IEEE P802.11  
Wireless LANs

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| Resolution for CIDs related to Random Access | | | | |
| Date: September 4, 2018 | | | | |
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Abstract

This submission proposes resolutions for comments received for TGax LB233 (25):

17124, 17125, 16506, 16498, 16507, 16539, 16538, 15091, 15686, 15092, 15109, 16545, 15111, 15812, 15114, 15112, 15113, 15813, 16544, 16546, 16468, 15872, 17103, 15057, 15060

Revisions:

* Rev 0: Initial version of the document.

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** |
| 17124 | Yunbo Li | 296.19 | 27.5.5.1 | change the "RA-RU" to "RA-RUs", because multiple RA-RUs could be allocated | as in comment | **Reject**  The sentence describes a single RU hence RA-RU is singular |
| 17125 | Yunbo Li | 296.19 | 27.5.5.1 | change "a STA" to "STAs", because the RA-RU is not allocated to a specific STA, mulitple STAs could contend for it. | as in comment | **Revised**  Agree with the comment.  **TGax editor, please make changes as shown in doc 11-18/1266r0 for CID 17125** |
| 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 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." 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**  The original text in D3.0 (see P297L8) did cover this condition – i.e., STA should be able to satisfy the conditions mentioned in the TF’s Common Info and User Info field. However, for clarity sake, revised the text to clarify that all the rules in 27.5.3.3 apply when deciding if a particular RA-RU is eligible or not  **TGax editor, please make changes as shown in doc 11-18/1266r0 for CID 16506** |
| 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 the A-MPDU contained in the HE TB PPDU sent as a response to the Trigger frame. The encoding of the Preferred AC 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**  Please see resolution for CID 16506  **TGax editor, please make changes as shown in doc 11-18/1266r0 for CID 16498** |
| 16507 | Oghenekome Oteri | 298.35 | 27.5.5.3 | "If the selected RU is idle as a result of both physical and virtual CS as defined in 27.5.3.5 (UL MU CS mechanism),". May be misleading as it implies a CS mechanism on a RU granularit. | Use same language as in 27.5.3.5: "channel that contains the STA's selected RU is idle, where the sensed subchannel consists of one or more MHz channels." | **Revised**  Revised the paragraph to indicate that STA follows rules from 27.5.3.5 to determine the state of the medium (section 27.5.3.5 covers both cases – i.e., when CS Required subfield is set to 1 or it is set to 0). Also made reference to 27.5.3.3. This reference was missing D3.0 and is required since that section provides rules and procedures that STA must follow when transmitting an HE TB PPDU.  **TGax editor, please make changes as shown in doc 11-18/1266r0 for CID 16507** |
| 16539 | Pascal VIGER | 298.44 | 27.5.5.5 | The sentence "set the RA field of the frame carried in the HE TB PPDU to the TA address of the soliciting Trigger frame or to the address of a nontransmitted BSSID if the soliciting BSS corresponds to transmitted BSSID" seems not correct for one case : when the solliciting AP is the transmitted BSSID and the answer is intended to the transmitted BSSID. | Modify the sentence to cover the case where the address of a transmitted BSSID is to be set if the soliciting BSS corresponds to transmitted BSSID abd the intended BSS for registration is also the transmitted BSSID. | **Revised**  Agree with the comment. The existing text doesn’t clarify the case when the TF is from the TxBSSID and mgmt. frame carried in the TB PPDU is directed to the TxBSSID.  Deleted the bullet on RA setting as section 27.5.3.3 covers the case. Added a note to the RA section in 27.5.3.3.  **TGax editor, please make changes as shown in doc 11-18/1266r0 for CID 16539** |
