IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Proposed resolution for comments related to  CIDs in 27.5.2 | | | | |
| Date: May 3, 2017 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Abhishek Patil | Qualcomm Inc. |  |  | appatil@qti.qualcomm.com |
| Alfred Asterjadhi | Qualcomm Inc. |  |  | aasterja@qti.qualcomm.com |
| George Cherian | Qualcomm Inc. |  |  | gcherian@qti.qualcomm.com |

Abstract

This submission proposes resolutions for multiple comments received for TGax LB225 (48 CIDs):

8700, 8057, 8274, 8298, 7645, 5913, 9294, 7180, 7646, 9899, 9478, 10266, 3226, 3225, 7094, 8553, 9527, 9900, 9903, 3227, 7227, 8172, 6101, 7973, 9296, 4826, 4827, 8704, 8277, 3233, 5718, 5989, 9096, 9097, 3234, 9590, 5719, 5192, 8218, 8345, 5995, 8219, 5996, 7974, 10015, 6699, 5017, 9915

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.***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CID** | **Commenter** | **Section** | **Pg / Ln** | **Comment** | **Proposed Change** | **Resolution** |
| 8700 | Sigurd Schelstraete | 27.5.2.2.2 | 166.21 | "Number of HE-LTF Symbols is set to 1" So only single-stream transmisson is allowed? | Clarify | Revised  Single stream is assumed when trigger is via UMRS Control subfield. If a TF is carried within a PPDU that also contains a MPDU with UMRS Control field, a single stream is assumed. Hence the value is set to 1. No changes are required to the spec text. |
| 8057 | Massinissa Lalam | 27.5.2.2.2 | 166.22 | In "Spatial Reuse is set to SR\_Disallowed", the value "SR\_Disallowed" is not defined. Please add a definition or clearly state that "Spatial Reuse is set to 0 (SR disallow)" if same meaning as Table 28-19 is meant. | As in comment. | Revised  Agree with the comment.  Changed SR\_Disallowed to 0 (SR\_DISALLOW) as defined in Table 28-18.  TGax editor please make changes as shown in 11-17/0249r1 |
| 8274 | Pascal VIGER | 27.5.2.2.2 | 166.51 | The paragraph 10 of section 27.5.2.2.2 is unclear. 1. "If an AP includes one or more Trigger Frames or HE variant HT Control fields with an UL MU Response Scheduling A-Control subfield, then they shall collectively elicit HE trigger-based PPDU responses..." - What does "AP includes" mean ? - what "they" refers to ? 2. "...such that at least one RU is allocated for each 20 MHz channel occupied by the eliciting PPDU. " In case of the one RU is of random access type, then there is chance to have no body emiting in that RU. | 1. as per comment, re-word the sentence. 2. modify the sentence accordingly: ".. Such that at least one scheduled RU is allocated..." In a optimized manner to avoid any empty 20MHz channel, add a complement sentence at the end of the paragraph : "In order to limit the effect of unusued random RUs over a given 20MHz channel, an AP may substantially uniformly distribute scheduled RUs and random RUs over the set of 20 MHz channels used by the eliciting PPDU." | Revised  Agree with the comment.  Updated the sentence to clarify that at least one scheduled RU is allocated for each 20MHz channel occupied by the soliciting trigger frame. Also, added text that suggest an AP can indicate unassigned RU (when present) via AID12 value of 2046. This will make signaling unassigned RU for UL case consistent with DL case where the same AID value is being used.  Further, added clarification text that an associated STA shall be assigned at most one RU in a trigger frame. This is consistent with existing text (see pg 323 line 56 in section 28.3.10.8.5 of D1.2)  TGax editor please make changes as shown in 11-17/0249r1 |
| 8298 | Patrice Nezou | 27.5.2.2.2 | 166.49 | A 20MHz channel must not remain empty. The draft specifies:" at least one RU is allocated for each 20MHz channel ..." To be sure that RU is really used by a STA. It would be better that at least one RU is a scheduled RU. | Revise the text with the following words : " ... at least non random access RU is allocated ... " | Revised  Agree with the comment.  Please see resolution for CID 8274. |
| 7645 | Liwen Chu | 27.5.2.2.2 | 166.56 | This paragraph is duplicated with the rules in multi-TID A-MPDU subclause. Delete it. | As in comment | Accept  Agree with the comment  The sentence is deleted as suggested by the comment. A similar sentence (with identical meaning) appears in section 27.10.4 pg 214 line 61 of D1.2  TGax editor please make changes as shown in 11-17/0249r1 |
| 5913 | James Yee | 27.5.2.2.2 | 166.62 | I suppose setting the TID Aggregation Limit to 1 means only 1 TID is used and there is no aggregation, but it seems simpler to assign a value of 0 for a STA that has indicated no support for Multi-TID. | As suggested. | Reject  The sentence is correct. When a STA indicates a value of 0 in the Multi-TID Aggregation Support field in its HE Cap element, there are two possibilities – depending on whether it is allowed to solicit an immediate response. When TID Aggregation Limit subfield value is 0, the STA is not allowed to solicit an immediate response as described in the following sentence in the paragraph. When the TID Aggregation Limit subfield value is > 0, the STA can aggregate up to that value and can solicit an immediate response. |
| 9294 | Tomoko Adachi | 27.5.2.2.2 | 167.01 | As in p.l. 48.60, the TID Aggregation Limit is to limit the maximum number of TIDs. The sentence here does not align with that definition. | Change the sentence "A value 0 indicates to the STA that it shall not solicit any immediate response for the MPDUs that the STA aggregates in the HE trigger-based PPDU." to "A value 0 indicates to the STA that it shall not transmit any QoS Data MPDUs in the HE trigger-based PPDU." Or change the definition of the TID Aggregation Limit to only apply to the number of TIDs transmitted in QoS Data frames with implicit BAR (i.e., don't care No Ack frames) and update the sentences in p.l. 48.60 and 167.01 to align with it. | Revised  Agree with the comment.  TID Aggregation Limit subfield having a value 0 indicates responding STA cannot solicit an immediate response. A value > 0 indicates that the STA may solicit an immediate response.  Since the comment also applies to a non-AP STA (i.e., TB PPDU), added two sentences to 27.5.2.3 to specify the action on the responding non-AP STA. Provided reference to appropriate tables in section 9 which list all the possible cases where immediate response can or cannot be solicited by the TB PPDU.  TGax editor please make changes as shown in 11-17/0249r1 |
| 7180 | kaiying Lv | 27.5.2.2.2 | 167.06 | According to P49,Line 1:"The value in the TID Aggregation Limit subfield in Trigger frame is less than or equal to the value indicated in the Multi-TID Aggregation Support field in the HE Capabilities element ". So if a STA indicates a nonzero value in the Multi-TID Aggregation Support field, AP should choose any value between 0 and the value that STA indicated in the Multi-TID Aggregation Support field. | Change as comment. | Revised  Agree with the comment  Updated the sentence to indicate that the value in the TID Aggregation Limit subfield is less than equal to the value indicated in the Multi-TID Aggregation Support subfield carried in the STA’s HE Cap element.  TGax editor please make changes as shown in 11-17/0249r1 |
