IEEE P802.11
Wireless LANs

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| Resolution for CIDs related to beacon optimization |
| Date: April 1, 2025 |
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 Abstract

This submission proposes resolutions for the following CIDs received for TGbn D0.1 CC:

3338, 3843

**Revisions:**

* Rev 0: Initial version of the document.

***TGbn editor: Baseline for this document is 11bn D0.1 and REVme D7.0***

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

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

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| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Clause** | **Page.line** | **Comment** | **Proposed Change** | **Resolution** |
| 3338 | Ahmadreza Hedayat | 37 | 67.05 | To avoid worsening the issue of Beacon bloat, it's wise to avoid adding UHR IEs to Beacon, and instead let non-AP STAs to obtain them during association. Define rules for UHR APs and non-AP STAs accordingly. | As in comment | **Revised**Agree with the comment. As mentioned by the comment, beacon length has reached critical threshold causing interop issues with legacy devices. The proposed resolution disallows inclusion of static parameters defined by UHR (i.e., UHR Capabilities element) and proposes to include a ‘restricted’ UHR Operation element (i.e., does not include parameters). The UHR Capabilities element is carried in Probe and (Re)Association Response frames.**TGbn editor, please make changes as proposed in this document.** |
| 3843 | Abhishek Patil | 9.3.3.2 | 55.45 | Beacon bloat is an industry wide problem. A large Beacon frame occupies more medium time and in some cases creates legacy interop issues. UHR must provide mechanisms to address beacon bloating. For example, consider not including static and semi-static parameters (such as UHR Capabilities etc) in the Beacon frame. | The commenter will bring a contribution | **Revised**Agree with the comment. As mentioned by the comment, beacon length has reached critical threshold causing interop issues with legacy devices. The proposed resolution disallows inclusion of static parameters defined by UHR (i.e., UHR Capabilities element) and proposes to include a ‘restricted’ UHR Operation element (i.e., does not include parameters). The UHR Capabilities element is carried in Probe and (Re)Association Response frames.**TGbn editor, please make changes as proposed in this document.** |

* **Elements**
* **General**

***TGbn editor: Please insert the following entry to Table 9-130 (Element IDs) (not all lines shown):***

|  |
| --- |
| **Table 9-130 – Element IDs** |
| **Element** | **Element ID** | **Element ID Extension** | **Extensible** | **Fragmentable** |
| UHR Configurations (see 9.4.2.aax (UHR Configurations element) | 255 | <ANA> | Yes | Yes |

* **(PV0) Management frames**
* **Beacon frame format**

***TGbn editor: Please delete the Editor’s Note from this subclause.***

* ***It is a placeholder subclause***

***TGbn editor: Please insert the following entry to Table 9-62 (Beacon frame body) (not all lines shown) in numeric order:***

|  |
| --- |
| **Table 9-62 – Beacon frame body** |
| **Order** | **Information** | **Notes** |
| <Lastassigned + 1> | UHR Operation | The UHR Operation element is present if dot11UHROptionImplemented is true; otherwise, it is not present. |
| <Lastassigned + 2> | UHR Configurations | The UHR Configurations element is present if dot11UHROptionImplemented is true; otherwise, it is not present. |

* **Association Response frame format**

***TGbn editor: Please insert the following entry to Table 9-65 (Association Response frame body) (not all lines shown) in numeric order:***

|  |
| --- |
| **Table 9-65 – Association Response frame body** |
| **Order** | **Information** | **Notes** |
| <Lastassigned + 1> | UHR Configurations | The UHR Configurations element is present if dot11UHROptionImplemented is true; otherwise, it is not present. |

* **Reassociation Response frame format**

***TGbn editor: Please insert the following entry to Table 9-67 (Reassociation Response frame body) (not all lines shown) in numeric order:***

|  |
| --- |
| **Table 9-67 – Reassociation Response frame body** |
| **Order** | **Information** | **Notes** |
| <Lastassigned + 1> | UHR Configurations | The UHR Configurations element is present if dot11UHROptionImplemented is true; otherwise, it is not present. |

* **Probe Response frame format**

***TGbn editor: Please insert the following entry to Table 9-69 (Probe Response frame body) (not all lines shown) in numeric order:***

|  |
| --- |
| **Table 9-69 – Probe Response frame body** |
| **Order** | **Information** | **Notes** |
| <Lastassigned + 1> | UHR Configurations | The UHR Configurations element is present if dot11UHROptionImplemented is true; otherwise, it is not present. |

* **UHR Operation Element**

The operation of UHR STAs in a UHR BSS is controlled by the following:

* The HT Operation element, HE Operation element, EHT Operation element, and UHR Operation element if operating in the 2.4 GHz band
* The HT Operation element, VHT Operation element (if present), HE Operation element, EHT Operation element, and UHR Operation element if operating in the 5 GHz band
* The HE Operation element, EHT Operation element and UHR Operation element if operating in the 6 GHz band

The UHR Operation element provides an indication of the operational parameters for the AP transmitting the element. If the AP corresponding to the transmitted BSSID in a multiple BSSID set, then the indicated parameters also apply to APs corresponding to the nontransmitted BSSID in the same set.