| 16538 | Pascal VIGER | 289.19 | 27.5.3.3 | The RA field of the QoS Null frames, QoS Data frames and Management frames sent in response to a Trigger frame shall be set to the MAC address of the destination AP. It should be preferable to indicate precisely who is the destination AP in case of multi-BSS support. | Text can be amended as other sections: "set the RA field of the frame carried in the HE TB PPDU to the TA address of the soliciting Trigger frame or to the address of a nontransmitted BSSID if the soliciting BSS corresponds to transmitted BSSID." | **Revised**  Agree with the comment that the language is not clear. Added a note after the paragraph on RA rules in 27.5.3.3  **TGax editor, please make changes as shown in doc 11-18/1266r0 for CID 16538** |
| 15091 | Abhishek Patil | 299.38 | 27.5.5.5 | Remove the 1st bullet. 27.5.3.3 covers this case on pg 287 line 27 | Delete the 1st bullet | **Revised**  Agree with the comment.  **TGax editor, please make changes as shown in doc 11-18/1266r0 for CID 15091** |
| 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 Management frame 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 Management frame from an unassociated non-AP HE STA by following the UORA procedure." | **Revised**  Agree with the comment. Revised text to clarify that for a single STA case either ACK or multi-STA BA is allowed. If multiple STAs have sent a mgmt. frame in an HE TB PPDU, then the AP is required to respond with a multi-STA BA.  **TGax editor, please make changes as shown in doc 11-18/1266r0 for CID 15686** |
| 15092 | Abhishek Patil | 299.65 | 27.5.5.5 | 11ax D3.0 already recommends HE AP to transmit broadcast Probe Response frame. Make it clear here as well - i.e., when AP receives multiple probe request frames via UORA. | As in comment | **Revised**  Agree with the comment.  **TGax editor, please make changes as shown in doc 11-18/1266r0 for CID 15092** |
| 15109 | Abhishek Patil | 362.06 | 27.14.2 | The contents of section 27.14.2 are applicable only to STAs that support TWT and UORA. | Change the first paragraph to: "This subclause illustrates the power save mechanisms for UORA capable non-AP HE STAs that are operating in PS mode and are capable of broadcast TWT operation." | **Revised**  Agree with the comment.  **TGax editor, please make changes as shown in doc 11-18/1266r0 for CID 15109** |
| 16545 | Patrice Nezou | 362.06 | 27.14.2 | "This subclause illustrates the power save mechanisms for UORA capable non-AP HE STAs that are operating in PS mode using the UORA procedure (see 27.5.5.3 (Transmission procedure for UORA))."  This subclause is only valid in the area of TWT scenario. It is not a global power save management procedure. | Please move this section in the subclause dedicated to TWT subclause. | **Revised**  Agree in principle  Removed the condition that No More RA-RU is applicable to non TWT scenarios also. The power save section in 27.7.5 is generic while 27.14.2 is applicable to STAs that support both UORA and TWT, therefore keeping it as a separate section of its own.  **TGax editor, please make changes as shown in doc 11-18/1266r0 for CID 16545** |
| 15111 | Abhishek Patil | 362.38 | 27.14.2 | Third paragraph is a single long sentence. Simplify it by separating the definition of TWT SP with RA-RU and then describing the client side actions. Also update the field names to the ones matching Broadcast TWT Parameter set. | Change the third paragraph as: "A TWT-SP with RA-RUs is a TWT SP corresponding to a TWT Broadcast Parameter Set field in a TWT element having Broadcast subfield equal to 1, Trigger subfield equal to 1, and a Broadcast TWT Recommendation subfield equal to 2. During a TWT-SP with RA-RUs, an AP is expected to send at least one Trigger frame allocating RA-RUs. An associated HE STA that supports TWT and UORA procedure when operating in PS mode, upon receiving a Management frame carrying TWT element indicating 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-RUs and follow the procedure defined in 27.5.5 (UL OFDMA-based random access (UORA)) to send an HE TB PPDU to the AP on an RA-RU with AID12 subfield set to 0 allocated in a Trigger frame sent by an AP." | **Revised**  Agree with the comment.  **TGax editor, please make changes as shown in doc 11-18/1266r0 for CID 15111** |
