IEEE P802.11
Wireless LANs

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| Comment resolutions for identifiers of WUR frames |
| 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 (8 CIDs):

* 2154, 2156, 2202, 2203, 2406, 2464, 2525, 2741

Revisions:

* Rev 0: Initial version of the document.

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** |
| 2154 | James Lepp | 64.05 | Add to the General section that a WUR non-AP STA in the WUR doze state maintains a list of multiple IDs to which it may wake up for including a WUR ID for unicast, a transmitter ID for broadcast and zero or more Group IDs for multicast. | Add to the General section that a WUR non-AP STA in the WUR doze state maintains a list of multiple IDs to which it may wake up for includeing a WUR ID for unicast, a transmitter ID for broadcast and zero or more Group IDs for multicast. | Revised –Agree in principle with the comment. Proposed resolution is to add a paragraph to cover the case of the WUR non-AP STA maintaining a list of IDs, upon reception of which the STA wakes up, inline with the suggestion of the commenter.TGba editor to make the changes shown in 11-19/0581r0 under all headings that include CID 2154. |
| 2156 | James Lepp | 64.18 | Add a note that for security and privacy the AP should assign identifiers randomly within the ID space and change them from time to time to make their values less predictable to attackers/trackers. | Note - For security and privacy, the WUR AP should set the identifiers in an manner that is not predictable based on past assignments. | Revised –Agree in principle with the comment. Proposed resolution adds the note as suggested and additionally adds the compressed BSSID as an optional field of the WUR Operation element so that the WUR AP can dynamically change the transmitter ID, nontransmitter IDs, and other IDs. Also please note that this solution is by no means a complete solution that provides guaranteed security and privacy since the PCR component of the AP and of the STAs rely on MAC addresses and AIDs that can be easily obtained from an attacker.TGba editor to make the changes shown in 11-19/0581r0 under all headings that include CID 2156. |
| 2202 | Joseph Levy | 64.06 | The setting of identifiers in the WUR frame is very unclear. There are 4 basic WUR frame types and each of these types contain the WUR ID field. The type of WUR ID depends on the WUR frame type, So which WUR IDs are used for which frame types needs to be defined clearly. These definitions is critical information belongs in clause 30.4.1 of the MAC clause. Add this information. | As in comment. | Revised –Agree in principle with the comment. Proposed resolution is to add a paragraph to cover the case of the WUR non-AP STA maintaining a list of IDs, and in which frames the IDs are used.TGba editor to make the changes shown in 11-19/0581r0 under all headings that include CID 2202. |
| 2203 | Joseph Levy | 64.14 | The compression of the BSSID seems to me to only be relative to the Transmitter ID - hence it should be moved there. | As in comment. | Revised –The compressed BSSID is used for both transmitted ID and embedded BSSID calculation. Proposed resolution is to move it in to a separate subclause, inline with other CID suggestion, and update the respective subclause references where it is cited.TGba editor to make the changes shown in 11-19/0581r0 under all headings that include CID 2203. |
| 2406 | Mark RISON |  | All this talk of "identifier's space" is just confusing | In 30.4.1 change "The ID field of WUR frames contains an identifier (ID) that is selected from the identifier's space, whichconsists of all integer values between 0 and 4095 (see 9.10.2.2 (ID field))." to "The ID field of WUR frames contains an identifier (ID) that is between 0 and 4095 (see 9.10.2.2 (ID field))." In 30.4.3 change "A WUR group ID identifies a group of one or more WUR non-AP STAs and is selected from a WUR groupID space which is a subset of consecutive values obtained from the identifier's space. A FL WUR Wake-upframe with WUR group ID in the ID field is defined as a group addressed WUR frame that is addressed to allthe WUR non-AP STAs identified by that WUR group ID. A VL WUR Wake-up frame with WUR group IDin the ID field is a group addressed WUR frame that is addressed to all the WUR non-AP STAs identified bythe WUR IDs included in the Frame Body field.The WUR AP shall randomly select the lowest WUR group ID of the WUR group ID space from theidentifier's space and shall ensure that none of the WUR group IDs coincide with any of the WUR IDs,transmitter ID, and nontransmitter IDs (if any). " to "A WUR group ID identifies a group of one or more WUR non-AP STAs. A FL WUR Wake-upframe with WUR group ID in the ID field is defined as a group addressed WUR frame that is addressed to allthe WUR non-AP STAs identified by that WUR group ID. A VL WUR Wake-up frame with WUR group IDin the ID field is a group addressed WUR frame that is addressed to all the WUR non-AP STAs identified bythe WUR IDs included in the Frame Body field.The WUR AP shall randomly select an identifier between 0 and 4095 and shall ensure that none of the WUR group IDs coincide with any of the WUR IDs,transmitter ID, and nontransmitter IDs (if any). " In 30.4.4 change " The WUR AP shall either select the WUR ID randomly from theidentifier's space" to " The WUR AP shall either select a WUR ID between 0 and 4095" | Rejected –The comment fails to identify a technical issue. It is unclear at this point what is confusing about the terminology “identifier’s space”. Please note that this terminology is widely used in the baseline in multiple other instances that are related to addressing: “Each IEEE 802.11 PHY operates in a single medium—the WM. The IEEE 802.11 MAC operates in a single address space. MAC addresses are used on the WM in the IEEE 802.11 architecture. Therefore, it is unnecessary for the standard to explicitly specify that its addresses are “WM addresses.” This is assumed throughout this standard.IEEE Std 802.11 has chosen to use the IEEE 802 48-bit address space (see 9.2.4.3.2 (Address representation)). Thus IEEE 802.11 addresses are compatible with the address space used by the IEEE 802 LAN family.” |
| 2464 | Minyoung Park | 64.13 | Although the compressed BSSID is referenced by many other subclauses the definition of the compressed BSSID is hidden in the 30.4.1 General subclause. It would be better to add a separate subclause heading for the compressed BSSID. | Insert a new subclause heading for the compressed BSSID after 30.4.1 as follows "30.4.2 Compressed BSSID". | Revised –Agree in principle with the comment. Added as a separate subclause and updated the cases where it is used by updating the respective reference.TGba editor to make the changes shown in 11-19/0581r0 under all headings that include CID 2464. |
| 2525 | Po-Kai Huang | 64.13 | Is the compressed BSSID calculated over transmitted BSSID or nontransmitted BSSID if dot11MultiBSSIDImplemented is true? I believe that the intention is to say transmitted BSSID because only BSS with transmitted BSSID transmits beacon. Propose change to clarify this point. | change "The compressed BSSID is equal to the 32-bit CRC calculated over the BSSID contained in Beacon frames transmitted by the WUR AP" to "The compressed BSSID is equal to the 32-bit CRC calculated over the BSSID contained in Beacon frames transmitted by the WUR AP if dot11MultiBSSIDImplemented is false, and the compressed BSSID is equal to the 32-bit CRC calculated over the BSSID contained in Beacon frames transmitted by the AP with transmitted BSSID of the multiple BSSID set where the WUR AP is a member if dot11MultiBSSIDImplemented is true" | Revised –Agree in principle with the comment. Proposed resolution accounts for the suggested changes, although with a slight deviation in terms of the wording used and removal of Note 1 which is essentially saying the same thing.TGba editor to make the changes shown in 11-19/0581r0 under all headings that include CID 2525. |
| 2741 | Xiaofei Wang | 64.13 | This paragraph seems to be out of place. 30.4.1. doesn't seem to directly discuss compressed BSSID before. Maybe it is better to move it to 30.4.2 where compressed BSSID is said to be used for transmitter ID. | as in comment. | Revised –Agree in principle with the comment. Added as a separate subclause, inline with suggestions from CID 2464, and updated the cases where it is used by updating the respective reference.TGba editor to make the changes shown in 11-19/0581r0 under all headings that include CID 2741. |

