### IEEE P802.11 Wireless LANs

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| 11ba D3.0 MAC Comment Resolution for Wake-up Operation | | | | |
| Date: 2019-06-28 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Po-Kai Huang | Intel Corporation | 2200 Mission College Blvd, Santa Clara, CA 950542200 |  | po-kai.huang@intel.com |
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Abstract

This submission proposes resolutions for comments of TGba Draft D3.0 with the following CIDs:

~~3012~~, 3039, 3061, 3087, 3155, 3380, 3105, 3144, 3157, 3201, 3158, 3159, 3379

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Defer 3012 and have revision based on the discussion in the teleconference call.
* Rev 2: Add CID 3201

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGba D3.0 Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGba D3.0 Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGba Editor: Editing instructions preceded by “TGba Editor” are instructions to the TGba editor to modify existing material in the TGba draft. As a result of adopting the changes, the TGba editor will execute the instructions rather than copy them to the TGba Draft.***

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| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **P.L** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| ~~3012~~ | ~~Alfred Asterjadhi~~ | ~~118.1~~ | ~~29.9.1~~ | ~~Issues identified by CID 2055 were partially addressed. For example it is still not clear what WUR frame the AP generates within the SP if the AP does not have any DL BUs to be sent to the STA. Please explicitly state the requirement for both cases (Yes DL BUs available and No DL BUs available keeping in mind that the STAs need some certainty that they are in range with the AP).~~ | ~~As in comment~~ | ~~Revised –~~  ~~Agree in principle with the commenter. We describe in details about cases of generating WUR frames described in the following clause.~~  ~~TGba editor to make the changes shown in 11-19/1052r2 under all headings that include CID 3012~~ |
| 3039 | Gaurav Patwardhan | 58.31 | 9.4.2.79 | Otherwise clause needs to set the value to "0" | Change to "Otherwise: Setting this field to 0 indicates the STA..." | Revised –  The otherwise is for the condtion not covered by “If a STA is a WUR non-AP STA:”. I revise “otherwise” to directly describe the condition.  TGba editor to make the changes shown in 11-19/1052r2 under all headings that include CID 3039 |
| 3061 | Gaurav Patwardhan | 119.50 | 29.9.2 | Add RSNE element update and BSS Termination element update to the critical BSS parameters update events | AS in comment | Revised –  We note that the list here follows the list provided in the baseline for critical update. Further, it is already stated that “A WUR AP may classify other changes in the Beacon frame as critical updates”. We add a note to describe that similar list is already provided in the baseline and add the suggestd parameter update ofr RSNE to the “may” list. After discussing with the commenter, since there is no BSS Termination element, the commenter is fine that we do not add BSS Termination element.  TGba editor to make the changes shown in 11-19/1052r2 under all headings that include CID 3061 |
| 3087 | Graham Smith | 118.59 | 29.9.2 | "If the WUR AP schedules a transmission that is not a WUR PPDU to the WUR non-AP STA," At this stage it is an AP and not a WUR AP. I think that you have complicated this too far. The "WUR AP " term is getting confusing in that it when operating in the normal mode it should have nothing to do with WUR. This WUR should only be referring to the power save part and not getting involved with when the STA is awake. By only dealing with going into doze and coming out of doze it could be so much easier. Hence, it should be not necessarily be referring to normal traffic or BUs other than the reason to wake up the STA. | This Draft is over complicated. It seems to have fallen into the trap of starting with a great simple idea and then adding to it and not describing it in a simple straightforward manner. It should have stuck with the power save side and kept it simple. It should have just kept to allowing the non-AP STA to doze for long periods at very low power. I would urge the TG to see if they really need all this text. | Rejected –  We understand the confusion that a commenter may have for the cited sentence. We explain the reasoning below. We note that it is described in 4.2.2 Wireless station (STA) that a STA may have multiple characteristics as shown below. As a result, a WUR AP can be a HE AP, VHT AP, HT AP, or non-HT AP to transmit non-WUR PPDU.  *A STA might take on multiple distinct characteristics, each of which shape its function. For example, a*  *single addressable unit might simultaneously be a portable STA, a quality-of-service (QoS) STA, a*  *dependent STA, and a hidden STA.*  We in general agree with the commenter that the WUR feature should be kept simple. We explain that the cited sentence is saying that when a WUR AP sends a wake-up frame, it needs to wait the transition delay time indicated by the non-AP STA to bring up the hardware to receive non-WUR frame before the WUR AP can send non-WUR frame. This long transition delay time is critical for the low power STA and implementation, which is the reason why we have the cited sentence. |