| 15812 | Julien Sevin | 363.06 | 27.14.2 | "The More TF subfield in the Common Info field of the Trigger frame is equal to 1 and the No More RA-RU subfield is equal to 1 in User Info fields with AID12 subfield equal to 0 (for an associated STA) or 2045 (for an unassociated STA)."  Although the "No More RA-RU" subfield is set to 1, some scheduled RUs can be allocated for the given STA by the AP in subsequent trigger frames. Consequently, if the station enters in anticipated manner in doze mode, It is not able to transmit a HE TB PPDU in the scheduled RUs | As it is not in line with the standard (section 27.5.3.3 STA behavior for UL MU operation ), modify the usage of "No More RA-RU" subfield. | **Revised**  Agree in principle with the comment. The issue pointed out by the comment is fixed by requiring that the TWT-SP with RA-RUs is an announced TWT. With this change, an AP shall not assign a schedule RU to a STA unless it has received an indication from the STA that it is in awake state (i.e., a frame from the STA in or before the TWT SP).  **TGax editor, please make changes as shown in doc 11-18/1266r0 for CID 15812** |
| 15114 | Abhishek Patil | 362.64 | 27.14.2 | Section 27.5.5.3 covers the case of transmitting an HE TB PPDU when OBO decrements to 0. This section doesn't need to repeat it. The case of OBO not decrementing to 0 is of interest here. Further, the condition MORE TF = 0 or No More RA-RU = 1 condition is not enough to determine if the STA can go to doze state. Need to add another condition that the STA has not declared to the AP that it in awake state (as described in 27.7.3.3). If the STA has declared to the AP that it is in awake state, there is a chance that AP would poll the STA or assign a directed RU in a subsequent TF. | Remove text related to OBO=0. Update the first two sentences of the paragraph as: "An HE STA shall decrement its OBO counter by following the procedure in 27.5.5.3 (Transmission procedure for UORA) and if the OBO counter decrements to a nonzero value, then the STA may enter the doze state until either the end of the current TWT SP or the duration indicated by the Duration/ID field in case of no TWT SP if the STA has not declared to the AP that it is in awake state (as described in 27.7.3.3) and no other condition requires it to remain awake and the following conditions are met:" | **Revised**  Agree in principle with the comment.  Please see resolution to CID 15812.  Further text in the last paragraph was revised to indicate that the STA may go to doze state if it has not indicated to the AP that it is in awake state.  **TGax editor, please make changes as shown in doc 11-18/1266r0 for CID 15114** |
| 15112 | Abhishek Patil | 362.47 | 27.14.2 | No need to point to the section which describes how the More TF field is set. If we go this route, the spec would need to provide reference for every field that is cited in that section. | Delete paragraph starting line 47 | **Revised**  Agree with the comment.  **TGax editor, please make changes as shown in doc 11-18/1266r0 for CID 15112** |
| 15113 | Abhishek Patil | 362.53 | 27.14.2 | The second sentence in the 5th paragraph (line 53) is general and should be moved to 27.7.5 (pg 328 line 50). | Move the second sentence of this paragraph to the paragraph starting line 50 on pg 328. Make this the last sentence of that paragraph | **Revised**  Agree with the comment.  **TGax editor, please make changes as shown in doc 11-18/1266r0 for CID 15113** |
| 15813 | Julien Sevin | 362.57 | 27.14.2 | "An AP shall set the No More RA-RU subfield to 1 in a User Info field with AID12 subfield equal to 0 (for an associated STA) or 2045 (for an unassociated STA) if it does not intend to allocate the corresponding RARUs in subsequent Trigger frames until either the end of the current TWT SP or the duration indicated by the Duration/ID field in case of no TWT SP". The sentence is not clear. In which trigger frame the setting is done ? | Please clarify. | **Revised**  Clarified spec text to say that the No More RA-RU subfield indicates presence of RA-RUs in subsequent TF and is ignored if the More TF field is set to 0.  **TGax editor, please make changes as shown in doc 11-18/1266r0 for CID 15813** |
