IEEE P802.11
Wireless LANs

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| CIDs related to Random Access |
| Date: September 8, 2017 |
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Abstract

This submission proposes resolutions for the following 47 CIDs received for TGax LB225:

8172, 5023, 3073, 10016, 7651, 6154, 7181, 3236, 6000, 8389, 7409, 7425, 6139, 5860, 6711, 6712, 6008, 5676, 7419, 9956, 6038, 6108, 7204, 9578, 5740, 5738, 5507, 5508, 9740, 4787, 6039, 8288, 9741, 9957, 6043, 9742, 10295, 4788, 7422, 6182, 7043, 5401, 4710, 5333, 6093, 8685, 8686

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Updated based on offline feedback
	+ Removed CID 8141 as it is resolved in another document (prepared by Alfred)
	+ Provided resolutions to additional CIDs: 6039, 7422, 10295
	+ Included revised resolution for CIDs 6182, 7043 and 5401
		- The CIDs were resolved in doc 11-17/0645r3 during May 2017 meeting. But corresponding changes are missing in the current draft.
		- The proposed text was revised
			* Some of the changes do not apply anymore
		- Additional text is being proposed to support the changes
* Rev 2: Updated resolution for CIDs that were deferred when the doc was presented on 9/6/17 (MAC ad-hoc)
	+ No change to resolution for CID 3073 based on discussion with Zhou
	+ No change to resolution for CIDs 7651, 6154, 7181, 3236, 6000 after discussion with several folks
	+ Revised the reason for rejecting CIDs 6711 & 6712 after discussion with Sean
	+ Updated figure 27-12 (resolution to CIDs 6038, 6108, 7204) based on discussion with Jeongki
	+ Resolution to CID 5507 was revised based on discussion with Jarrko
	+ Resolution text for CIDs 6182, 7043, 5401 was revised after discussion with Yongho and Kaiying
	+ Included resolutions for CIDs: 4710, 5333, 6093, 8685, 8686 after discussion with Chitto
* Rev 3: Fixed rev reference for doc 1280 (Visio file for figure 27-12)
* Rev 4: Minor edits based on feedback when the doc was presented on 9/8/17 (MAC ad-hoc day 3)

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** |
| 8172 | Osama Aboulmagd | 167.59 | 17.5.2.3 | There is one occurance of "TBD" on page 167 | TBD has to be either deleted or resolvced | RevisedDoc 11-17/229r2 resolved the TBD and it is not present in the current draft. **TGax editor: No further changes are required.** |
| 5023 | Chao Chun Wang |  | 27.5.2.6.2 | There are a couple of issues with the unrestricted use of UL OFMA RA in trigger-access opportunity. (a) Un-associated STA can't send data frame while associated STA may send both data and management frames. (b) The management functions for associated, and un-associated STA are different and the size of frames may be very different. (c) It is unclear why an AP would schedule RUs for un-associated STAs and not using all available RUs for associated STAs to send UL data. (d) Mixing UL OFMA RA opportunities in one triggered-access duration for associated and un-associated STAs makes little sense. There are many parameters need to consider by AP in order to decide the suitable duration for the UL transmission slot. Any remedy to address the duration issue tends to increase the complexity of the feature. |  | RevisedAgree with the comment. The latest draft separates RA for associated and unassociated STAs. Doc 11-17/0229r2 (approved during March 2017 meeting) defined a separate AID (2045) for indicating RA for unassociated STAs only. AID=0 is used to addressed associated STAs for RA. Keeping RA for associated and unassociated STAs would enable the AP to trigger each type separately – thus providing fair opportunity to unassociated STAs. **TGax editor: No further changes are required.** |
| 3073 | Abhishek Patil | 173.38 | 27.5.2.6.2 | Condition for when the STA should use random access needs to be defined. In the absence of such restriction there will be a lot of un-necessary random access attempts | As in the comment | RevisedAgree with the comment. The current draft has specified reasonable criteria to restrict random access. For example, separation of RA for associated and unassociated STA, STA needs to have pending traffic for the AP, STA needs to meet all the requirements in Common Info and User Info etc. Therefore, no further restrictions are required at this point.**TGax editor: No further changes are required.** |
| 10016 | Yuichi Morioka | 172.28 | 27.5.2.6 | It should be beneficial if the AP can allocate part of the random access RUs for BSRP and partly for other UL small data. | Define a field within the trigger frame that indicates which RU set is intended for BSRP. | RejectedThe spec permits a non-AP STA to send unsolicited BSR in a TB PPDU via random access in response to a TF carrying one or more random access RUs (see 27.5.2.5 in D1.4). We don’t need a separate field to indicate RUs for BSRP. Further defining a new kind of multi-type TF would add unnecessary complexities. |
| 7651 | Liwen Chu | 172.35 | 27.5.2.6.1 | It seems reasonable to add BQRP here. | As in comment | RevisedAgree with the comment. The current spec already allowed TF of Basic and BSRP variant to carry RUs for random access. Further, the current spec permits a non-AP STA to send unsolicited BSR or BQR in a TB PPDU via random access in response to a TF carrying one or more random access RUs (see 27.5.2.5 and 27.5.1.3 in D1.4).* Added text to indicate that TF of BQRP variant can carry RUs for random access.
* Added a note to clarify that no other TF variants can carry RUs for random access.
* Added text to specify that TF variant BQRP and BSRP are only allowed to carry random access RUs for associated STAs.
* Added note in 27.5.1.3 to provide clarification with respect to unsolicited BQR operation (similar note exists in 27.5.2.5 to cover unsolicited BSR).

