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Wireless LANs

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Abstract

This document provides resolutions for CID 471.

The changes are in the following subclauses: 8.2.4.170b, 8.3.4.15b, 9.19.4a.6, 9.32.g2, 9.32m.4.2, and 10.2.1.19,

.

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# 0 Revision Notes

R0: First draft

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| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Page** | **Line** | **Category** | **Comment** | **Proposed Change** | **Remark** |
| 471 | 76 | 52 | Technical | The RPS element has been designed to be very flexible and to support many variants of RAWs: a regular RAW, PRAW, AP power management, Sounding RAW, etc. To support these many options, many fields have been added to the element, which may not be necessary for a very simple operation. For example, if the AP just need to divide a beacon interval in N time slots and assign time slots to all the associated STAs, many fields can be removed from the element. The spec should define a simpler version of the RPS element to reduce the overhead and complexity. | Define a simpler version of the RPS element to support the example described in the comment. | Revised– see document IEEE 802.11-13/1096r0 for the resolution |

**Discussion:***In the current draft, four types of the RAW Assignment field have been defined. These fields are Regular RAW, Sounding RAW, AP PM RAW and PRAW. The structure of RAW assignment fields for different RAW takes different formats. Some of the fields can be made optional and some of subfields are redundant with others. A unified RAW N Assignment definition is necessary. Therefore, in this resolution, we propose an unified RAW N Assignment format for various RAW N Assignment types and make some modification over some of the existing subfileds to further improve efficiency.*

***Proposed changes:***

**Instruction to Editor*: Please modify the subclause of 8.4.2.170b with the proposed changes as follows.***

***Some previous CIDs (42, 43, 44, 157, 158, 159, 224, 225, 226, 227, 228, 229,230, 231, 373, 465, 466, 467, 468, 469, 470, 472, 473, 474, 475, 477, 478, 479, 480, 481, 789, 790, 904, 905) have been changed and they should be superceded by this document.***

**CID 471:**

**8.4.2.170b RPS element**

The RPS element contains the set of parameters necessary for restricted medium access only to ~~a~~ one or multiple groups of STAs within one or multiple RAWs. The Information field contains the RAW Assignment fields for one or multiple groups ~~1 to N~~ of STAs. The total length of the Information field is variable octets. The frame format of the RPS element is defined in Figure 8-401ck (RPS element format).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Element ID | Length | RAW ~~1~~ Assignment | RAW ~~1~~ Assignment | ... | RAW ~~N~~ Assignment |
| Octets: | 1 | 1 | variable | variable |  | Variable |

**Figure 8-401ck --- RPS element Format**

The RAW ~~N~~ Assignment field contains ~~PRAW Indication,~~ RAW Control, ~~Same Group Indication,~~ RAW Slot Definition, RAW Start Time (conditionally present), RAW Group (conditionally present), ~~RAW Start Time, RAW Duration, Options, and RAW Slot Definition, and~~ Channel Indication (conditionally present) and Periodic Operation Parameters (conditional present) ~~, and AP PM~~ subfields as shown in Figure 8-401cl ~~(RAW N Assignment field format for RAW)~~.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | ~~PRAW~~~~Indication~~~~(0)~~ | ~~AP~~~~PM~~~~(0)~~ | ~~Same~~~~Group~~~~Indication~~ | ~~Sounding~~~~RAW~~~~Indication~~ | ~~RAW~~~~Group~~ | ~~RAW~~~~Start~~~~Time~~~~(TU)~~ | ~~RAW~~~~Duration~~~~(TU)~~ | ~~Options~~ | ~~RAW Slot~~~~Definition~~ | ~~Channel~~~~Indication~~ |
| ~~bits:~~ | ~~1~~ | ~~1~~ | ~~1~~ | ~~1~~ | ~~24~~ | ~~16~~ | ~~16~~ | ~~3~~ | ~~16~~ | ~~8~~ |
|  |  |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | RAW Control | RAW Slot Definition | RAW Start Time | RAW Group | Channel Indication | Periodic Operation Parameters |
| bits: | 8 | 16 | 8 | 24 | 8 | 24 |

