IEEE P802.11
Wireless LANs

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| Resolution for CIDs related to Random Access |
| Date: October 15, 2018 |
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 Abstract

This submission proposes resolutions for following comments received for TGax LB233 (4): 16870, 16498, 16506, 15686

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Updated based on offline feedback:
	+ Added text to 27.5.5.5 to clarify that a Management frame from an unassociated STA sent in a TB PPDU has the A3 field is set to AP’s BSSID.

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** |
| 16870 | stephane baron | 298.48 | 27.5.5.3 | this sentence is incomplete (the OBO selection is missing) and redundant with the sentence line1-6 of the same page. Please update this sentence, or remove it. | as in comment | **Revised**Agree with the comment.**TGax editor, please make changes as shown in doc 11-18/1812r1 for CID 16870** |
| 16498 | Oghenekome Oteri | 105.12 | 9.3.1.23.1 | "The Preferred AC subfield indicates the lowest AC that is recommended for aggregation of MPDUs in theA-MPDU contained in the HE TB PPDU sent as a response to the Trigger frame. The encoding of the PreferredAC subfield as defined in Table 9-136 (ACI-to-AC encoding)." Is this applicable for the RA case ? i.e. are only STAs with AC traffic at or above the preffered AC allowed to compete for the resource ? | Clarify that it is applicable to both RA and scheduled access. | **Revised**Agree with the comment. A STA should not consider an RA-RU as eligible if it cannot satisfy the conditions specified in the Common Info field and the User Info field corresponding to that RU**TGax editor, please make changes as showing in doc 11-18-1812r1 for CID 16498** |
| 16506 | Oghenekome Oteri | 296.18 | 27.5.5.1 | "An HE AP may transmit a Basic Trigger frame, BQRP Trigger frame or a BSRP Trigger frame that containsone or more RUs for random access.NOTE--Trigger frame variants other than Basic, BQRP or BSRP are not allowed to carry RA-RUs." Is the Trigger Dependent User Info subfield for the Basic Trigger variant applicable here? i.e. does the perferred AC field limit the STAs that compete for the RA-RU ? | Please clarify and if so explicitly state this in the specification e.g. in a NOTE | **Revised**Please see resolution to CID 16498 |
| 15686 | Huizhao Wang | 299.64 | 27.5.5 | Should allow AP response with ACK to an unassociated STA's mgmt frame in a TB PPDU using Random Access RU | Change the text:"An AP shall respond with a Multi-STA BlockAck Frame in an SU PPDU if the AP receives a Managementframe from an unassociated non-AP HE STA by following the UORA procedure."To:"An AP shall respond with a Multi-STA BlockAck,or ACK Frame in an SU PPDU if the AP receives a Managementframe from an unassociated non-AP HE STA by following the UORA procedure." | **Revised**When an AP responds to an HE TB PPDU, the context could be that multiple STAs have responded to the Trigger frame - but AP received the HE TB PPDU from only one STA. In such case, the signaling should be such that STAs whose transmission has failed can quickly detect the failure – i.e., determine that the issue was on the UL side. The situation is further worsened in case of UORA which has a higher probability of collision. In such case, AP should not send an ACK frame directed to a single STA.**TGax editor, please make changes as shown in doc 11-18-1812r1 for CID 15686** |

***TGax Editor: Changes marked with the tag [#AP] are not related to any particular CID. These changes are meant to fix the spec language when referring to RA-RUs. In the current spec, there are several instances where the text says ‘AID12 of an RA-RU’ – which is incorrect since an RU is not a field. Instead the text should say AID12 subfield of a User Info field or something like that.***

**3.2 Definitions**[#AP]

***TGax Editor: Please add the following definition to this section:***

**Random Access Resource Unit (RA-RU):** A resource unit (RU) allocated in a Trigger frame to support the uplink orthogonal frequency division multiple access random access (UORA) procedure.

