- |
| aMaxExplicitAwakeSchedule | 8 |