IEEE P802.11
Wireless LANs

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| Comment resolution for section 9.3.1.23  |
| Date: 2017-01-17 |
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Abstract

This submission proposes resolutions for multiple comments related to TGax D1.0 with the following CIDs (17 CIDs):

* 3018, 8190
* 3167, 3216, 5130, ~~8114,~~ 8166, 8335, 8336, 8380, 8415, 8539, 8540, 9494, 9645
* 6082, 7484
* 9831

Revisions:

* Rev 0: Initial version of the document.
* Rev 0.1: Updated document with feedback from Yongho
* Rev 1.0: editorial changes to resolution
* Rev 2.0: Updated spec text change to D1.1
* Rev 3.0: Modification made during adhoc 8114 (deferred), 9647 (already covered in 17/207), 9831 (moved text to appropriate normative section).
* Rev 4.0: Changed Preferred AC value to match baseline AC mapping.

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.***

# PARS I (AC Preference Level)

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| **CID** | **Commenter** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 3018 | Abhishek Patil | 49.06 | The AC Preference level is not required. If the AP wants to set AC Preference level to 0 then it could as well set Preferred AC to 3 and allow the STA to send any type of traffic. This frees up one bit. | Remove AC Preference level and add statement, If the AP does not have a recommendation for preferred AC then Preferred AC level is set to 3. | Accepted Modified[TGax editor to make changes as shown in doc 17/283r6 under all heading that contain 3018, 8190] |
| 8190 | Osama Aboulmagd | 49.06 | AC Preference level seems to be useless. Wouldn't Preferred AC be sufficient? | delete AC Preference level | Accepted Modified[TGax editor to make changes as shown in doc 17/283r6 under all heading that contain 3018, 8190] |

**Discussion: *None.***

**TGax Editor: *Make the following changes in section 9.3.1.23.1, D1.1 p49.l27 (#CID 3018, 8190):***

If the Trigger frame is a Basic Trigger variant, the Trigger Dependent Common Info field is not present and the Trigger Dependent User Info field is defined in Figure 9-52g (Trigger Dependent User Info field for the Basic Trigger variant).

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| --- | --- | --- | --- | --- |
|  | B0                      B1 | B2                    B4 | B5 | B6               B7 |
|  | MPDU MU Spacing Factor | TID Aggregation Limit | Reserved | Preferred AC |
| Bits: | 2 | 3 | 1 | 2 |
| * Trigger Dependent User Info field for the Basic Trigger variant
 |

**TGax Editor: *Make the following changes in section 9.3.1.23.1, p50.l6 (#CID 3018, 8190):***

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The Preferred AC subfield indicates the AC that is recommended for aggregation of MPDUs of ACs belonging to the same AC as indicated or higher priority AC(s) within a multi-TID A-MPDU sent as a response to the Trigger frame (see 9.3.1.23 (Trigger frame format)). The encoding of the Preferred AC subfield is shown in Table 9-25i (Preferred AC subfield encoding).

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| --- |
| * Preferred AC subfield encoding
 |
| Value | Description |
| 3 | AC\_VO |
| 2 | AC\_VI |
| 1 | AC\_BE |
| 0 | AC\_BK |

**TGax Editor: *Make the following changes in section 27.5.2.2.2, D1.1 p171, line 32 (#CID 3018, 8190):***

~~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.~~

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 Preffered AC subfield to a value AC\_BK .

**TGax Editor: *Make the following changes in section 27.10.4, D1.1, p201, line 52 (#CID 3018, 8190):***

When the AP specifies a value defined in Table 9-25i (Preferred AC subfield encoding) in the Preferred AC subfield in the Trigger Dependent User Info field of a Basic Trigger variant Trigger frame, then an HE STA with dot11AMPDUwithMultipleTIDOptionImplemented set to true and with buffered traffic in the indicated preferred AC should aggregate MPDUs from any one of the TIDs from the same AC or higher AC as indicated in the Preferred AC subfield of the Trigger Dependent User Info field in the Trigger frame.

When the AP specifies a value defined in Table 9-25i (Preferred AC subfield encoding) in the Preferred AC subfield in the Trigger Dependent User Info field of a Basic Trigger variant Trigger frame, then an HE STA with dot11AMPDUwithMultipleTIDOptionImplemented set to true may aggregate MPDUs from any other TID.

The STA may aggregate MPDUs from TIDs in other ACs within the remaining time to the UL PPDU duration value indicated in the Length subfield in the Common Info field of the Trigger frame.

