IEEE P802.11
Wireless LANs

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| Comment resolution for UL OFDMA-based random access (UORA) |
| Date: 2017-06-27 |
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Abstract

The document contains comment resolutions to 3 CIDs and an associated proposal of evolution of the clauses 27.5.4.1 and 27.5.4.2.

The submission solves 3 CIDs

The solved CIDs are: 6106, 9571, 10173.

Red-color text (review mode): CIDs solved

**References:**

**[1] Draft P802.11ax\_D1.3**

**[2] 11-17-0010-11-00ax-comments on tgax-d1-0**

**Revisions :**

* Rev 0 (red-color text): Initial verion of the document
* Rev 1 (modification in blue color): Editorial changes taking into comments during audio conference presentation

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| **CID** | **Pg, Li** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| 6106 | 172,23 | 27.5.2.6 | An emergency service mechanism should be introduced in UL OFDMA based random access procedure to further prioritize he emergency traffic | Add the details, will bring a proposal | RejectedAn HE STA with ot11AMPDUwithMultipleTIDOptionImplemented can send any frame on the random access RU as defined the subclause 27.10.4 (A-MPDU with multiple TIDs). No reason to define a specific service mechanism using the random access. |
| 9571 | 172,45 | 27.5.2.6.1 | If HE STA can use OFDMA based random access for any AC traffic, it may create fairness concern on the higher priority AC. | suggest random access transmission is separated according to the Access Category | Revised - Agree in principle. The fairness can be handled by using the eligible random access RU that is not against the subclause 27.10.4 (A-MPDU with multiple TIDs) that allows. The eligible random access RU selects and sorts random access RUs used for different purposes. However the definition of the eligible random access RU needs to be clarified as it is mentioned several times in the subclause 27.5.4.2.TGax editor please make change as shown in the 11-17-0935r0 under all headings that include the CID 9571. |
| 10173 | 172,45 | 27.5.2.6.1 | "An HE STA shall use the OCWmin and OCWmax values indicated in the RAPS element within the most recently received Beacon or Probe Response regardless of the access category of traffic the HE STA intendsto transmit."What's the reason that a STA using OFDMA random access will neglect the AC of the traffic? | Give the technical reasons. Otherwise, the OFDMA random access should also consider the AC of traffic. | RejectedAn HE STA with ot11AMPDUwithMultipleTIDOptionImplemented can send any frame on the random access RU as defined the subclause 27.10.4 (A-MPDU with multiple TIDs). No reason to define a specific service mechanism using the random access. |

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

**27.5.4.1 General**

A STA that supports UORA(#8142) shall set the UL OFDMA RA Support subfield in the HE MAC Capa-bilities Information field of the HE Capabilities element to 1. Otherwise, it shall set the UL OFDMA RA Support subfield to 0.(#8063, #6702)

 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.(#8220)

**TGax Editor: *Make the following changes in section 27.5.4.1, D1.3 p229***

UORA(#8142) 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 eligible random access RU is a random access RU (#6106, #9571, #10173) 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 access RU(#10173) that is intended for associated STAs~~

~~— 2045 to indicate a random access RU(#10173) that is intended for unassociated STAs(#3074)~~

~~An HE STA receiving a Trigger frame that contains random access RU(s) shall consider as eligible only random access RU(s) for which the HE STA is capable of generating an HE TB PPDU, i.e. the HE STA supports all transmit parameters indicated in the Common Info field and in the User Indo field(s) indicating in the random access RU(s).~~

An eligible random access RU is a random access RU for which the HE STA is capable of generating an HE TB PPDU (i.e. the HE STA supports all transmit parameters indicated in the Common Info field and in the User info field in the random access RU) and shall satisfy at least one of the following recommendations:

* The HE STA is a non-associated STA and the AID12 value of the random access RU is equal to 2045
* The HE STA is an associated STA, the AID12 value of the random access RU is equal to 0(#6106, #9571, #10173)

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

~~An HE STA receiving a Basic Trigger variant Trigger frame that contains random access RU(s) should not consider as eligible a random access RU with AID12=0 if the HE STA has no MPDU ready for transmission in the same AC or higher AC as indicated in the Preferred AC subfield in the Trigger Dependent User Info field of the random access RU.(#6106, #9571, #10173)~~

The HE AP may include the RAPS element (see 9.4.2.239 (OFDMA-based Random Access Parameter Set (RAPS) element) in Beacon, Probe Response and (Re)Association frames(17/645r3) 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.