| 7646 | Liwen Chu | 27.5.2.2.2 | 167.06 | It shouldn't be any value from 0 to 7. The value should be less than the STA's maximal TC levels being announced. | As in comment | Revised  Agree with the comment  Please see resolution to CID 7180 |
| 9899 | Young Hoon Kwon | 27.5.2.2.2 | 167.06 | This sentence is not in line with sentence shown in P49L1, which says "The value in the TID Aggregation Limit subfield in Trigger frame is less than or equal to the value indicated in the Multi-TID Aggregation Support field in the HE Capabilities element". In my opinion, the text shown in P167L6 makes more sense than the other one. Anyway, further clarification is needed. | As in the comment. | Revised  Agree with the comment  Please see resolution to CID 7180 |
| 9478 | xun yang | 27.5.2.2.2 | 167.12 | "The AP may assign any value in the AC Preference Level subfield in the Trigger Dependent User Info field for an HE STA identified by the AID12 subfield of the User Info field of a Basic Trigger frame". Since trigger can be sent in any AC, it is possible that AP use any AC to contend the channel, and use trigger another AC in the UL transmissions. That is, the primary AC in AP's TXOP is not the AC of the TXOP. Not sure if there is any unfair issue. | It is safer to limit the preferred AC field in trigger to be the AC in which the trigger is sent to contend the channel. | Reject  The sentence in reference is no longer present in D1.2. With respect to fairness issue, the value in Preferred AC is a recommendation that STA should follow. An AP cannot guarantee an optimal assignment of RUs – i.e., there can be cases where the AP provides resources that are more than what is available for transmission for the recommended AC. In such case, the medium (air-time) resource is wasted instead of being used for other ACs. To ensure this doesn’t happen, the spec allows STA to transmit other ACs during the remaining time (see line 47 on pg 215 of D1.2). |
| 10266 | Yusuke Tanaka | 27.5.2.2.2 | 167.40 | The spec should define the acknowledgement rule when the AP received a MPDU which contains lower priority traffic than the Preferred AC subfield in the Trigger frame transmitted prior to the response. The AP should acknowledge for even the violating responders for the medium efficiency. | Add texts as follows. "The AP shall respond to MPDUs which contain lower priority traffic than the Preferred AC subfield in the Trigger frame with AC Preference Level subfield set to 1 transmitted prior to the MPDUs." | Reject  The current spec allows an AP to ACK a frame belonging to a lower AC than the Preferred AC subfield in the Trigger frame. Please see resolution to CID 9478. |
| 3226 | Ahmadreza Hedayat | 27.5.2.2.2 | 167.15 | There should be a behavior for the AP in what value to set for the Preferred AC subfield, and the Preferred AC subfield should be set according to the winning AC etc. | As in the comment | Reject  An AP implementation would need to change the contents of the Trigger frame already in the queue and ready for transmission. Also, please see resolution to CID 9478 if there are concerns about fairness. |
| 3225 | Ahmadreza Hedayat | 27.5.2.2.2 | 167.15 | "The AP may assign any value defined in Table 9-25i (Preferred AC subfield encoding) in the AC Preference Level subfield in the Trigger Dependent User Info field to 1 for an HE STA and identified by the AID12 subfield of the User Info field of a Basic Trigger frame." This paragraph needs rewritting; the Preferred AC subfield (table 9-25i) is a 2-bit subfield and the doesn't related to AC Preference Level subfield with 1 bit. | As in the comment | Revised  Agree with the comment.  Latest draft D1.2 has fixed this discrepancy. In addition, AC Preference Level subfield is no longer present in User Info field. No further changes are required to fix this comment. |
| 7094 | Junichi Iwatani | 27.5.2.2.2 | 167.15 | "The AP may assign any value defined in Table 9-25i (Preferred AC subfield encoding) in the AC Preference Level subfield in the Trigger Dependent User Info field to 1..." The meaning of this sentence is unclear. "AC Preference Level subfield" does not include the value in Table 9-25i. | Clarify | Revised  Agree with the comment  The sentence was fixed in D1.2 and no further changes are required. |
| 8553 | Rojan Chitrakar | 27.52.2.2 | 167.15 | "AC Preference Level subfield" should be "Preferred AC subfield" and grammar is wrong | Replace the sentence with "The AP may assign any value defined in Table 9-25i (Preferred AC subfield encoding) in the Preferred AC subfield in the Trigger Dependent User Info field for an HE STA identified by the AID12 subfield of the User Info field of a Basic Trigger frame." | Revised  Agree with the comment  The sentence was fixed in D1.2 and no further changes are required. |
| 9527 | Yasuhiko Inoue | 27.5.2.2.2 | 167.15 | "The AP may assign any value defined in Table 9-25i (Preferred AC subfield encoding) in the AC Preference Level subfield in ..."  AC Preference Level subfield should be Preferred AC subfield. | As in the comment. | Revised  Agree with the comment  The sentence was fixed in D1.2 and no further changes are required. |
| 9900 | Young Hoon Kwon | 27.5.2.2.2 | 167.15 | The sentence is not written correctly. | Change the sentence to "The AP may assign any value defined in Table 9-25i (Preferred AC subfield encoding) in the Preferred AC subfield for an HE STA that the AC Preference level subfield in the Trigger Dependent User Info field is set to 1 and is identified by the AID12 subfield of the User Info field of a Basic Trigger frame.". | Revised  Agree with the comment  The sentence was fixed in D1.2 and no further changes are required. |
| 9590 | Yongho Kim | 27.5.2.2.2 | 167.16 | There are no specific information and instruction about using preferred AC. | Define it. | Reject  The use of Preferred AC when responding with a TB PPDU is specified in 27.10.4 (pg 215 in D1.2). |
| 9903 | Young Hoon Kwon | 27.5.2.2.3 | 167.30 | This sentence is not true if the AP sends more than one Trigger frame in a PPDU. For example, if the AP sends two Trigger frames and received immediate trigger-based PPDU in response to only one Trigger frame, even if the AP does not receive an immediate response with at least one MPDU from at least one STA solicited by a Trigger frame, its transmission is not failure. Further clarification is needed. | As in the comment. | Revised  Agree with the comment  Clarified the sentence to say “solicited by a PPDU that contains at least one Trigger frame”  TGax editor please make changes as shown in 11-17/0249r1 |
| 3227 | Ahmadreza Hedayat | 27.5.2.2.2 | 167.38 | These sentence "An AP may use any AC for sending a PPDU that contains only Trigger frames." needs to be combined with the following paragraph: "An AP may send the Trigger frame using any access category and follows the rules defined in 10.22.2 (HCF contention based channel access (EDCA)) for obtaining and sharing the TXOP." | As in the comment | Revised  The text in D1.2 has addressed the inconsistency pointed out by this comment. No further changes are required. |
| 7227 | Katsuo Yunoki | 27.5.2.3 | 167.59 | TBD is remaining. | STA behavior should be identified if it isn't associated with AP. | Revised  Doc 11-17/229r2 resolved the TBD and it is no longer present in D1.2. No further changes are required. |
