IEEE P802.11
Wireless LANs

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| Proposed resolution for comments related to CIDs in in 27.5.2.6 (Random Access)  |
| Date: May 3, 2017 |
| 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 multiple comments received for TGax LB225 (12 CIDs):

8220, 7411, 5399, 6181, 9417, 8278, 9919, 5395, 5396, 6180, 9416, 8527

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Minor text changes for clarification
* Rev 2: Revised based on feedback received when the document was presented to the group
* Rev 3:
	+ Changed ‘associate’ to 'transmit’ for the case where un-associated STA is using RA RU to communicate with AP
	+ Added text to indicate that STA shall not contend for random access RU if it has no pending frames for the AP

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** | **Section** | **Pg / Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 8220 | Osama Aboulmagd | 27.5.2.6 | 172.28 | If a STA doesn't support UL OFDMA RA, then I am assuming it associates with the AP by acquiring the medium and sends an association request maybe using a SU PPDU. Is that correct? | If correct, then I just adding some language to that effect after the first paragraph of the clause | RevisedAgree with the commentAdded a note to clarify that a STA that doesn’t support Random Access may use other means (e.g., SU PPDU) to send a frame to the AP.TGax editor please make the changes as shown in 11-17/0708r3  |
| 7411 | Lei Huang | 27.5.2.6.1 | 172.46 | "Beacon or Probe Response" shall be changed to "Beacon or Probe Response frame" | as per comment | AcceptedAdded ‘frames’ to the sentence.TGax editor please make the changes as shown in 11-17/0708r3 |
| 5399 | Geonjung Ko | 27.5.2.6.2 | 173.36 | The spec does not instruct that a STA receiving a Trigger frame soliciting the STA shall ignores the rest of User Info fields (after the User Info field with the AID12 subfield set to the STA's AID). In case that the STA is scheduled by the Trigger frame and its OBO counter decrements to zero, the scheduled STA should use the RU allocated by the User Info field with the AID12 subfield set to the STA's AID. Also the STA shall initialize its OBO counter to avoid the collision on the next random access opportunity.Allowing the scheduled STA to decrease its OBO counter can make the STA to transmit a frame using a random access RU quickly. The collision is avoided by the OBO counter of the random number and the random RU selection. | When a Trigger frame includes the User Info field with its AID12 subfield set to 12 LSBs of the AID of a STA, if the scheduled STA decrements its OBO counter to zero, the STA shall not use the RU allocated by the User Info field with the AID12 subfield set to 0 and the STA shall initialize its OBO counter. | RevisedAgree with the comment.Added text to indicate that a STA may ignore rest of the User Info fields in the TF if it is an intended recipient of an RU. In addition, section 27.5.2.2.1 (pg 178, ln 4 in D1.2) addresses this comment. However, the note is in the wrong section (27.5.2.2 specifies AP-side actions). Moved the text in the note to 27.5.2.6.2 as normative text.TGax editor please make the changes as shown in 11-17/0708r3 |
| 6181 | Jin-Sam Kwak | 27.5.2.6.2 | 173.36 | The spec should define the operation when a STA that is scheduled by a Trigger frame receives User Info fields indicating the random access RU. | As per comment | RevisedAgree with the commentPlease see resolution to CID 5399TGax editor please make the changes as shown in 11-17/0708r3 |
| 8278 | Pascal VIGER | 27.5.2.6.2 | 173.36 | The case of having an assigned RU with AID of the STA is not considered, in the case a STA has already started a random access procedure in the past (previous TF) and its OBO is pending (non null). Even it is specified that this scheduled STA will transmit other its scheduled RU, it is not specified that OBO procedure is not effective for this TF. | Add following sentence after 3rd paragraph: "An HE STA shall not decrement its OBO counter if it has found a RU assigned to it with its STA's AID." | RevisedAgree with the commentPlease see resolution to CID 5399TGax editor please make the changes as shown in 11-17/0708r3 |
| 9417 | Woojin Ahn | 27.5.2.6.2 | 173.36 | Does a scheduled STA decrement its OBO if there exists other User Info Fields soliciting random access? | Please clarify | RevisedAgree with the commentPlease see resolution to CID 5399TGax editor please make the changes as shown in 11-17/0708r3 |
| 5395 | Geonjung Ko | 27.5.2.6.2 | 173.37 | Although a STA receives a User Info field with the AID12 subfield set to 0, the STA may not have a capability to send a frame using the RU indicated by the User Info field. For example, a 20 MHz only HE STA cannot transmit a PPDU using a RU not within the primary 20 MHz channel. | If a STA is not able to transmit a frame using the RU indicated by the User Info field with the AID12 subfield set to 0, the STA should not decrement its OBO counter on the User Info field indicating the RU not capable to transmit a frame. Also when the OBO counter decrements to 0, the STA should not select the RU which is not capable. | RevisedAgree with the commentAdded a sentence to specify that a STA will not consider a particular RA RU for transmission or for decrementing it OBO count if the STA cannot satisfy the conditions indicated by the subfields in the User Info field for that RU.TGax editor please make the changes as shown in 11-17/0708r3 |
| 5396 | Geonjung Ko | 27.5.2.6.2 | 173.37 | Although a STA receives a User Info field with the AID12 subfield set to 0, the STA may not have a capability to send a frame as indicated in the User Info field. For example, the MCS subfield in the Common Info field may indicate the value which is not supported by the STA. | If a STA does not have a capability to transmit a frame as indicated by the User Info field with the AID12 subfield set to 0, the STA should not decrese its OBO counter on the User Info field and when the OBO counter is 0, the STA should not select the RU allocated by the User Info field. | RevisedAgree with the comment.Please see resolution for CID 5395TGax editor please make the changes as shown in 11-17/0708r3 |
| 6180 | Jin-Sam Kwak | 27.5.2.6.2 | 173.37 | Even though a STA receives a Trigger frame containing the User Info field that indicates the random access RU, the STA may not have a capability to transmit a frame on the RU. | If a STA does not have a capability to access the random access RU indicated by a Trigger frame, the STA should not decrease its OBO counter on the random access RU. | RevisedAgree with the comment.Please see resolution for CID 5395TGax editor please make the changes as shown in 11-17/0708r3 |
| 9416 | Woojin Ahn | 27.5.2.6.2 | 173.37 | Does an HE STA decrement its OBO for a random access RU that is not available? (e.g., MCS, BW constraints) | Please clarify | RevisedAgree with the comment.Please see resolution for CID 5395TGax editor please make the changes as shown in 11-17/0708r3 |
| 9919 | Young Hoon Kwon | 27.5.2.6.2 | 173.36 | It is not clear if an HE STA is allowed to participate in random access procedure even in case the HE STA does not have anything to transmit. For example, if the HE STA keeps decreasing the OBO counter by participating random access procedure even in case the STA does not have anything to transmit, the STA may get advantage when the STA has something to transmit because the STA may use smaller OBO counter value. This is a cheating and shouldn't be allowed. Further clarification is needed. | As in the comment. | RevisedAgree with the commentAdded a sentence to indicate that a STA shall not decrement its OBO counter if it does not have any pending frames for the AP.TGax editor please make the changes as shown in 11-17/0708r3 |
| 8527 | Robert Stacey | 27.5.2.6 | 174.20 | Random access behavior for unassociated STAs is not defined | Define behavior for unassociated STAs | RevisedAgree with the commentContributions from doc 11-17/395r8 and 11-17/229r2 have addressed this comment. The contents of both the documents have been incorporated in to D1.2 and no further changes are needed to address this comment. |