**TGax editor: Please make changes as shown in doc 11-17/1276r4** |
| 6154 | Jinjing Jiang | 172.35 | 27.5.2.6.1 | It seems only basic trigger and BSRP trigger could initiate random acess OFDMA, how about other variants, such as BQRP? | Please clarify | RevisedAgree with the comment that random access should be permitted for BQRP. Please resolution to CID 7651.**TGax editor: Please make changes as shown in doc 11-17/1276r4** |
| 7181 | kaiying Lv | 172.35 | 27.5.2.6.1 | Could BQRP variant Trigger frame be used to allocate RA RU? Since BQRP frame is the same as basic trigger frame╥╟Θ | Please clarify it | RevisedAgree with the comment that random access should be permitted for BQRP. Please resolution to CID 7651.**TGax editor: Please make changes as shown in doc 11-17/1276r4** |
| 3236 | Ahmadreza Hedayat | 172.35 | 27.5.2.6 | In D1.0, random access RUs are only allowed to be within a Basic Trigger frame; "An HE AP may transmit a Basic Trigger frame or a BSRP Trigger frame that contains one or more RUs for random access." | Either remove the reference to BSRP, or update the spec so that RA RUs can be included withion a BSRP Trigger frame (and if so then any other variant should be included?) | RevisedAgree with the comment. Please resolution to CID 7651.**TGax editor: Please make changes as shown in doc 11-17/1276r4** |
| 6000 | Jarkko Kneckt | 172.35 | 27.5.2.6.1 | 27.5.2.6.1 states that only basic variant or BSRP variant trigger may contain random access opportunities. 27.5.1.3 has a contradiction stating that BQR variant Trigger may include Rus for random access. The random access should be possible for all Trigger variants except MU-RTS. | Delete the sentence in lines 35 and 36 and add the following sentence:" One or more RUs for UL OFDMA random access may be included to all trigger frame variants, except to MU-RTS variant." | RevisedAgree with the comment. Please resolution to CID 7651.**TGax editor: Please make changes as shown in doc 11-17/1276r4** |
| 8389 | Po-Kai Huang | 172.35 | 27.5.2.6 | An HE AP may transmit a Basic Trigger frame or a BSRP Trigger frame that contains one or more RUs for random access. However, a STA only maintains one counter for OFDMA random access. Assume the same system behavior for two different types of solicitation is awkward. Specifically, a STA that intends to transmit data to AP may get its chance at the slot of BSR random access allocation and needs to backoff again. | Make clear separation between operation of regular random access allocations and BSR random access allocations by separating into two backoff counters for OFDMA random access based on trigger type. | RejectedThe UORA procedure provides means for a STA to access a random access RU. Upon expiration of the timer the STA sends whatever feedback or data it is being requested. It is up to the AP to determine the prioritization of the resources (be it for short data, BSRP, or BQRP feedback). Adding multiple counters for OFDMA would further add to the complexity to the mechanism which is intended to simply provide random resources for STAs to UL.  |
| 7409 | Lei Huang | 172.35 | 27.5.2.6.1 | There is currently no rule regarding how RUs are assigned for random access in a Trigger frame by an AP. Without such a rule, it is possible that no any RUs assigned for random access in a Trigger frame are available to 20MHz operating STAs. In order for 20MHz operating STA to always get an opportunity to reach AP via random access procedure, every Trigger frame for random access shall include at least one RU for random access which is available to 20MHz operating STAs. | Add the following statement at the end of the second paragraph of section 27.5.2.6.1:"Every Trigger frame for random access transmitted by the HE AP shall include at least one RU for random access which is available to 20MHz operating STAs. In other words, every Trigger frame for random access shall contain at least one RU for random access which is in the primary 20MHz channel and unrestricted to be used for 20MHz operating STAs." | RejectedGenerally agree with the comment but this need not be specified in the spec. An AP has global knowledge of its BSS and it can decide to allocate a random access RU in primary 20MHz if there is at least one associated STA that operates as a 20MHz only STA and is not the recipient of a directed RU in the Trigger frame. Further, if the random access RU is for unassociated STA(s), the AP may make the decision based on several factors (i.e., how congested its 20MHz primary is and whether it prefers to have higher BW STAs etc) |
| 7425 | Lei Huang | 174.16 | 27.5.2.6.3 | The retransmission procedure for random access is not clearly defined. | 1. define a local MIB variable "dot11RARetryLimit",which indicates the maximum number of successive retransmission attempts.2. Change the sentence in L52-L54 of P172 as follows:"The non-AP STA with dot11OFDMARandomAccessOptionImlemented set to true shall maintain an internal OFDMA backoff (OBO) counter and an internal random access retry (RAR) counter.3. Change the second paragraph of 27.5.2.6.3 as follows:"If the HE trigger-based PPDU is not successfully transmitted in the randomly selected RU, the HE STA shall update its OCW to 2\*OCW+1 for every retransmission, until the OCW reaches OCWmax, and shall also increment its RAR counter by one and initialize its OBO counter to a random value in the range of 0 and OCW for every retransmission. Once the OCW reaches OCWmax for successive retransmission attempts, the OCW shall remain at the value of OCWmax until the OCW is reset. If the RAR counter has reached dot11RARetryLimit, there is no more retransmission attempt. "4. Change the third paragraph of 27.5.2.6.2 as follows:"For an initial HE trigger-based PPDU transmission or following a successful HE trigger-based PPDU transmission or following an unsuccessful HE trigger-based PPDU transmission for which there is no more retransmission attempts, 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 RAR counter to zero, and shall initialize its OBO counter to a random value in the range of 0 and OCWmin. | RejectedRandom access mechanism is quite different from traditional EDCA based mechanism. Random access is AP controlled and the AP decides how may RUs to assign for RA in a TF and also the frequency with which a TF containing random access RUs is transmitted. If the retry counter for random access hits maximum and the STA decides to drop the frame and reset the counter to 0, it doesn’t change the situation for the next frame. In fact, if OBO counter is also reset, it will make the situation worst since the collision situation has likely not changed but now the STA would find itself with a lower OBO counter and as such being more aggressive, potentially leading to more collisions. |