| 8172 | Osama Aboulmagd | 17.5.2.3 | 167.59 | There is one occurance of "TBD" on page 167 | TBD has to be either deleted or resolvced | Revised  Doc 11-17/229r2 resolved the TBD and it is no longer present in D1.2. No further changes are required. |
| 6101 | Jian Yu |  | 167.59 | Define TBD | As in comment | Revised  Doc 11-17/229r2 resolved the TBD and it is no longer present in D1.2. No further changes are required. |
| 7973 | Mark RISON | 26.5.2.3 | 168.17 | There is an issue if this length is shorter than the CBR that we generated, because 27.6.3 says we can't always fragment CBRs | Add at 168.19 a "NOTE---It is not always possible to fragment HE compressed beamforming feedback (see 27.6.3). If the length is insufficient to contain the HE compressed beamforming feedback requested by a Beamforming Report Poll variant Trigger frame, no feedback is sent." | Accept  Agree with the comment.  Added note as suggested by the comment.  TGax editor please make changes as shown in 11-17/0249r1 |
| 9296 | Tomoko Adachi | 27.5.2.3 | 168.51 | There is no SS Allocation field in Common Info field. The Starting Spatial Stream subfield is a value based on Nss and the STARTING\_STS\_NUM is a value based on Nsts. So it is not proper to set exactly the same value of Starting Spatial Stream subfield to the STARTING\_STS\_NUM. Also "shall be set to" is repeated. | Change the item "The STARTING\_STS\_NUM parameter shall be set to shall be set to the value of the Starting Spatial Stream subfield of the SS Allocation field in the Common Info field of the eliciting Trigger frame" to "The STARTING\_STS\_NUM parameter shall be set to the starting STS number indicated by the Starting Spatial Stream subfield of the SS Allocation field of the User Info field and STBC field in the Common Info field of the Trigger frame". | Revised  The issues pointed out by the comment are fixed in D1.2. No further changes are required. |
| 4826 | Alfred Asterjadhi | 27.5.2.3 | 169.30 | Is UL OFDMA PPDU format defined? | Define UL OFDMA format or contextualy add more details to define the intended type of PPDU. | Reject  The term UL OFDMA is defined in section 3.4 |
| 4827 | Alfred Asterjadhi | 27.5.2.3 | 169.43 | doesn't the presence of the UL MU Response Scheduling imply there is an immediate response? | Clarify what an immediate response means. | Revised  Removed the text “containing the UL MU Response Scheduling A-Control subfield subfield” to fix the error in sentence and convey the desired meaning.  TGax editor please make changes as shown in 11-17/0249r1 |
| 8704 | Sigurd Schelstraete | 27.5.2.3 | 169.69 | NSYM is not a TXVECTOR parameter. What is the correct requirement? | Clarify | Revised  Agree with the comment.  Replaced *NSYM* with L\_LENGTH parameter.  TGax editor please make changes as shown in 11-17/0249r1 |
| 8277 | Pascal VIGER | 27.5.2.3 | 170.01 | In case of Basic Trigger frame, STA behavior for selecting content for HE trigger-based PPDU is unclear, for the case that "the STA does not have a frame of the required type". What is such required type ? Does the required type refer to an AC type? In case of scheduled RU, it seems detrimental not to transmit any data PPDU (anyway the 'type' is) ! | - Clarify the 'type' meaning. - Instead not transmitting or transmitting Qos Null frames, consider transmitting any other pending MPDU(s) (as per rules of 27.10.4) for the only case where a scheduled RU is allocated, in order to enhance medium usage. | Revised  In D1.2, the paragraph is no longer referring to absence of “required type” of frames. Instead it is suggesting that if the triggered STA does not have anything to send it shall not transmit anything or transmit QoS Null frames. If the STA has anything to transmit in any of the AC categories, it shall consider recommendations from the Preferred AC subfield and 27.10.4. The current text is in-line with the suggested resolution. No further changes are needed. |
| 3233 | Ahmadreza Hedayat | 27.5.2.3 | 170.01 | Is there a required type frame for Basic Trigger frame? If so then need to clarify it here ... "If the Trigger Type field of the soliciting Trigger frame is Basic Trigger and the STA does not have a frame of the required type, the STA shall either not transmit a response or transmit one or more QoS Null frames." | As in the comment | Revised  Agree with the comment.  See resolution for CID 8277 |
| 5718 | Guoqing Li | 27.5.2.3 | 170.01 | If the trigger is basic trigger, then there is not required type. Please clarify. | Clarify | Revised  Agree with the comment.  See resolution for CID 8277 |
| 5989 | Jarkko Kneckt | 27.5.2.3 | 170.01 | The required frame type should be specified for the Basic Trigger frame. | Change the text to read: " ... and the STA does not have a data or management frame to transmit, the STA shall..." | Revised  Agree with the comment.  See resolution for CID 8277 |
| 9096 | stephane baron | 27.5.2.3 | 170.02 | required type of a basic trigger frame is not defined. Use the "Preferred AC" instead of the "required type" | Modify the text as follow :" If the Trigger Type field of the soliciting Trigger frame is Basic Trigger and the AC Preference Level subfield of the trigger dependant info field is set to 1, then if the STA does not have a frame corresponding to the AC value indicated in the Preferred AC subfield, the STA shall either not transmit a response or transmit one or more QoS Null frames. | Revised  Agree with the comment.  See resolution for CID 8277 |
| 9097 | stephane baron | 27.5.2.23 | 170.05 | When the AC preference Level is set to 0 in a Basic trigger, A-MPDU content of the trigger based PPDU is not defined (if the STA doesn't support A-MPDU with multiple TIDs).When the AC preference Level is set to 0, the STA is responsible of the AC selection, and shall respect the EDCA rules to ensure QoS to its applications. | Add the following sentence between lines 4 and 5 : "If the Trigger Type field of the soliciting Trigger frame is Basic Trigger and the AC Preference Level subfield of the trigger dependant info field is set to 0, the STA shall follow the EDCA rules to determine the content of each A-MPDU by selecting frames from the non empty AC queue with the lowest corresponding backoff counter value. | Reject  AC Preference Level subfield is no longer present in draft D1.2. Preferred AC subfield indicates a recommended AC. The existing EDCA rules would apply. |
| 3234 | Ahmadreza Hedayat | 27.5.2.3 | 170.09 | This needs to be revised to consider the role of Preferred AC subfield of a Basic Trigger frame: "A STA that is an intended receiver of a Basic Trigger frame may include MPDUs with any TID in the HE trigger-based PPDU sent in response to a Trigger frame subject the rules of 27.10.4 (AMPDU with multiple TIDs)." | As in the comment | Reject  The use of Preferred AC when responding with a TB PPDU is specified in 27.10.4 (please see page 215 in D1.2). |
| 5719 | Guoqing Li | 27.5.2.3 | 170.26 | line 26-32 seem to miss the condition mentioned in line 53-54. | Add the condition that the soliciting PPDU contains an UL MU response schedulig A-Control field to the list. | Revised  In D1.2 the paragraph that describes CS Required field set to 0 in a TF or the case of trigger via UMRS Control field (line 53-54 in the comment) is moved before the paragraph that provides NAV rules (lines 26-32 in the comment). Added a note to clarify that the STA doesn’t need to check physical CS and virtual CS (i.e., basic and intra NAV).  TGax editor please make changes as shown in 11-17/0249r1 |