**Figure 8-401cl—RAW ~~N~~ Assignment field format ~~for RAW~~**

The RAW Control subfield is 8 bits in length and consists of RAW Types, Start Time Indication, Channel Indication Presence, Periodic RAW Indication and RAW Type Options as shown in Figure 8-401cm.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | ~~PRAW~~~~Indication~~~~(0)~~ | ~~AP~~~~PM~~~~(0)~~ | ~~RAW Start~~~~Time~~~~(TU)~~ | ~~RAW~~~~Duration~~~~(TU)~~ |
| ~~bits:~~ | ~~1~~ | ~~1~~ | ~~16~~ | ~~16~~ |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | RAW Type | Start Time Indication | Same Group Indication | Channel Indication Presence | Periodic RAW Indication | RAW Type Options |
| bits: | 2 | 1 | 1 | 1 | 1 | 2 |

**Figure 8-401cm—RAW Control Subfield Format ~~N Assignment field format for AP PM RAW~~**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | ~~PRAW~~~~Indication~~~~(0)~~ | ~~Same~~~~Group~~~~Indication~~ | ~~PRAW~~~~Group~~ | ~~PRAW~~~~Start Time~~~~(TU)~~ | ~~PRAW~~~~Duration~~~~(TU)~~ | ~~PRAW Periodicity~~ | ~~PRAW~~~~Start Offset~~ | ~~Channel~~~~Indication~~ |
| ~~bits:~~ | ~~1~~ | ~~1~~ | ~~24~~ | ~~16~~ | ~~16~~ | ~~16~~ | ~~16~~ | ~~8~~ |

**~~Figure 8-401cn—RAW N Assignment field format for PRAW~~**

~~The PRAW Indicator subfield indicates whether the current RAW N Assignment field is for a regular RAW~~

~~or PRAW and is of length 1 bit. A PRAW Indicator subfield value of 0 indicates that the current RAW N~~

~~Assignment field is for a regular RAW, while a value of 1 indicates that the RAW N Assignment field is for~~

~~a PRAW. Figure 8-401cl (RAW N Assignment field format for RAW) depicts RAW N Assignment field~~

~~format for RAW with PRAW Indicator bit is set to 0. Figure 8-401cn (RAW N Assignment field format for~~

~~PRAW) depicts RAW N Assignment field format for PRAW with PRAW Indicator bit is set to 1.~~

The RAW Type is 2 bits in length and it indicates the type of the RAW Assignment. There are four RAW types: Regular RAW, Sounding RAW, AP PM/Non-TIM RAW and Triggering Frame RAW. The interpretation of the RAW Type subfields is illustrated in Table 8-191a.

**Table 8-191a—Interpretation of RAW Type and RAW Type Options**

|  |  |  |
| --- | --- | --- |
| RAW Type | Description | RAW Type Options Subfield |
| Bit 0  | Bit 1   |
| 0 | 0 | The RAW is a Regular RAW.  | Bit 0: Paged STABit 1: RA Frame |
| 0 | 1 | The RAW  is a Sounding RAW.  | 00: SST Sounding RAW01: Sector Sounding RAW10, 11: Reserved |
| 1 | 0 | The RAW  is an AP PM/non-TIM RAW. | 00: AP PM RAW01: Non-TIM RAW10, 11: Reserved |
| 1 | 1 | The RAW is a Triggering Frame RAW.  | Reserved |

When the RAW Type is Regular RAW, it is used to provide restricted medium access only to a group of STAs.

When the RAW Type is Sounding RAW, non-AP STAs are prohibited from initiating a TXOP during the RAW but may elect to listen to sector sounding (described in 9.32m.4.2) or SST sounding (described in 9.32k). Non-AP STAs may still transmit control response frames and may transmit responses when they receive a Poll frame that is addressed to them.

When the RAW Type is AP PM RAW/ non-TIM RAW, the RAW is either used for AP Power Management (as described in 10.2.1.19) or used for reserving channel time for non-TIM STAs, depending on the values of RAW Type Options subsubfield.