The format of the UHR Operation element is shown in Figure 9-aa1 (UHR Operation element format).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Element ID | Length | Element ID Extension | Basic UHR-MCS And NSS Set | UHR Operation Bitmap |  | UHR Operation Parameters |  |
| Octets: | 1 | 1 | 1 | TBD | TBD |  | TBD |  |
|  | * **UHR Operation element format**
 |

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1 (General).

The format of the UHR Operation Bitmap field is shown in Figure 9-aa2 (UHR Operation Bitmap field format).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | B0 | B1 | B2 B7 |  |   |  |
|  | DPS Enabled | NPCA Operation Enabled | Reserved |  |  |  |
| Bits: | 1 | 1 | 6 |  |  |  |
| * **UHR Operation Bitmap field format**
 |

The DPS Enabled field is set to 1 if the AP sending a frame containing the UHR Operation element is a mobile AP (TBD for non-mobile AP) and dynamic power save (DPS) is enabled at the AP and set to 0 otherwise.

The NPCA Operation Enabled field is set to 1 to indicate that NPCA operation is enabled at the AP transmitting this field; Otherwise, the NPCA Operation Enabled field is set to 0.

The format of the UHR Operation Parameter field is shown in Figure 9-aa2 (UHR Operation Parameters field format).

|  |  |  |
| --- | --- | --- |
|  | DPS Operation Parameters field | NPCA Operation Information field |
| Octet: | 2 | TBD |
| **Figure 9-aa3 – UHR Operation Parameters field format** |

The DPS Operation Parameters field contains parameters for dynamic power save operation as defined in 9.4.1.85 (DPS Operation Parameters field). The DPS Operation Parameters field is present if the DPS Enabled field is 1 and the frame carrying the UHR Operation element is not a Beacon frame; Otherwise, the DPS Operation Parameters field is not present.

The format of the NPCA Operation Parameters field is defined in Figure 9-aa4 (NPCA Operation Parameters field format). The NPCA Operation Parameters field is present if NPCA Operation Enabled field is 1 and the frame carrying the UHR Operation element is not a Beacon frame; Otherwise, the NPCA Operation Parameters field is not present.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B0 B7 | B8 Bx | Bx+1 Bx+6 | Bx+7 Bx+12 |
|  | NPCA Primary Channel | NPCA Minimum Duration Threshold | NPCA Switching Delay | NPCA Switch Back Delay |
| Bits: | 8 | TBD | 6 | 6 |
| **Figure 9-aa4 – NPCA Operation Parameters** **field format** |

The NPCA Primary Channel field indicates the channel number of a channel within the BSS bandwidth that corresponds to the channel that the NPCA AP and its associated NPCA non-AP STAs switch to in order to perform NPCA operation, as described in 37.11 (Non-primary channel access (NPCA)).

The NPCA Minimum Duration Threshold field indicates the minimum duration of inter-BSS activity (inter-BSS PPDU or inter-BSS TXOP) that is required to have been indicated on the primary channel of the BSS as a necessary condition to permit an NPCA STA to switch to the NPCA primary channel to perform NPCA operation. The encoding and the maximum value of this field are TBD.

The NPCA Switching Delay field indicates the time needed by an NPCA STA to switch from the BSS primary channel to the NPCA primary channel in units of 4 µs.

The NPCA Switch Back Delay field indicates the time needed by an NPCA STA to switch from the NPCA primary channel to the BSS primary channel in units of 4 µs.

***TGbn editor: Please insert a new subclause after 9.4.2.aa3 (MAPC element) as shown below:***

**9.4.2.aax UHR Configuration Element**

The UHR Configuration element provides an indication of the configuration at the AP transmitting this element. It consists of a bitmap that indicates which features are currently enabled at the AP and based on the frame carrying the element, it also provides (when applicable) the parameters for each of the enabled features.

