IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| WUR Short Wake-up Frame | | | | |
| Date: March 1, 2019 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Menzo Wentink | Qualcomm | Utrecht, The Netherlands | +31-65-183-6231 | mwentink  @qualcomm.com |
| Po-Kai Huang | Intel | San Jose, CA, USA |  |  |
| Jouni Malinen | Qualcomm | Finland |  |  |
| Alfred Asterjadhi | Qualcomm | San Diego, CA, USA |  |  |
| George Cherian | Qualcomm | San Diego, CA, USA |  |  |

Abstract

This document contains normative text for a WUR short wake-up frame, addressing CIDs 2416, 2462, 2367.

The baseline for this document is Draft P802.11ba D2.0.

**Related CIDs**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 2416 | 9.10.3.2 | 58 | 24 | The current WUR wake-up frame can have a significant duration, in particular at the low data rate. | Add a short wakeup frame that can be used in addition to the current WUR wake-up frame. |
| 2462 | 9.10.3.2 | 58 | 24 | For the individually addressed Wake-up frame, when the Protected subfield in the Frame Control field is set to 0, the Type Dependent Control field (12 bits) is reserved and not being used but adding a huge overhead due to the LDR = 62.5kbps. By removing the Type Dependent Control field for this case, the airtime (including WUR preamble) shrinks from 920 usec to 728 usec, which is 20% overhead reduction. | Define a shorter individually addressed WUR Wake-up frame by removing the Type Dependent Control field when the frame is not protected. Also remove the Length Present field and the Length/Misc field from the Frame Control field. Also remove the Protected field. This shortens the individually addressed WUR Wake-up frame to 24usec+128usec+31bitsx16usec = 648 usec. |
| 2367 |  |  |  | The size of the WUR wakeup frame can be significantly reduced by using a paging identifier, because Address, MIC, and FCS are not needed in this case. | Picking up on comments made in the previous letter ballot on D1.0, the TG did not properbly address the issue raised in the comment, nor does the TG provide an indication that the text commented on has been deleted and hence the comment does not apply. (Note, page and line and sublause number refer to D1.0). In fact, as stated in the TGba minutes (11-19/226r0), the intend of the task group was to "Move to resolve CIDs that have no approved resolution as rejected with a reason read "TGba is unable to reach consensus on a resolution" in the interest of releasing draft 2.0". Also, the statement ""TGba is unable to reach consensus on a resolution" was added to the motion text there was one person speaking against the motion." was only added to the motion after objection to the original motion trying to reject comments in bulk with the reason of releasing a new LB.  The TG is asked to give the original comment due consideration and debade the proposed comment resolution as included in 11-18/1794r10. The referenced document includes an actionable comment resolution. |

**Proposed Resolution**

Revised - implement changes described in 11-19-0482-00-00ba-wur-short-wake-up-frame.docx.

**Proposed Changes**

Changes are relative to Draft P802.11ba D2.0.

**4.3.15a Wake-up radio (WUR) STA**

***At 21.30 (Four WUR frames are defined), add " — The WUR Wake-up frame is a shortened version of the WUR Wake-up frame."***

***At 21.57 (A WUR AP has the following optional main features), add " — Transmit a WUR Short Wake-up frame."***

***At 22.18 (A WUR non-AP STA has the following optional main features), add " — Receive a WUR Short Wake-up frame."***

**9.4.2.290 WUR Capabilities element**

***In Figure 9-772c (WUR Capabilities Information field format) add a "WUR Short Wake-up Frame Support" subfield at B14, and update the reserved values accordingly.***

***In Table 9-321a (Subfields of the WUR Capabilities Information field) add a subfield "WUR Short Wake-up Frame Support" with definition "Indicates support for the WUR Short Wake-up Frame" and description "For a WUR AP: —Set to 1 to indicate support for the transmission of WUR Short Wake-up frames. Set to 0 otherwise. For a WUR non-AP STA: —Set to 1 to indicate support for the reception of WUR Short Wake-up frames. Set to 0 otherwise.".***

**9.6.34.1 WUR Action field**

***In Table 9-524a (WUR Action field values) insert a new row with Value 3 and Meaning "WUR Wake-up Indication", and update the reserved values accordingly.***

***Add a new subclause:***

**9.6.34.2 WUR Wake-up Indication frame format**

The WUR Wake-up Indication frame is an Action frame of category WUR. The Action field of a WUR Wake-up Indication frame contains the information shown in Table 9-524d (WUR Wake-up Indication frame Action field format).