The total number of TIDs from which QoS Data MPDUs are aggregated by the STA shall not exceed the limit indicated in the TID Aggregation Limit subfield of its User Info field in the Trigger frame.

When the AP specifies a value of AC\_BK in the Preferred AC subfield in the Trigger Dependent User Info field of a Basic Trigger variant Trigger frame, then an HE STA with dot11AMPDUwithMultipleTIDOptionImplemented set to true may aggregate MPDUs from any AC/TID or combination of TIDs, up to the limit indicated in the TID Aggregation Limit subfield in Trigger Dependent User Info field of the Trigger frame.

An HE STA with dot11AMPDUwithMultipleTIDOptionImplemented set to false should select any one of the TID value within the AC value indicated in the Preferred AC subfield in the Trigger Dependent User Info field of a Basic Trigger variant Trigger frame.

An HE STA with dot11AMPDUwithMultipleTIDOptionImplemented set to false may select a TID from any AC when the Preferred AC subfield is AC\_BK in the Trigger Dependent User Info field of a Basic Trigger variant Trigger frame.

# PARS II (MISC)

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| **CID** | **Commenter** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 3167 | Ahmadreza Hedayat | 48.23 | The subfields listed in the Trigger-dependent User Info are all the attributes that are relevent to all the STAs in a Trigger frame. For instance the MPDU MU Spacing factor would be applicable to all STAs within a Triger frame equally and there would be no logic for an AP to set this value differently across the STAs. Similarly the TID Aggregation limit; if AP wishes to establish a TID limit would better to do it for all STAs. Also, all the discussions in the TGax related to the AC Preference Level and Preferred AC where related to such preference being established for all teh STAs with a Trigger frame ... There is little benefit to have these subfields in the User Info and better if these subfields appear in a Trigger -dependent Common Info. | As in the comment | RejectedThe Trigger dependent user info fields are parameters which are specified per STA and changes between STAs. The MPDU MU spacing factor depends on the number of RUs and spatial stream allocated to the STA. The TID aggregation limit is present as the AP could have limited BA score board capability and will limit the number of TIDs which can be aggregated by each STA which further depends on if the STA supports multi TID of not. The Preferred AC value depends on the Buffer status report received from the STA which gives the AP the number of packets per TID at each STA. The AP would indicate to the STA which ACs to transmit in the UL and this would be different for each STA. The location of these fields were carefully designed so that to preserve flexibility and allow optimal allocation in a trigger-based PPDU. Not all STAs are born equal to have the same parameters when being triggered |
| 3216 | Ahmadreza Hedayat | 48.20 | Allow a way to indicate the number of RA RUs available in a Trigger frame within the Common-Info field. This helps a STA's implementation/operation. | E.g. add a Trigger-dependent Common Info field for the Basic Trigger frame with a subfield that indicated the number of RA RUs. | RejectedTo reduce the implementation burden of processing the trigger frame the spec already provides in p45,l36 “An AID12 subfield that is 0 indicates that the User Info field identifies an RU for random access.User Info fields with AID = 0 shall be allocated only after User Info fields with AID not equals to 0, if any, and before the MAC padding field, if present”Therefore all the Random access allocations are grouped together and at the end. |
| 5130 | Dorothy Stanley | 9.3.1.23 | Its rediculous to have two LTF types for just the UL MU-MIMO PPDU. Save a bit in Trigger frame and PHY implementation complexity by just selecting single stream pilots which we used in 11ac and removing Mask LTF. | As in comment | Rejected.Both LTF modes have been thoroughly discussed and adopted in TGax. Each mode has its own performance and implementation benefit. The frequency domain masking based LTF allows relative simple implementation of frequency offset estimation. |
| 8114 | Matthew Fischer | 41.36 | Discontiguous resource allocations are possible, but it is not clear how this is done - does an AP deliver in a trigger, multiple UL user info fields for a single AID to deliver multiple discontiguous RU s to that STA? Or does it have new encodings that indicate discontiguous tones? And if multiple RUs are possible, can they be contiguous and how does that differ from a single one that spans the same tones as more than one combined? And when a STA has discontiguous RU allocations, does it treat them as a single allocation for the purpose of interleaving, for example? | Provide clear instructions as to AP and STA behavior when invoking the multiple RU allocation option. | RejectedDiscontinuous resource allocation to the STA increases the operatibg bandwidth of the STA in the uplink and also requires the STA to check the CCA at multiple discontiguous 20 MHz bands. Further the section 28 does not define the procedure to support discontiguous operation like interleaving etc.Further even in the DL Multiple RU allocation is not allowed for a single STA D1.0 P293L60:“Multiple RU allocations addressed to a single STA shall not be allowed in 802.11ax.” |