**Discussion: *None.***

* Setting the identifiers of WUR frames
* General

**TGba Editor: *Change the paragraphs below as follows (#CID 2154, 2464, 2741, 2525, 2203, 2202, 2516):***

The ID field of WUR frames contains an identifier (ID) that is selected from the identifier’s space, which consists of all integer values between 0 and 4095 (see 9.10.2.2 (ID field)).

A WUR AP ensures that each identifier is either a transmitter ID (see 30.4.2 (Transmitter ID)), a WUR group ID (see 30.4.3 (WUR Group ID)), a WUR ID (see 30.4.4 (WUR ID)), a nontransmitter ID (see 30.4.5 (Nontransmitter ID)) or a portion of the OUI (see 9.10.3.4 (WUR Vendor Specific frame format)). (#789, #97, #496, #620)

NOTE—A WUR AP might dynamically change the identifiers used within the WUR BSS sporadically and randomly to provide a certain degree of security and privacy.*(#2516)*

A WUR non-AP STA maintains a list of multiple IDs and may wake up upon receiving a WUR frame that contains any of these IDs. The list of IDs maintained by the STA includes:

* A WUR ID for individually addressed FL WUR Wake-up frames,
* A transmitter ID for WUR Beacon, WUR Discovery frames, and for broadcast addressed WUR Wake-up frames sent by the transmitting BSSID
* A nontransmitter ID for broadcast addressed WUR Wake up frames sent by the nontransmitting BSSID
* A list of the 12 LSBs of one or more OUIs for WUR Vendor Specific frames,
* A list of group IDs for group addressed FL WUR frames and for VL WUR Wake-up frames.*(#2154, 2202)*

30.4.1a Compressed BSSID*(#2464, 2741, 2203, 2156)*

The compressed BSSID is used by a WUR STA to obtain several of the identifiers defined in the remaining subclauses.

