IEEE P802.11
Wireless LANs

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Abstract

This submission proposes resolutions for multiple comments related to TGax D1.0 with the following CIDs:

* CIDs: 5411, 9406, 6188, 9405, 7417, 7418, 9404, 9408, 9448, 3238, 7652, 8301, 9105, 9326, 9493, 9581, 10175

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.***

# OFDMA random access –Part I (in 27.5.2.6.2)

| **CID** | **Page** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
| --- | --- | --- | --- | --- | --- |
| 5411 | 173.45 | 27.5.2.6.2 | The spec needs to define the operation of a STA when the STA decrements its OBO counter to zero and has no data to transmit. | As per comment | Revised.Agree in principle.But, this is already resolved in D1.2(11-17/0443r2). According to the related text, HE STA that is having pending frame for the AP decrements their non-zero OBO counter. Therefore, this does not happen. But, for clarification, the related text(“having pending frame for the AP”) need to be described in spec text as well as example text.TGax editor please make the changes as shown in 11-17/0634r0 |
| 9406 | 173.45 | 27.5.2.6.2 | p170.1 says "If the Trigger Type field of the soliciting Trigger frame is Basic Trigger and the STA does not have a frame of the required type, the STA shall either not transmit a response or transmit one or more QoS Null frames."It is better to prevent an HE STA whose OBO is 0 and has no data from transmitting QoS Null in order to reduce unnecessary collision. | As per comment | Revised.Agree in principle.But, this is already resolved in D1.2(11-17/0443r2). According to the related text, HE STA that is having pending frame for the AP decrements their non-zero OBO counter. Therefore, this does not happen. But, for clarification, the related text(“having pending frame for the AP”) need to be described in spec text as well as example text.TGax editor please make the changes as shown in 11-17/0634r0 |
| 6188 | 173.45 | 27.5.2.6.2 | If a STA does not have any data to transmit, it shall not participate random access procedure, or, at least it shall not transmit anything including QoS Null even if its OBO becomes 0. | As per comment | Revised.Agree in principle.But, this is already resolved in D1.2(11-17/0443r2). According to the related text, HE STA that is having pending frame for the AP decrements their non-zero OBO counter. Therefore, this does not happen. But, for clarification, the related text(“having pending frame for the AP”) need to be described in spec text as well as example text.TGax editor please make the changes as shown in 11-17/0634r0 |
| 9405 | 173.36 | 27.5.2.6.2 | Does a random access capable STA without Data to transmit decrements its OBO value upon a reception of TF-R? | Please clarify | Revised.Agree in principle.But, this is already resolved in D1.2(11-17/0443r2). According to the related text, HE STA that is having pending frame for the AP decrements their non-zero OBO counter. Therefore, this does not happen. But, for clarification, the related text(“having pending frame for the AP”) need to be described in spec text as well as example text.TGax editor please make the changes as shown in 11-17/0634r0 |
| 7417 | 173.46 | 27.5.2.6.2 | CCA is based on individual 20MHz channel(s) and is not RU-based. | Change "If the selected RU is idle..." to "If each of one or more 20 MHz channels containing the selected RU is idle..." | Rejected.The suggested text is valid only for the physical carrier sensing. But, the indicated text covers the virtual carrier sensing as well as the physical carrier sensing. And, the current text includes the referece for the details of CS. Therefore the current text doesn’t need to be changed. |
| 7418 | 173.48 | 27.5.2.6.2 | CCA is based on individual 20MHz channel(s) and is not RU-based. | Change "If the selected RU is considered busy..." to "If each of one or more 20 MHz channels containing the selected RU is considered busy..." | Rejected.The suggested text is valid only for the physical carrier sensing. But, the indicated text covers the virtual carrier sensing as well as the physical carrier sensing. And, the current text includes the referece for the details of CS. Therefore the current text doesn’t need to be changed. |
| 9404 | 173.55 | 27.5.2.6.2 | What happens to the OBO value after a STA succeeded a random access procedure?Should the OBO remain the same, the STA will have another opportunity at the subsequent TF-R | The OBO value shall be reset by randomly chosen between 0 and OCW-1 after a STA succeeded UL OFDMA random access procedure | Revised.Agree in principle.But, the related text already exists in D1.2 as following:“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.”Therefore, we don’t need to describe the reduandant text in the spec |
| 9408 | 173.45 | 27.5.2.6.2 | Is it possible for STAs to choose not participate UL OFDMA random access upon the reception of TF-R? | Allow STA to choose not to participate random access in which case the STA does not decrement its OBO | Revised.Agree in principle.But, this is already resolved in D1.2(11-17/0443r2).According to the related text in D1.2, HE STA that is having pending frame for the AP decrements their non-zero OBO counter. |
| 9448 | 173.45 | 27.5.2.6.2 | The current random access procedure requires the STA to choose a second random number to select a random access RU to transmit when the STA already uses a first random number to determine that it can conduct random access. Using a second random number is redundant; since the first random number is sufficient to determine both whether the STA is allowed to conduct random access and which RU to use. OBO counter can be used to choose RU if the OBO counter is smaller than the number of RUs assigned to AID value 0 | Simplify the random access procedure by using use just the OBO counter for both determination whether a STA is allowed to conduct random access and which RU to use for random access. | Rejected.Each random number have each different feature.For example, the frist random number is slected in the range of 0 and OCWmin and is used to determine if the STA can conduct random access or not. The second random number is selected in the range of 0 and the number of the assigned RUs for RA and is used to select the random RU to send a frame. Futhermore, when the second random number is set to OBO, if the OBO is larger than (the number of RUs in the TF-R1), is larger than (the number of RUs in the TF-R2) and is less than (the number of RUs in the TF-R1 + the number of RUs in the TF-R2), the STA could not transmit its PPDU through the random RU assigned by the TF-R2. Therefore, the second random number should not be set to the OBO. |