| 8166 | Ming Gan | 50.17 | MU-BAR frame is not only used for single TID per STA, but also for multiple TIDs per STA. Howerver, it is uesd for multiple TIDs per STA, there are a lot of redudancy, such as "Per TID info" of 2 bytes in BAR info field. Each TID require one "Per TID info" subfield . Instead, using TID bitmap of 1 byte per STA, not "Per TID info" subfield Per TID Per STA, can save lots of byes.We also see an example of GCR MU-BAR frame, it is separated from MU-BAR frame to save the overhead. | Define a new variant for Multi-TID MU-BAR frame like GCR MU-BAR frame. Using TID bitmap of 1 byte in Multi-TID MU-BAR frame to short the whole frame. | RejectedThe AP could solicit through the MU-BAR acknowledgement from STA to which it transmitted one TID and acknowledgement from STAs to which it transmitted Multi-TID. However it sends one MU-BAR after sending a DL OFDMA PPDU. Having a separate MU-BAR for Multi-TID would restrict the AP from mixing single TIDs with multiple TIDs.The comment fails to identify a technical issue. Adding a new type of variant adds to the complexity in terms of parsing (note that the current design is backward compatible with multi\_TID BAR information) wihle the new design is not and its benefits are questionable considering that the TXOPs that are preceded with Trigger frames will be in the order of milliseconds |
| 8335 | Peter Khoury | 47.44 | An FCS could be placed as part of the padding to enable a client device to abort construction of the UL triggered frame early and thus save power. | Add a clause stating that if the number of octets of padding is greater than 4 that the first 4 octets of padding shall consist of an FCS for the previous octets. | RejectedThe comment fails to identify a technical issue. The padding is 16 us at most. Having an FCS as part of the padding would complicate the design, add unneceesarily overhead, while bringing very mariginal benefit (at most 16 us of processing power for frames, and exchanges that generally are in the order of tens of times longer |
| 8339 | Peter Khoury | 46.62 | The trigger frame specifies the MCS for all users on the subsequent UL MU OFDMA frame. This seems overly restrictive especially when the non-AP STA has just received the trigger frame from which is has immediate knowledge of the channel. Its even more restrictive for the random access RUs in which case a client may be forced to use an MCS much lower than necessary and waste bandwidth or may be precluded from using an RU that was specified for an MCS that was too high for the current link budget. | Include an option for an Uplink OFDMA format similar to the downlink MU PPDU format that includes MCS but not RU. This new frame type would be specified in section 28.3.4 and would be a frame similar to the HE MU PPDU with another OFDMA signalling symbol in which uplink RU MCS could be specified by the transmitting stations. | RejectedThe AP has to ensure that it can receive the UL transmission from the STA and that transmission from one STA does not cause interference or is at a much lower power from the transmission from other STAs. If a STA uses Random access RU and is close to the AP and blasts with maximum transmit power it could lead to the AP not decoding the whole PPDU. Therefore the AP selects the MCS for each STA and also specifies the transmit power.The AP has better knowledge of the link (i.e., it can better determine the RX parameters for frames sent by STAs) when triggering the STAs. |
| 8380 | Po-Kai Huang | 50.01 | Currently, MU-BAR is the only variant of Trigger frames with variable length of User Info field due to variable length of BAR information. We see two issues for the current design with variable length of User Info field. First, STA needs to parse every BAR control to figure out the length even if STA does not support certain types of BAR request (ex multi-TID BAR variant). Second, In the future, if additional BAR variant is added, then legacy HE STA may not be able to parse the MU-BAR with the new BAR variant. This introduces backward compatibility issue. | Two options to address the issue. Option 1: Add a length field in Trigger dependent User Info field of MU-BAR to indicate the length of BAR control and BAR Info. Option 2: Add length field in Trigger dependent Common Info field of MU-BAR to indicate the length of the User Info field. Each User info field is padded to the indicated length if required. | RejectedThere is already an effective length field based on Multi-TID bit and TID\_INFO field of the BA control field. So no new length fields are required. If a device does not support Multi-TID it just has to implement the length based on Multi-TID and TID INFO field. Adding a new length field would make the length field redundant. Future BAR variants would have to use the Multi-TID bit and the TID INFO field the same way as it is unsed in Multi-TID BAR. |