* FILS Discovery frame format

***TGax Editor: Please update the following paragraph in this section as shown below:***

The FILS Discovery frame may include a broadcast TWT element, which is defined in 9.4.2.199 (TWT element), to aid an unassociated STA determine the target transmission times of Trigger frames that contain at least one User Info field with AID12 subfield set to 2045 (i.e., RA-RUs for unassociated STAs) (see 27.5.5.5 (Additional considerations for unassociated STAs) and 27.7.3.1 (General)).[#AP]

* A-MPDU contents in an HE TB PPDU

***TGax Editor: Please update the following paragraph in this section as shown below:***

An unassociated non-AP STA shall not include more than one Management frame in the HE TB PPDU that is sent in response to a Basic Trigger frame that contains at least one RA-RUs for unassociated STAs.[#AP]

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

***TGax Editor: Please update the 3rd paragraph in this section as shown below:***

An HE AP that transmits a Trigger frame for random access, shall set the AID12 subfield of a User Info field in the Trigger frame to 0 to indicate that one or more RA-RUs are available for non-AP STAs associated with it, and shall set the AID12 subfield of a User Info field in the Trigger frame to 2045 to indicate that one or more RA-RUs are available for non-AP STAs not associated with it.[#AP]

***TGax Editor: Please update the note below the 7th paragraph in this section as shown below:***

NOTE—An AP with dot11MultiBSSIDActivated set to true can allocate RA-RUs to non-AP STAs associated with different BSSIDs in the set by transmitting a DL MU PPDU carrying BSS specific broadcast RUs (see 27.5.1.2 (RU addressing in an HE MU PPDU)) with an A-MPDU in each RU carrying a Trigger frame with at least one User Info field with AID12 subfield set to 0.[#AP]

* **Eligible RA-RUs**

***TGax Editor: Please update the 2nd paragraph in this section as shown below:***

***TGax Editor: CIDs 16498 & 16506 were resolved during Sept meeting (Motion #684) however, I received offline feedback that the resolution doesn’t entirely satisfy the comment. I agree with the feedback and I have updated my resolution to address the concerns.***

An eligible RA-RU is an [#AP]RU for which the non-AP STA [16498, 16506]supports all the transmit parameters indicated in the Common Info field and in the User Info field that corresponds to the RU and is capable of generating an HE TB PPDU (as described in 27.5.3.3 (Non-AP STA behavior for UL MU operation)) and shall satisfy at least one of the following conditions:

* The non-AP STA is not associated with the BSS it intends to transmit frames to and the RU corresponds to the User Info field with AID12 subfield set to 2045
* The non-AP STA is an associated STA, the TA field of the Trigger frame is set to the BSSID of the associated BSS and the RU corresponds to the User Info field with AID12 subfield set to 0[#AP]
* **Transmission procedure for UORA**

***TGax Editor: Please move the 2nd paragraph in this section as shown below:***

[16870]

***TGax Editor: Please update the 3rd paragraph in this section as shown below:***

 In the example in Figure 27-5 (Illustration of the UORA procedure):

* Before Trigger frame 1 was sent by the AP, HE STA 1, STA 2, STA 3 and STA 4 had initial OBO values of 3, 5, 4 and 2 respectively.
* Upon receiving Trigger frame 1:
* STA 4, which is associated with the AP and has pending frames for the AP, is allocated a dedicated RU (RU6). The STA does not contend for RA-RUs and instead transmits its pending frames on RU6.
* STA 1 and STA 2, both associated with the AP and having pending frames for the AP, decrement their respective OBO counters by the number of eligible RA-RUs indicated in the Trigger (i.e., three RA-RUs for associated STAs). Since STA 1's OBO counter decrements to 0, it transmits its pending frames on RU2 which it randomly selects from the eligible set of RUs (i.e., RU1, RU2, and RU3). Since STA 2's OBO counter decrements to a nonzero value, it maintains the new OBO value (2) until it receives a later Trigger frame carrying RA-RUs for associated STAs.[#AP]
* STA 3, which is not associated with the AP but has a pending frame for the AP, decrements its OBO counter by the number of eligible RA-RUs indicated in the Trigger frame (i.e., two RA-RUs for unassociated STAs). Since STA 3's OBO counter decrements to a nonzero value, it maintains the new OBO value (2) until it receives a later Trigger frame carrying RA-RUs for unassociated STAs.[#AP]
* After transmission of HE TB PPDU in response to Trigger frame 1:
* STA 4 has additional frames pending for the AP. Therefore, it maintains its initial OBO value (2) until it receives a later Trigger frame carrying RA-RUs for associated STAs.
* STA 1 has additional frames pending for the AP and randomly selects a new OBO value (4).
* Upon receiving Trigger frame 2:
* STA 1, STA 2 and STA 4 decrement their respective OBO counters by number of eligible RA-RUs (two in this case). Since STA 2 and STA 4's OBO counters decrements to 0, they both transmit their pending frames on a randomly selected RU (RU2 in case of STA 2 and RU1 in case of STA 4). If either STAs have additional frames pending for the AP, each would randomly select a new OBO value. Since STA 1's OBO decrements to a nonzero value, it maintains the new OBO value (2) until it receives a later Trigger frame carrying RA-RUs for associated STAs.
* STA 3 decrements its OBO counter by the number of eligible RA-RUs (two in this case). Since the STA's OBO counter decrements to 0, it transmits its pending frame on a randomly selected RU (RU4 in this case).