| 16544 | Patrice Nezou | 103.29 | 9.3.1.23 | "The No Further RA RU subfield is set to 1 to indicate that random access RUs are not allocated in subsequent Trigger frames that are sent before either the end of the current TWT SP or the end of the current TXOP in the case of no TWT SP."  This information is not sufficient for a non-AP STA to decide going in doze state or not. If a scheduled RU is assigned to a STA after the "No further random RUs" was set to 1, if it is in doze state, it cannot answer to a scheduled RU. Moreover this bit seems to be limited for the TWT usage. But why not extend for others cases ? | Add another bit to drive the status "No further scheduled RU" and remove the words "before either the end of the current TWT SP or the end of the current TXOP in the case of no TWT SP" | **Revised**  Agree in principle  Please see resolution for CIDs 15114 and 15812.  **TGax editor, please make changes as shown in doc 11-18/1266r0 for CID 16544** |
| 16546 | Patrice Nezou | 362.57 | 27.14.2 | "An AP shall set the No More RA-RU subfield to 1 in a User Info field with AID12 subfield equal to 0 (for an associated STA) or 2045 (for an unassociated STA) if it does not intend to allocate the corresponding RARUs in subsequent Trigger frames until either the end of the current TWT SP or the duration indicated by the Duration/ID field in case of no TWT SP."  The No More RA-RU subfield is only used for TWT scenario. It creates many inconsistencies. More globally a STA can enter in power save mode because this bit is set to 1, although it can be scheduled by an AP in the same TXOP. | Please restrict the usage of this bit in a TWT scenario only. At least, add a restriction to avoid being scheduled after entering in power save mode. | **Revised**  Agree in principle  Please see resolution for CID s 15114 and 15812.  **TGax editor, please make changes as shown in doc 11-18/1266r0 for CID 16546** |
| 16468 | Ming Gan | 362.03 | 27.14.2 | It says "the following condtions are met". However, once either condition is met , the STA may enter doze state | Change "the following condtions are met" to "one of the following condtions is met" | **Revised**  Agree with the comment.  **TGax editor, please make changes as shown in doc 11-18/1266r0 for CID 16468** |
| 15872 | Liwen Chu | 102.26 | 9.3.1.23 | make it clear that the more tha none RU are continuous RUs. | As in the comment | **Revised**  Agree with the comment.  **TGax editor, please make changes as shown in doc 11-18/1266r0 for CID 15872** |
| 17103 | yujin noh | 102.26 | 9.3.1.23 | make it clear the text "If there is more than one RA-RU, the sizes of all RA-RUs are 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 RA-RUs." What does the size here indicate? it is not clear whether it is its RU size or User info field or etc. |  | **Revised**  Agree with the comment.  **TGax editor, please make changes as shown in doc 11-18/1266r0 for CID 17103** |
| 15057 | Abhishek Patil | 238.30 | 11.1.4.3.2 | The active scanning procedure should include UORA as one of the access procedure | Update section 11.1.4.3.2 to include UORA as another access mechanism using which unassociated STAs can send a probe request frame to an AP | **Revised**  Agree with the comment.  **TGax editor, please make changes as shown in doc 11-18/1266r0 for CID 15057** |
| 15060 | Abhishek Patil | 241.34 | 11.3.3 | Since unassociated STAs that support UORA are expected to receive and decode Basic Trigger frame, Basic TF should be added to the list of Class 1 frames. | As in comment | **Revised**  Agree with the comment.  **TGax editor, please make changes as shown in doc 11-18/1266r0 for CID 15060** |