# OFDMA random access – Part II (in 27.5.2.6.2)

| **CID** | **Page** | **Clause** | **Comment** | **Proposed Change** | **Resolution** |
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| 3238 | 173.49 | 27.5.2.6.2 | This is not the best use of RA RUs: "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 trigger-based PPDU in the randomly selected RU and it randomly selects any one of the RUs that are assigned to AID value 0 in the subsequent Trigger frame." It'd be better if the spec let the STA to pick another RA RU from the same Trigger frame (instead of referring to the next Trigger frame). | As in the comment | RejectedDue to time restrict (i.e., during SIFS), it may not be possible for a STA to pick up another RA RU from the same TF-R after the STA determines that the STA could not transmit a frame through the firstly selected RU of the same TF-R. Although it’s possible, picking another RA RU from the same Trigger frame can increase contension and collision. |
| 7652 | 173.48 | 27.5.2.6.1 | "If the selected RU is considered busy as a result ofeither physical or virtual carrier sensing, then the HE STA shall not transmit its HE trigger-based PPDU inthe randomly selected RU and it randomly selects any one of the RUs that are assigned to AID value 0 in thesubsequent Trigger frame."This violates backoff basic assumption and may create high collision. Change it to "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 trigger-based PPDU in the randomly selected RU and it start another backoff by doubling its CW" | As in comment | Revised.Agree in principle.In the indicated case, the another random backoff can reduce the collision in dense environment. But it’s better to perform the backoff with the current CW rather than the doubled CW because the case is not a collision situation.TGax editor please make the changes as shown in 11-17/0634r0 |
| 8301 | 173.48 | 27.5.2.6.2 | "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 trigger-based PPDU in the randomly selected RU and it randomly selects any one of the RUs that are assigned to AID value 0 in the subsequent Trigger frame."Why keeping OBO equal to 0 ? For the next subsequent Trigger frame, perhaps no more data will be ready to send. | Proposal: "... the HE STA shall not transmit its HE trigger-based PPDU in the randomly selected RU and the HE STA shall reinitialize its OBO counter to a new random value in the range of 0 and OCWmin" | Revised.Agree in principle.In the indicated case, the another random backoff can reduce the collision in dense environment. But it’s better to perform the backoff with the current CW rather than the CWmin because the case is not a successful frame TX situation.TGax editor please make the changes as shown in 11-17/0634r0 |
| 9105 | 173.48 | 27.5.2.6.2 | The random access procedure suffer from a low efficiency (<38%), so the draft shall not additional collision cases. The procedure described line 49 to 52 will create extra collisions, on the subsequent trigger frame reception, since the STA that failed to transmit in previous trigger frame due to a busy channel (already having their OBO to 0) will fight against new stations decrementing their OBO to 0. So the congestion window cannot fully play its role | replace the sentence by : "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 trigger-based PPDU in the randomly selected RU and roll backs its OBO value to its original value." | Revised.Agree in principle.In the indicated case, the another random backoff can reduce the collision in dense environment. But it’s better to perform the backoff with the current CW rather than rolling back its OBO value to its original value.TGax editor please make the changes as shown in 11-17/0634r0 |
| 9326 | 173.51 | 27.5.2.6.2 | Those STAs that had their CS busy and not transmitted should reselect OCW to avoid collision with new STAs whose OBO counter decremented to zero in the next Trigger frame. | Change "... and it randomly selects any one of the RUs that are assigned to AID value 0 in the subsequent Trigger frame." to "... and it shall initialize its OBO counter to a random value in the range of 0 and OCWmin" | Revised.Agree in principle.In the indicated case, the another random backoff can reduce the collision in dense environment. But it’s better to perform the backoff with the current CW rather than rolling back its OBO value to its original value.TGax editor please make the changes as shown in 11-17/0634r0 |