***TGax Editor: Please update the 5th paragraph in this section as shown below (includes the text moved from the 2nd paragraph):***

If a non-AP 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 non-AP STA shall follow the retransmission procedure defined in 27.5.5.4 (Retransmission procedure for UORA) if the transmission is not successful.[16870]

* **Additional considerations for unassociated STAs**

***TGax Editor: Please update the 1st paragraph in this section as shown below:***

An AP shall transmit a Trigger frame that allocates one or more RA-RUs for unassociated STAs in an HE PPDU so that an unassociated non-AP STA can determine the BSS color of the AP’s BSS.[#AP]

***TGax Editor: Please update the 4th paragraph in this section as shown below:***

A non-AP STA, upon receiving a FILS Discovery frame from an AP to which it is not associated with, may derive the operating parameters for that AP and may use the information when preparing an HE TB PPDU as a response to a Trigger frame from the AP containing RA-RUs for unassociated non-AP STAs.

***TGax Editor: Please update the 7th paragraph in this section as shown below:***

A non-AP STA that transmits an HE TB PPDU on an RA-RU allocated in a Trigger frame sent by an AP to which the non-AP STA is not associated shall include at most one Management frame, with the A3 field set to the BSSID of the AP, in the HE TB PPDU.

***TGax Editor: Please update the following paragraph in this section as shown below:***

***TGax Editor: CID 15686 was resolved during Sept meeting (Motion #684) however, I received offline feedback that the resolution isn’t entirely correct. I agree with the feedback and I have updated my resolution to address the concerns.***

[15686]An AP that receives Management frames from one or more unassociated non-AP STAs, carried in an HE TB PPDUs in response to a Trigger frame with RA-RUs, shall respond with a Multi-STA BlockAck frame carried either in an SU PPDU or in a DL HE MU PPDU on a broadcast RU with STA-ID 2045.

* Broadcast TWT operation
* General

***TGax Editor: Please update the following paragraph in this section as shown below:***

The TWT scheduling AP shall not include a broadcast TWT element in FILS Discovery frames and in broadcast Probe Response frames unless the TWT Flow Identifier subfield is set to 2, the Trigger subfield is set to 1, and the AP has scheduled transmission of a Trigger frame containing at least one User Info field allocating RA-RU for unassociated STAs during the next scheduled TWT SP. The AP transmits broadcast Probe Response frames if it has dot11FILSOmitReplicateProbeResponses equal to true.[#AP]

* **Power save with UORA and TWT**

***TGax Editor: Please update the following paragraph in this section as shown below:***

A *TWT-SP with RA-RU* is a TWT SP corresponding to a Broadcast TWT Parameter Set field in a TWT element having Broadcast TWT ID equal to 0, Flow Type equal to 0, Trigger subfield equal to 1, and a Broadcast TWT Recommendation subfield equal to 2. An associated HE STA that supports TWT and UORA procedure when operating in PS mode, upon receiving a Management frame from its associated AP carrying TWT element indicating a schedule for *TWT-SP(s) with RA-RU*, may enter doze state if no other condition requires it to be awake. The STA may transition to awake state at the start of a *TWT SP with RA-RU* and follow the procedure in 27.5.5 (UL OFDMA-based random access (UORA))) to send an HE TB PPDU to its associated AP. [#AP]

* **Power save with UORA and TWT**

***TGax Editor: There are no CIDs associated with this change. An update to Figure 27-12 is needed to account for an approved changes during the September meeting (doc 1266r6 motion #684). In the Trigger frame, the Common Info field name ‘No More RA-RU’ was changed to ‘More RA-RU’ and the meaning of the value was reversed.***

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| * **Example of power save operation with UORA and TWT**
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***TGax Editor: Visio file for updated figure 27-12 can be found in doc: 11-18-1454-03-00ax***