| 3155 | Joseph Levy | 118.63 | 29.9.2 | Why does the specification allow for transmission of PPDUs that are not a WUR PPDU to a WUR non-AP STA from which it has not received and indication that the WUR non-AP STA is awake? Allowing transmission simply based on transition delay assumes the WUR non-AP STA has correctly received the wake up WUR PPDU and is in awake state waiting to receive the PPDUs, this seems to be a poor way of assuring reliable data transmission to a WUR non-AP STA and may cause the WUR AP to transmit multiple PPDUs for which there is no receiver (no ACK can be generated by a WUR non-AP STA that is not awake or active). A better use of the transition delay would be to allow the WRU AP to send an additional WUR PPDU to attempt to wake the WUR non-AP STA. | Delete: "The transition delay indicated by the WUR non-AP STA in the WUR Capabilities elements following the most recent transmitted WUR Wake-up frame intended to the WUR non-AP STA has expired." and correct the grammar. | Revised –  We understand the confusion that a commenter may have for the cited sentence. We explain the reasoning below. During the discussion, it is mentioned that there is a mode of TWT operation called unannounced TWT SP, at the start of which the TWT requesting STA is assumed to already be awake, and AP may directly deliever data to the non-AP STA. We follow the general design philosophy to have WUR operation connect with existing power save operation, and this leads us to allow WUR AP to send data to WUR non-AP STA directly.  We agree in general that a WUR AP should be able to send multiple WUR PPDU, and we clarify this with a note in the spec.  TGba editor to make the changes shown in 11-19/1052r2 under all headings that include CID 3155 |
| 3380 | Yonggang Fang | 120.34 | 29.9.3 | In the WUR AP operation of the clause 29.2.2, it indicates that "If the WUR AP receives any transmission from the WUR non-AP STA within the timeout interval, then the WUR Wake-up frame transmission is successful." . However, in the clause 29.9.3 WUR non-AP STA operation, it does not indicate that the WUR non-AP STA needs to send anything to the WUR AP to indicate reception of WUR wake-up message. It needs to clearly indicate the WUR non-AP STA needs to sends something to the WUR AP. Otherwise, the WUR AP will perform retransmission of WUR Wake-up message. | As shown in the comment. | Revised –  We understand the confusion that a commenter may have for the cited sentence. We explain the reasoning below. During the discussion, it is mentioned that there is a mode of TWT operation called unannounced TWT SP, at the start of which the TWT requesting STA is assumed to already be awake, and AP may directly deliever data to the non-AP STA. We follow the general design philosophy to have WUR operation connect with existing power save operation, and this leads us to allow WUR AP to send data to WUR non-AP STA directly. In this case, if the STA sends an acknowledgement, then the whole WUR transmission is then successful. We also note that a WUR AP can send multiple WUR frames in a TXOP to increase the reliability. We add a note to clarify this case.  TGba editor to make the changes shown in 11-19/1052r2 under all headings that include CID 3380 |
| 3105 | James Lepp | 121.4 | 29.9.3 | "A WUR non-AP STA that receives the Counter subfield of the Type Dependent Control field in a broadcast WUR Wake-up frame that contains a value that is different from the value of its BSS Parameter Update Counter shall follow the procedure defined in 11.2.3.15 (TIM Broadcast) to attempt to receive the Beacon information." Attempt to receive the Beacon information isn't precise. | Remove "to attempt to receive the Beacon information". | Rejected –  We understand the confusion that a commenter may have for the cited sentence. We explain the reasoning below. We note that the language follows the language used in the baseline for TIM broadcast as shown below. “The non-AP STA shall attempt to receive the next Beacon frame when it receives a Check Beacon field that contains a value that is different from the previously received Check Beacon field.” There are also 99 instances of “attempt to” in the baseline. |
| 3144 | Joseph Levy | 58.15 | 9.4.2.79 | This is a repeat of comment (CID 2184): "The 802.11 style guide states that: c. The use of "value of <field> field" is deprecated. So the following should not be used: i. A STA that received an MPDU with the value of the Retry subfield of the Frame Control field equal to 1 shall determine if the MPDU is a duplicate using the duplicate cache." As there are still location in the draft that need to be corrected. | e.g. Replace: "A value of 0 for this field indicates no deletion of the traffic filter set upon a match." With: "This field = 0 indicates no deletion of the traffic filter set upon a match." Also correct statements such as "value of the field" to be "the field" This also applies in 29.5.6 where statements such as "... where k is equal to the value of the BSSID index field corresponding .." Should be changed to: "... where k is equal to the BSSID index field corresponding... " | Revised –  Agree in principle with the commenter. We note that the following sentence is from revmd “A value of 0 for this field indicates no de-letion of the traffic filter set upon a match.” As a result, the comment to revise the sentence should be directed to revmd. We revised the sentence in 29.5.6 as suggested by the commenter.  TGba editor to search through the spec and fix the editorial style.  TGba editor to make the changes shown in 11-19/1052r2 under all headings that include CID 3144 |
