IEEE P802.11
Wireless LANs

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| Resolution for CID 11002 |
| Date: May 1, 2018 |
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 Abstract

This submission proposes resolutions for CID 11002 received for TGax LB230

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Updated based on feedback received when the doc was presented during ad-hoc (1/11/18)
	+ Removed the proposed entries for ‘Restricted RU’ in RU Allocation table
	+ Defined a new 1-bit subfield in Figure 9-25i to signal that the RU is a restricted RU
	+ Added corresponding description text and updated references
	+ Revised text to clarify that the power headroom is with respect to a particular MCS assigned by the AP for that RU (also made reference to equation 27-1).
* Rev 2: Revised based on feedback from Al Patrick
	+ Changed text to ‘aid STAs having a weak link condition to the AP’ to be consistent with baseline (‘link condition’).
* Rev 3: Offline discussions could not converge on a single solution. Therefore, 4-options are presented for TGax members to select.
* Rev 4: Updated based on offline feedback
	+ For option 3: Added ‘No Restriction’ as a choice for Power Headroom Limit subfield value = 3
	+ Revised text for option 4 to minimize spec text changes/additions
		- Single field to indicate ‘No Restriction’ and possible headroom limit values
	+ Updated field names and text referring to ‘random access RU’ to RA-RU to align with the changes proposed (and approved) in docs: 11-18/0065r3 and 11-17/1849r3
* Rev 5: added option 5 based on offline feedback
	+ The new option is a hybrid of option 2 and option 4
* Rev 6: consolidated to one option based on preference expressed by several folks during offline discussion.
* Rev 7: Text revised to match D2.2 + few editorial changes + new text in Table 9-25i
* Rev 8: Some content in 27 applies to a new section which was approved in doc 11-18/0360r3
* Rev 9: Revised to match D2.3

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

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

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

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| **CID** | **Commenter** | **Pg / Ln** | **Section** | **Comment** | **Proposed Change** | **Resolution** |
| 11002 | Abhishek Patil | 85.10 | 9.3.1.23 | Random access procedure is broken as it provides an unfair advantage to certain STAs. For instance, a STA having a strong transmit power to the AP is better positioned to successfully deliver its frames to the AP than the one with a weaker link. | As in comment | RevisedAgree with the comment. One of the key motivations behind random access feature was to help UL limited STAs close the link with the AP. However, the current spec provides no mechanism to enable this behavior. As a result, STAs near to the AP and having a stronger link with the AP and are permitted to use random access RUs. This provides an unfair advantage to such STAs as they have SU, targeted RU and RA-RU mechanism available to send UL to the AP. This compared to a far off STA that is unable to close the link with the AP and TB access is the only way for such STAs to close the link with the AP. An AP should have the ability to regulate the availability (or eligibility) of the random access RUs based on the composition of its BSS. This contribution provides a mechanism for AP to prioritize random access RUs. The proposal requires that STAs are allowed to use random access RU only if they can meet the Target RSSI specified for the RU the specified MCS while staying within a certain power headroom. STAs closer to the AP (i.e., with stronger signal) would not be able to meet this requirement as they would have to reduce their TxPower beyond the specified power headroom threshold. **TGax editor, please make changes as suggested in doc 11-17-1860r9.** |

**Discussion:**

One of the main motivations for OFDMA Random Access was to allow STAs that are far away from the AP and cannot send SU packets to the AP to be able to close the link with the AP. However, the current spec (11ax D2.0) doesn’t have any rules for OFDMA random access that favor this behavior. The spec allows STAs that are near to the AP to use random access. Therefore, such STAs have an unfair advantage in gaining access to the medium (i.e., they can use SU as well as random access to send frames to the AP) and their use of random RUs is detrimental to the usage of the same RUs by UL-limited STAs that have random-access RUs as the only means to communicate with the AP. Since AP has global knowledge of its BSS, there is a clear need for the AP to better configure its UORA parameters to enable UL limited STAs to access the resources. This proposal provides the necessary tools for an AP to regulate access to one or more random access RU(s) so that the RU(s) are available to the most deserving STAs.