When the RAW is used as the non-TIM RAW as indicated by the RAW Type Options subfield, the access is restricted to non-TIM STAs such as TWT STAs or doze awake cycle rescheduled STAs. The RAW Assignment subfield for non-TIM RAW also conditionally contains the RAW Start Time, Channel Indication, and Periodic Operation Parameters subfields.

When the RAW is used as the AP PM RAW as indicated by the RAW Type Options subfield, the RAW Assignment subfield for AP PM RAW also conditionally contains the RAW Start Time, and Periodic Operation Parameters sub-subfields.

When the RAW Type is Triggering Frame RAW, each eligible STA may send up to one frame during its assigned slot with frame duration less than 1.7ms. The procedure of slot assignment is described in 9.19.4a.3 (Slot assignment procedure in RAW).

The Start Time Indication is of length 1 bit and it indicates whether RAW Start Time subfield is present in the RAW Assignment field or not. If it is set to 0, the RAW Start Time subfield is not present. If it is set to 1, the RAW Start Time subfield is present. In the first RAW Assignment, Start Time Indication set to 0 indicates that the RAW starts immediately after the (short) Beacon or (Short) Probe Response frame that includes the RPS element. For the other RAW Assignments, Start Time Indication subfield set to 0 indicates that the current RAW starts immediately after the end of the previous RAW.

The Same Group Indication is of length 1 bit and it indicates whether the RAW Group defined in the current RAW Assignment is the same RAW Group ~~that~~ as defined in the previous RAW Assignment. When the Same Group Indication bit is set to 1, the RAW Group defined in the current RAW Assignment is the same as the RAW Group defined in the previous RAW Assignment and the RAW Group subfield is not present in this RAW assignment. When the Same Group Indication bit is set to 0, ~~the RAW Group defined in the current RAW Assignment is different from the RAW Group defined in the previous RAW Assignment~~ the RAW Group subfield is present in this RAW assignment. ~~The Same Group Indication bit is set to 0 in the first RAW Assignment. The Same Group Indication bit is defined similarly for PRAW.~~ The Same Group Indication in the first RAW Assignment is set to 1 to indicate the RAW Group in the first RAW Assignment is the same as the range of AIDs in all the TIM Bitmaps in the (short) Beacon frame.

The Channel Indication Presence is of length 1 bit and it indicates whether the Channel Indication Subfield in the current RAW Assignment is present or not. If it is set to 0, the Channel Indication subfield is not present. If it is set to 1, the Channel Indication subfield is present.

The Periodic RAW Indication is of length 1 bit and it indicates whether the RAW is periodic. When the Periodic RAW Indication is set to 1, the RAW is periodic RAW (PRAW), and the Periodic Operation Parameters subfield is present. When the Periodic RAW Indication is set to 0, the Periodic Operation Parameters subfield is not present.

The RAW Type Options subfield is 2 bits in length and the definitions of RAW Type Options subfield are specified in Table 8-191a.

When the RAW Type is Regular RAW, the first bit in the RAW Type Options is Paged STA indication. When it is set to 0, the RAW can be accessed by any STA (paged or un-paged). When it is set to 1, the RAW can only be accessed by paged STAs. The second bit in the RAW Type Options is RA Frame Indication. If it is set to 1, the AP will transmit a Resource Allocation frame, as defined in 8.3.4.15b, at the beginning of the RAW defined by the RAW Assignment field of the RSP element.

When RAW Type is Sounding RAW, the RAW Type Option is treated as one subfield. If it is set to 00, the RAW is used for SST sounding only for SST capable STAs. If it is set to 01, the RAW is used for sector sounding only for sectorization capable STAs. 10 and 11 are reserved.

When the RAW Type is AP PM/ non-TIM RAW, the RAW Type Options subfield is treated as one subfield. If it is set to 00, the RAW is used as AP PM RAW. If it is set to 01, the RAW is used as the Non-TIM RAW.

When the RAW Type is Triggering Frame RAW, the RAW Type Option subfield is reserved.