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* **Rules for soliciting UL MU frames**
* **General**

An AP shall not send a frame that contains a UMRS Control subfield to a STA that has not set the UMRS Support subfield to 1 in the HE MAC Capabilities Information field of the HE Capabilities element it transmits.

An AP that transmits a PPDU may solicit an HE TB PPDU from one or more STAs through one of the following mechanisms:

* Including in the PPDU one or more Trigger frames that include one or more User Info fields with the one of the following AID12 subfield settings:
* The AID12 subfield is equal to 12 LSBs of the when the User Info field is addressed to a STA that is associated with the AP.
* The AID12 subfield is 0 when the User Info field when the User Info field is addressed to STAs that are associated with the AP and that follow the UL OFDMA-based random access procedure described in 27.5.2.6 (UL OFDMA-based random access (UORA)).
* The AID12 subfield is set to 2045 when the User Info field is addressed to STAs that are not associated with the AP and that follow the UL OFDMA-based random access procedure described in 27.5.2.6 (UL OFDMA-based random access (UORA)).
* Including in the PPDU one or more individually addressed frames that include a UMRS Control subfield and that:
* Are carried in an S-MPDU format that solicits an immediate Ack frame (see 10.13.8 (Transport of S-MPDUs))
* Are carried in an A-MPDU format that solicits an immediate BlockAck frame (see 10.24.7.7 (Originator's behavior))
* Are carried in a multi-TID A-MPDU format that solicits an immediate Multi-STA BlockAck frame (see 27.10.4 (A-MPDU with multiple TIDs))

NOTE—The AP additionally follows the rules defined in 27.3.3 (Procedure at the originator) when fragments are present in the generated MPDU(s).