| 5192 | Dorothy Stanley | 27.5.2.3 | 170.61 | "The AP shall set the CS Required subfield to 1 except when" seems to contradict pg 166, line 27 "CS Required subfield is set to 0". Please clarify | as in comment | Reject  Line 27 of pg 166 in D1.0 (line 12 pg 179 of D1.2) describes a set of rules that an AP follows to populate the subfields of the Common Info field of a Trigger frame if a UMRS Control subfield is carried in an MPDU within the same PPDU. Note, UMRS Control subfield does not have CS Required field and is assume to have a value 0. |
| 8218 | Osama Aboulmagd | 27.5.2.5 | 171.12 | Once again, What is "efficient way"? | clarify | Revised  AP is expected to make use of the BSR information to make allocation decisions. It is up to an AP’s implementation on how “efficiently” it schedules STAs or allocates UL resources. Therefore, removed “in an efficient way” from the sentence.  TGax editor please make changes as shown in 11-17/0249r1 |
| 8345 | Peter Loc | 27.5.2.5 | 171.14 | To ensure that BSR feedback frames are aligned at the AP, STAs should use explicit BSR feedbacks in response to a BSRP variant Trigger Frame, eliminating any padding related issues from the transmitting STAs | Change the first paragraph of this sub clause to the following: The non-AP STA can either implicitly deliver BSRs in the QoS Control field or BSR A-Control field of any frame transmitted to the AP (unsolicited BSR) or shall explicitly deliver BSRs in any frame sent to the AP in response to a BSRP variant Trigger frame (solicited BSR). | Revised  Agree with the comment.  Restructured the sentence to clarify that a STA is required to respond with a frame carrying BSR when AP solicits such a report (via a BSRP TF). Alternatively, the STA could optionally send such a report to the AP via any frame (i.e., unsolicited reporting).  TGax editor please make changes as shown in 11-17/0249r1 |
| 5995 | Jarkko Kneckt | 27.5.2.5 | 171.26 | The non-AP STA could benefit, if it could indicate its Buffer status report for all TIDs that it has buffered traffic. An exception to the Multi-TID aggregation rules could be made to allow QoS Null frames that are not acknowledged addition to any Multi-TID aggregated A-MPDU | Please allow non-AP STA to aggregate QoS Null frames that do not require ACK from any TID to A-MPDU to be able to indicate buffer status report for all TIDs that the non-AP STA has buffered traffic. | Reject  The standard does not preclude this behavior. This is allowed and can be done by a non-AP STA. |
| 8219 | Osama Aboulmagd | 27.5.2.5 | 171.30 | Clause 27.5.2.5 desctibes two methods to achieve the same function. Since the use of Queue Size in QoS Control frame is mandatory while the use of the BSR A-Control is optional, the suggestion is to remove the optional one. | as in comment | Reject  QoS Control field is only present in QoS Data or QoS Null frames. BSR A-Control subfield can be present in management frames as well. The support for Rx of the latter is optional on the AP side (support indicated with a bit in HE Cap element). BSR A-Control can carry more info (e.g., Per AC or all AC) therefore more efficient since QoS Control can carry only per TID. It is beneficial to have both mechanisms present as it provides the flexibility on how a non-AP STA provides BSR information to its AP. |
| 5996 | Jarkko Kneckt | 27.5.2.5 | 171.44 | The unsolicited BSR should be allowed to transmit as a response to all Trigger variants, except MU-RTS. | Change to: " Note 1-The STA can send an unsolicited BSR is a response to all variants of the Trigger frame, except MU-RTS variant... | Revised  Agree with the comment.  The note was updated to indicate any variant of TF except MU-RTS or BSRP.  TGax editor please make changes as shown in 11-17/0249r1 |
| 7974 | Mark RISON | 27.5.2.5 | 171.50 | If the queue size of both fields is a non-255 value the values need to be consistent | Append to the NOTE "If neither is 255, the values ought to be consistent (e.g. if the latter refers to the same TID as the former, the value ought to be the same)." | Revised  Agree with the comment.  The note is updated to suggest that when both fields carry a value other than 255, the values needs to be the same.  TGax editor please make changes as shown in 11-17/0249r1 |
| 10015 | Yuichi Morioka | 27.5.2.5 | 172.01 | Even if STA has already reported buffer status, STA should retransmit same BSR because AP may have missed the previous BSR. | Delete the first condition. | Reject  This section of the spec does not discuss or limit the retransmission of a BSR. Also, if the AP has missed the BSR from the STA it can send another BSRP to the STA. |
| 6699 | John Coffey | 27.5.2.5 | 172.10 | Inconsistent terminology: here we have "the trigger-based PPDU", whereas almost everywhere else in the draft we have "the HE trigger-based PPDU". If the same thing is intended, the same term should be used. | Change to "the HE trigger-based PPDU". | Revised  Agree with the comment.  D1.2 has changed all references to “trigger-based PPDU” or “HE trigger-based PPDU” to “HE TB PPDU”. Therefore, the inconsistency pointed by this comment is fixed and no further changes are needed. |
| 5017 | Chao Chun Wang | 27.5.2.1.1 | 165.00 | Clauses 27.5.2.2 Rules for soliciting UL MU frames has the following statement, "A non-AP STA shall not send a Trigger frame or an MPDU carrying an UL MU Response Scheduling A-Control field." To more efficiently support peer-to-peer operations in HE BSS, a non-AP STA that is capable of managing operation with basic trigger variant frame should be allowed to send trigger frame for soliciting OFMDA frames from multiple STAs. It is beneficial for HE STAs and BSS. | Adding text to support MU OFDMA-capable non-AP STA to manage basic trigger variant frame operation in peer-to-peer mode. commentator will submit text. | Reject  Allowing non-AP STA to send trigger frames will open doors to all sort of possibilities which would lead to lengthy and messy spec text required to manage the various exception cases (e.g., which trigger variant are allowed, conditions when such triggers can be sent etc). In addition, the spec would need to clarify behavior for intra/inter NAV, how capability information is advertised (i.e., a non-AP STA supports receiving TF from another non-AP STA), etc. It also raises questions such as how does it compare with RDG and if RDG can be used as a solution. At present, there is no compelling p2p use-case that requires basic triggering between peer devices and warrants such massive additions to the spec. |
| 9915 | Young Hoon Kwon | 27.5.2.5 | 171.19 | As reporting the buffer status for a given TID in the Queue Size subfield is a mandatory feature, bit 4 of QoS Control field shall be set to 1, which implies that bits 8-15 of the QoS Control field represents Queue Size. | At the end of the 2nd paragraph of 10.13.1, add the following text: "HE non-AP STA shall set the bit 4 to1 across all MPDUs that contain the Qos Control fields." | Reject  Unsolicited BSR is an optional feature. Therefore, Bit 4 can be set to 0 when the frame is not carrying any unsolicited BSR. |



