IEEE P802.11
Wireless LANs

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| Power management fixes |
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Abstract

This document addresses CID 6001

**8.4.2.133 Wakeup Schedule element**

*Change the third para as follows (from 12/48r1)*

The remaining fields are set as follows:

*Remove the last paragraph as follows*

*At P217L5 (Table 8-281c) change name of the field to DBand Power Management and change the name in all places where this field is used*

### 10.2.5.1 General

*Change the text at the start of the subclause as follows*

To enable non-PCP/non-AP STAs and PCPs to sleep for one or more beacon intervals or part of a beacon interval, a non-PCP/non-AP STA power save mechanism and a PCP power save mechanism are defined in this subclause.

Non-PCP/non-AP STA power save mode, as described in section , allows a non-PCP/non-AP STA to sleep at intervals negotiated with the PCP/AP. Each non-PCP/non-AP STA can choose an independent wakeup schedule that fits its own power consumption and traffic delivery requirements.

PCP Power Save (PPS) mode, as described in section , allows a PCP to sleep at intervals to minimize the energy consumption. The PCP operating in PPS mode can choose an independent wakeup schedule to sleep for one or more consecutive beacon intervals and does not transmit DBand Beacons during this time.

The Wakeup Schedule element (8.4.2.133) is used to schedule the wakeup and sleeping of STAs. The Wakeup Schedule element defines two types of beacon intervals (BIs):

* Doze BI: a BI that is explicitly defined as a Doze BI in the last, if any, Wakeup Scheduled element successfully negotiated with the PCP/AP in the case of non-PCP/non-AP power save mode or transmitted by the PCP in the case of PCP power save mode.
* Awake BI: a BI that is not defined as a Doze BI.
* iswhen d

A PCP/AP keeps track of wakeup schedules of all associated non-PCP/non-AP STAs. Each STA delivers traffic to a peer STA only when the peer STA is in awake state.

An AP shall buffer MPDUs addressed to non-AP STAs in Doze state. The buffered data shall be transmitted only at designated times (10.2.5.2). A non-AP STA shall defer delivering of MPDUs addressed to other non-AP STA in Doze state. The MPDUs shall be transmitted only at designated times (10.2.5.2).

*Move the following text to the beginning of the subclause (as shown above)*

*Remove the following text*

*Add the following text and table after Table 10-1a*

Table xyz lists the power states for a non-PCP/non-AP STA in PS mode and a PCP in PS mode during a Doze BI. Each entry indicates the state, either Awake or Doze, for the non-PCP/non-AP STA or the PCP in PS mode at various times during the Doze BI.

Table xyz Power management states for a Doze BI

|  |  |  |
| --- | --- | --- |
| **BI portion** | **PPS PCP** | **PS non-PCP/non-AP STA**  |
| BTI | BTI | NA | Awake or Doze |
| A-BFT | A-BFT  | NA | Awake or Doze |
| AT | AT | Awake | Awake |
| DTT | CBAP marked as PCP available in the schedule | Awake | Doze |
| CBAP marked as PCP unavailable in the schedule | Doze | Doze |
| SP with broadcast AID as Destination AID | Doze | Doze |
| SP with unicast destination AID | Doze | Awake |
| Non-truncatable or non-extensible SP with non-PCP STA as Source AID or Destination AID | Doze | Doze |
| Truncatable SP or extensible SP with non-PCP/non-AP STA (excluding the PS STA) as Source AID or Destination AID | Doze | Doze |
| SPs allocated to itself  | Doze | Doze |
| All other SPs  | Doze | Doze |

*Change the paragraph after Table 10-1a as follows*

The source DBand STA and the destination DBand STA of a non-truncatable SP or allocated CBAP with unicast destination AID may go to Doze state within the SP or within the CBAP, respectively, after the source DBand STA transmitted a frame to the destination DBand STA of the SP or the CBAP, respectively, with the EOSP field set to 1 and successfully received the following response frame from the destination DBand STA of the SP or the CBAP, respectively.

#### Non-PCP/non-AP STA power management mode

##### 10.2.5.2.1 General

*Change the first para as follows*

The Power Management mode of a non-PCP/non-AP STA is selected by the PowerManagementMode parameter of the MLME-POWERMGT.request. A STA that acknowledge the reception of a PSC-RSP frame with Status Code indicating success shall update the STA’s power management mode at the value of the BI Start Time field of the corresponding Wakeup Schedule element.