More than one Trigger frame may be aggregated in an A-MPDU. If more than one Trigger frame is aggregated in an A-MPDU, all of them shall have the same content.

NOTE—The UMRS Control fields within MPDUs carried in an A-MPDU have the same value (see 10.9 (HT Control field operation)).

The following two frames shall not be present in the same A-MPDU:

* A Trigger frame with a User Info field addressed to a STA
* An MPDU that contains an UMRS Control subfield and that is addressed to the same STA

TGax Editor: Please remove the following note on pg 178, line 4 in D1.2 in section 27.5.2.2.1:

[6181, 5399, 9417, 8278]~~NOTE—A STA that is the intended receiver of a User Info field in a Trigger frame (i.e., AID12 subfield equal to the 12 LSBs of the AID of the STA) or of a UMRS Control field cannot contend for a random access RU that is indicated by a Trigger frame contained in the same PPDU and will not decrement its OBO counter.~~

When one or more Trigger Frames are aggregated with other frames in an A-MPDU, the following ordering rules apply:

* When an Ack, BlockAck or Multi-STA BlockAck frame is not present in the A-MPDU, a Trigger frame shall be the first MPDU in the A-MPDU
* When an Ack, BlockAck or Multi-STA BlockAck frame is present in the A-MPDU, the Ack, BlockAck or Multi-STA BlockAck frame shall be the first MPDU in the A-MPDU and a Trigger frame shall follow the Ack, BlockAck or Multi-STA BlockAck frame

A non-AP STA shall not send a Trigger frame or a frame with a UMRS Control field.

An AP transmitting a PPDU that contains a Trigger frame or frame containing a UMRS Control field shall ensure that the duration of the PPDU that follows *BSYM* is greater than or equal to the time indicated by the non-AP STA in the Trigger Frame MAC Padding Duration subfield in the HE MAC Capabilities Information field of the HE Capabilities element that it transmits. *BSYM* is the OFDM symbol of the PPDU that contains either the last bit of *SCH* when BCC is used to encode the PSDU or the last coded bit of the LDPC codeword that encodes the last bit of *SCH* when LDPC is used to encode the PSDU, where *SCH* is either:

* The User Info field addressed to the STA of the last (or only) Trigger frame, or
* The UMRS Control subfield of the last (or only) frame.

An AP transmitting a Trigger frame that contains a User Info field for random access shall ensure that a *MinTrigProcTime* corresponding to at least the largest value amongst all associated STAs passes from the last User Info field with AID12 subfield equal to 0. An AP transmitting a Trigger frame that contains a User Info field for random access should ensure that a *MinTrigProcTime* of at least 16 us passes from the last User Info field with AID12 subfield equal to 2045.

NOTE—The AP can use any type of padding to ensure that the duration of time passes, such as using the Padding subfield in a Trigger frame, post-EOF padding in an A-MPDU, aggregating other MPDUs in the A-MPDU.

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

A STA that supports UORA 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.

TGax Editor: Please add the following note after the 1st paragraph on pg 186, line 16 in D1.2:

[8220]NOTE—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.

UORA is a mechanism for HE STAs to randomly select resource units (RUs) assigned by an AP in a soliciting Trigger frame that contains RUs for random access. An RU for random access is identified by an AID12 subfield contained in a User Info field of a Trigger frame that is equal to one of the following:

* 0 to indicate a random RU that is intended for associated STAs
* 2045 to indicate a random RU that is intended for unassociated STAs

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

The HE AP may include the RAPS element (see 9.4.2.220 (OFDMA-based Random Access Parameter Set (RAPS) element) in Beacon and Probe Response frames it transmits. The AP shall indicate the range of OFDMA contention window (OCW) in the RAPS element for HE STAs to initiate random access following the Trigger frame transmission.

TGax Editor: Please modify 5th paragraph on pg 186, line 39 in D1.2 in section 27.5.2.6.1 as follows:

An HE STA shall use the OCWmin and OCWmax values indicated in the RAPS element within the most recently received Beacon or Probe Response frame[7411] regardless of the access category of traffic the HE STA intends to transmit.

NOTE—If the STA does not receive the RAPS element, the STA does not transmit any HE TB PPDU using random access RUs.

A non-AP STA with dot11OFDMARandomAccessOptionImlemented set to true shall maintain an internal OFDMA backoff (OBO) counter. The STA shall follow the random access procedure defined in 27.5.2.6.2 (UORA procedure) to contend for an RU assigned for random access.