| 6139 | Jing Ma | 174.17 | 27.5.2.6.3 | Clarify whether the short & long retry counter should be updated or not for every retransmission in random access operation | as the comment | RejectedNo short and long retry counters are not updated. Random access mechanism is different from traditional EDCA mechanism and having a retry counter does not help improve the changes of a successful transmission of subsequent frames. Please see resolution to CID 7425. |
| 5860 | Hyunhee Park | 173.54 | 27.5.2.6.2 | If the selected RU size for random access is quite small, the STA cannot send frames in random access through the selected RU. For clarification, an RU selection rule should be defined in random access.When the selected RU size is small in random access, how the STA operate to send frames? There are many candidate optoins, for example, re-selection, fragmentation, non-transmission, etc. For clarification, an RU selection rule should be defined in random access. | Define an RU selection rule considering the RU size in random access. | RejectedThe current random access feature is sufficient and doesn’t require the proposed changes which will add unnecessary complexities to this feature. Random access mechanism should be used for short frame exchanges potentially followed by a directed TF from the AP to solicit larger data (if required). A STA can make decisions on how much data to UL to the data in a random access RU. Further, the STA can send BSR to the AP in its UL frame to the AP to let the AP know the STA’s buffer status. |
| 6711 | John Coffey | 174.19 | 27.5.2.6.2 | How does coexistence with deployed legacy devices, especially those in OBSSs, work? Here it seems that the HE AP transmits an initial trigger frame, which holds all devices within range off the medium for the signaled duration. Perhaps HE devices in OBSSs may still transmit (this is not clear), but certainly legacy devices in OBSSs cannot. These legacy devices may suffer a huge loss of access to the medium if use of this mode becomes prevalent. Essentially, instead of the HE non-AP STAs that take advantage of this mode having to fight their own way to the top via ordinary EDCA, their AP unilaterally seizes the medium with AP priority and these devices then share the rarified space with each other. This is far too favorable to HE devices and some controls are necessary. At the very least recomemnded practices for best behavior need to be specified. | Provide specifications for recommended behavior for APs that use this mode, that will have the effect of allowing fair access to the medium by legacy devices in OBSSs. (Note: a sketch of one approach that would be acceptable can be found in doc. IEEE 802.11/16-0102r1, slides 20-23.) | RejectedThe comment has some merit. However, the proposed resolution lacks details. TF with random access is intended to reduce the contention in the medium by facilitating UL opportunity to several non-AP STAs all at once (via MU). With such a scheme, the number of contender is expected to reduce.It is possible that in a bad AP implementation, the AP could over-allocate the number of RUs for random access (thus wasting RUs and/or medium time). While some of this can be handled in a good AP implementation, the commenter (during offline discussion) indicated that he may bring a proposal (in the future) that provides some guidelines to the AP implementation. A simple scheme could be the AP adapts the number of RA-RU allocations based on recent history. |
| 6712 | John Coffey | 174.19 | 27.5.2.6.2 | In some ways the random access OFDMA modes are an odd fit for the 11ax project: one of the main benefits of OFDMA is the potential increase in efficiency from the removal of most contention-based overhead (collisions, RTS, CTS, unused backoffs slots). This potential increase in efficiency may provide a net gain even after accounting for the new, considerably longer, HE preambles. But with random access OFDMA we still have the contention overhead but now with the new, longer, preambles as well. Perhaps there's an arguable potential range difference, but once again range extension isn't part of the project. A stronger justification is that 11ax will involve OFDMA as a major component, and it's difficult to jump straight from contention-based access to fully scheduled operation; perhaps there should be a way of bridging the two modes of operation. However even accepting that, we really must do something to keep the contention overhead under tcontrol. There are ways of doing this: it's possible for the AP to send out an optional supplemetary frame identifying RUs and devices (via MAC address or Partial AID), in which the first few slots are assigned to thoe devices in order, if they use them (and the remaining devices just freeze their OCW backoff counters). See 15/1115r1, 16/0102r1, and 16/0394r0 for a similar scheme (a little more elaborate than what's suggested here). | Permit the AP to send an immediate supplementary frame identifying RU's and for each RU a list of STAs. These STAs may access the RU if it's not already in use. If none on the list does (or are seen to do so), other STAs start counting down their OCW backoff counters as in the current draft. | RejectedIn general, trigger based access is expected to help facilitate a more controlled access for multiple STAs all at once. Further, via random access RUs, the AP can provide access to STAs that are not listed in the directed. Random access also enables STAs to report their buffer status, which lets the AP make decisions on allocation of RUs in future TFs. In addition, random access for unassociated STAs permits several unassociated STAs to exchange of management frames in MU fashion with the AP.Also, please see resolution to CID 6711 |
| 6008 | Jarkko Kneckt | 174.24 | 27.5.2.6.3 | The clause 27.5.2.7 seems relate to the clause 27.6. The clause 27.5.2.7 is unclear and difficult to understand. | Please merge clause 27.5.2.6.3 with the clause 27.6 and delete the clause 27.5.2.7. | RejectedClause 27.6 relates to HE Sounding while clause 27.5.2.7 (27.5.5 in D1.4) relates to NDP short feedback mechanism. There is no relation between the two. Further, 27.5.2.6.3 (27.5.4.3 in D1.4) relates to random access (UORA). No relation with HE Sounding or NDP feedback. |
| 5676 | Guoqing Li | 199.60 | 27.14.2 | As I understand, TWT element does not containt "start time of the trigger frame", it contains start time of the TWT SP. And contains indication for trigger-enabled SP and indication for random access RU. As such, the sentence here is not accurate. |  | RevisedAgree with the comment. The text in the paragraph and figure 27-12 has been updated to clarify that that broadcast TWT element provides start time of one or more TWT SPs and other fields in the element indicate whether the SPs will include Trigger frames with random access.**TGax editor: Please make changes as shown in doc 11-17/1276r4** |
