IEEE P802.11  
Wireless LANs

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| Comment resolutions for WUR frame format | | | | |
| Date: 2019-04-10 | | | | |
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Abstract

This submission proposes resolutions for multiple comments related to TGba D2.0 with the following CIDs (13 CIDs):

* 2033, 2144, 2145, 2167, 2385, 2386, 2401, 2414, 2509, 2726,
* 2733, 2734, 2808

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Revised version of the document that includes feedback received from Yunsong via e-mail. Changes in green.
* Rev 2: Revised version of the document that includes some additional feedback received from Yunsong. Deletion of “and WUR Vendor Specific frames”.

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 Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGba 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** | **Comment** | **Proposed Change** | **Resolution** |
| 2033 | Alfred Asterjadhi | 35.06 | WUR frame is a MAC frame, as such it has to be called out as such in clause 9.1 | Add respective WUR frame citations to this subclause. | Revised –  Agree in principle with the comment. Proposed resolution adds appropriate references to the WUR frames in subclause 9.2.3 (General frame format).  TGba editor to make the changes shown in 11-19/0583r2 under all headings that include CID 2033. |
| 2144 | James Lepp | 55.27 | Change CRC to 16-bit CRC | "...otherwise it is set to 0 to indicate that the WUR frame contains the 16-bit CRC as defined in..." | Accepted |
| 2145 | James Lepp | 56.60 | Two sentances can be combined into a single paragraph. |  | Revised –  Agree with the comment.  TGba editor: Remove the \\ “newline” instruction between the two sentences of 9.10.2.5.1. |
| 2167 | Jeongki Kim | 53.13 | The MAC header of the WUR frame consists of the Frame Control, ID, and Type Dependent Control fields. How about indicating where the MAC header is in Figure 9-2 (MAC frame format)? | as per comment | Revised –  Agree in principle with the comment. However, this cannot be done in Figure 9-2 because that is the frame format for PV0 frames. Proposed resolution is to add the arrow delimiting the fields that make up the MAC header of WUR frames in Figure 9-988a (WUR frame format.  TGba editor to make the changes shown in 11-19/0583r2 under all headings that include CID 2167. |
| 2385 | Mark Hamilton | 55.39 | Be specific, to avoid errors due to the reader missing something. This field is used (not reserved) for broadcast WUR Wake-up frame. (And not for WUR Vendor Specific, if my other comment on 9.10.3.4 is accepted, otherwise, add that frame here, too.) | Change to "The Misc subfield is reserved except in the broadcast WUR Wake-up frame." | Revised –  Agree in principle with the comment. Misc field is indeed reserved in all WUR frames except for broadcast WUR Wake-up frames and Vendor Specific frames. Proposed resolution accounts for these changes, inline with the comment.  TGba editor to make the changes shown in 11-19/0583r2 under all headings that include CID 2385. |
| 2386 | Mark Hamilton | 56.04 | Incomplete phrase: "The ID field contains an identifier for the," | Insert the noun/noun phrase. | Revised –  Agree in principle with the comment. Proposed resolution adds the missing portion to complete the sentence.  TGba editor to make the changes shown in 11-19/0583r2 under all headings that include CID 2386. |
| 2401 | Mark RISON |  | The frame format descriptions are circular. 9.10.2: The Frame Body field is optionally present in certain WUR frame types and is defined in 9.10.2.4 (Frame Body field).. 9.10.2.4: The Frame Body field is a variable-length field that contains information specific to individual WUR frame types (see 9.10.3 (Format of individual WUR frame types)). 9.10.3.1: The frame format of the WUR Beacon frame is as defined in Figure 9-988a (WUR frame format) ... which is in 9.10.2 | Do not xref back to 9.10.2 from 9.10.3. Just give the content of the Frame Body field | Rejected –  The comment fails to identify a technical issue. Subclause 9.10.2 provides a general structure of the WUR frames, and 9.10.3 provide details for each of the fields of the frame depending on the type of WUR frame under discussion. This helps determine which WUR frames have what fields used or set in a specific way.  In addition I could not find any sentence in subclause 9.10.3 that refers back to 9.10.2 regarding the Frame Body content. |
| 2414 | Mark RISON | 56.27 | "OUI1" is a weird field name | Change "OUI1" to "OUI12" | Rejected –  The comment fails to identify a technical issue. The field is called OUI1 because another portion of the OUI (i.e., OUI2) is in the Type Dependent field of the Vendor Specific frame. If the field is to be renamed as OUI12 then the other field needs to be named in such a way to differentiate from this OUI12. |
| 2509 | Osama Aboulmagd | 54.47 | what does the word "Misc." mean? Is this an English word? If it is the abbreviation for the word "Miscellaneous" why not include it in the table in clause 3.4 | as in comment | Revised –  It is indeed an abbreviation of the word miscellaneous. Proposed resolution is to use the long version of the word rather than the abbreviation.  TGba editor: Please replace “Misc” with “Miscellaneous” throughout the draft. |
| 2726 | Xiaofei Wang | 56.37 | The reference to claus 9.10.3 in fact is a link to claus 9.10.2. Please fix the link | fix the link | Rejected –  The comment fails to identify a technical issue. The link is indeed referring to subclause 9.10.3 (Format of individual WUR frame types), but that is intentional because the Type Dependent field contains information that is dependend to the individual frame types. |
| 2733 | Xiaofei Wang | 56.04 | The sentence is "The ID field contains an identifier for the," is not complete. Please complete the sentce. | please complete the sentence | Revised –  Agree in principle with the comment. Proposed resolution adds the missing portion to complete the sentence.  TGba editor to make the changes shown in 11-19/0583r2 under all headings that include CID 2733. |
| 2734 | Xiaofei Wang | 57.04 | The embedded BSSID field is neither embedded nor present in the WUR frame. It may be better to define the calculation field first and then refer to whetehr the embedded BSSID field is present in the calculation field. | change the first paragraph into "The CRC is calculated over a calculation field which includes all the fields of the Frame Control, ID, Type Dependent Control, Frame Body field (if present), and Embedded BSSID field (if present in the calculation field)." | Revised –  Agree in principle with the proposed change. Proposed resolution accounts for the proposed change, while editorially amending the proposed text.  TGba editor to make the changes shown in 11-19/0583r2 under all headings that include CID 2734. |
| 2808 | Yunsong Yang | 56.03 | First, the expression of "for the" is either incomplete or redundant. Secondly, it is incorrect to say that the identifier is selected from the table, because the table contains only the types of the identifiers. | Change the whole paragraph to read: "The ID field contains an identifier, which type is selected from Table 9-540b (Identifiers of WUR frames), based on the type of WUR frame (see 9.10.3 (Format of individual WUR frame types)). | Revised –  Agree in principle with the comment. Proposed resolution clarifies that the type if selected from the table and that the type of identifier depends on the type of WUR frame.  TGba editor to make the changes shown in 11-19/0583r2 under all headings that include CID 2808. |