| 3157 | Joseph Levy | 120.29 | 29.9.2 | A statement to the effect that a WUR AP may disassociate an WUR non-AP STA if it fails to wake up, seems to be missing from clause 29. This statement is critical to allow the WRU AP to not maintain buffered PPDUs for a WUR non-AP STA that it can no longer communicate with. | ADD the following sentence following the last paragraph of 29.9.4: "If the maximum number of retries is reached the WUR AP may disassociate the WUR non-AP STA." | Revised –  Agree in principle with the commenter.  29.1 describes that the max ilde period operation defined in 11.22.13 is supported by WUR STA as shown below.  *A WUR STA supports the MAC and MLME functions defined in Clause 29 (Wake-Up Radio (WUR) MAC specification) in addition to the MAC functions defined in Clause 10 (MAC sublayer functional descrip­tion), the MLME functions defined in Clause 11, the security functions defined in Clause 12 (Security), and the HE MAC functions defined in Clause 26 if a WUR STA is an HE STA except when the functions in Clause 30 supersede the functions in Clause 10, Clause 11, Clause 12 or Clause 26.*  Further, there is no modification of max idle period in clause 29. We add a note to describe that WUR AP may disassociate non-AP STA based on the BSS max idle period management.  TGba editor to make the changes shown in 11-19/1052r2 under all headings that include CID 3157. |
| 3201 | Mark Hamilton |  |  | Is there an escape from the requirement for a non-AP STA to transmit a frame within the Max Idle Period (or be disassociated)? I don't see any text in the TGba draft mentioning this. | Add a statement (probably in 11.22.13) that a WUR AP does not apply the Max Idle Period procedure to a non-AP STA in WUR mode and power save mode. | Revised –  Agree in principle with the commenter.  29.1 describes that the max ilde period operation defined in 11.22.13 is supported by WUR STA as shown below.  *A WUR STA supports the MAC and MLME functions defined in Clause 29 (Wake-Up Radio (WUR) MAC specification) in addition to the MAC functions defined in Clause 10 (MAC sublayer functional descrip­tion), the MLME functions defined in Clause 11, the security functions defined in Clause 12 (Security), and the HE MAC functions defined in Clause 26 if a WUR STA is an HE STA except when the functions in Clause 30 supersede the functions in Clause 10, Clause 11, Clause 12 or Clause 26.*  Further, there is no modification of max idle period in clause 29. We add a note to describe that WUR AP may disassociate non-AP STA based on the BSS max idle period management.  TGba editor to make the changes shown in 11-19/1052r2 under all headings that include CID 3201. |
| 3158 | Joseph Levy | 120.35 | 29.9.3 | The current WRU non-AP STA operation does not seem to allow for the simple option of a WUR non-AP STA awaking into the Active mode and sending a PPDU to the WUR AP indicating it is awake. Add such a statement. | Insert the following after "... shall follow existing operation, which is": "to send a PPDU to the WUR AP indicating the WRU no-AP STA is awake and ready to receive PPDUs or is ..." | Revised –  Agree in principle with the commenter. We add a note to describe that WUR non-AP STA is allowed to change power management mode to Active mode by following the procedure in 11.2.3.2 Non-AP STA power management modes.  TGba editor to make the changes shown in 11-19/1052r2 under all headings that include CID 3158 |
| 3159 | Joseph Levy | 120.51 | 29.9.3 | The current WRU non-AP STA operation does not seem to allow for the simple option of a WUR non-AP STA awaking into the Active mode and sending a PPDU to the WUR AP indicating it is awake. Add such a statement. | Insert the following after "... shall follow existing operation, which is": "to send a PPDU to the WUR AP indicating the WRU no-AP STA is awake and ready to receive PPDUs or is ..." | Revised –  Agree in principle with the commenter. We add a note to describe that WUR non-AP STA is allowed to change power management mode to Active mode by following the procedure in 11.2.3.2 Non-AP STA power management modes.  TGba editor to make the changes shown in 11-19/1052r2 under all headings that include CID 3159 |
| 3379 | Yonggang Fang | 118.44 | 29.9.1 | The broadcast address is mentioned in "The WUR AP may transmit a broadcast addressed WUR Wake-up frame to associated WUR non-AP STA(s) to indicate that a critical update to the BSS parameters of the WUR AP has occurred for the associated WUR non-AP STA (see 29.9.2 (WUR AP operation)).". But the broadcase address of WUR frame for Non-AP station is not defined in the spec. Need to define the "broadcast address of WUR" | As shown in the comment. | Revised –  Agree in principle with the commenter. We add a reference to the definition of broadcast addressed wake-up frame in 29.5.3 Transmitter ID.  TGba editor to make the changes shown in 11-19/1052r2 under all headings that include CID 3379 |