The RAW Slot Definition is of length 16 bits, and it consists of four subsubfields, the Slot Duration/Number Configuration subsubfield, Cross Slot Boundary subsubfield, Slot Duration Count subsubfield and the Number of Slots subsubfield as shown in Figure 8-401cn.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Slot Duration/ Number Configuration | Cross Slot Boundary | Slot DurationCount | Number of Slots |
| bits: | 1 | 1 | y | 14-y |

**Figure 8-401cn— Format of RAW Slot Definition Subfields**

The Slot Duration/Number Configuration is of length 1 bit and it indicates the number of bits used for Slot Duration Count subsubfields, i.e. the value y in Figure 8-401cn, of the Slot Duration Count filed. If it is set 0, the Slot Duration Count subsubfield is 8 bits in length. If it is set to 1, the Slot Duration Count subsubfield is 11 bits in length.

The Cross Slot Boundary subsubfield is a binary bit and indicates whether STAs are allowed to transmit after the assigned RAW slot boundary. If the bit is set to 1, crossing a RAW slot boundary is allowed. If the bit is set to 0, crossing a RAW slot boundary is not allowed for transmissions from STAs.

The Slot Duration Count subsubfield is y-bit unsigned integer and it is used to calculate the duration of a slot, or the Slot Duration. The Slot Duration has time unit of microsecond and it is calculated as:

Slot Duration = 500 us + Slot Duration Count× 120 us.

The Number of Slots subsubfield is a (14-y)-bit unsigned integer and indicates the number of time slots (NRAW) in the RAW. The value y is determined by the Slot Duration/Number Configuration subfield

The Slot Definition subfield is used to calculate the RAW Duration. The RAW Duration indicated by the corresponding RAW Assignment can be calculated as follows:

RAW Duration = Slot Duration × Number of Slots

The RAW Duration indicates the duration, unsigned integer in microsecond~~TU~~, of restricted medium access assigned to a RAW ~~and is 2 octets in length~~.

When the RAW Type is Regular RAW or Triggering Frame RAW, the RAW Slot Definition subfield also provides the Number of Slots and Slot Duration information for RAW slot assignment. The procedure of slot assignment is described in 9.19.4a.3 (Slot assignment procedure in RAW).

The RAW Start Time subfield is 8 bits in length and it indicates the duration, in TU, from the end of (Short) Beacon or (Short) Probe Response frame transmission that includes the RPS element to the start time of the RAW. The time unit for RAW Start Time subfield is 2 TU.

~~When the Same Group Indication bit is set to 0, the RAW Assignment field contains RAW Group, RAW~~

~~Start Time, RAW Duration, Options, RAW Slot Definition, Channel Indication, and AP in Doze State~~

~~subfields as shown in Figure 8-401cl (RAW N Assignment field format for RAW). When the Same Group~~

~~Indication bit is set to 1, the RAW Group subfield is not present in the current RAW Assignment field, and~~

~~the RAW Group defined in current RAW Assignment is identical to the RAW Group defined in the previous~~

~~RAW Assignment. In this case, the RAW Assignment field contains RAW Start Time, RAW Duration,~~

~~Options, RAW Slot Definition, Channel Indication, and AP in Doze State subfields.~~

|  |  |  |  |
| --- | --- | --- | --- |
|  | Page Index | RAW Start AID | RAW End AID |
| bits: | 2 | 11 | 11 |

**Figure 8-401co—RAW Group subfield**

The RAW Group subfield indicates the STA AIDs that are allowed restricted access within the RAW period. The RAW Group subfield contains Page Index, RAW Start AID, and RAW End AID sub-subfields according to the hierarchical addressing method of AIDs (see 8.87b). The Page Index sub-subfield indicates the page index of the subset of AIDs and is of length 2 bits.

The RAW Start AID field is 11 bits in length and indicates the 11 LSBs of the AID of the STA with the lowest AID allocated in the RAW.

The RAW End AID field is 11 bits in length and indicates the 11 LSBs of the AID of the STA with the highest AID allocated in the RAW.