**Discussion: *None.***

9.2.3 General frame format

**TGba Editor: *Change the paragraphs below of this subclause as follows (#CID 2033):***

The MAC frame format comprises a set of fields that occur in a fixed order in all frames. Figure 9-2 (MAC frame format) depicts the general MAC frame format for protocol version 0 (PV0) MPDUs, and Figure 9-956 (PV1 frame format) (in 9.8.2 (General PV1 frame format)) depicts the general MAC frame format for protocol version 1 (PV1) frames. The first 2 bits of the first subfield (Protocol Version) of the Frame Control Field and the last field (FCS) in Figure 9-2 (MAC frame format) are present in all PV0 MPDUs and PV1 MPDUs, including reserved types and subtypes. Figure 9-988a (WUR frame format) depicts the general MAC frame format for Wake-up Radio (WUR) frames.*(#2033)*

For PV0 MPDUs, the first three fields (Frame Control, Duration/ID, and Address 1) and the last field (FCS) in Figure 9-2 (MAC frame format) constitute the minimal frame format and are present in all these frames, including reserved types and subtypes. The fields Address 2, Address 3, Sequence Control, Address 4, QoS Control, HT Control, CMMG Control, and Frame Body are present only in certain frame types and subtypes. Each field is defined in 9.2.4 (Frame fields). For PV1 MPDUs, the fields constituting the minimal frame format are defined in 9.8 (MAC frame format for PV1 frames(11ah)).

The format of each of the individual subtypes of each frame type is defined in 9.3 (Format of individual frame types), the format of each PV1 frame type is defined in 9.8 (MAC frame format for PV1 frames(11ah)), and the format of NDP CMAC frames is defined in 9.9 (NDP CMAC frames(11ah)). The components of management frame bodies are defined in 9.4 (Management and Extension frame body components). The formats of Action frame bodies (PV0 and PV1) are defined in 9.6 (Action frame format details). The formats of WUR frames are defined in 9.10 (MAC frame format for Wake-up Radio (WUR) frames.*(#2033)*

The Frame Body field is of variable size, constrained as defined in 9.2.4.7.1 (General).