* **UORA procedure**

In this subclause, the random access procedure is described with respect to UL OFDMA contention parameters. The procedure is also illustrated in Figure 27-4 (Illustration of the UORA procedure).

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| * **Illustration of the UORA procedure**
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The OFDMA contention window (OCW) is an integer with an initial value of OCWmin. An HE AP indicates the values of OCWmin and OCWmax in the RAPS element in a Beacon or Probe Response frame for the UORA operation. OCWmax is the upper limit of OCW.

For an initial HE TB PPDU transmission or following a successful HE TB PPDU transmission, when an HE STA obtains the value of OCWmin from the HE AP indicated in the RAPS element, it shall set the value of OCW to the OCWmin and shall initialize its OBO counter to a random value in the range of 0 and OCWmin.

TGax Editor: Please modify 4th paragraph on pg 187, line 43 in D1.2 in section 27.5.2.6.2 as follows:

An HE AP that transmits a Trigger frame for random access, uses the AID value 0 to indicate random RUs allocated for STAs associated with it, and the AID value 2045 to indicate random RUs allocated for STAs not associated with it. [TGax editor, please add line break to improve readability]

[6181, 5399, 9417, 8278]A STA that is the intended receiver of a User Info field in a Trigger frame (i.e., AID12 subfield equal to the 12 LSBs of the AID of the STA) may ignore the remainder of User Info fields in the Trigger frame. A STA that is the intended receiver of a User Info field in a Trigger frame shall not contend for a random access RU that is indicated by a Trigger frame contained in the same PPDU and will not decrement its OBO counter.

[5395, 5396, 6180, 9416]A STA shall not consider a particular RU for random access for transmission or for decrementing its OBO counter if it does not have the capability of transmitting a frame as indicated by one or more subfields of the User Info field corresponding to that random access RU.

[9919]A STA shall not contend for random access RU or decrement its OBO counter if it does not have pending frames for the AP.

For an HE STA that is associated with the AP, if the OBO counter of an HE STA is not larger ~~smaller~~ than the number of RUs assigned to AID12 subfield value 0 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 RUs assigned to AID12 subfield value 0 in a Trigger frame. [TGax editor, please add line break to improve readability]

For an unassociated HE STA~~, that is not associated with the AP~~, if the OBO counter is not larger ~~smaller~~ than the number of RUs assigned to AID12 subfield value 2045 in a Trigger frame from an AP it intends to transmit, then the HE STA shall decrement its OBO counter to zero. Otherwise, the HE STA decrements its OBO counter by a value equal to the number of RUs assigned to AID12 subfield value 2045 in a Trigger frame. [TGax editor, please add line break to improve readability]

In the example shown in Figure 27-4 (Illustration of the UORA procedure), HE STA 1 and HE STA 2, both associated with the AP and having a pending frame for the AP, decrement their nonzero OBO counters by the number of User Info fields 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 number of User Info fields 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.

For an HE STA associated with the AP, if the OBO counter is 0 or decrements to 0, then the STA randomly selects one of the RUs assigned to AID12 subfield value 0. For an HE STA not associated with the AP, if the OBO counter is 0 or if the OBO counter decrements to 0, then the STA randomly selects one of the RUs assigned to AID12 subfield value 2045. [TGax editor, please add line break to improve readability]

If the selected RU is idle as a result of both physical and virtual carrier sensing as defined in subclause 27.5.2.4 (UL MU CS mechanism), the HE STA transmits its HE TB PPDU in the selected RU. If the selected RU is considered busy as a result of either physical or virtual carrier sensing, then the HE STA shall not transmit its HE TB PPDU in the selected RU. Instead, the STA randomly selects any one of the RUs that are assigned to AID12 subfield value 0 if it is an associated STAs or AID12 subfield value 2045 if it is an unassociated STA in the subsequent Trigger frame. If the OBO counter is not zero and does not decrement to 0, the STA resumes with its OBO counter in the next Trigger frame with RUs assigned for random access. In the example shown in Figure 27-4 (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.

If the HE TB PPDU is successfully transmitted in the randomly selected RU, then the STA shall set its OCW to OCWmin.

NOTE—If the transmitted HE TB PPDU does not solicit an immediate response, then the STA follows the OCW reset rule that applies to successful transmission.

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

If a STA transmits an HE TB PPDU that solicits an immediate response in a random access RU and the expected response is not received, the transmission is considered unsuccessful and the STA invokes the UORA retransmission procedure as defined in 27.5.2.6.3 (Retransmission procedure for UORA)