TGax Editor: Please make the following changes to sections in 27.5.2 (D1.2 baseline):

* **Allowed settings of the Trigger frame fields and UMRS Control field**

An HE AP shall not send a Trigger frame with User Info fields addressed to STAs from two or more BSSs of a multiple BSSID set to a STA unless the STA has set the Rx Control Frame To MultiBSS subfield in the HE MAC Capabilities Information field of the HE Capabilities element it transmits to 1.

An AP that transmits a Trigger frame shall set the TA field of the frame to the MAC address of the AP, except when dot11MultiBSSIDActivated is true and the Trigger frame is directed to STAs from at least two different BSSs of a multiple BSSID set, in which case, the AP shall set the TA field of the frame to the transmitted BSSID.

An AP shall not set any subfields of the Common Info field of a Trigger frame to a value that is not supported by all the recipient STAs of the Trigger frame.

An AP shall set all the subfields, except the Trigger Type subfield, of the Common Info field of a Trigger frame to the same value of the corresponding subfield of the Common Info field of any other Trigger frame that is carried in the same PPDU. An AP shall set the UL PPDU Length and DL Tx Power subfields of an UMRS Control subfield to the same value of the corresponding subfield of any UL MU Response Scheduling A-Control that is carried in the same PPDU. An AP shall set the following subfields of the Common Info field of a Trigger frame accordingly if an UMRS Control subfield is carried in an MPDU within the same PPDU:

* MU-MIMO LTF Mode and STBC are set to 0
* Number of HE-LTF Symbols is set to 1
* Spatial Reuse is set to [8057]0 (SR\_DISALLOW)~~SR\_Disallowed~~
* GI and LTF Type is set to 2 if the carrying PPDU TXVECTOR parameter HE\_LTF\_TYPE is 4x LTF for 3.2 µs or 2x LTF for 1.6 µs; otherwise is set to 1
* CS Required subfield is set to 0

NOTE—STAs obtain the common information explicitly, implicitly or both. Explicit information is obtained in the Common Info field of a Trigger frame, or in the UL PPDU Length and DL TX Power subfields of the UMRS Control field contained in the soliciting PPDU. Implicit information is obtained in previously exchanged frames with the AP, e.g., in the BSS Color and the Default PE Duration subfields of the HE Operation element, or from default values specified in 27.5.2.3 (STA behavior for UL MU operation).

An AP shall not set any subfields of the User Info field of a Trigger frame to a value that is not supported by the recipient STAs of the User Info field. An AP shall not set any subfields of a UMRS Control field in an HE variant HT Control field to a value that is not supported by the recipient STAs of the UMRS Control field. When an RU is allocated to only one STA the Starting Spatial Stream subfield for that STA shall be set to 0.

If a Trigger frame is transmitted in an RU of an HE MU PPDU and the RU is addressed to multiple STAs, then the Trigger frame shall not include any User Info fields addressed to a STA that is identified as recipient of another RU or spatial stream of the same HE MU PPDU.

A UMRS Control field shall not be included in a group addressed MPDU.

If an AP ~~includes~~ transmits one or more Trigger frames ~~Frames~~ or frames carrying a UMRS Control field, then ~~they~~ the frames shall collectively elicit HE TB PPDU responses such that at least one scheduled RU is allocated for each 20 MHz channel occupied by the eliciting PPDU. An AP shall not allocate an RU in any 20 MHz channel that is not occupied by the immediately preceding DL PPDU. An AP may indicate an unassigned RU by using value 2046 in the AID12 subfield. An AP’s Trigger frame shall not contain more than one User Info field with the same value in the AID12 subfield except when the value of the AID12 subfield is 0, or greater than 2007.[8298, 8274]

[7645, 7252]~~The responding STA shall not aggregate QoS Data frames in the multi-TID A-MPDU with a number of TIDs that exceeds the value indicated by the TID Aggregation Limit subfield in the Trigger Dependent User Info field of a Basic Trigger frame (see 9.3.1.23.1 (Basic Trigger variant)) addressed to it.~~

The AP shall set the value in the TID Aggregation Limit subfield in the Trigger Dependent User Info field to 0 or 1 for an HE STA that has 0 in the Multi-TID Aggregation Support subfield in the HE MAC Capabilities Information field of the HE Capabilities element it transmits and is identified by the AID12 subfield of the User Info field of a Basic Trigger frame (see 9.3.1.23 (Trigger frame format)). A value 0 in the TID Aggregation Limit subfield indicates to the STA that it shall not solicit any immediate response for the MPDUs that the STA aggregates in the HE TB PPDU. A value greater than 0 in the TID Aggregation Limit subfield indicates the number of TIDs that the STA can aggregate in the A-MPDU carried in the HE TB PPDU (see 27.10.4 (A-MPDU with multiple TIDs)).

[7180, 7646, 9899]The AP may assign any value between 0 and ~~7~~ the value in the Multi-TID Aggregation Support subfield in the HE MAC Capabilities Information field of the HE Capabilities element that the triggered non-AP STA transmits to ~~in~~ the TID Aggregation Limit subfield in the Trigger Dependent User Info field ~~for an~~ corresponding to the triggered non-AP HE STA that has a non-zero value in the Multi-TID Aggregation Support subfield in the HE MAC Capabilities Information field of the HE Capabilities element it transmits and is identified by the AID12 subfield of the User Info field of a Basic Trigger frame. A value of 7 in the TID Aggregation Limit subfield indicates to the STA that it may aggregate QoS Data frames from any number of different TID values in the multi-TID A-MPDU.

[3225, 7094, 8553, 9527, 9900]The AP may assign any value defined in Table 9-25i (Preferred AC subfield encoding) in the Preferred AC subfield in the Trigger Dependent User Info field for an HE STA and identified by the AID12 subfield of the User Info field of a Basic Trigger frame. If the AP does not have a recommendation then it shall set the Preferred AC subfield to a value 0~~AC\_BK~~.

[Moved to 27.5.2.3 since this specifies an action on the non-AP STA side]~~NOTE—A STA follows the rules in 27.10.4 (A-MPDU with multiple TIDs) for aggregating the QoS Data frames with multiple TIDs in HE TB PPDUs.~~

Short guard interval shall not be used for a Trigger frame transmission if the Trigger frame is transmitted using HT or VHT PPDU format. DSSS or HR/DSSS PPDU format shall not be used for Trigger frame transmission.

* **AP access procedures for UL MU operation**

When an AP receives an immediate response with at least one MPDU from at least one STA solicited by a Trigger frame, the procedures described in 10.22.2.7 (Multiple frame transmission in an EDCA TXOP) apply.

When an AP does not receive an immediate response with at least one MPDU from at least one STA solicited by a [9903]PPDU that contains at least one Trigger frame the backoff procedure described in 10.22.2.2 (EDCA backoff procedure) applies.

[3227]An AP may use any AC for sending a PPDU that contains only Trigger frames. If the PPDU contains frames that are not Trigger frames in addition to a Trigger frame, then the AP shall access the medium using the primary AC as defined in 10.22.2.6 (Sharing an EDCA TXOP).

* **STA behavior for UL MU operation**

A STA shall not send an HE TB PPDU unless it is explicitly triggered by an AP in one of the operation modes described in this subclause.

The inter-frame space between a PPDU that contains a Trigger frame or frame that includes a UMRS Control subfield that solicits an immediate response and the HE TB PPDU is SIFS.