***Insert the following new subclause after the last subclause in clause 9:***

* Revmd 2.0 uses up to 9.9. 11ax D3.3 does not add new subclause. 11ay D2.2 does not add new subclause. 11az D0.6 does not add new subclause.
* MAC frame format for Wake-up Radio (WUR) frames
* General WUR frame format

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

* A *MAC header*, which comprises Frame Control, ID, and Type Dependent Control fields;
* A variable-length *frame body*, which, if present, contains information specific to the frame *type*;
* An *FCS*,which, depending on the Protected subfield in the Frame Control field, contains either a 16-bit CRC or a 16-bit MIC.
* General WUR frame format
* Revmd D2.0 uses up to Figure 9-988.

Figure 9-988a (WUR frame format) depicts the general MAC frame format for WUR frames.

**TGba Editor: *Change the figure below of this subclause as follows (#CID 2167):***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | MAC header | | |  |  |
|  | B0   B7 | B8  B19 | B20  B31 |  |  |
|  | Frame Control | ID | Type Dependent Control | Frame Body | FCS |
| Bits: | 8 | 12 | 12 | variable | 16 |
| * WUR frame format*(#2167)* | | | | | |

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

The Starting WUR Group ID field contains the starting WUR group ID (SGID) of the WUR Group ID Bitmap field if the WUR Group ID Bitmap Size field is set to a non-zero value. The Starting WUR Group ID field contains a single WUR group ID assigned by the WUR AP to the WUR non-AP STA if the WUR Group ID Bitmap Size field is set to 0. (#Ed)

The Dialog Token field is defined in 9.4.1.12 (Dialog Token field).

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

* MAC header
* Frame Control field

The format of the Frame Control field is illustrated in Figure 9-988b (Frame Control field format of WUR frame).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B0      B2 | B3 | B4 | B5           B7 |
|  | Type | Protected | Length Present | Length/Misc |
| Bits: | 3 | 1 | 1 | 3 |
| * Frame Control field format of WUR frame | | | | |

* Revmd D2.0 uses up to Table 9-540.

The Type subfield indicates the type of the WUR frame, as defined in Table 9-540a (WUR frame types).

|  |  |
| --- | --- |
| * WUR frame types | |
| Type | Type description |
| 0 | WUR Beacon |
| 1 | WUR Wake-up |
| 2 | WUR Vendor Specific |
| 3 | WUR Discovery |
| 4-7 | Reserved |

**TGba Editor: *Change the paragraphs below of this subclause as follows (#CID 2144):***

The Protected subfield indicates whether the information carried in the WUR frame has been processed by a message integrity check (MIC) algorithm. The Protected subfield is set to 1 if the WUR frame is protected utilizing the MIC algorithm as defined in 30.9 (Protected WUR frames); otherwise it is set to 0 to indicate that the WUR frame contains the 16-bit CRC as defined in 9.10.2.5.2 (Cyclic Redundancy Check (CRC) for WUR frames).*(#2144)*

The Length Present subfield indicates whether the Length/Misc subfield contains the Length subfield or not.

The Length/Misc subfield contains the Length subfield when the Length Present subfield is set to 1; otherwise it contains the Misc subfield.

The Length subfield indicates the length of the Frame Body field as defined in 9.10.2.4 (Frame Body field).

**TGba Editor: *Change the paragraphs below of this subclause as follows (#CID 2385):***

The Misc subfield is reserved in all FL WUR frames except for broadcast addressed WUR Wake-up frames. *(#2385)*

* ID field

**TGba Editor: *Change the paragraphs below of this subclause as follows (#CID 2386, 2733, 2808):***

The ID field contains an identifier for the WUR frame, which type is selected from Table 9-540b (Identifiers of WUR frames). The type of identifier depends on the type of WUR frame (see 9.10.3 (Format of individual WUR frame types)). *(#2386, 2733, 2808)*

|  |  |
| --- | --- |
| * Identifiers of WUR frames | |
| ID field | Identifier description |
| Transmitter ID | Identifier of the transmitting AP (see 30.4.2 (Transmitter ID)) |
| Nontransmitter ID | Identifier of the nontransmitted BSSID (see 30.4.5 (Nontransmitter ID)) |
| WUR Group ID | Identifier of a group of receiving WUR non-AP STAs (see 30.4.3 (WUR Group ID)) |
| WUR ID | Identifier of an individual receiving WUR non-AP STA (see 30.4.4 (WUR ID)) |
| OUI1 | The 12 LSBs of the OUI (see 9.4.1.31 (Organization Identifier field)) |

* Type Dependent Control field

The Type Dependent Control field contains control information that depends on the WUR frame type (see 9.10.3 (Format of individual WUR frame types)).