The RAW Group field is set to all zeros to indicate that all STAs are allowed to access within the RAW.

~~The RAW Start Time subfield indicates the duration, in TU, from the end of beacon or Probe Response~~

~~frame transmission that includes the RPS element to the start time of the RAW. This subfield is 1 octet in~~

~~length. A RAW Start Time value of 0 indicates that the RAW starts immediately after the end of the beacon~~

~~transmission.~~

~~The RAW Duration subfield indicates the duration, in TU, of restricted medium access allowed only for the~~

~~group of STAs indicated in the RAW Group subfield. In other words, this interval indicated in the RAW~~

~~Duration subfield is the difference between the end time of the RAW and the RAW Start Time. This~~

~~duration is used by all other STAs to set their NAV in order to protect transmissions within the RAW period.~~

|  |  |  |  |
| --- | --- | --- | --- |
|  | ~~Access Restricted to Paged STAs Only~~ | ~~Frame Type Restriction~~ | ~~Resource Allocation Frame Presence Indication~~ |
| ~~bits:~~ | ~~1~~ | ~~1~~ | ~~1~~ |

**~~Figure 8-401cp—Options subfield~~**

~~The Options subfield contains Paged STAs’ Access, Frame Type Restriction, Resource Allocation Frame~~

~~Presence Indicator, and Sounding RAW indication sub-fields. The Options subfield is present when the~~

~~PRAW Indicator subfield value is set to 0, and the Options subfield is not present when the PRAW Indicator~~

~~subfield value is set to 1. The interpretation of the first two sub-subfields is illustrated in Table 8-191a~~

~~(Illustration of Access restricted to Paged STAs Only sub-subfield in Option subfield ).~~

|  |  |  |  |
| --- | --- | --- | --- |
|  | ~~Slot Duration~~ | ~~Number of Slots~~ | ~~Cross Slot Boundary~~ |
| ~~bits:~~ | ~~7~~ | ~~8~~ | ~~1~~ |

**~~Figure 8-401cq—RAW Slot Definition subfield~~**

**~~Table 8-191a—Illustration of Access Restricted to Paged STAs Only sub-subfield in Option~~**

**~~Subfield~~**

|  |  |  |
| --- | --- | --- |
| ~~Bit 0 (Paged STAs’Access)~~ | ~~Bit 1 (Frame Type Restriction)~~ | ~~Description~~ |
| ~~0~~ | ~~0~~ | ~~Any STA (paged or un-paged) may transmit UL frame of any type (~~*~~e.g~~*~~., data, PS-Poll)~~ |
| ~~0~~ | ~~1~~ | ~~Any STA may transmit UL frame with durations shorter than duration specified in Slot Duration in the RAW Slot Definition subfield~~ |
| ~~1~~ | ~~0~~ | ~~Only paged STAs may transmit UL frame of any type~~ |
| ~~1~~ | ~~1~~ | ~~Only paged STAs may transmit UL frames with durations shorter than duration specified in Slot Duration in the RAW Slot Definition subfield~~ |

~~The Resource Allocation Frame Presence Indicator sub-subfield is of length 1 bit and it indicates if STAs~~

~~that are part of the current RAW group need to wake up at the beginning of the next RAW to receive the~~

~~Resource Allocation frame (see 8.3.3.15f) for indication of downlink buffered data and their assigned time~~

~~slots to next service period.~~

~~A Resource Allocation Frame Presence Indicator bit set to 1 indicates that a resource allocation frame in~~

~~transmitted by the AP at the RAW Start Time. A Resource Allocation Frame Presence Indicator bit set to 0~~

~~indicates that STAs wake up and access the channel based on slot assignment procedure (9.19.4a.3 (Slot~~

~~assignment procedure in RAW)).~~

~~The Sounding RAW Indication sub-field of length 1 bit indicates, when set to 1, that non-AP STAs are~~

~~prohibited to transmit but may elect to listen to sector training for the entire RAW. When set to 0, it indicates~~

~~otherwise.~~

~~The RAW Slot Definition subfield contains Slot Duration, Slot Assignments, and Cross Slot Boundary subsubfields.~~