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

***TGax Editor: Please update the 3rd paragraph of 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 the RA-RU is available for STAs associated with it, and shall set the AID value 2045 to indicate that the RA-RU is available for STAs not associated with it.[#17125]

* **Eligible RA-RUs**

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

[#16506, 16498]An eligible RA-RU is an RA-RU for which the HE STA is capable of generating an HE TB PPDU (as described in 27.5.3.3 (STA behavior for UL MU operation)) and shall satisfy at least one of the following conditions:

* The HE STA is not associated with the BSS it intends to transmit frames to and the AID12 value of the RA-RU is 2045
* The HE STA is an associated STA, the TA field of the Trigger frame is set to the BSSID of the associated BSS and the AID12 value of the RA-RU is 0
* Transmission procedure for UORA(#13652)

***TGax Editor: Please replace the 4th and the 5th paragraph of this section with the content below:***

[#Ed]In the example shown 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. (18/0065r3)
  + 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 with AID12 subfield equal to 0). Since STA 1’s OBO counter decrements to 0, it transmits it 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.
  + 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 with AID12 subfield equal to 2045). 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.
* 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 to 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 6th paragraph of this section as shown below:***

An HE STA shall follow the rules defined in 27.5.3.3 to construct an HE TB PPDU and shall follow the rules as defined in 27.5.3.5 (UL MU CS mechanism) to determine the state of the medium. If CS is required and the selected RU is considered busy, then the HE non-AP STA shall not transmit the HE TB PPDU and the STA shall set its OBO counter to a random value drawn from a uniform distribution in the range 0 to OCW(#Ed). If CS is not required or the state of the medium is determined to be idle, the HE STA shall transmit an HE TB PPDU in the selected RU.[#16507]

(#11713)

* **Additional considerations for unassociated STAs(#13796)**

***TGax Editor: Please update this section as shown below (including moving paragraphs 6 & 7 before paragraph 5):***

An AP shall transmit a Trigger frame that allocates one or more RA-RUs with AID12 set to 2045 in an HE PPDU so that an unassociated STA can determine the BSS color.

An HE AP shall not transmit BQRP Trigger frame or BSRP Trigger frame that contains RA-RUs for unassociated STAs.

An AP should transmit FILS Discovery frames as described in 11.47.2.1 (FILS Discovery frame transmission) at regular intervals within a beacon period to assist an unassociated STA in the discovery of the BSS and its operating parameters.

A non-AP STA may derive the operating parameters of an AP's BSS upon receiving a FILS Discovery frame from the AP and use the information to send a Management frame in an HE TB PPDU as a response to a Trigger frame from the AP containing RA-RUs for unassociated STAs.(#11001)

[#Ed]

[#Ed]

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 STA is not associated shall include at most one Management frame in the HE TB PPDU.[#16539][#15091][#16539][#16539][#Ed]

[#Ed](#11045)

[#15686]An AP that receives a Management frame from one unassociated non-AP STA in an HE TB PPDU transmitted on an RA-RU shall respond with either an ACK or a Multi-STA BlockAck Frame in an SU PPDU or in a broadcast RU with STA\_ID\_LIST set to 2045 of an HE DL MU PPDU. An AP that receives Management frames from more than one unassociated non-AP STAs in an HE TB PPDU transmitted on an RA-RUs shall respond with a Multi-STA BlockAck Frame carried either in an SU PPDU or in a broadcast RU with STA\_ID\_LIST set to 2045 of an HE DL MU PPDU.