| 7419 | Lei Huang | 199.60 | 27.14.2 | Broadcast TWT element actually does not indicate start times for Trigger frames with random access allocations. Instead it indicates start time of broadcast TWT SP which contains Trigger frames with random access allocations. | 1. Change"An HE AP may indicate one or more start times for Trigger frames with random access allocations in the broadcast TWT element that is included in the Beacon frame or a management frame ..."to"An HE AP may indicate start time for broadcast TWT SP containing Trigger frames with random access allocations in the broadcast TWT element that is included in the Beacon frame or a management frame ..."2. Change Figure 27-7 accordingly. | RevisedAgree with the comment.Please see resolution to CID 5676 **TGax editor: Please make changes as shown in doc 11-17/1276r4** |
| 9956 | Young Hoon Kwon | 199.60 | 27.14.2 | Not sure how an HE AP indicate the start times for Trigger frames. Even within a Trigger-enabled TWT SP, the AP does not specifically indicate the start time of each Trigger frame, if I remember correctly. Further clarification is needed. | As in the comment. | RevisedAgree with the comment.Please see resolution to CID 5676 **TGax editor: Please make changes as shown in doc 11-17/1276r4** |
| 6038 | Jarkko Kneckt | 200.05 | 27.14.2 | The Figure 27-7 is hard to understand. The trigger frame start time is shown to be long and the transmission of the Trigger frame is not started in the beginning of the trigger frame start time. There is a trigger frame that is transmitted before the TF Start time. | Please clarify the figure. The Trigger Frame start time does not look like correctly drawn to the figure. | RevisedAgree with the comment.A new (hi-res) figure has been provided (document 11-17/1280r2). The new figure fixes the inaccuracies in the earlier figure and also depicts the functionality of Cascade Indication field.**TGax editor: Please make changes as shown in doc 11-17/1276r4** |
| 6108 | Jian Yu | 200.05 | 27.14.2 | Replace the figure with a high resolution one | As in comment | RevisedPlease see resolution to CID 6038**TGax editor: Please make changes as shown in doc 11-17/1276r4** |
| 7204 | kaiying Lv | 200.06 | 27.14.2 | the figure27-7 is not clear | Please re-draw it | RevisedPlease see resolution to CID 6038**TGax editor: Please make changes as shown in doc 11-17/1276r4** |
| 9578 | Yonggang Fang | 199.60 | 27.14.2 | An HE AP can schedule a TWT SP for TWT scheduled STA and TWT for random access. It is not clear whether the TWT STA should wake up at both scheduled TWT SP and TWT RA period? | Need to clarify in the spec | RejectWhile it is true that AP can setup different types of broadcast TWT SPs, it is up to the STA to subscribe to (i.e., wake-up for) all or a subset of the SPs. This section describes the behavior for a STA in power save mode which goes to doze state for an extended period until a TWT SP that is expected to have random access TFs so that the STA can use one of the random access RU to send UL to the AP (which also serves as an indicator to the AP that the STA is awake during this SP and can receive DL traffic during that SP). |
| 5740 | Guoqing Li | 200.22 | 27.14.2 | I think this subsection (power save with UL OFDMA-based random access) only apply to the case when this Beacon doesn't beong to the beacon that the STA is supposed to monitor. Otherwise, if this is a Beacon that the STA is supposed to wake up and monitor based on braodcast TWT Setup, then the STA need to wake up at the start of the TWT SP anyway no matter whether it will contain random RU or not in order to get triggered by AP. | Clarify | RejectedThis section describes behavior for a power-save STA that would be in PS mode for an extended period. The TWT SP with random access TF serves as a means for the STA to use random access RUs to send UL to AP. This behavior also helps let the AP know that the STA is awake to receive DL from the AP. The section also covers the case of an unassociated monitoring management frames from a candidate AP (to receive broadcast TWT element pointing to TWT SPs with random access TFs) so that the STA can send management frames to the AP via random access RUs |
| 5738 | Guoqing Li | 200.22 | 27.14.2 | Even if the TWT flow identifier indicates that this TWT doesn't contain random RU, I think the STA can still go to doze until the start of the SP if the AP doesn't indicate presence of DL traffic in TIM, right? If so, then there is no need to mention the ramdom access here. | Clarify | RejectedSection 27.14.2 is more general covers the case where a STA may not have explicitly indicated to the AP which TWT SP it intents wake-up for. In such case, the STA is able to use random access to send UL frame to the AP and also let the AP know that it is awake to receive DL frames from the AP. Further, please see resolution to CIDs 9578 & 5738. |
| 5507 | Graham Smith | 200.21 | 27.14.2 | "value of 1 in the Broadcast subfield a value of 2 in the TWT Flow Identifier subfield". Is there a missing 'and', or a missing 'or". Which is it? | Add an "and" or "or" as appropriate. | RevisedAgree with the comment. The missing ‘and’ was fixed in an earlier revision of the draft and no longer appears in D1.4. Added missing condition that the Trigger subfield in the broadcast TWT element should be set to 1. Made minor editorial revision to the sentence based on feedback received when the doc was presented at the MAC ad-hoc (on 9/7/17).**TGax editor: Please make changes as shown in doc 11-17/1276r4** |
| 5508 | Graham Smith | 200.25 | 27.14.2 | "If random access allocations are made in a sequence of Trigger frames within a trigger-enabled TWT SP, then all the Trigger frames in the sequence shall have the Cascade Indication field set to 1, except for the last Trigger frame in the sequence, which shall have the Cascade Indication field set to 0." THis definitive requirement, I assume, is repeated somewhere else as this is not a requirement of the power save idea. A STA may choose to use the Cascade Indication field to enter the doze state, but how the and what the Cascade Indication fields are set should be in the appropriate place not here. | Either delete the cited text or make it a note, or make a reference.after "Cascade Indication field" in line 30. | RevisedAgree with the comment. The sentence describing how the value of Cascade Indication field is set has been deleted and replaced with a new sentence referencing section 27.7.3.3.**TGax editor: Please make changes as shown in doc 11-17/1276r4** |
| 9740 | Yongho Seok | 200.25 | 27.14.2 | "If random access allocations are made in a sequence of Trigger frames within a trigger-enabled TWT SP, then all the Trigger frames in the sequence shall have the Cascade Indication field set to 1, except for the last Trigger frame in the sequence, which shall have the Cascade Indication field set to 0."The same normative text is already included in 27.7.3.2 (Rules for TWT scheduling STA).Please remove the corresponding paragraph. | As per comment. | RevisedAgree with the comment. Please see resolution to CID 5508.**TGax editor: Please make changes as shown in doc 11-17/1276r4** |