The format of the UHR Configuration element is shown in Figure 9-ab1 (UHR Configuration element format).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Element ID | Length | Element ID Extension | UHR Configuration Bitmap | UHR Configuration Parameters |
| Octets: | 1 | 1 | 1 | TBD | TBD |

**Figure 9-ab1 – UHR Configuration element format**

The Element ID, Length, and Element ID Extension fields are defined in 9.4.2.1 (General).

The format of the UHR Configuration field is shown in Figure 9-ab2 (UHR Configuration Bitmap field format).

|  |  |  |
| --- | --- | --- |
|  | B0 | B1 B7 |
|  | P-EDCA Enabled | Reserved |
| Bits: | 1 | 7 |
| **Figure 9-ab2 – UHR Configuration Bitmap field format** |

The P-EDCA Enabled field is set to 1 to indicate that P-EDCA operation is enabled for the BSS of the AP transmitting this field; Otherwise, the P-EDCA Enabled field is set to 0.

The format of the UHR Configuration Parameter field is shown in Figure 9-ab3 (UHR Configuration Parameters field format).

|  |  |  |
| --- | --- | --- |
|  | P-EDCA Parameters field | Reserved |
| Octet: | TBD | TBD |
| **Figure 9-ab3 – UHR Configuration Parameters field format** |

The P-EDCA Parameters field is present if P-EDCA Enabled field is 1 and the frame carrying the UHR Configuration element is not a Beacon frame; Otherwise, the P-EDCA Parameters field is not present.

* **Active scanning procedure for a non-DMG STA**

***TGbn editor: Please update the second paragraph in this subclause as shown below:***

For each channel to be scanned:

* Wait until the ProbeDelay time has expired or a PHY‑RXSTART.indication primitive has been received.
* If the STA is a FILS STA, a UHR STA or a 6 GHz HE STA, set the FILSProbeTimer to 0 and starts the FILSProbeTimer. While the FILSProbeTimer is less than dot11FILSProbeDelay, the STA may skip a Probe Request frame transmission and proceed to step g) after setting the ActiveScanningTimer to 0 and starting the ActiveScanningTimer, if one of the following conditions matches:
* The STA receives a broadcast Probe Request frame that the SME considers to be suitable to discover a candidate AP for association.
* The STA receives one or more of Probe Response, Beacon, Measurement Pilot, or FILS Discovery frame that identify an AP that the SME considers a suitable candidate for association.
* The STA successfully sent a Probe Request frame by following the UORA procedure as defined in 26.5.4 (UL OFDMA-based random access (UORA))).
* **Criteria for sending a response**

***TGbn editor: Please update the following paragraphs in this subclause as shown below:***

If a FILS STA, that is a non-UHR STA, receives one or more Probe Request frame(s) and the STA has dot11FILSOmitReplicateProbeResponses equal to true, then the responding STA shall respond, subject to the criteria above, via the next Beacon frame, a broadcast Probe Response frame, or one or more individually addressed Probe Response frames.

The FILS STA, that is a non-UHR STA, shall respond with the next Beacon frame, as described in 11.1.3 (Maintaining synchronization), to Probe Request frames addressed to individual or broadcast address if all of the following conditions are met:

* The STA is queuing a Beacon frame for transmission;
* The next TBTT of the responding STA is within dot11FILSBeaconResponseWindow;
* The next TBTT is no later than any deadline of Max Channel Time indicated in the FILS Request Parameter element of the Probe Request frame(s), if present; and
* The Beacon frame contains all elements requested by the Request element.

If the next Beacon frame is not used as a response, a Probe Response frame is transmitted. The Probe Response frame shall be addressed to the broadcast or the address of the transmitter of the Probe Request frame if the Probe Request is received from a non-UHR STA or if the transmitter of the Probe Response is a non-UHR STA. If the Probe Request is transmitted by a UHR STA and the responder is a UHR STA, then the responding UHR STA shall set the address of the Probe Response frame to broadcast address. The Probe Response frame may be transmitted to all or some of the Probe Request frames received from FILS STAs. A first FILS STA may choose not to respond to Probe Request frames from a second FILS STA addressed to the broadcast address if the first STA receives an acknowledged Probe Response frame addressed to the second STA containing the SSID of the first STA’s BSS. A non-S1G AP shall remain in the awake state, and shall respond to Probe Request frames, subject to the criteria above.

NOTE – A responding UHR STA determines the transmitter of a received Probe Request frame as a UHR STA based on the presence of the UHR Capabilities element in the request frame.