*Change Figure 10-5a as follows*

Active

Mode

Power Save

Mode

Doze BI

as per Table xyz

as per Table xyz

PSC-REQ(DPM=1, WS) && PSC-RSP(success);&& && at the value of the BI Start Time field

Awake BI

As per Table 57

Power Save States

Power Save States

As per Table 57

PSC-REQ(DPM=1, WS) && PSC-RSP

PSC-REQ(DPM=1, WS) && PSC-RSP(Reject, WS\_new);

PSC-REQ(PM=0);

Figure State Transition Diagram of non-PCP/non-AP STA in Active and Power Save Mode

##### 10.2.5.2.2 Power management mode operation of a non-PCP/non-AP STA with no wakeup schedule

*Change the first para as follows*

A non-PCP/non-AP STA that has not set up a wakeup schedule with the PCP/AP is in Active mode and every BI is an Awake BI. The non-PCP/non-AP STA shall enter PS mode only after a successful frame exchange as described in Annex G, …

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

*Change the first para as follows*

To transition from Active mode to PS mode, a non-PCP/non-AP STA that is associated with a PCP/AP shall establish a wakeup schedule with the PCP/AP. A wakeup schedule (WS) is established with the PCP/AP following the successful transmission of a PSC-REQ frame to the PCP/AP with the PM field set to 1 and an acknowledged receipt of the corresponding PSC-RSP from the PCP/AP provided that the PSC-RSP contained a status code indicating success.After receiving a PSC-RSP frame from the PCP/AP with a status code indicating success and acknowledging the frame , the STA switches to the PS mode at the moment defined by the BI Start Time field of the Wakeup Schedule element transmitted to the PCP/AP, and follows the WS established with the PCP/AP.

*Remove the following para*

*Change the text at the last para as follows*

... A PCP/AP may send an unsolicited PSC-RSP frame without a WS and indicating a status code of SUCCESS to a non-PCP/non-AP STA in PS mode. Upon receiving the unsolicited PSC-RSP frame meeting these conditions, the non-PCP/non-AP STA shall switch to Active mode.

##### 10.2.5.2.4 Power management mode operation of a non-PCP/non-AP STA with or without a wakeup schedule

*Change the text starting at the fifth para as follows*

In order for a STA to learn the WS of another STA within the BSS, the STA may send an Information Request frame to the other STA or to the PCP/AP as defined in 10.29.1 If the Information Request frame is transmitted to the PCP/AP and the STA indicated in the Information Request’s Target Address field does not have an established WS with the PCP/AP, the PCP/AP shall set the length of the Wakeup Schedule element to zero in the Information Response frame. Every time the STA indicated in the Information Request’s Target Address field changes its WS with the PCP/AP, the PCP/AP shall inform the STA that requested the information by transmitting an unsolicited Information Response frame with the updated Wakeup Schedule element.

*Change at P*376L11 *as follows*

 … Any two STAs that successfully complete an ATIM frame exchange with each other during the Awake Window become peer STAsIf a STA receives or transmits an ATIM frame during the Awake Window, it shall be awake during the CBAP(s) within the current BI that have the source AID or destination AID described by the ATIM frame to wait for the announced MSDU(s) and/or MMPDU(s) to be received and/or to transmit announced MSDU(s) and/or MMPDU(s).

#### PCP Power management mode

 *Change the first para as follows*

A PCP in PPS mode (PPS PCP) may enter the Doze state for one or more consecutive BIs in order to minimize its energy consumption..

*Change Figure 10-5b as follows*

Active

Mode

PPS Mode

Doze BI

as per Table xyz

as per Table xyz

WS IE in DBand Beacon or Announce frames

No WS IE in DBand Beacon or Announce frames

WS IE for dot11MaxLostBeacons in DBand Beacon or Announce frames & BI Start Time && at the value of the BI Start Time field

Awake BI

As per Table 57

Power Save States

Power Save States

As per Table 57

Figure State Transition Diagram of PCP Power Management Mode

*Change text at P377L7 as follows*

... The PCP enters PS mode at the moment defined by the BI Start Time field of the corresponding Wakeup Schedule element. In order to transition from PS mode to active mode, the PCP shall stop including Wakeup Schedule elements in DBand Beacon and Announce frames.