| 4787 | Alfred Asterjadhi | 200.00 | 27.14.2 | Some of this text applies to the Cascade Indication setting for the Trigger frame from the AP side, which would be more appropriate to be in the TWT subclause. It is appropriate to clarify that the reception of this Trigger frame for random access is classified as an early termination period. | Please organize the subclause such that the normative behavior from AP side is contained in one subclause and the normatvie behavior from STA side is contained in one subclause (in terms of early termination events). If necessary add declarative statements to indicate where such a behavior is defined. Similar considerations for power save in congested environment. | RevisedAgree with the comment. The sentence describing how the value of Cascade Indication field is set has been deleted and replaced with a new sentence referencing section 27.7.3.3. Further, a reference to TWT SP termination has been added. *[Note, doc 11-17/1138 is proposing to add a new section 27.7.5 to describe TWT SP termination and PS operation]***TGax editor: Please make changes as shown in doc 11-17/1276r4** |
| 6039 | Jarkko Kneckt | 200.28 | 27.14.2 | The BC TWT Flow ID value 2 is used for TWTs that include random access RUs. Each TWT service period has a nominal minimum duration that defines the maximum time that STAs may transmit in the service period. The maximum duration of the TWT SP is not described in the UL OFDMA random access. Also EOSP and more data fields use in the TWT SP termination are not explained. | Please refer to the TWT SP termination rules in UL OFDMA random access. The TWT SP duration, EOSP and More Data fields should terminate the TWT SP for all power save mode STAs. | RevisedAgree with the comment.An HE STA can go to doze state if the TWT SP termination event occurs. Added text that refers to the section describing rules for determining TWT termination event.**TGax editor: Please make changes as shown in doc 11-17/1276r4** |
| 8288 | Pascal VIGER | 200.23 | 27.14.2 | Power save with UL OFDMA may make the STA waking up at the same time. They "may enter the doze state until the start of that TWT SP". If the TF is collided or delayed due to contention, STA s may miss the TWT SP (can not use TWT SP). | The Trigger Frames having a targeted wake time schedule (trigger-enabled SPs) shall be prioritized for being transmitted by HE AP.This will ensure the timing contract with TWT scheduled stations is respected for trigger-enabled TWT agreement, which is beneficial for medium usage efficiency. | RevisedThe text in D1.0 was inaccurate. The broadcast TWT element indicates the time when TWT SP would begin – it doesn’t point to the start time of a TF as described in this section under D1.0. The text has been fixed as a resolution to CIDs 5676, 7419, 9956 covered in this document. The condition mentioned by this comment should not occur anymore as STAs that wake up during the TWT SP may go to sleep under certain conditions. Further text was added to indicate that the STA can go to sleep after AdjustedMinimumTWTWakeDuration time has elapsed if no TF was received. **TGax editor: Please make changes as shown in doc 11-17/1276r4** |
| 9741 | Yongho Seok | 200.30 | 27.14.2 | "If the OBO counter decrements to a non-zero value with the random access procedure in a Trigger frame with Cascade Indication field set to 0, it may enter the doze state immediately."The OBO counter having a non-zero value does not mean that a STA did not exchange a PS-Poll frame or an APSD trigger frame with an AP.After exchanging a PS-Poll frame or an APSD trigger frame, the STA still can continoue to be in the UL OFDMA-based random access if it has some pending frame.So, it is very odd that a STA is permitted to enter the doze state immediately after receiving a Trigger frame with Cascade Indication field set to 0.Please remove the corresponding sentence. | As per comment. | RevisedAgree with the comment. Added a text to clarify that the STA may not go to sleep if there are other conditions that require the STA to remain awake.**TGax editor: Please make changes as shown in doc 11-17/1276r4** |
| 9957 | Young Hoon Kwon | 200.32 | 27.14.2 | Even when Cascade Indication field is set to 0 and there's non-zero OBO counter, the STA cannot go to doze state because there's still a chance that the serving AP may send DL data to the STA. Further clarification is needed. | As in the comment. | RevisedAgree with the comment. Added a text to clarify that the STA may not go to sleep if there are other conditions that require the STA to remain awake.**TGax editor: Please make changes as shown in doc 11-17/1276r4** |
| 6043 | Jarkko Kneckt | 200.30 | 27.14.2 | A Cascade Indication set to 0 indicates the last Trigger frame that contains UL OFDMA random access RUs. Clause 27.7.3.3 P185 L54 has a different logic for Cascade Indication handling: A non-AP STA may return to Doze, if the Trigger has Cascade Indication set to 0 and there is no RU allocated to the STA. The definition in P185 would allow a STA to continue TWE SP if it receives a Trigger with Cascade Indication set to 0 and has RUs allocated for the STA, in definition P200, the TWT SP will be terminated regardless of the allocated RUs. | Please unify the handling of the Cascade indications in TWT SPs. The TWT SP should be terminated if Cascade Indication has value 0 and there is no allocated Rus for the STA. | RejectedBoth the sections are correct. 27.7.3.3 indicate that STA may go to sleep if this is the last TF (i.e., Cascade Indication = 0) and the STA has not been the intended recipient and the TF doesn’t contain any random access RUs. Section 27.14.2 captures the case where the TF contains random access RU(s). In such case, if the OBO count is non-zero, then the STA can’t access via the random access RU. In which case, it may go to sleep unless there is any other condition that requires it to remain in awake state. |
| 9742 | Yongho Seok | 200.32 | 27.14.2 | The following is a behavior of the TWT scheduled STA (see 27.7.3.3)"The TWT scheduled STA shall be in the awake state for AdjustedMinimumTWTWakeDuration time that corresponds to that TWT parameter set, except that the STA may go to doze state when a TWT SP termination event occurs."And, the following is not listed in the TWT SP termination event."If the OBO counter decrements to a non-zero value with the random access procedure in a Trigger frame with Cascade Indication field set to 1..."So, please change "may" to "shall" as the following:"..., it shall remain awake for random access in the cascaded Trigger frame." | As per comment. | RejectedThe ‘shall’ condition cited by the comment is no longer present in section 27.7.3.3 in the latest (D1.4) draft. Further, when Cascade Indication is 1, it is up to the STA on whether it wants to remain awake or go to sleep. |