| 9493 | 173.48 | 27.5.2.6.2 | "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 trigger-based PPDU in the randomly selected RU and it randomly selects any one of the RUs that are assigned to AID value 0 in the subsequent Trigger frame." It will cause both the STAs finishing backoff in next trigger and current trigger to contend for random access RUs in next trigger. The over-crowd attempts cause low channel access efficiency. | Change this sentense to:If the selected RU is considered busy as a result of either physical or virtual carrier sensing, then the HE STA shall transmit its HE trigger-based PPDU in the randomly selected idle RU or it backoffs again and randomly selects any one of the RUs that are assigned to AID value 0 in the subsequent Trigger frame. | Revised.Agree in principle.In the indicated case, the another random backoff can reduce the collision in dense environment. The STA will perform the backoff with the current CW.TGax editor please make the changes as shown in 11-17/0634r0 |
| 9581 | 173.45 | 27.5.2.6.2 | The HE STA may sense multiple carriers in the same time depending on implementation.Therefore HE STA may randomly select an "idle" RU from assigned RUs by trigger frame for random access to avoid the sensing after selection.The spec should allow this flexibility in the implementation. | For an HE STA, if the OBO counter is 0 or if the OBO counter decrements to 0, then the STA randomlyselects one of the RUs assigned to AID value 0.The HE STA may randomly select one "idle" RU from RUs assigned to AID value 0 and from the result of physical and virtual CS. | Rejected.Using another random RU selection rule (e.g., selecting one from idle RUs) may cause unfairness issue with other STAs which select one of the assign RUs.Those STAs can have more TX opportunities but it will increase the contention and collision.Selecting one of the assigned RUs is simple. |
| 10175 | 173.51 | 27.5.2.6.2 | It is not reasonable to let a STA randomly select a RU in the subsequent Trigger frame. Because it will cause severe collision in the subsequent Trigger frame without a backoff. | The STA should perform a backoff before randomly select a RU in the subsequent Trigger frame to avoid the severe collision. | Revised.Agree in principle.In the indicated case, the another random backoff can reduce the collision in dense environment. The STA will perform the backoff with the current CW.TGax editor please make the changes as shown in 11-17/0634r0 |

**27.5.2.6.2 UORA procedure**

**TGax Editor: Modify the 4th and 5th paragraphs of 27.5.2.6.2 (D1.2) as follows :**

(#3074)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.

For an HE STA that is associated with the AP, if the OBO counter of an HE STA(#Ed) is smaller than the number of RUs assigned to AID12 subfield value 0(#6161) in a Trigger frame, 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(#6161) in a Trigger frame.

For an HE STA, that is not associated with the AP, if the OBO counter is smaller than the number of RUs assigned to AID12 subfield value 2045 in a Trigger frame, 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.(#3074)

In the example shown in Figure 27-4 (Illustration of the UORA(#8142) procedure(#7103, #7413)), 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(#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 associated with the AP and having a pending frame for the AP(#5411, #6188, #9405, #9406), if the OBO counter is 0 or decrements to 0(#Ed), then the STA randomly selects one of the RUs assigned to AID12 subfield value 0(#6161). For an HE STA not associated with the AP and having a pending frame for the AP(#5411, #6188, #9405, #9406), 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.(#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. 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 (#7652, #8301, #9105, #9326, #9493, #10175) and if the OBO counter decrements to 0, then the STA (#3074) randomly selects any one of the 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) in the subsequent Trigger frame. If the OBO counter is not zero and does not decrement(#6710) 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(#8142) procedure(#7103, #7413)), 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)