IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CIDs related to Random Access – Part 2 | | | | |
| Date: February 22, 2018 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Abhishek Patil | Qualcomm Inc. |  |  | appatil@qti.qualcomm.com |
| Alfred Asterjadhi | Qualcomm Inc. |  |  | aasterja@qti.qualcomm.com |
| George Cherian | Qualcomm Inc. |  |  | gcherian@qti.qualcomm.com |

Abstract

This submission proposes resolutions for following CID received for TGax LB230 (4):

13651, 11034, 13097, 13197

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Revised (changes w.r.t r0 highlighted) based on feedback from Stephane/Patrice

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.***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Pg / Ln** | **Section** | **Comment** | **Proposed Change** | **Resolution** |
| 13651 | Tomoko Adachi | 258.05 | 27.5.5.1 | "An unassociated HE STA shall initialize the range of OFDMA contention window (OCW) upon reception of the UORA Parameter Set element from the intended HE AP." In this subclause, only unassociated STAs' behaviour to set the OCW is described, but not for associated STAs.  And sorry, I remember I insisted that default parameters may be used when a STA missed the latest element, but reading the 8th para in 27.5.5.1, it just says the most recently received element at the non-AP STA and doesn't care whether the STA missed the real latest one. So, that case is already taken care there. | Remove the following second para in 27.5.5.2: "An HE STA shall maintain an internal OFDMA contention window (OCW) and an internal OBO counter. OCW is an integer in the range [OCWmin, OCWmax]."  Change the 8th and 9th para in 27.5.5.1 as follows: "\*An HE STA shall maintain an internal OFDMA contention window (OCW) and an internal OFDMA random access backoff (OBO) counter. The OCW is an integer in the range [OCWmin, OCWmax].\*  An \*associated\* HE STA shall obtain OCWmin and OCWmax from the most recently received UORA Parameter Set element (see 9.4.2.239 (UL OFDMA-based Random Access (UORA) Parameter Set element)) carried in the management \*frame\* transmitted by its associated AP \*and select the OCW from the latest OCWmin and OCWmax\*. A non-AP STA with dot11MultiBSSIDActivated set to true and associated with a nontransmitting BSSID may inherit the OCW Range values from the UORA Parameter Set element advertised by the transmitted BSSID if the element is not carried in the Nontransmitted BSSID Profile subelement for that BSSID.  An unassociated HE STA shall initialize the range of \*OCW\* upon reception of the UORA Parameter Set element from the intended HE AP. If the \*unassociated\* HE STA has not received UORA Parameter Set element from the AP it wishes to communicate with, it shall use the default value OCWmin = 7 and OCWmax = 31 to be used upon reception of a Trigger frame containing RU with an AID12 subfield equal to \*2045\*. Each time an unassociated HE STA communicates with a different AP using random access\*,\* it shall initiate its \*OBO\* based on the default values or based on the parameters from the received UORA Parameter Set element for that AP." | Revised  Agree in principle.  There was an ambiguity in D2.0 as to whether the default UORA parameter apply only to unassociated STAs. The inconsistency was fixed in D2.2. The rest of the comment makes sense and the text was reorganized as suggested.  **TGax editor, please make changes as showing doc 11-18/0360r1** |
| 11034 | Abhishek Patil | 259.24 | 27.5.5.2 | The first sentence in this paragraph can be deleted. The language needs to be normative. A note or a sentence may be helpful to clarify reference to 'all User Info fields' - i.e., An AP is allowed to include one or more User Info field corresponding to the same AID12 value for random access (0 or 2045). | As in comment | Revised  Agree with the comment.  Removed duplicate text and updated the language to be normative text.  The text is rewritten to clarify that an AP is allowed to advertise a set of contiguous RA-RUs and the total is a the value in Number Of RA-RUs subfield plus 1.  **TGax editor, please make changes as showing doc 11-18/0360r1** |
| 13097 | Patrice Nezou | 259.24 | 27.5.5.2 | "A non-AP HE STA can determine the number of eligible random access RUs based on the SS Allocation/Random Access RU Information subfield belonging to all the User Info fields corresponding to eligible random access RUs. A non-AP HE STA can determine the number of eligible random access RUs by adding the values of the Random Access RU Number subfields plus one belonging to all the User Info fields corresponding to eligible random access RUs."  You can not say "can" because all non-AP STAs shall compute the number of eligible random access RUs in tha same way. | Replace "can" with a "shall" . Moreover define multiple contiguous random access Rus is not appropriate because of possible low signal strength level at the reception side. Use multiple random access Rus with the same properties reduce the global efficiency. So please remove the possibility to use only one User Info field for multiple random access RUs. | Revised  Agree with the comment.  Please see resolution for CID 11034  **TGax editor, please make changes as showing doc 11-18/0000r1** |
| 13197 | Rajesh Kumar | 259.24 | 27.5.5.2 | Delete duplicate sentence and use normative language to describe the operation. Also add clarification that all the User Info fields (referred in the paragraph) have the same AID12 value (either 0 or 2045) | Replace the paragraph as follows (two paragraphs - one each for AP and STA operation): "An HE AP shall indicate the number of contiguous RUs allocated for random access RUs via the Random Access RU Number subfield in the User Info field of the Trigger.  A non-AP HE STA can determine the number of eligible random access RUs by adding the values of the (Random Access RU Number subfield plus one) belonging to all the User Info fields corresponding to eligible random access RUs. The eligible random access RUs for a non-AP HE STA are the K contiguous RUs starting from the RU indicated in the RU allocation subfield belonging to all the User Info fields corresponding to eligible random access RUs where K equals to the value of the (Random Access RU Number subfields plus one)." | Revised  Agree with the comment.  Please see resolution for CID 11034  **TGax editor, please make changes as showing doc 11-18/0360r1** |