* Frame Body field

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

The length of the Frame Body field is in units of octets and is equal to 2 × (*L* + 1), where *L* is equal to the Length/Misc subfield in the Frame Control field. The minimum length of the Frame Body field is 2 octets, and the maximum length of the Frame Body field is 16 octets.

* Frame Check Sequence (FCS) field
* General

**TGba Editor: *Change the paragraphs below of this subclause as follows (#CID 2145):***

The FCS field contains a *TBD*-bit CRC. The FCS is calculated over all the fields of the Frame Control, Address, TD Control, Frame Body field (if present), and Embedded BSSID field (if present). These fields are referred to as the *calculation fields*.

NOTE—The Embedded BSSID field, if present, is part of the *calculation fields* but is not part of the fields of the WUR frame transmitted over the *WM*.

The Frame Body field is present in the *calculation fields* only when the WUR frame is a variable-length WUR frame (9.10.2.4 (Frame Body field)); otherwise, the Frame Body field is not present.

The Embedded BSSID field is present in the *calculation fields* only for WUR frames that are post-association WUR frames; otherwise the Embedded BSSID field is not present. The Embedded BSSID field, if present, is the last field of the *calculation fields*. The size and contents of the Embedded BSSID field is *TBD*.

The FCS is the 1s complement of the remainder generated by the modulo 2 division of the *calculation fields* by the polynomial *TBD*, where the shift-register state is preset to all 1s.

NOTE—The order of transmission of bits within the FCS field is defined in 9.2.2 (Conventions).

The *calculation fields* are processed in the order they would have been transmitted.

NOTE—The Embedded BSSID field, if present, is part of the *calculation fields* but is not part of the fields of the WUR frame transmitted over the *WM*.

A schematic of the processing is shown in Figure X (CRC-*TBD* implementation), where the SERIAL DATA INPUT consists of the *calculation fields (BL, BL-1…, B1, B0),* with *BL* being the most significant bit of the *calculation fields*.

NOTE – THE CRC in the FCS is one of the CRC-8, CRC-16, or CRC-32. Which of these ones is still *TBD*.The FCS field contains a 16-bit CRC when the Protected subfield in the Frame Control field is 0 and contains a 16-bit MIC when the Protected subfield in the Frame Control field is 1. The CRC is calculated as defined in 9.10.2.5.2 (Cyclic Redundancy Check (CRC) for WUR frames), and the MIC is calculated as defined in 30.9 (Protected WUR frames). *(#2145)*

* Cyclic Redundancy Check (CRC) for WUR frames

**TGba Editor: *Change the paragraphs below of this subclause as follows (#CID 2734):***

The CRC is calculated over the *calculation fields*, which include all the fields of the Frame Control, ID, Type Dependent Control, Frame Body field (if present in the WUR frame), and Embedded BSSID field (if present in the *calculation fields*).*(#2734)*

NOTE 1—The Embedded BSSID field, if present, is part of the *calculation fields* but is not part of the fields of the WUR frame transmitted over the *WM*.

NOTE 2—The Frame Body field is present in the *calculation fields* only when the WUR frame is a VL WUR frame (see 9.10.2.4 (Frame Body field)); otherwise, the Frame Body field is not present.

The Embedded BSSID field, if present, is the last field of the *calculation fields*. The Embedded BSSID field contains the 16 MSBs of the compressed BSSID, which is defined in 30.4.1 (General).

The Embedded BSSID field is present in the *calculation fields* of a WUR Beacon frame and of a WUR Wake-up frame. The Embedded BSSID field is not present in the *calculation fields* of a WUR Discovery frame. Whether the Embedded BSSID field is present or not in the *calculation fields* of a WUR Vendor Specific frame is vendor specific.

The CRC is the 1s complement of the remainder generated by the modulo 2 division of the *calculation fields* by the polynomial x16+x12+x5+1, where the shift-register state is preset to all 1s.

NOTE—The order of transmission of bits within the FCS field is defined in 9.2.2 (Conventions).

The *calculation fields* are processed in the order they would have been transmitted.

A schematic of the CRC processing is shown in Figure 9-988c (CRC-16 implementation for WUR frames), where the SERIAL DATA INPUT consists of the *calculation fields (BL, BL-1…, B1, B0),* with *BL* being the most significant bit of the *calculation fields*. The CRC computation and transmission is the same as the one depicted in Figure 16-3 (CRC-16 implementation).

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|  |
| * CRC-16 implementation for WUR frames |