An AP with dot11FILSOmitReplicateProbeResponses equal to true shall respond with a broadcast Probe Response frame (see 11.1.4.3.4) when it receives Probe Request frame via the UORA procedure.[#15092] (#11037, #13781, #11347)

* STA behavior for UL MU operation

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

The RA field of the frames sent in response to a MU-RTS Trigger frame is set as defined in 9.3.1.3 (CTS frame format). The RA field of the MPDUs sent in response of a GCR MU-BAR Trigger frame or MU-BAR Trigger frame is set as defined in 9.3.1.9 (BlockAck frame format). (#11320)The RA field of the QoS Null frames, QoS Data frames(#13189) and Management frames sent in response to a Trigger frame shall be set to the MAC address of the destination AP (see 9.3.2.1 (Format of Data frames) and 9.3.3.2 (Format of Management frames)). The RA field of a QoS Null frame or Action No Ack frame sent in response to a frame carrying TRS Control subfield shall be the MAC address of the destination AP (see 9.3.2.1 (Format of Data frames) and 9.3.3.2 (Format of Management frames)).(#11157)

NOTE 1 – When dot11MultiBSSIDActivated is true and the soliciting Trigger frame has TA set to the transmitted BSSID, the destination AP is the BSSID that the non-AP STA intends to send the frame to.[#16539, 16538]

NOTE 2 —All MPDUs within an A-MPDU carried in an HE TB PPDU have the same RA (see 9.7.3 (A-MPDU contents)). The settings of the address fields of MPDUs within the A-MPDU depend on the type and subtype of the MPDU as defined in 9.3 (Format of individual frame types).

* **Power save with UORA and TWT**[#15109, 16545]

***TGax Editor: Please update this section as shown below:***

This subclause illustrates the power save mechanisms for UORA [#15109, 16545]and TWT capable non-AP HE STAs that are operating in PS mode using the UORA procedure (see 27.5.5.3 (Transmission procedure for UORA)).

An HE AP may indicate start times for one or more broadcast TWT SPs(#11379) containing Trigger frames with random access allocations in the broadcast TWT element that is included in the a Management frame as described in 27.7.3.2 (Rules for TWT scheduling AP). An example of power save operation is shown in Figure 27-12 (Example of power save operation with UORA).

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| * **Example of power save operation with UORA and TWT**[#15109, 16545] |

***TGax Editor: Visio file for updated figure 27-12 can be found in doc: 11-18-1454-00-00ax***

[#15111] 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[#15114, 15812], 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 carrying TWT element indicating 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 defined in 27.5.5 (UL OFDMA-based random access (UORA)) to send an HE TB PPDU to the AP on an RA-RU with AID12 subfield set to 0 allocated in a Trigger frame sent by an AP.

[#15112]An HE STA shall follow the procedure described in 27.7.5 (Power save operation during TWT SPs) to determine if TWT SP termination event has occurred and may enter doze state if no other condition requires the STA to remain awake. [#15113]

An AP shall set the No More RA-RU subfield to 1 in a User Info field with AID12 subfield equal to 0 (for an associated STA) or 2045 (for an unassociated STA) if it does not intend to allocate the corresponding RA-RUs in subsequent Trigger frames until the end of the current TWT SP. A non-AP STA shall ignore the No More RA-RU subfield if the More TF field in the Trigger frame is set to 0.[#15813, 16544, 16545, 16546] (#11713)

[#15114]An HE STA shall decrement its OBO counter by following the procedure in 27.5.5.3 (Transmission procedure for UORA). If the OBO counter decrements to a nonzero value, then the STA may enter the doze state until the end of the current TWT SP if [#15114, 15812]the STA has not declared to the AP that it is in awake state (as described in 27.7.3.3) and no other condition requires it to remain awake and [#16468]one of the following conditions is met:

* The More TF subfield in the Common Info field of the Trigger frame is equal to 0.
* The More TF subfield in the Common Info field of the Trigger frame is equal to 1 and the No More RA-RU subfield is equal to 1 in User Info fields with AID12 subfield equal to 0 (for an associated STA) or 2045 (for an unassociated STA).(#11713)
* Power save(#11955) operation during TWT SPs

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

A TWT requesting STA or a TWT scheduled STA in PS mode that is in the awake state for a TWT SP may transition to the doze state after AdjustedMinimumTWTWakeDuration time has elapsed from the TWT SP start time even if it has previously transmitted a PS-Poll frame or U-APSD trigger frame(#Ed) and has not yet received the expected frames from the AP in response. For a trigger-enabled TWT SP, i[#15113] (#12539)