* **UL OFDMA-based random access (UORA)**

***TGax Editor: Please re-organize text in sections 27.5.5.1, 27.5.5.2 (new) and 27.5.5.3 as shown below:***

* **General**

***TGax Editor: Please make changes as shown below:***

A STA with dot11OFDMARandomAccessOptionImplemented equal to true shall set the UL OFDMA RA Support subfield in the HE MAC Capabilities Information field of the HE Capabilities element to 1. Otherwise, it shall set the UL OFDMA RA Support subfield to 0.

NOTE—A STA that does not support UORA can contend for the WM using EDCA for sending UL frames to the AP with which it intends to communicate.

A non-AP STA with dot11OFDMARandomAccessOptionImplemented set to true shall follow the procedure defined in 27.5.5.2 (UORA procedure) to contend for an eligible RA-RU.

An HE AP may transmit a Basic Trigger frame, BQRP Trigger frame or a BSRP Trigger frame that contains one or more RUs for random access.

NOTE—Trigger frame variants other than Basic, BQRP or BSRP are not allowed to carry RA-RUs.

An HE AP that transmits a Basic Trigger frame should set the TID Aggregation Limit subfield in the User Info field indicating an RA-RU to 0 or 1.

The HE AP may include the UORA Parameter Set element (see 9.4.2.239 (UL OFDMA-based Random Access (UORA) Parameter Set element) in Management frames that it transmits. The AP shall indicate the range of OFDMA contention window (OCW) in the UORA Parameter Set element for HE STAs to initiate random access following the Trigger frame transmission.

An HE BSS belonging to a Multiple BSSID set (see 11.11.14 (Multiple BSSID set)) may advertise OCW Range values via the UORA Parameter Set element carried in the Management frames sent by the transmitted BSSID. An HE AP may include the UORA Parameter Set element in a nontransmitted BSSID profile subelement carried in the Multiple BSSID element (see 9.4.2.46 (Multiple BSSID element)) to provide different OCW Range values for STAs associated with that nontransmitted BSSID.

[13651] A non-AP HE STA shall obtain 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 OCW Range 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.

[13651]An HE STA that has not received a UORA Parameter Set element from the AP with which it intends to communicate, shall use the default values OCWmin = 7 and OCWmax = 31 when contending for eligible RA-RUs allocated by that AP.

***TGax Editor: Please add a new section as shown below:***

* **Eligibility of RA-RUs**

shall

[11034, 13097, 13197]

An HE AP may indicate a set of contiguous RUs allocated for random access via the Number Of RA-RU subfield in the User Info field of the Trigger frame. When an AP allocates a contiguous set of RA-RUs, the first RA-RU in the set shall represent the starting RU allocation for the set.

Note: When contiguous RA-RUs are assigned, the size of all contiguous RA-RUs is the same and equal to the size of the first RU. Further, all the remaining subfields of the User Info field apply to all the contiguous RA-RUs in the set and the starting spatial stream and the number of spatial streams of the HE TB PPDU transmitted on each RA-RU shall be 1.

A non-AP HE STA shall determine the number of eligible RA-RUs in a contiguous set by adding the value carried in the Number Of RA-RU subfields plus one for each User Info field corresponding to an eligible RA-RU.

* UORA procedure

***TGax Editor: Please make changes as shown below:***

In this subclause, the random access procedure is described with respect to UL OFDMA contention parameters. The procedure is also illustrated in Figure 27-5 (Illustration of the UORA procedure).

|  |
| --- |
|  |
| * **Illustration of the UORA procedure** |

[13651]

After each successful HE TB PPDU transmission, an HE STA shall set the value of OCW to the OCWmin obtained from the most recent OCWmin indicated in the UORA Parameter Set element from the HE AP and shall initialize its OBO counter to a random integer value in the range of 0 and OCW.

For an HE STA that has a pending frame for the AP, upon the reception of a Trigger frame containing at least one eligible RA-RU, if the OBO counter of an HE STA is not greater than the number of eligible RA-RUs in a Trigger frame from that AP, then the HE STA shall decrement its OBO counter to zero. Otherwise, the HE STA decrements its OBO counter by the number of eligible RA-RUs in the Trigger frame.