| 8415 | Po-Kai Huang | 42.16 | It is possible that AP may not have enough time to decode multiple responses, which can be up to 32-36 responses, to Trigger frame simultaneously and continue the following transmission in SIFS. AP can choose to separate the Trigger process to Multiple Trigger frame, but this will then increase the overhead. | Add a field called required MAC padding duration in Trigger Dependent Common Info every variant of Trigger frame except MU-RTS. A STA that receives the field must have MAC padding larger than or equal to the indicated required MAC padding duration. As a result, AP can have enough time. Add description that AP should make sure that STA has enough time to include the required response such as BSR. | RejectedThe specification already allows the AP to limit the number of UL PPDUs based on the trigger frame. If the AP can’t receive 32-36 responses then it could schedule a lesser number of response in the trigger frame. The spec allows this flexibility without adding extra padding to the MAC packets which leads to wastage of medium. |
| 8539 | Rojan Chitrakar | 45.36 | STAs with limited/inaccurate transmission power adjustment capabilities may not be able to accurately match the "Target RSSI" level specified in the Trigger Frame. This may cause large differences in the received power among STAs, leading to severe Multi-User Interference (MUI). As an example, an STA located very close to the AP may cause high RSSI at the AP even at minimum transmission power. This issue would be even more serious in the case of random access since the AP cannot know which STAs will actually transmit. | In order to enable the AP to reduce the chances of Multi-User Interference (MUI), aside from AID = 0, add two more special AIDs to identify RUs for random access with some restrictions as below:AID = 2008: Only STAs whose estimated received signal power at the AP does not exceed the "Target RSSI" specified in the Trigger frame, when the STA transmits at the transmit power level calculated as per Eqn. 28-118, may transmit on the RU.AID = 2009: Only STAs that cause the estimated received signal power at the AP to exceed the "Target RSSI" specified in the Trigger frame, even when the STA transmits at minimum transmit power level calculated as per Eqn. 28-118, may transmit on the RU. The definition of AID = 0 remains the same: AID = 0 : Random access with no restriction. | RejectedThe fact that the AP does not know which STA wlll transmit in response to a Trigger frame for random access is an inherent property of this operation. The absence of this knowledge sets the behavior for the access to the medium and adding other restrictions in terms of transmit power would not solve the issue and its mitigation is also questionable. The specification already allows two device classes, Class A and Class B described in Table 28-40. Further a STA is required to transmit a minmum transmit power of max(P-32, -10 dBm) (section 28.3.14.3). At -10dBm with 50dB of path loss (the STA is already very close) the receive power at the AP is close to -60dBm which the AP can receive. |
| 8540 | Rojan Chitrakar | 42.32 | Even though the Basic Trigger variant Trigger frame allows STAs to aggregate management frames with Data frames in an HE trigger based PPDU, in certain situations, it is more efficient if the AP is able to restrict the frame type that is included in the HE trigger based PPDU. For e.g. during the BSS setup, the AP can expect many simultaneous exchanges of block ack setup frames. In such times, it would be more efficient for the AP to restrict the uplink frames to management frames (ADDBA request/ADDBA response etc.). | Add a new Trigger variant for management frame types (Management frame Trigger variant) to solicit specific management frames from STAs. An two octet "preferred response type" field in the Type dependent common info field can be used to specify the specific management frame. The same encoding for frame subtypes defined in Section 9. Frame formats, may be reused. For Action frames, the remaining bits may be used to specify the Action category (as defined in 9.4.111) as well as the Action field defined for each Action frame. | RejectedThe comment fails to identify a technical issue and the proposed change impacts flexibility and increases complexity. It is desirable that the STA can always send management frames in the UL aggregated with data MPDUs, whenever the STA deems it is necessary for it to deliver this type of frames. |
| 9645 | Yongho Seok | 46.27 | "B12 is set to 0 for a 20 MHz, 40 MHz and 80 MHz PPDU. For the 2x996-tone RU case, B12 is set to 1."An interpretation of B12 shown in above is different with the previous paragraph.Probably, it may be for a case when the triggered PPDU is a non-OFDMA PPDU.But, even though it is a non-OFDMA case, current B12 definition is useless. Because B19-B13 has a complete information for indicating a 20/40/80/160/80+80MHz non-OFDMA PPDU.Please explain how current B12 encoding is utilized by a non-AP STA.Otherwise, change it as the following:"When a non-OFDMA PPDU is triggered, B12 is reserved and set to 0." | As per comment. |  Rejected.There is no inconsistency in the definition of Bit 12. Bit 12 indicates if Bit19-Bit 13 refer to the primary 80 MHz, 0 for primary or for the non-primary 80, 1 for non-primary. For 2x996 when both Primary 80 and non primary-80 is used then Bit 12 is set to 1. |