~~The RAW Slot Definition subfield is present when the PRAW Indicator subfield value is set to 0,~~

~~and the RAW Slot Definition subfield is not present when the PRAW Indicator subfield value is set to 1.~~

~~The Slot Duration sub-subfield indicates the duration of a time slots of equal duration within the RAW.~~

~~The Slot Assignment sub-subfield indicates the assignment of slots to STAs based on their location in the~~

~~TIM element. Noffset is indicated in the Slot Assignment sub-subfield and the two least significant bytes of~~

~~the FCS field of the Beacon frame is used for the Noffset. The procedure of slot assignment is discussed in~~

~~9.19.4a.3 (Slot assignment procedure in RAW).~~

~~The Cross Slot Boundary sub-subfield is a binary bit and indicates whether STAs are allowed to transmit~~

~~after the assigned RAW slot boundary until the end of the RAW. If the bit is set to 1, crossing a slot boundary is allowed. If the bit is set to 0, crossing a slot boundary is not allowed for transmissions from STAs.~~

The Channel Indication field contains a bitmap allowing the identification of allowed operating channels for

the STAs indicated in the RAW, as defined in 9.19.4a.1. Each bit in the bitmap corresponds to one minimum

width channel within the current BSS operating channels, with the least significant bit corresponding to the

lowest numbered operating channel of the BSS.

~~The AP PM field is 1 bit in length and indicates whether the AP is operating in Active or Power Save mode~~

~~for this RAW, as defined in clause 10.2.1.19. If the AP PM bit is set to 1 and the PRAW Indication bit is set~~

~~to 0, the RAW N Assignment field contains RAW Start Time and RAW Duration sub-subfields as shown in~~

~~Figure 8-401cm (RAW N Assignment field format for AP PM RAW).~~

~~If the PRAW Indication bit is set to 1, the RAW N Assignment field contains Same Group Indication, PRAW~~

~~Group (conditionally present), PRAW Start Time, PRAW Duration, PRAW Periodicity, PRAW Start Offset,~~

~~and Channel Indication sub-subfields. The PRAW Group, PRAW Start Time, and PRAW Duration are~~

~~defined similarly as RAW Group, RAW Start Time, and RAW Duration, respectively.~~

~~The PRAW Periodicity sub-subfield indicates the period of current PRAW occurrence in the unit of short~~

~~beacon interval, and is of length TBD bits.~~

~~The PRAW Start Offset sub-subfield indicates offset value to a short beacon frame that the first window of~~

~~the PRAW appears from a reference point, and is of length TBD bits (Reference point details and unit is~~

~~TBD).~~

|  |  |  |  |
| --- | --- | --- | --- |
|  | PRAW Periodicity | PRAW Validity | PRAW Start Offset |
| bits: | 8 | 8 | 8 |

**Figure 8-401cp—Periodic Operation Parameters**

The Periodic Operation Parameters subfield is 24 bits in length and it comprises the PRAW Periodicity, PRAW Validity, and PRAW Start Offset sub-subfields.

The PRAW Periodicity sub-subfield indicates the period of current PRAW occurrence in the unit of short

beacon interval, and is of length 8 bits.

The PRAW Validity sub-subfield indicates the number of periods that the PRAW repeats, and is of length 8 bits.

The PRAW Start Offset sub-subfield indicates the offset value in TU from the end of the (Short) Beacon

frame that the first window of the PRAW appears from, and is of length 8 bits (Reference point details is

TBD).