Reference: <https://mentor.ieee.org/802.11/dcn/15/11-15-0875-01-00ax-random-access-with-trigger-frames-using-ofdma.pptx>

From slide #11:

* **OFDMA supports more flexibility on packet transmission:**
	+ Closing the link with significant asymmetry (>=10dB) in transmit power between AP and STAs located far away
	+ STAs use the Trigger frame allowing random access (TF-R) for UL transmissions on narrow bandwidth
* Trigger frame format

TGax Editor: Please update Figure 9-52i and add a new paragraph after the figure as shown below:

|  |  |  |  |
| --- | --- | --- | --- |
|  | B26 | B27 B30 | B31 |
|  | Restricted RA-RU | Number Of RA-RU | No Further RA RU |
| Bits: | 1 | 4 | 1 |
| * **SS Allocation/RA-RU Information subfield format (AID12 subfield is 0 or 2045)**
 |

The Restricted RA-RU is set to 1 to indicate if the RA-RU is regulated to assist STAs having a weak link condition to the AP. A value of 1 in this subfield indicates that a STA receiving the Trigger frame is permitted to use this RA-RU only if it can meet the Target RSSI requirement for the assigned MCS (as defined in equation 27-1) with UPH less than or equal to the value specified in the UORA UPH Limit field carried in the UORA Parameter Set element. The Restricted RA-RU subfield is set to 0 if the RA-RU is unregulated.

TGax Editor: Please update Table 9-25i as shown below:

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| --- |
| * Target RSSI subfield encoding
 |
| Target RSSI subfield | Description |
| 0–90 | Values 0 to 90 map to 110 dBm(#5059) to 20 dBm |
| 91–126 | Reserved |
| 127 | Indicates to the STA to transmit an HE TB PPDU response at its maximum transmit power for the assigned MCS. Reserved when User Info corresponds to RA-RU and Restricted RA-RU subfield is set to 1. |

* **UL OFDMA-based Random Access (UORA) Parameter Set element**

TGax Editor: Please make the following changes to Figure 9-589cs:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
|  | Element ID | Length | Element ID Extension | OCW Range | UORA UPH Limit |
| Octets: | 1 | 1 | 1 | 1 | 1 |
| **Figure 9-589ct – UORA Parameter Set element format** |

TGax Editor: Please add the following new paragraph and table at the end of this section:

UORA UPH Limit field carries the UPH threshold value. An RA-RU with Restricted RA-RU subfield set to 1 is considered as an eligible RA-RU by a non-AP STA only if the STA can meet the Target RSSI requirement for the assigned MCS (as defined in equation 27-1) without exceeding this UPH threshold. Table 9-262add (Encoding of UORA UPH Limit field) shows the encoding for UORA UPH Limit field.

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| Table 9-262add – Encoding of UORA UPH Limit field |
| Field value | Encoding |
| 0 – 25 | Values 0 to 25 map to 5 dB to 30 dB |
| 26 – 255 | Reserved |

* General

TGax Editor: Please modify the 8th paragraph in section 27.5.5.1 as follows:

An HE STA shall maintain an internal OCW and an internal OBO counter. OCW is an integer in the range *OCWmin* to *OCWmax*. A non-AP HE STA shall obtain UORA UPH limit, *OCWmin* and *OCWmax* from the most recently received UORA Parameter Set element carried in the Management frames transmitted by its associated AP. A non-AP STA with dot11MultiBSSIDActivated set to true and associated with a nontransmitting BSSID shall inherit the values from the UORA Parameter Set element when advertised by the transmitted BSSID if the element is not carried in the Nontransmitted BSSID Profile subelement for that BSSID.

* **Eligibility of RA-RUs**

TGax Editor: Please add following two paragraphs at the end of section 27.5.5.2:

An HE AP may include one or more regulated RA-RU(s) to assist STAs having a weak link condition to the AP. The AP shall designate an RA-RU as regulated by setting the Restricted RA-RU subfield for that RU to 1. The AP shall advertise a UORA UPH limit in the UORA Parameter set element that it transmits to provide a power headroom limit for regulating the eligibility of a restricted RA-RU.

A non-AP HE STA shall consider an RA-RU as regulated if the Restricted RA-RU subfield for that RU is set to 1. A non-AP STA shall consider a restricted RA-RU as eligible RA-RU only if it can satisfy the Target RSSI requirement for the assigned MCS (as defined in equation 27-1) without exceeding the UORA UPH limit specified in the UORA Parameter Set element.