# PARS III

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| **CID** | **Commenter** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 6082 | Jian Yu | 9.3.1.23 | For OFDMA PPDUs, the number of HE-LTFs should be greater or equal to the maximum across RUs of the Number of HE-LTFs as defined in Table 22-13. For example, if the maximum STS is 7, the number of HE-LTF cannot be 7, but should be 8. | As in comment | RejectedThe spec text already says “For OFDMA PPDUs, the number of HE-LTFs is greater than or equal to the maximum across RUs of the total number of space time streams.” So it does say that equal to or greater than the number of HE-LTF. The HE-LTF table is also defined in Table 28-17. |
| 7484 | Lei Huang | 9.3.1.23 | The HE-SIG-A field of an HE trigger-based PPDU does not contain the Number Of HE-LTF Symbols field. "Table 28-18 (HE-SIG-A field of an HE trigger-based PPDU)" should be changed to "Table 28-17 (HE-SIG-A field of an HE MU PPDU)". | As per comment | Accepted[TGax editor to make changes as shown in doc 17/0283r6 under all heading that contain 7484] |

**TGax Editor: *Make the following changes in section 9.3.1.23, D1.1 p45.l24 (#CID 7484):***

The encoding of the Number Of HE-LTF Symbols subfield is the same as the Number of HE-LTF Symbols in HE-SIG-A2, which is defined in Table 28-17 (HE-SIG-A field of an HE MU PPDU).

# PARS IV

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| **CID** | **Commenter** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 9831 | Young Hoon Kwon | 48.61 | How to encode the TID Aggregation Limit subfield is not defined. In HE Capabilities element, Multi-TID Aggregation Support subfield is set to the number of TIDs minum 1 of QoS Data frames that can be aggregated. If the same rule is applied, it is not clear the meaning of value 0 in the TID Aggregation Limit subfield. If the TID Aggregation Limit subfield is set to the number of TIDs of frames that can be aggregated, the text shown in P49L1 "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" is not valid. Further clarification is needed. | As in the comment. | Accepted modified.Draft 1.1 already specifies the encoding of TID aggregation limit of 0 in P 171, line 17. As suggested during the March adhoc the Note which describes the encoding of TID aggregation level 7 is moved to section 27.5.2.2.2 [TGax editor to make changes as shown in doc 17/283r6 under all heading that contain 9831] |

**TGax Editor: *Make the following changes in section 9.3.1.23.1, D1.1, p50.1 (#CID 9831):***

~~NOTE–A value of 7 in the TID Aggregation Limit subfield indicates to the STA that it can aggregate QoS Data frames from any number of different TID values in the multi-TID A-MPDU.~~

**TGax Editor: *Make the following changes in section 27.5.2.2.2, D1.1, p171.26 (#CID 9831):***

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.

# PARS V

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| **CID** | **Commenter** | **P.L** | **Comment** | **Proposed Change** | **Resolution** |
| 9494 | Yanchun Li | 51.26 | "the Trigger Dependent User Info field is not present" causes degraded trigger based UL random access performance. 11ax is designed to work under high dense environment with large number of STAs which have diverse application demands. When BSRP variant Trigger frame triggers random access BSRs, the BSR from the STA with high priority AC shall not contend with low priority AC BSR. Need to reuse the AC-aware design in Basic Trigger variant. | Trigger Dependent User Info field for BSRP variant reuses Figure 9-52g--Trigger Dependent User Info field for the Basic Trigger variant. B0-B4 bits are discarded and reserved. |  Rejected –AC indication in the basic trigger frame is related to the queues the STA is recommended to transmit from in the Trigger-based PPDU; from the BSR delivery perspective it is of outmost importance for the AP to have knowledge of as many queues as possible from the STA. And from the STA perspective the STA can decide which of its queues it deems whith higher priority. The current design enabled both,Further due to the inherent delay when making Random access BSR requests it will be difficult if not impossible to support latency requirements for Voice and Video with UL OFDMA based random access BSRP as the latency requirements will not be met. It is therefore preferred to do piggy back (QoS Control or BSR A-Control) based buffer status feedback. |