| 10295 | Yusuke Tanaka | 200.27 | 27.14.2 | In case the AP need to terminate the sequence earlier, it is beneficial to define a method to transmit a Trigger frame not to intend to solicit PPDUs. | Add texts as follows."The last Trigger frame can solicit no HE trigger-based PPDUs for early terminate of the sequence." | RejectedThe proposed mechanism will be a new behavior and a feature that is not required. There are existing mechanisms like determining TWT termination event or elapse of AdjustedMinimumTWTWakeDuration which lets a STA to determine if it can go to doze state. |
| 4788 | Alfred Asterjadhi | 200.30 | 27.14.2 | The other condition is missing. Specify that when the OBO counter is 0 the STA transmits a Trigger-based PPDu in the selected resource (and provide a subclause reference where the norm behavior is defined. | As in comment. | RevisedAgree with the comment. Added a text to capture the case when OBO counter decrements to 0.**TGax editor: Please make changes as shown in doc 11-17/1276r4** |
| 7422 | Lei Huang | 200.31 | 27.14.2 | The condition for an HE STA to enter the doze state using the value inidcated in the Cascade Indication field in a Trigger frame is incomplete. For example, if the OBO counter decrements to zero and but each of one or more 20MHz channels containing the selected RU is considered busy with the random access procedure in a Trigger frame with Cascade Indication field set to 0, the HE STA may enter the doze state immediately as well. | Change"If the OBO counter decrements to a non-zero value with the random access procedure in a Trigger frame with Cascade Indication field set to 0, it may enter the doze state immediately. If the OBO counter decrements to a non-zero value with the random access procedure in a Trigger frame with Cascade Indication field set to 1, it may remain awake for random access in the cascaded Trigger frame."to"If the OBO counter decrements to a non-zero value or if the OBO counter decrements to zero and but each of one or more 20MHz channels containing the selected RU is considered busy with the random access procedure in a Trigger frame with Cascade Indication field set to 0, it may enter the doze state immediately. If the OBO counter decrements to a non-zero value or if the OBO counter decrements to zero and but each of one or more 20MHz channels containing the selected RU is considered busy with the random access procedure in a Trigger frame with Cascade Indication field set to 1, it may remain awake for random access in the cascaded Trigger frame." | RejectedIf the OBO counter decrements to 0, the STA is expected to follows the procedure defined in section 27.5.4.2 – see resolution to CID 4788. Section 27.5.4.2 captures the case where the selected RU is detected to be busy (P238L25). Therefore, no further description is required in this section.  |
| 5401 | Geonjung Ko | 27.5.2.6.2 | P173L01 | There is always the Beacon frame from the transmitted BSSID, but Beacon frames from the nontransmitted BSSIDs may not exist. Moreover, a STA cannot determine whether a Trigger frame is soliciting STAs only associated with the BSS of the transmitted BSSID or at least two BSSs using the TA field.STAs associated with the BSS of the nontransmitted BSSID should have an opportunity to participate in the random access. Also all of STAs associated with BSSs of the transmitted BSSID and nontransmitted BSSIDs need to have fair opportunities. | STAs associated with BSSs of nontransmitted BSSIDs should use the RAPS element in a Beacon frame from the transmitted BSSID.Also it should be allowed that STAs associated with the BSS of the transmitted BSSID decrement OBO counters on the Trigger frame with the TA field set to the nontransmitted BSSID and STAs associated with BSSs of nontransmitted BSSIDs decrement OBO counters on the Trigger frame with the TA fiels set to the transmitted BSSID. | Revised.Agree with the comment. Added text describing how a multi-BSS AP advertises UORA Parameter Set for transmitted and nontransmitted BSSID. Provided spec language for a STA associated with a nontransmitted BSSID to receive UORA Parameter Set. The rest of the UORA procedure remains the same for an AP belonging to multiple BSSID set. An associated STA uses the UORA parameters and attempts to send TB frames to the AP via one of the random access RUs sent by its associated AP (AID12=0).**TGax editor: Please make changes as shown in doc 11-17/1276r4** |
| 6182 | Jin-Sam Kwak | 27.5.2.6.2 | P173L01 | The spec should define the random access procedure when the multiple BSSID function is used. | As per comment | Revised.Agree with the comment. Please see resolution for CID 5401**TGax editor: Please make changes as shown in doc 11-17/1276r4** |
| 7043 | Ju-Hyung Son | 27.5.2.6.2 | P173L01 | Please specify UL OFDMA-based random access when a BSS is operating in Multiple BSSID mode. An HE STA in Multiple BSSID mode would receive RAPS elements and Trigger frames from its multiple BSSs in Multiple BSSID set. Please clarify how to decrement/initialize its OBO in multiple BSSID mode. | As per comment. | Revised.Agree with the comment. Please see resolution for CID 5401**TGax editor: Please make changes as shown in doc 11-17/1276r4** |
| 4710 | Alfred Asterjadhi | 7.11 | 3.4 | OBO is not OFDMA backoff, but OFDMA random access backoff, Find a fancy acronym that reflects it. Same observation with OCW. Apply it throughout. | As in comment. | RevisedAgree with the comment. Fixed incorrect reference.**TGax editor: Please make changes as shown in doc 11-17/1276r4** |
| 5333 | EVGENY KHOROV | 93.45 | 9.4.2.220 | The maximal value of OCWmin and OCWmax is just 2^7-1=127, while there are some reserved bits in the field | Change size of the EOCWmin and EOCWmax fields to 4 bits.  | RejectedIf OCWmax is increased to 4 bits long, it permits a STA to select a value up to 2^15-1 which is too high value. A STA may never get a chance if it picks such high value. 2^7-1 (127) is sufficient for random access. |
| 6093 | Jian Yu | 93.51 | 9.4.2.220 | EOCWmin is an abbreviation of what? Should add the full name of EOCW | As in comment. | RejectedThe definition is consistent with baseline (see REVmd D0.1 P958L12) |
| 8685 | Sigurd Schelstraete | 93.51 | 9.4.2.220 | Change "minimum value of OCW" to "minimum value of the exponent of OCW" | See comment | AcceptedAgree with the comment.**TGax editor: Please make changes as suggested by the comment** |
| 8686 | Sigurd Schelstraete | 93.60 | 9.4.2.220 | Change "maximum value of OCW" to "maximum value of the exponent of OCW" | See comment | AcceptedAgree with the comment.**TGax editor: Please make changes as suggested by the comment** |