A non-AP HE STA may ignore a Trigger frame or UMRS Control field that is intended to the STA if the Trigger frame or UMRS Control field contains one or more subfields whose values are not recognized or not supported by the STA. A non-AP STA shall update the intra-BSS NAV (see 27.2.3 (Updating two NAVs)) based on the duration information of the trigger frame or frame containing UMRS Control field even if it decides to ignore its content.

A STA shall commence the transmission of an HE TB PPDU at the SIFS time boundary after the end of a received PPDU, when the following conditions are met:

* The received PPDU contains either a Trigger frame (that is not an MU-RTS variant) with a User Info field addressed to the STA, or an MPDU addressed to the STA that contains an UMRS Control field. The User Info field in the Trigger frame is addressed to a STA if one of the following conditions are met:[7227, 8172, 6101]
* The AID12 subfield is equal to the 12 LSBs of the AID of the STA and the STA is associated with the AP
* The AID12 subfield is 0, the STA supports the UL OFDMA-based random access procedure (see 27.5.2.6 (UL OFDMA-based random access (UORA))) and the STA is associated with the AP
* The AID12 subfield is 2045, the STA supports the UL OFDMA-based random access procedure (see 27.5.2.6 (UL OFDMA-based random access (UORA))), and the STA is not associated with the AP.
* The CS Required subfield in the Trigger frame is 1 and the UL MU CS condition described in 27.5.2.4 (UL MU CS mechanism) indicates the medium is idle, or the CS Required subfield in a Trigger frame is 0.

If the either condition is not met, then the STA shall not send an HE TB PPDU.

A non-AP HE STA transmitting an HE TB PPDU in response to a Trigger frame shall set the TXVECTOR parameters as follows:

* The FORMAT parameter is set to HE\_TRIG
* The PE\_DURATION parameter is set according to the value of the Packet Extension field in the Trigger frame
* The TXOP\_DURATION parameter is set as defined in 27.2.3 (Updating two NAVs)
* The BSS\_COLOR parameter is set as follows:
* If the Trigger frame was received in an HE PPDU, then set to the value of the RXVECTOR parameter BSS\_COLOR of the HE PPDU
* If the Trigger frame was received in a non-HE PPDU, then set to the value of the BSS Color subfield of the most recently received HE Operation element for the BSS with which the STA is associated
* The L\_LENGTH parameter is set to the value indicated by the Length subfield in the Common Info field of the Trigger frame
* The GI\_TYPE and HE\_LTF\_TYPE parameters are set to the value indicated by the GI and LTF Type subfield of the Common Info field of the Trigger frame
* The NUM\_STS parameter is set to the number of space time streams indicated by the Number Of Spatial Streams subfield of the SS Allocation field of the User Info field and STBC field in the Common Info field of the Trigger frame
* The CH\_BANDWIDTH parameter is set to the value of the BW field in the Common Info field of the Trigger frame
* The HE\_LTF\_MODE parameter is set to the value indicated by the MU-MIMO LTF Mode subfield of the Common Info field of the Trigger frame
* The NUM\_HE\_LTF parameter is set to the value indicated by the Number Of HE-LTF Symbols subfield of the Common Info field of the Trigger frame
* The STBC parameter is set to the value indicated by the STBC subfield of the Common Info field of the Trigger frame
* The LDPC\_EXTRA\_SYMBOL parameter is set to the value indicated by the LDPC Extra Symbol Segment subfield of the Common Info field of the Trigger frame
* The SPATIAL\_REUSE parameter is set to the value of the Spatial Reuse subfield in the Common Info field of the eliciting Trigger frame
* The HE\_SIGA\_RESERVED parameter is set to the value of the HE-SIG-A Reserved subfield in the Common Info field of the Trigger frame
* The MCS parameter is set to the value of the MCS subfield in the User Info field of the Trigger frame
* The DCM parameter is set to the value indicated by the DCM subfield of the User Info field of the Trigger frame
* [9296]The STARTING\_STS\_NUM parameter is set to the value of the Starting Spatial Stream subfield in the SS Allocation field in the User Info field of the Trigger frame
* The FEC\_CODING parameter is set to the value indicated by the Coding Type subfield of the User Info field of the Trigger frame
* The RU\_ALLOCATION parameter is set to the value indicated by the RU Allocation subfield of the User Info subfield of the Trigger frame
* The TXPWR\_LEVEL\_INDEX parameter is set to a value based on the Transmit Power Control for HE TB PPDU and based on the value of the AP Tx Power subfield in the Common Info field and the Target RSSI subfield in the User Info field of the Trigger frame (see 28.3.14.2 (Power pre-correction)).

[7973]NOTE – It is not always possible to fragment HE compressed beamforming feedback (see 27.6.3). If the length is insufficient to contain the HE compressed beamforming feedback requested by a Beamforming Report Poll variant Trigger frame, no feedback is sent.

A STA transmitting an HE TB PPDU in response to a frame containing a UMRS Control field, shall set the TXVECTOR parameters as follows:

* [8704]L\_LENGTH parameter *~~N~~~~SYM~~*is set to *FVAL* + 1, where *FVAL* is the value of the UL PPDU Length subfield of the UMRS Control subfield
* The RU\_ALLOCATION and MCS parameters are set to the values of the RU Allocation and UL MCS subfields of the UMRS Control subfield, respectively.
* The CH\_BANDWITDTH parameter is set to the value of the RXVECTOR parameter CH\_BANDWIDTH of the soliciting DL MU PPDU
* The BSS\_COLOR and DCM parameters are set to the values of the RXVECTOR parameters BSS\_COLOR and DCM of the soliciting DL MU PPDU, respectively
* The HE\_LTF\_MODE, STBC, and NUM\_STS parameters are set to 0
* The CODING\_TYPE parameter is set to 0 if the RU Allocation subfield indicates less than 484-tone RU; otherwise set to 1
* The LDPC\_EXTRA\_SYMBOL parameter is not present if the RU Allocation subfield indicates less than a 484-tone RU; otherwise set to 1
* The SPATIAL\_REUSE parameter is set to [8057]0 (SR\_DISALLOW)~~SR\_Disallowed~~
* The PE\_DURATION parameter is set to the default PE duration value for UL MU response scheduling, which is indicated by the AP in the Default PE Duration subfield of the HE Operation element it transmits and the pre-FEC padding factor is set to 4 (see 28.3.12 (Packet extension))
* The TXOP\_DURATION parameter is set as defined in 27.2.3 (Updating two NAVs)
* The HE\_LTF\_TYPE parameter is set to 4x LTF for 3.2 s if the RXVECTOR parameter HE\_LTF\_TYPE is either 4x LTF for 3.2 s or 2x LTF for 1.6 s; otherwise it is set to 2x LTF for 1.6 s

NOTE 1—The HE TB PPDU in this case is only sent in UL OFDMA format and CS is not required prior to its transmission (see 27.5.2.4 (UL MU CS mechanism)).

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). BlockAck frame and Data frames whose RAs are different shall not be aggregated in one A-MPDU in responding to a GCR MU-BAR Trigger frame or MU-BAR Trigger frame. The RA field of the Data frames and Management frames sent in response to a Trigger frame shall be set to the MAC address of the destination AP.