A WUR AP shall include the Compressed BSSID field in WUR Operation elements it transmits if the AP intends to use for the WUR BSS a compressed BSSID that is different from the compressed BSSID obtained from the BSSID of Beacon frames transmitted by the AP.

If the Compressed BSSID field is present in the most recently received WUR Operation element, then the compressed BSSID is equal to the Compressed BSSID field of the WUR Operation element. Otherwise the compressed BSSID is equal to the 32-bit CRC calculated over the BSSID contained in Beacon frames transmitted by the WUR AP if dot11MultiBSSIDImplemented is false and calculated over the transmitted BSSID of the multiple BSSID set (see 11.1.1.3.8 (Multiple BSSID procedure) when dot11MultiBSSIDImplemented is true (calculation is performed as defined in 9.2.4.8 (FCS field) where the BSSID is the *calculation fields*).*(#2525, 2516)*

 *(#2525, 2516)* 9.10.2.5.2 Cyclic Redundancy Check (CRC) for WUR frames

**TGba Editor: *Change the paragraphs below of this subclause as follows (#CID 2464, 2741, 2203):***

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 30.4.1a (Compressed BSSID).*(#2464, 2741, 2203)*

9.10.3.3 WUR Discovery frame format

**TGba Editor: *Change the paragraphs below of this subclause as follows (#CID 2464, 2741, 2203):***

The Type Dependent Control field is set to 12 MSBs of the compressed BSSID (see 30.4.1a (Compressed BSSID)).*(#2464, 2741, 2203)*

* WUR Operation element

**TGba Editor: *Change the paragraphs and the figures below of this subclause as follows (#CID2156):***

The WUR Operation element contains the set of parameters necessary to support the WUR operation. The format of the WUR Operation element is defined in Figure 9-772d (WUR Operation element format).

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|  | Element ID | Length | Element ID Extension | WUR Operation Parameters | Compressed BSSID |
| Octets: | 1 | 1 | 1 | 10 | 0 or 4 |
| * WUR Operation element format*(#2156)*
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The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1 (General).

The format of the WUR Operation Parameters field is defined in 9-772e (WUR Operation Parameters(#2446)).

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|  | B0        B7 | B8          B23 | B24   B31 | B32 B39 | B40 B55 | B56  B71 | B72 B75 | B76 | B77 | B78 B79 |
|  | Minimum Wake-up Duration | Duty Cycle Period Units | WUR Operating Class | WUR Channel | WUR Beacon Period | Offset of **Offset of Target Wake-up radio Beacon Transmission Time (TWBTT)**TWBTT | Counter | Common IPN | Compressed BSSID Present | Reserved |
| Bits: | 8 | 16 | 8 | 8 | 16 | 16 | 4 | 1 | 1 | 2 |

* WUR Operation Parameters*(#2156)*

The Minimum Wake-up Duration subfield indicates the minimum on duration of the WUR duty cycle operation (see 30.6 (WUR duty cycle operation)) in units of 256 µs.

The Duty Cycle Period Units subfield indicates the basic unit of the period of the WUR duty cycle operation (see 30.6 (WUR duty cycle operation)) in the unit of 4 µs.

The granularity of the Duty Cycle Period Units field is 4 .

The WUR Operating Class subfield indicates the operating class values as defined in Annex E in use for transmission of WUR Beacon frames from the WUR AP to the WUR non-AP STA. The operating class is interpreted in the context of the country specified in the Beacon frame. The encoding is the same as the definition of Operating Class field in 9.4.1.22 (Operating Class and Channel field).

The WUR Channel subfield indicates a channel number, which is interpreted in the context of the indicated operating class as defined in Annex E in use for transmission of WUR Beacon frames from the WUR AP to the WUR non-AP STA. The encoding is the same as the definition of Channel field in 9.4.1.22 (Operating Class and Channel field).

The WUR Beacon Period subfield represents the number of time units (TUs) between consecutive target WUR beacon transmission times (TWBTTs) (see 30.5.2 (WUR Beacon generation)).

The Offset of TWBTT subfield indicates the time difference between the TWBTT with the smallest TSF time in units of TU and TSF 0 (see 30.5.2 (WUR Beacon generation)).

The Counter subfield indicates the current value of the Counter subfield included in the broadcast WUR Wake-up frames (see 30.4.2 (Transmitter ID)).

The Common IPN subfield indicates if a common IPN is used for all protected WUR frames generated within the BSS. The Common IPN subfield is set to 1 to indicate that the IPN is common for all protected WUR frames and is set to 0 to indicate that the IPN is separate for protected WUR frames addressed to different receivers (see 30.9.3 (Generation and construction of IPN for WUR frames)).

The Compressed BSSID Present subfield indicates the presence of the Compressed BSSID field. The Compressed BSSID Present subfield is set to 1 if the Compressed BSSID is present; otherwise it is set to 0.

The Compressed BSSID field, if present, contains a compressed BSSID for the WUR BSS.*(#2156)*