**8.3.4.15b Resource Allocation frame format**

Page 42, Line 51: modify the sentence as follows:

The RAW Duration field indicates the duration of the current RAW where the Resource Allocation frame is

transmitted. ~~The format of the RAW Duration field is defined in 8.4.2.170b (RPS element).~~

**9.32m.4.2 Procedure**

**Page 157 Line 48: modify the sentence as follows:**

AP may schedule sector sounding for multiple STAs by RAW in a beacon interval using the RAW Parameter Set element with the RAW type field set to Sounding RAW ~~Indication set to 1~~ and the RAW Type Options sub-field set to SST Sounding RAW(see 8.4.2.170b (RPS element)). During the Sounding RAW, non-AP STAs are prohibited to transmit but can elect to listen to the sector training for the ~~entire~~ RAW. This SST Sounding RAW may be scheduled ~~in~~ ~~a~~as periodic or non-periodic ~~impromptu way~~.*(CID 420)*

**10.2.1.19 AP Power management**

**Page 191 Line 43: modify the sentence as follows:**

The AP may indicate it is operating in Power Save mode by:

— including an AP Power Management element in Beacon or Short Beacon frame with the PM Mode subfield set to 1;

— or including one or more RPS elements in Beacon or Short Beacon frame, with the ~~AP PM field set to 1~~ RAW Assignment Type set to AP PM RAW/non-TIM RAW and RAW Type Options is set to 00.

The AP shall operate in Active mode during a Beacon or short Beacon interval if the AP Power Management element is either absent in the Beacon or Short Beacon or the PM Mode subfield is set to 0. Similarly, the AP shall operate in Active mode during one or more RAWs defined by an RPS element with the ~~AP PM field set to 0~~RAW Assignment type set to Regular RAW, Sounding RAW, Triggering Frame RAW or AP PM RAW/non-TIM RAW with RAW Type Options set to 01.

An AP including an AP Power Management element with the PM Mode subfield set to 1 in Beacon or Short

Beacon frame may be in Doze state at any time, except that it shall be in Awake state during any of the following intervals of time:

— any RAW intervals that are setup according to 9.19.4a (Restricted Access Window (RAW) Operation), except for RAWs that are defined by any RPS element with ~~AP PM field set to 1~~ RAW Assignment Type set to AP PM RAW/non-TIM RAW and RAW Type Options is set to 00;

**9.19.4a.6 Periodic RAW (PRAW) operation**

Remove the entire subclause in 9.19.4a.6.

**9.32g.2 Resource protection for non-TIM STAs**

Create a new subclause 9.32g.2a with the following content:

**9.32g.2a Resource protection for non-TIM STAs using Periodic RAW (PRAW) operation**

PRAW is a series of RAWs that are allocated to one or a group of STAs in a periodic manner with identical resource allocation. An AP may indicate to TIM STAs information of scheduled RAW during which no TIM STAs are allowed to contend, and PRAW can be used for this purpose.

An AP may schedule and indicate TWT for a non-TIM STA within the PRAW duration in periodic manner, when the STA is associated with the AP or reschedule is needed. Operation details for TWT is described in 9.32f. By allocating PRAW only for one or a group of STAs that an AP scheduled TWT, the AP can indicate to TIM STAs information of periodically scheduled RAWs during which no TIM STAs are allowed to contend.

PRAW allocation may be indicated by an RPS element included in Beacon and/or Probe Response frames. Once a PRAW is allocated, the allocation indication is broadcasted by the AP periodically such that every TIM STA can identify the allocation of PRAW. However, it is not necessary for an AP to indicate the PRAW allocation in every (short) beacon frame transmitted in the beacon interval for which PRAW is allocated. The allocated resource for PRAW will not be changed until updated PRAW information is broadcasted.

An example of the basic operation of PRAW allocation is shown in Figure 9-44e-1 (Example of PRAW operation). In this figure, PRAW is allocated at every Short Beacon interval, but the allocation of the PRAW is indicated only in every Beacon frame. STA1 is a TIM STA that is not included in the PRAW allocation and STA2 is a non-TIM STA for which the AP has scheduled TWT and is included in the PRAW allocation. When STA1 listens to the Beacon frame, it can identify the allowed user group, start time, duration, and the periodicity of the allocated PRAW. As STA1 is not included in the allowed user group of the PRAW, STA1 will not access the channel during allocated PRAW in every Beacon and Short Beacon frame. And, STA2 wakes up at its scheduled TWT which is within the PRAW, and send its uplink data if it has a data frame to send.

|  |
| --- |
|  |
| Figure 9-44e-1 – Example of PRAW operation |