NOTE—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).

A STA that responds to a DL MU PPDU containing MPDU(s) addressed to it that include ~~UL MU Response Scheduling A-Control~~UMRS Control subfield(s) follows the rules defined in 10.3.2.9 (Ack procedure) for generating the Ack frame, the rules defined in 10.24.7.5 (Generation and transmission of BlockAck frames by an HT STA or DMG STA) for generating the BlockAck frame, and the rules defined in 27.4 (Block acknowledgement) for generating the Multi-STA BlockAck frame. The STA shall construct the A-MPDU carried in the HE TB PPDU as defined in Table 9-428 (A-MPDU contents MPDUs in the control response context) when the A-MPDU [4827]~~containing the UL MU Response Scheduling A-Control subfield~~ solicits an immediate response and as defined in Table 9-426 (A-MPDU contents in the data enabled no immediate response context) when the A-MPDU does not solicit an immediate response.

NOTE—The STA additionally follows the rules defined in 27.3.3 (Procedure at the originator) when fragments are present in the soliciting (A-)MPDU(s).

The MAC padding procedure is described in 27.10.3 (A-MPDU padding for an HE TB PPDU).

The content of each A-MPDU in an HE TB PPDU is defined in 9.7.3 (A-MPDU contents) and 27.10.3 (A-MPDU padding for an HE TB PPDU) and is subject to the following additional constraints:

* If the Trigger Type field of a Trigger frame is not Basic Trigger, then the STA shall include in the response A-MPDU at least one MPDU of the requested type. A Beamforming Report Poll Trigger frame solicits HE Compressed Beamforming and CQI frames (see 27.6 (HE sounding protocol), an MU-BAR Trigger frame or GCR MU-BAR Trigger frame solicits BlockAck frames (see 27.4 (Block acknowledgement)), a BSRP Trigger frame solicits QoS Null frames (see 27.5.2.5 (HE buffer status feedback operation for UL MU)). The MPDUs included in the response shall not solicit a response.
* If the Trigger Type field of the soliciting Trigger frame is Basic Trigger and the STA does not have a frame to transmit, the STA shall either not transmit a response or transmit zero or more QoS Null frames.[8277, 3233, 5718, 5989, 9096]

A STA that is an intended receiver of a Trigger frame that is not a Basic Trigger frame shall construct the A-MPDU carried in the HE TB PPDU as defined in Table 9-428 (A-MPDU contents MPDUs in the control response context). A STA that is an intended receiver of a Basic Trigger frame may include MPDUs with any TID in the HE TB PPDU sent in response to a Trigger frame subject the rules of 27.10.4 (A-MPDU with multiple TIDs).

[9294]A STA shall not solicit any immediate response (as defined in Table 9-426 (A-MPDU contents in the data enabled no immediate response context) and Table 9-428 (A-MPDU contents MPDUs in the control response context)) for the MPDUs that the STA aggregates in the HE TB PPDU if the TID Aggregation Limit subfield in the Trigger Dependent User Info field is set to value 0 in the eliciting Trigger frame.

A STA may aggregate MPDUs belonging to one or more TIDs in the HE TB PPDU (see 27.10.4 (A-MPDU with multiple TIDs) and Table 9-425 (A-MPDU contents in the data enabled immediate response context)) up to the value carried in the TID Aggregation Limit subfield in the Trigger Dependent User Info field of the soliciting Trigger frame, when the TID Aggregation Limit subfield has a value greater 0.

NOTE 1—An AP can include other MPDUs in a soliciting DL MU PPDU that contains Trigger frames as specified in 9.7.3 (A-MPDU contents).

NOTE 2—The frame type of MPDUs may be different across A-MPDUs within a same HE TB PPDU.

[Moved from 27.5.2.2.2 since these are non-AP STA actions]NOTE 3—A STA follows the rules in 27.10.4 (A-MPDU with multiple TIDs) for aggregating the QoS Data frames with multiple TIDs in HE TB PPDUs.

A STA that is scheduled in a Trigger frame or is the intended receiver of an UMRS Control field transmits the dB value of its UL power headroom, *HRSTA*, in the HE TB PPDU sent in response to assist in the AP's MCS selection. The UL power headroom for the assigned MCS is defined in Equation (27-1).



where

 represents the maximum UL transmit power of an HE TB PPDU with the assigned MCS

 represents the current UL transmit power of the HE TB PPDU for the assigned MCS

*HRSTA* is the UL headroom, in dB, of the HE TB PPDU, the encoding of which is specified in 9.2.4.6.4.6 (UL power headroom (UPH) Control.

NOTE—If the Maximum Transmit Power Flag subfield in the UPH Control field is 1, then the STA is transmitting the HE TB PPDU at its minimum  for the assigned MCS.

The STA shall include an HE Control field containing the UPH Control field in MPDUs carried in the A-MPDU of the HE TB PPDU except when:

* The remaining space in the A-MPDU, after inclusion of solicited MPDUs that cannot contain an HE Control field, is not sufficient to contain MPDU(s) that contain an HE Control field
* The STA includes other Control fields in the HE Control field and the available space in the HE Control field is not sufficient to contain an additional UPH Control field.
* **UL MU CS mechanism**

The ED-based CCA and virtual CS functions are used to determine the state of the medium if CS is required before responding to a received Trigger frame. ED-based CCA for the UL MU CS mechanism is defined in 28.3.17.6.2 (CCA sensitivity for operating classes requiring CCA-ED) and virtual CS is defined in 10.3.2.1 (CS mechanism).

If the CS Required subfield in a received Trigger frame is 0 or a frame that includes a UMRS Control field and solicits a response is received, then the STA may respond without regard to the busy/idle state of the medium.

[5719]Note - Responding without regard to the busy/idle state of the medium means that a STA can respond without the need to check the medium indication from physical CS and virtual CS (i.e., basic NAV and Intra-BSS NAV).

A NAV is considered in virtual CS for a STA that is solicited by a Trigger frame for transmission unless one of the following conditions is met:

* The NAV was set by an intra-BSS frame
* The NAV counter is 0

NOTE 1—The details of how a STA is solicited by the Trigger frame for transmission are described in 27.5.2.2.2 (Allowed settings of the Trigger frame fields and UMRS Control field).

For a STA that is solicited by a Trigger frame for transmission, the indication of the virtual CS is described as follows. If no NAV is considered, then the virtual CS indicates idle. Otherwise, the virtual CS indicates busy.

If the CS Required subfield in a Trigger frame is set to 1, the STA shall consider the status of the CCA (using Energy Detect defined in 28.3.17.6.5 (Per 20 MHz CCA sensitivity) and the virtual carrier sense (NAV) during the SIFS between the Trigger frame and the PPDU sent in response to the Trigger frame. In this case, the STA shall sense the medium using energy-detect (ED) after receiving the PPDU that contains the Trigger frame (i.e. during the SIFS time), and it shall perform the energy-detect (ED) at least in the subchannel that contains the STA’s UL allocation, where the sensed subchannel consists of one or more 20 MHz channels. The STA may transmit the solicited PPDU when the 20 MHz channels containing the RUs allocated in the Trigger frame are considered idle. If the STA detects that the 20 MHz channels containing the allocated RUs are not all idle, then the STA shall not transmit.