**Table 9-524d—WUR Wake-up Indication frame Action field format**

|  |  |
| --- | --- |
| Order | Information |
| 1 | Category |
| 2 | WUR Action |
| 3 | WUR Wake-up Indication |

The Category field is defined in Table 9-53 (Category values).

The WUR Action field is set to 0 as defined in Table 9-524a (WUR Action field values).

The WUR Wake-up Indication field is 8 bits in size and contains an unsigned integer. Value 0 indicates Unsolicited\_Wakeup. Values 1-255 are reserved.

**9.10.1 Basic components**

***Modify as shown:***

Each Wake-up Radio (WUR) frame except the WUR Short Wake-up frame consists of the following basic components:

**9.10.2.1.1 Frame Control field**

***In Table 9-540a (WUR frame types) add a WUR Short Wake-up frame as Type 4 and update the reserved values accordingly.***

***Add a new subclause:***

**9.10.3.5 WUR Short Wake-up frame format**

The frame format of the WUR Short Wake-up frame is defined in Figure 9-xxx (WUR Short Wake-up frame format).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B0 B2 | B3 | B4 B16 | B17 B32 |
|  | Type | Protected | WUR ID | FCS |
| Bits: | 3 | 1 | 12 | 16 |

**Figure 9-xxx—WUR Short Wake-up frame format**

The Type field is defined in Table 9-540a (WUR frame types).

The Protected field is set to 0.

The WUR ID field is defined in 30.4 (Setting the identifiers of WUR frames).

The FCS field is defined in 9.10.2.5 (Frame Check Sequence (FCS) field).

***Add a new subclause:***

**30.12 WUR Short Wake-up Frame Operation**

When a WUR non-AP STA and its WUR AP support WUR Short Wake-up frames,

* the WUR AP may transmit WUR Short Wake-up frames instead of WUR Wake-up frames to the WUR non-AP STA. WUR Wake-up frames and WUR Short Wake-up frames may be used interchangeably in this case, according to the rules outlined in this subclause.
* the WUR non-AP STA shall act on received WUR Short Wake-up frames with a matching WUR ID and FCS in the same way it acts on received WUR Wake-up frames with a matching WUR ID and FCS, according to the rules outlined in this subclause.

Otherwise, a WUR AP shall not transmit WUR Short Wake-up frames to the WUR non-AP STA and the WUR non-AP STA shall ignore received WUR Short Wake-up frames with a matching WUR ID and FCS.

When a WUR AP transmits WUR Short Wake-up frames to a WUR non-AP STA and the WUR AP has a secure association with the non-AP STA, the following rules apply:

* The WUR AP shall select the WUR non-AP STA's WUR ID randomly.
* The WUR AP shall configure a new random WUR ID at the WUR non-AP STA when the WUR AP receives a frame not indicating Unsolicited\_Wakeup from the WUR non-AP STA.
  + When the WUR AP receives a frame not indicating Unsolicited\_Wakeup from the WUR non-AP STA and the WUR AP did not transmit a prior WUR Short Wake-up frame to the WUR non-AP STA, the WUR AP should wait at least 1 minute and until a regular wake-up has occurred before configuring a new WUR ID at the WUR non-AP STA. During this time, the WUR AP uses WUR Wake-up frames to wake up the WUR non-AP STA, using the current WUR ID. The WUR AP should double this interval upon each consecutive unsolicited wake-up event not indicating Unsolicited\_Wakeup.
* The WUR AP should not retransmit a WUR Short Wake-up frame. The WUR AP may retransmit using a WUR Wake-up frame.
* The WUR non-AP STA shall ignore received WUR Short Wake-up frames with a matching WUR ID and FCS after the WUR non-AP STA received a WUR Short Wake-up frame with a matching WUR ID and FCS, until a new WUR ID has been configured at the WUR non-AP STA by the WUR AP.
* The WUR non-AP STA may transmit a WUR Wake-up Indication frame indicating Unsolicited\_Wakeup as the first frame when it wakes up without receiving a prior WUR Short Wake-up frame. This avoids that the WUR AP configures a new WUR ID at the WUR non-AP STA.

**B.4.4.2 MAC frames**

***Add the following PICS entry:***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| FR<Last\_as- signed+7> | WUR Short Wake-up frame | 9.10.3.5 (WUR Short Wake-up frame format) | CFWUR:O | Yes  No  N/A  |

**B.4.36.1 WUR MAC features**

***Add the following PICS entry:***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| WURM 13 | WUR Short Wake-up frame operation | 30.8.1 (General) | CFWUR:O | Yes  No  N/A  |