**Discussion:** *None.*

**Propose:** Revised for CID 3039, 3061, 3144, 3157, 3201, 3158, 3159, 3155, 3380 per discussion and editing instructions in 11-19/1052r2.

***TGba editor: Change 29.9 Wake-up operation as follows:***

**29.9 Wake-up operation**

**29.9.1 General**

(..existing texts …)

The WUR AP may transmit a broadcast addressed WUR Wake-up frame (see 29.5.3 (Transmitter ID)) to associated WUR non-AP STA(s) to indicate that a critical update to the BSS parameters of the WUR AP has occurred for the associ­ated WUR non-AP STA (see 29.9.2 (WUR AP operation)). The critical update is indicated in the Counter subfield of the Type Dependent Control field.(#3379)

***TGba editor: Change 29.9.2 WUR AP operation as follows:***

* WUR AP operation

A WUR AP that transmits a WUR Wake-up frame to a WUR non-AP STA that indicates the availability of individually addressed BU(s) shall follow the existing operation, which is any PS operation that the WUR AP and the WUR non-AP STA has agreed to use (e.g., baseline active mode and PS mode change, U-APSD, TWT, etc.), to deliver individually addressed BU(s) to the WUR non-AP STA. Individually addressed BU(s) are delivered at specific times, which are provided along with the agreed PS operation.

NOTE – As described in 29.3 (Channel access), a WUR AP can transmit multiple WUR Wake-up frames in a TXOP (see 10.24.2.8 (Multiple frame transmission in an EDCA TXOP).(#3155, #3380)

(…existing texts …)

A WUR AP shall maintain a BSS Parameter Update Counter. The WUR AP shall increase the BSS Parameter Update Counter if a critical update occurs to any of the elements inside the Beacon frame. The following events shall be classified as a critical update:(#Ed)

* Inclusion of a Channel Switch announce element
* Inclusion of an Extended Channel Switch announce element
* Inclusion of a Wide Bandwidth Channel Switch element
* Inclusion of an Operating Mode Notification element
* Modification of the EDCA parameters
* Modification of the HT Operation element
* Modification of the VHT Operation element
* Modification of the HE Operation element
* Modification of the DSSS Parameter Set
* Inclusion of a Channel Switch Wrapper element

NOTE – The list of elements for critical update advertised by a broadcast addressed WUR Wake-up frame aligns with the list of elements for critical update advertised in Check Beacon field in the TIM frame(s) (see 11.2.3.15 (TIM Broadcast)).(#3061).

The WUR AP shall include the current value of the BSS Parameter Update Counter in the WUR Parameter field in the WUR Operation element. The WUR AP shall include a WUR Operation element in the WUR Mode Setup frames if the Counter value in the WUR Operation element has been recently updated.

The WUR AP shall include the current value of the BSS Parameter Update Counter in the Counter subfield of the Type Dependent Control field in all transmitted broadcast WUR Wake-up frames.

A WUR AP may classify other changes in the Beacon frame as critical updates, which may include modification of the RSNE (see 9.4.2.24 RSNE) or those that are described in 11.2.3.15 (TIM Broadcast).(#3061)

RSNE element update and BSS Termination element update

(…existing texts …)

The methods by which a WUR AP determines the exact value of the timeout interval and determines the number of retries after the transmission of individually addressed WUR Wake-up frame fails are implementation specific and out of scope of this standard.