In the example shown in Figure 27-5 (Illustration of the UORA procedure), HE STA 1 and HE STA 2, both associated with the AP and that has a pending frame for the AP, decrement their nonzero OBO counters by the eligible RA-RUs indicated in the Trigger frame where the AID12 subfield is 0. HE STA 3, which is not associated with the AP but has a pending frame for the AP, decrements its nonzero OBO counter by the eligible RA-RUs indicated in the Trigger frame where the AID12 subfield is 2045. HE STA 4, which is associated with the AP and has a pending frame for the AP, is assigned RU6 and does not decrement its nonzero OBO counter. HE STA 4 will transmit its pending frame in an HE TB PPDU using the assigned RU6. HE STA 4 still has pending frame for the AP so it maintains OBO counter and resumes random access in next Trigger frame.

[11034, 13097, 13197]

If the OBO counter is greater than the number of eligible RA-RUs, then the STA resumes with its OBO counter in the next Trigger frame with RUs assigned for random access. In the example shown in Figure 27-5 (Illustration of the UORA procedure), after receiving Trigger frame 1, HE STA 1 transmits an HE TB PPDU because its OBO counter decrements to 0. HE STA 1 then randomly selects RU2 from RU1, RU2, and RU3 which are assigned to AID12 subfield value 0. HE STA 2, HE STA 3, and HE STA 4 hold their OBO counters and wait for the next Trigger frame because their OBO counters don't decrement to 0. On receiving Trigger frame 2, HE STA 2, HE STA 3, and HE STA 4 decrement their OBO counters to 0 and each transmit their pending frame in an HE TB PPDU on a randomly selected RU.

The MU acknowledgment procedure for UORA follows the procedure as defined in 10.3.2.10.3 (acknowledgment procedure for an UL MU transmission).

If a STA transmits an HE TB PPDU that solicits an immediate response in an RA-RU and the expected response is not received, the transmission is considered unsuccessful. Otherwise, the transmission is considered successful. The STA shall initialize OCW to OCWmin if the transmission is successful and shall follow the retransmission procedure defined in 27.5.5.3 (Retransmission procedure for UORA) if the transmission is not successful.

NOTE—A non-AP STA that transmits an HE TB PPDU in response to a Trigger frame allocating RA-RU(s) by following the UORA procedure does not update its state variables to the values contained in the MU EDCA Parameter Set element (see 27.2.6 (EDCA operation using MU EDCA parameters)).

* FILS Discovery frame format

***TGax Editor: Please modify the 4th paragraph of this section as follows:***

The FILS Discovery frame may include a broadcast TWT element, which is defined in 9.4.2.200 (TWT element), to aid an unassociated STA determine when it can start listening for Trigger frames from this AP containing RA-RUs with AID12 set to 2045 (see 27.5.5.5).

* STA behavior for UL MU operation

***TGax Editor: Please modify the 4th paragraph of this section as follows:***

A STA shall transmit an HE TB PPDU a SIFS after a received PPDU, if both the following conditions are met:

* The received PPDU contains either a Trigger frame (that is not an MU-RTS variant) with a User Info field addressed to the STA, or an MPDU addressed to the STA that contains an UMRS Control subfield. The User Info field in the Trigger frame is addressed to a STA if one of the following conditions are met:
* The AID12 subfield is equal to the 12 LSBs of the AID of the STA and the Trigger frame is sent by the AP with which the STA is associated with or by the AP corresponding to the transmitted BSSID if STA is associated with a nontransmitted BSSID and has indicated support for receiving Control frames with TA set to the transmitted BSSID by setting the Rx Control Frame To MultiBSS subfield to 1 in the HE Capabilities element that the STA transmits.
* The AID12 subfield is 0, the STA supports the UL OFDMA-based random access procedure (see 27.5.5 (UL OFDMA-based random access (UORA))) and the Trigger frame is sent by the AP with which the STA is associated with.
* The AID12 subfield is 2045, the STA supports the UL OFDMA-based random access procedure (see 27.5.5 (UL OFDMA-based random access (UORA))), and the STA is not associated with the AP.
* The CS Required subfield in the Trigger frame is 1 and the UL MU CS condition described in 27.5.3.5 (UL MU CS mechanism) indicates the medium is idle, or the CS Required subfield in a Trigger frame is 0.

***TGax Editor: Please modify the bullet on “***RU\_ALLOCATION parameter***” in the 7th paragraph of this section as follows:***

A STA transmitting an HE TB PPDU in response to a Trigger frame shall set the TXVECTOR parameters as follows:

* The RU\_ALLOCATION parameter is set as follows:
* When the RU is not an RA-RU or an RA-RU with Number Of RA-RU subfield of the User Info subfield of the Trigger frame set to 0, it is set to the value indicated by the RU Allocation subfield of the User Info subfield of the Trigger frame
* When the RU is the kth RU of a set of contiguous RA-RUs starting with an RA-RU with Number Of RA-RU subfield of the User Info subfield of the Trigger frame set to a nonzero value, it is set to the value indicated by the RU Allocation subfield of the corresponding User Info subfield of the Trigger frame plus *k* minus 1.