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

TGax Editor: Please make the following changes to the 4th paragraph in this section (D1.4 P236L37):

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 for associated STAs. An HE AP shall not transmit BQRP Trigger frame or BSRP Trigger frame that contains random access RUs for unassociated STAs.[7651, 6154, 7181, 3236, 6000]

Note – Trigger frame variants other than Basic, BQRP or BSRP are not allowed to carry random access RUs.[7651, 6154, 7181, 3236, 6000]

* **HE bandwidth query report operation for MU**

TGax Editor: Please add a note after the 2nd paragraph in this section as shown below (D1.4 P223L36):

A non-AP STA reports its channel availability information (unsolicited BQR) to the AP to which it is associated using the BQR Control field of frames it transmits as defined below:

* The HE STA may report the channel availability information in the BQR Control field of frames it transmits if the AP has indicated its support in the BQR Support subfield of its HE Capabilities element; otherwise the STA shall not report the channel availability information in the BQR Control field.

NOTE—The STA can send an unsolicited BQR in response to certain Trigger frames except MU-RTS and BQRP (with or without random access RUs, as defined in 27.5.2.3 (STA behavior for UL MU operation) and in 27.5.4 (UL OFDMA-based random access (UORA))) or it can send the unsolicited BQR after accessing the WM using EDCA.[7651, 6154, 7181, 3236, 6000]

* HE buffer status feedback operation for UL MU

TGax Editor: Please modify Note 1 in this section as shown below (D1.4 P234L8):

NOTE 1—The STA can send an unsolicited BSR in response to [#Ed]certain Trigger frames except MU-RTS and BSRP (with or without random access RUs, as defined in 27.5.2.3 (STA behavior for UL MU operation) and in 27.5.4 (UL OFDMA-based random access (UORA))) or it can send the unsolicited BSR after accessing the WM using EDCA.

* **Retransmission procedure for UORA**

TGax Editor: Please modify the 2nd paragraph in section 27.5.4.3 (D1.4 P238L62) as follows:

[#Ed]If the HE TB PPDU is not successfully transmitted in the selected random access RU, then the STA shall update its OCW to 2OCW + 1 when the OCW is less than the value of OCWmax, and shall randomly select its OBO counter in the range of 0 and OCW. Once the OCW reaches OCWmax for successive retransmission attempts, the OCW shall remain at the value of OCWmax until the OCW is reset as described in 27.5.4.2 (UORA procedure).[#Ed]

* **Power save with UORA**

TGax Editor: Please make the following changes to this section (D1.4 P279L8):

This subclause illustrates the power save mechanisms for [#Ed]UORA capable non-AP HE STAs [#Ed]that are operating in PS mode using the UORA procedure (see 27.5.4.2 (UORA procedure)).

[5676, 7419, 9956]An HE AP may indicate one or more start times for broadcast TWT SP containing Trigger frames with random access allocations in the broadcast TWT element that is included in the Beacon frame or 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).

|  |
| --- |
|  |
| * **Example of power-save operation with UORA**[5676, 7419, 6038, 6108, 7204]
 |

[5507]An associated HE STA that supports UORA procedure when operating in PS mode may enter the doze state after receiving a management frame containing a TWT element with the Broadcast subfield equal to 1, Trigger subfield equal to 1, and the TWT Flow Identifier subfield equal to 2 and may transition to awake state at the start of that broadcast TWT SP as described in 27.7.3.3 (Rules for TWT scheduled STA). An associated STA shall follow the procedure defined in 27.5.4 (UL OFDMA-based random access (UORA)) when the AP includes one or more RUs with AID12 value equal to 0 in a Trigger frame transmitted during that broadcast TWT SP.

[5507]An unassociated HE STA that supports UORA procedure may enter the doze state after receiving a Beacon frame, a broadcast Probe Response frame or a FILS Discovery frame containing a TWT element with the Broadcast subfield equal to 1, Trigger subfield equal to 1, and the TWT Flow Identifier subfield equal to 2 and may transition to awake state at the start of that broadcast TWT SP as described in 27.7.3.3 (Rules for TWT scheduled STA) . An unassociated STA shall follow the procedure defined in 27.5.4 (UL OFDMA-based random access (UORA)) when the AP includes one or more RUs with AID12 value equal to 2045 in a Trigger frame transmitted during that broadcast TWT SP.

[5508, 9740, 4787]An HE AP that transmits a Trigger frame shall set the Cascade Indication field in the frame as defined in 27.7.3.2 (Rules for TWT scheduling AP) to indicate an early TWT SP termination event as described in 27.7.5 (PS operation during TWT SP)*[#11-17/1138]*.

[4787, 6039]An HE STA shall follow the procedure described in 27.7.5 (PS operation during TWT SP)*[#11-17/1138]* to determine if an early TWT SP termination event has occurred or [8288]AdjustedMinimumTWTWakeDuration time has elapsed from the scheduled TWT SP start time and may enter doze state [9741, 9957]if no other condition requires the STA to remain awake.