NOTE – As described in 29.1 (Introduction), a WUR AP might disassociate a WUR non-AP STA by following the operation based on max idle period (see 11.22.13 (BSS max idle period management)).(#3157, #3201)

***TGba editor: Change 29.9.3 WUR non-AP STA operation as follows:***

**29.9.3 WUR non-AP STA operation**

A WUR non-AP STA that receives a WUR Wake-up frame addressed to it with an indication of individually addressed BU(s) (see 29.9.1 (General)) shall follow existing operation, which is any PS operation the associ­ated WUR AP and the WUR non-AP STA has agreed to use (e.g., baseline PM change, U-APSD, TWT, etc.), to retrieve individually addressed BU(s) and follow the wake up timing information (e.g., the next ser­vice period) that is provided along with the agreed PS operation. In this case, the WUR non-AP STA may be in the doze state until the time indicated by the wake up timing information (e.g., the next service period) that is provided along with the agreed PS operation.

NOTE 1—For example, rule b), c), and d) in 11.2.3.7 (Receive operation for STAs in PS mode) describes one operation for a WUR non-AP STA to retrieve individually addressed BU(s) using PS-Poll or U-APSD.

NOTE 2—To use both PS-Poll and U-APSD, the WUR non-AP STA can set all ACs as delivery-enabled as defined in 11.2.3.7 (Receive operation for STAs in PS mode).

NOTE 3— As described in 29.1 (Introduction), the WUR non-AP STA can follow the procedures in 11.2.3.2 (Non-AP STA power management modes) to change the power managemenet mode to active mode. (#3158, #3159)

(…existing texts …)

***TGba editor: Change 9.4.2.79 TFS Request element as follows:***

* TFS Request element

***Change Table 9-222 (TFS Action Code field values) as shown below:***

|  |  |  |
| --- | --- | --- |
| * TFS Action Code field values | | |
| Bit(s) | Name | Notes |
| 0 | Delete After Match | Setting this field to 1 for any traffic filter set indicates all traffic filter sets established at the AP for the non-AP STA are deleted when a frame matches any of the traffic filter sets established for the non-AP STA. A value of 0 for this field indicates no deletion of the traffic filter set upon a match. |
| 1 | Notify | If a STA is a WUR non-AP STA:   * Setting this field to 1 indicates the STA is to be sent a WUR Wake-up frame as described in 29.9 (Wake-up operation) upon the first frame matching to the traffic filter set or the first frame match after the AP receives a Notify Response frame containing the corresponding TFS ID. Setting this field to 0 indicates the AP does not send a WUR Wake-up frame to the requesting STA.   If a STA is not a WUR non-AP STA: (#3039)   * Setting this field to 1 indicates the STA is to be sent a TFS Notify frame upon the first frame matching to the traffic filter set or the first frame match after the AP receives a Notify Response frame containing the corresponding TFS ID. Setting this field to 0 indicates the AP does not send TFS Notify frame to the requesting STA. |

***TGba editor: Search through the spec for “the value of” and see if it complies with the following style guid line(#3144)***

*The use of “value of <field> field” is deprecated.[[1]](#footnote-1) So the following should not be used:*

*A STA that received an MPDU with the value of the Retry subfield of the Frame Control field equal to 1 shall determine if the MPDU is a duplicate using the duplate cache.*

***TGba editor: Change 29.5.6 Nontransmitter ID as follows:***

**29.5.6 Nontransmitter ID**

A nontransmitter ID identifies a nontransmitted BSSID from the multiple BSSID set (see 11.1.3.8 Multiple BSSID procedure).

A WUR Wake-up frame is a broadcast addressed WUR Wake up frame if the WUR Wake-up frame has a nontransmitter ID in the ID field. The WUR Wake up frame is addressed to all the WUR non-AP STAs that are associated with the AP corresponding to a nontransmitted BSSID in a multiple BSSID set.

A WUR AP that operates a multiple BSSID set containing a nontransmitted BSSID and a WUR non-AP STA that is a member of a BSS corresponding to a nontransmitted BSSID shall calculate the nontransmitter ID as k + transmitter ID, where k is equal to the BSSID index field corresponding to that BSS (see 9.4.2.73 (Multiple BSSID-Index element) for the nontransmitted BSSID, the transmitter ID is defined in 29.5.3 (Transmitter ID), and the addition performed between the two identifiers is circular modulo 212.(#3144)

1. [↑](#footnote-ref-1)