NOTE—The solicited PPDU is a non-HT or non-HT duplicate PPDU if the Trigger frame is an MU-RTS Trigger frame (see 27.2.4 (MU-RTS/CTS procedure)); otherwise, the solicited PPDU is an HE TB PPDU (see 27.5.2.3 (STA behavior for UL MU operation)).

The CS Required subfield in the MU-RTS Trigger frame and BQRP Trigger frame shall be set to 1.

The AP shall set the CS Required subfield to 1 except when one of the following conditions is met:

* The RA of the Trigger frame is an individually addressed STA's MAC address and a QoS Data frame with Ack Policy set to HE TB PPDU (HTP) Ack is aggregated with the Trigger frame in an A-MPDU, and the Length subfield in the Common Info field of the Trigger frame is less than or equal to 418.
* The Trigger Type of the Trigger frame is either MU-BAR or GCR MU-BAR, and the Length subfield in the Common Info field of the Trigger frame is less than or equal to 418.

NOTE—The threshold value 418 of the Length subfield in the Common Info field of the Trigger frame is obtained from the maximum HE TB PPDU duration, 584 s, that can be solicited by the ~~UL MU Response Scheduling A-Control~~UMRS Control subfield based on Equation (28-16). This duration is the sum of 20 s for the L-STF, L-LTF and L-SIG fields, 20 s for the RL-SIG, HE-SIG-A and HE-STF fields, 16 s for the 4x HE-LTF field with 3.2 s GI, 512 s for 32 OFDM symbols in the Data field with 3.2 s GI, and 16 s PE field (see 9.2.4.6.4.2 (UL MU response scheduling (UMRS) Control), 27.5.2.3 (STA behavior for UL MU operation), and 28.3.4 (HE PPDU formats)).

* **HE buffer status feedback operation for UL MU**

A non-AP STA delivers buffer status reports (BSRs) to assist its AP in allocating UL MU resources ~~in an efficient way~~.[8218] ~~The non-AP STA can either implicitly deliver BSRs in the QoS Control field or BSR Control field of any frame transmitted to the AP (unsolicited BSR) or explicitly deliver BSRs in any frame sent to the AP in response to a BSRP variant Trigger frame (solicited BSR).~~ When a non-AP STA receives a BSRP variant Trigger frame, it shall explicitly deliver BSRs in any frame sent to the AP (solicited BSR). Otherwise, a non-AP STA may implicitly deliver BSRs in the QoS Control field or BSR Control field of any frame transmitted to the AP (unsolicited BSR).[8345]

A non-AP STA reports its buffer status (unsolicited BSR) to the AP to which it is associated using either the QoS Control field or the BSR Control field of frames it transmits as defined below:

* The HE STA shall report the buffer status for a given TID in the Queue Size subfield of the QoS Control field in QoS Data or QoS Null frames it transmits; except that the STA may set the Queue Size subfield to 255 to indicate an unknown/unspecified BSR for that TID.
* The HE STA may aggregate multiple QoS Data frames or QoS Null frames in an A-MPDU to report the buffer status for different TIDs. The HE STA shall follow the A-MPDU aggregation rules defined in 27.10.4 (A-MPDU with multiple TIDs) for aggregating QoS Data frames with multiple TIDs. The HE STA does not follow the rules defined in 27.10.4 (A-MPDU with multiple TIDs) for QoS Null frames whose Ack Policy subfield is No Ack.
* The HE STA may report the buffer status in the BSR Control field of frames it transmits if the AP has indicated its support in the BSR Support subfield of its HE Capabilities element; otherwise the STA shall not report the buffer status in the BSR Control field.
* The HE STA shall report the buffer status for its preferred AC, indicated by the ACI High subfield, in the Queue Size High subfield of the BSR Control field; except that the STA may set the Queue Size High subfield to 255 to indicate an unknown/unspecified BSR for that AC
* The HE STA shall report the buffer status for all ACs, indicated by the ACI Bitmap subfield, in the Queue Size All subfield of the BSR Control field; except that the STA may set the Queue Size All subfield to 255 to indicate an unknown/unspecified BSR for those ACs
* The HE STA shall set the Delta TID subfield according to Table 9-18c (Delta TID subfield encoding), and the Scaling Factor subfield as defined in 9.2.4.6.4.5 (Buffer status report (BSR) Control).

NOTE 1—The STA can send an unsolicited BSR in response to [5996]any variant of Trigger frame except MU-RTS or BSRP ~~Basic variant Trigger frames~~ (with or without random RUs, as defined in 27.5.2.3 (STA behavior for UL MU operation) and in 27.5.2.6 (UL OFDMA-based random access (UORA))) or it can send the unsolicited BSR after accessing the WM using EDCA.

NOTE 2—The STA can include both the QoS Control and the BSR Control field in the same frame. ~~and~~ In such case it can set the Queue Size subfield of either field ~~of them~~ to a value of 255 or have both fields carry the same value in the Queue Size subfield.[7974]

An AP can also solicit one or more non-AP STAs for their BSR(s) by sending a BSRP variant Trigger frame (see 9.3.1.23 (Trigger frame format)). The non-AP STA responds (solicited BSR) as defined below:

* The STA that receives a BSRP Trigger frame shall follow the rules defined in 27.5.2.3 (STA behavior for UL MU operation) to generate the HE TB PPDU when the Trigger frame contains the 12 LSBs of the STA's AID in any of the User Info fields; otherwise if the STA's buffers are not empty and the STA supports the UL OFDMA-based random access procedure, it may follow the rules defined in 27.5.2.6 (UL OFDMA-based random access (UORA)) to gain access to a random RU and generate the HE TB PPDU when the Trigger frame contains one or more random RU(s).
* The STA shall include in the HE TB PPDU one or more QoS Null frames containing one or more of the following:
* The QoS Control field(s) with Queue Size subfields for each of the TIDs for which the STA has buffer status to report to the AP.
* The BSR Control field with the Queue Size All subfield indicating the queue size for all the ACs, indicated by the ACI Bitmap subfield, for which the STA has buffer status to report to the AP when the AP has indicated its support in the BSR Support subfield of its HE Capabilities element. The STA shall set Delta TID, SF, ACI High and Queue Size High subfields of the BSR Control field as defined in 9.2.4.6.4.5 (Buffer status report (BSR) Control)).
* The HE STA shall not solicit an immediate response for the frames carried in the HE TB PPDU (e.g., by setting the Ack Policy subfield of the frame to Normal Ack or Implicit BAR).

NOTE—Similar to unsolicited BSR, the STA can set Queue Sizes in either QoS Control or BSR Control field to 255 to indicate unknown/unspecified BSR for a TID, AC or all AC.

An AP may include a BSRP Trigger frame together with other control, data and management frames in one A-MPDU to a STA if the HE Capabilities element received from the STA has the BSRP A-MPDU Aggregation field equal to 1. If a STA receives a BSRP Trigger frame aggregated with control, data and management frames that solicits an acknowledgement, the response A-MPDU shall contain MPDUs in the order described in Table 9-425 (A-MPDU contents in the data enabled immediate response context).