While TWT SP termination event has not occurred, an HE STA may use the value indicated in the Cascade Indication field in a Trigger frame to enter the doze state. [#Ed]An HE STA shall decrement its OBO counter as defined in 27.5.4 (UL OFDMA-based random access (UORA)). If the OBO counter decrements to a non-zero value and the Cascade Indication field is equal to 0, then the STA may enter the doze state if no other condition requires the STA to remain awake[9741, 9957]. If the OBO counter decrements to a non-zero value and the Cascade Indication field is equal to 1, then the STA may remain awake for random access in the cascaded Trigger frame. If the OBO counter decrements to zero then the STA shall follow the procedure defined in 27.5.4.2 (UORA procedure) to transmit an HE TB PPDU in response to the Trigger frame.[4788]

**TGax Editor: Following changes are related to CIDs 5401, 6182, 7043**

NOTE:

* The CIDs were resolved in doc 11-17/0645r3 during May 2017 meeting. But corresponding changes are missing in the current draft.
* The proposed text was revised
	+ D1.4 was used as baseline.
	+ General language changed to fit with the multi-BSS definition and terms
	+ Added a note to section 9.4.2.46
	+ there is no need to add a note in 27.5.4.1 as originally suggested in doc 645r3
	+ the changes in 27.5.4.2 are not needed.
* UL OFDMA-based random access (UORA)
* General

TGax Editor: Please modify the 2nd paragraph (D1.4 P236L28) as shown below:

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 corresponding to the random access RU) and shall satisfy at least one of the following conditions:

* The HE STA is [6182, 7043, 5401]not associated with the BSS it intends to transmit frames to and the AID12 value of the random access 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[6182, 7043, 5401] and the AID12 value of the random access RU is 0

TGax Editor: Please add a new paragraph before the 7th paragraph (D1.4 P236L51) as shown below:

[6182, 7043, 5401]An HE BSS belonging to a Multiple BSSID set (see 11.11.14 (Multiple BSSID set)) may advertise OCW Range values via the UORA Parameter Set element carried in the management frames transmitted by the transmitted BSSID. An HE AP may include the UORA Parameter Set element in a Nontransmitted BSSID profile subelement carried in the Multiple BSSID element (see 9.4.2.46 (Multiple BSSID element)) to provide different OCW Range values for STAs associated with that nontransmitted BSSID.

TGax Editor: Please modify the 7th paragraph (D1.4 P236L53) as shown below:

An HE STA shall obtain OCWmin and OCWmax from the most recently received UORA Parameter Set element (see 9.4.2.239 (UL OFDMA-based Random Access (UORA) Parameter Set element)) carried in the management frames transmitted by its associated AP. A non-AP STA with dot11MultiBSSIDActivated set to true and associated with a nontransmitting BSSID may inherit the OCW Range values from the UORA Parameter Set element advertised by the transmitted BSSID if the element is not carried in the Nontransmitted BSSID Profile subelement for that BSSID.[6182, 7043, 5401]

* **Multiple BSSID element**

TGax Editor: Please make the following changes to this section (D1.4 P109L44):

The Nontransmitted BSSID Profile subelement contains a list of elements for one or more APs or DMG STAs that have nontransmitted BSSIDs, and is defined as follows:

* For each nontransmitted BSSID, the Nontransmitted BSSID Capability element (see 9.4.2.72 (Nontransmitted BSSID Capability element)) is the first element included, followed by a variable number of elements, in the order defined in 9-27 (Beacon frame body).
* The SSID [#Ed]element (see 9.4.2.2 (SSID element)) and multiple BSSID-index [#Ed]element [#Ed](see 9.4.2.74 (Multiple BSSID-Index element)) are included in the Nontransmitted BSSID Profile subelement.
* The FMS Descriptor element is included in the Nontransmitted BSSID Profile subelement if the Multiple BSSID element is included in a Beacon frame and if the TIM field indicates there are buffered group addressed frames for this nontransmitted BSSID.
* The Timestamp and Beacon Interval fields, DSSS Parameter Set, IBSS Parameter Set, Country, Channel Switch Announcement, Extended Channel Switch Announcement, Wide Bandwidth Channel Switch, Transmit Power Envelope, Supported Operating Classes, IBSS DFS, ERP Information, HT Capabilities, HT Operation, VHT Capabilities, ~~and~~ VHT Operation, HE Capabilities, HE Operation, BSS Color Change Announcement, and Spatial Reuse Parameter Set elements are not included in the Nontransmitted BSSID Profile subelement; the values of these elements for each nontransmitted BSSID are always the same as the corresponding transmitted BSSID element values.

Note – A Nontransmitted BSSID Profile subelement may carry other element(s) if the content of the the element(s) are different for the nontransmitted BSSID than those for the transmitted BSSID.[6182, 7043, 5401]

**TGax Editor: Following changes are required to resolve CID 4710**

* Abbreviations and acronyms

TGax Editor: Please make the following changes to this section (D1.4 P37L29):

OBO Orthogonal frequency division multiple access (OFDMA) random access backoff

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

TGax Editor: Please make the following changes to the 8th paragraph in this section (D1.4 P236L58):

An unassociated HE STA shall initialize the range of OFDMA contention window (OCW) upon reception of the UORA Parameter Set element from the intended HE AP. If the HE STA has not received UORA Parameter Set 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 0 or 2045. Each time an unas-sociated HE STA communicates with a different AP using random access it shall initiate its OFDMA random access backoff (OBO) based on the default values or based on the parameters from the received UORA Parameter Set element for that AP.

* UORA procedure

TGax Editor: Please make the following changes to the 2nd paragraph in this section (D1.4 P237L37):

An HE STA shall maintain an internal OFDMA contention window (OCW), and an internal OBO counter. OCW is an integer within the range [OCWmin, OCWmax].