An HE STA shall obtain OCWmin and OCWmax from the most recently received RAPS element (see 9.4.2.239 (OFDMA-based Random Access Parameter Set (RAPS) element))(#7411)(#10173)(#5386, #8282).

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

An unassociated HE STA shall initialize the range of OFDMA contention window (OCW) upon reception of the RAPS element from the intended HE AP(#5386). If the HE STA has not received RAPS 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 RAPS element for that AP(#8300, #7410).

* UORA procedure

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

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| * Illustration of the UORA(#8142) procedure(#7103, #7413)
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An HE STA shall maintain an internal OFDMA contention window (OCW), and an internal OFDMA backoff (OBO) counter. OCW is an integer within the range [OCWmin, OCWmax].(#7414)

After each successful HE TB PPDU transmission(#9918), an HE STA shall set the value of OCW to the OCWmin obtained from the most recent OCWmin(#6005) indicated in the RAPS element from the HE AP and shall initialize its OBO counter to a random integer value in the range of 0 and OCW(#3237, #7104).

(#3074)An HE AP that transmits a Trigger frame for random access, uses the AID value 0 to indicate random access RUs(17/646r4) allocated for STAs associated with it, and the AID value 2045 to indicate random access RUs(17/646r4) allocated for STAs not associated with it.

(#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.

**TGax Editor: *Make the following changes in section 27.5.4.2, D1.3 p230, line 59***

~~(#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.~~ (#6106, #9571, #10173)

(#9919)A STA shall not contend for an eligible (#6106, #9571, #10173) random access RU or decrement its OBO counter if it does not have pending frames for the AP.

For an HE STA that has a pending frame for the AP, upon the reception of a Trigger frame containing at least one eligible random access RU,(#7105) if the OBO counter of an HE STA(#Ed) is not greater(17/ 708r3, #7415) than the number of eligible random access RUs in a Trigger frame from that AP(17/708r3, #6182, #7043), then the HE STA shall decrement its OBO counter to zero. Otherwise, the HE STA decrements its OBO counter by the number of eligible random access RUs in the(#6182, #7043) Trigger frame.

 (#7105)In the example shown in Illustration of the UORA, HE STA 1 and HE STA 2, both associated with the AP and that has(17/646r4) 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(#9103). 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(#9103). 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.(#8152, #9103, #Ed)

For an HE STA that has a pending frame for the AP(#5401, #6182, #7043), upon the reception of a Trigger frame containing at least one eligible random access RU,(#7105) if the OBO counter is not larger than the number of eligible random access RUs,(#7415) then the STA randomly selects one of the eligible random access RUs.(#3074)

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 (#Ed)selected RU following the rules of the subclause 27.10.4 (A-MPDU with multiple TIDs).(#9571, #10173)

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 (#Ed)selected RU. Instead, the STA shall randomly select its OBO counter in the range of 0 and OCW and if the OBO counter is 0 or the OBO counter decrements to 0, then(#7652, #8301, #9105, #9326, #9493, #10175) the STA (#3074)randomly selects any one of the eligible random access RUs ~~that are assigned to AID12 subfield value 0(#6161) if it is an associated STAs or AID12 subfield value 2045 if it is an unassociated STA(#3074)~~ [#6106, #9571, #10173] in the subsequent Trigger frame.

If the OBO counter is greater than the number of eligible random access RUs,(#7415) then the STA resumes with its OBO counter in the next Trigger frame with RUs assigned for random access. In the example shown in Illustration of the UORA, 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.(#8152, #Ed)

(#7426)(#7427)The MU acknowledgment procedure for UORA(#8142) 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. Otherwise, the transmission is considered successful. The retransmission procedure for UORA is defined in 27.5.4.3 (Retransmission procedure for UORA).(#7427)