* Trigger frame format

***TGax Editor: Please update the 2nd paragraph after Table 9-25h in this section as shown below:***

If there is more than one RA-RU (i.e., the Number Of RA-RU subfield of this User Info field has a value greater than 0), then the allocated RUs are contiguous and the RU sizes of all RA-RUs are 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 RA-RUs. [#15113, 17103]

***TGax Editor: Please update the 2nd paragraph after Figure 9-25i in this section as shown below:***

The No More RA-RU subfield(#12875) is set to 1 to indicate that RA-RUs, for associated STAs if AID12 subfield is equal to 0 and for unassociated STAs if AID12 subfield is equal to 2045,(#11033) are not allocated in subsequent Trigger frames that are sent until the end of the TWT SP in which the Trigger frame carrying this field was sent.[#15813, 16544, 16545, 16546] (#11713)

* **Active scanning procedure for a non-DMG STA**[15057]

***TGax Editor: Please update this section in baseline spec (802.11-2016 pg 1591) as shown below:***

Upon receipt of the MLME-SCAN.request primitive with ScanType indicating an active scan, a STA shall use the following procedure.

For each channel to be scanned:

* Wait until the ProbeDelay time has expired or a PHY‑RXSTART.indication primitive has been received. While waiting:

1. If a Trigger frame allocating RA-RU(s) for unassociated STAs is received, attempt to send a Probe Request frame by following the UORA procedure described in 27.5.5 (UL OFDMA-based random access (UORA)) and then proceed to step f) after the frame is sent.
2. If a Trigger frame allocating RA-RU(s) for unassociated STAs is not received or a Probe Request frame was not sent after following the UORA procedure when such a Trigger frame was received, proceed to step b)

NOTE – It is possible that an unassociated STA is unable to send a Probe Request frame after performing the UORA procedure if the OBO counter has not reach zero or if the selected allocated RU was sensed to be busy or if there is a collision on the selected RU. See 27.5.5.3 (Transmission procedure for UORA) for details.

* If the STA is a FILS STA, set the FILSProbeTimer to 0 and starts the FILSProbeTimer. While the FILS ProbeTimer is less than dot11FILSProbeDelay the STA may skip a probe request transmission and proceed to step i) after setting the ActiveScanningTimer to 0 and starting the ActiveScanningTimer, if one of the following conditions matches:
* The STA receives a broadcast addressed Probe Request frame that the SME considers to be suitable to discover a candidate AP for association.
* The STA receives one or more of Probe Response, Beacon, Measurement Pilot, or FILS Discovery frame that identify an AP that the SME considers a suitable candidate for association.

NOTE—The logic how an SME considers a probe request suitable or the AP as a suitable candidate for association is out of the scope of this standard.

* If a Trigger frame allocating RA-RU(s) for unassociated STAs is received, attempt to send a Probe Request frame by following the UORA procedure described in 27.5.5 (UL OFDMA-based random access (UORA)) and then proceed to step f) after the frame is sent. If such a Trigger frame is not received or a Probe Request frame is not sent after following the UORA procedure when such a Trigger frame was received, perform ~~Perform~~ the basic access procedure as defined in 10.3.4.2 (Basic access) and proceed to step d).
* Frame filtering based on STA state[15060]

***TGax Editor: Please add a new bullet under Class 1 Control frames this section in baseline spec (802.11-2016 pg 1644) as shown below:***

1. Class 1 frames

* Control frames
* RTS

….

* In an IBSS and in a PBSS when dot11RSNAActivated is false, Block Ack (BlockAck)
* In an IBSS and in a PBSS when dot11RSNAActivated is false, Block Ack Request (BlockAckReq)

1. Basic Trigger frame