IEEE P802.11  
Wireless LANs

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| **CIDs for: Section 9.3.1.23**  **Trigger Frame Format** |
| **Date:** 2016-04-17 |

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Revision

0.1: Original document

0.2: Added bit location and bits for SS Allocation

0.3: Added Table and Figure headers. Also made changes to resolution based on Alfred’s feedback.

0.4: Editorial comments based on input from IEEE 802.11 conference call on 6/16/16. Changes include updated table formats, added CIDs covered in the document to Abstract, changed reserved bit to 1 in per user info, updated references to Draft 0.2

0.5: Editorial changes and added Doppler bit to the common info field

Abstract

This submission proposes resolutions for multiple comments related to TGax D0.1 with the following CIDs:

* 101,103, 104,374,375, 377, 558, 561, 661, 662, 664, 688, 1296, 1299, 1301, 1717, 1718, 1882, 2113, 2114, 2174, 2217, 2302, 2421, 227, 720,
* 663,688,1303,1305,1306

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** | **PP.LL** | | **Comment** | **Proposed Change** | | **Resolution** |
| 101 | Alfred Asterjadhi | 37.51 | Needles to say these TBDs must disappear. Add the appropriate lengths for each of these fields. If variable then add "variable" in bytes. Also add a number 1 and N in the first and last "Per User Info", respectively. | | | As in comment. | Revised  Fixing the TBDs. |
| 103 | Alfred Asterjadhi | 38.07 | There was a motion at the March F2F that defined some of these TBDs. Add those changes. Also make sure that each of these fields has the length defined and also its descriptions. Also for the the Trigger Dependent Common Info it is not clear to me what this field contains. If it serves no purpose then remove it. | | | As in comment. | Revised.  Agree in principle.  The Trigger dependent common information field is also required as it contains common information for that trigger type. The information is common over all the STAs. This is required to reduce the number of bits in the Trigger frame, else this information has to be repeated for all the stations. |
| 104 | Alfred Asterjadhi | 38.53 | There is a TBD in this CP and LTF field of the Trigger frame (I think the lengh is 3 bits so possible 8 values). Add any missing combinations (if any) and add a row for the unused values with Reserved. | | | As in comment. | Revised  .  Not all CP + LTF types are allowed for HE TRIG PPDU. Only 3 values are allowed.So we need 2 bits. |
| 374 | Brian Hart | 20.32 | "The TBD bits in HESIGA that may be implicitly lknown by all responding STAs can be excluded" is too vague for the 802.11 spec | | | Which bits? Under what circumstances are they implicitly known? How is the truncation signalled? | Revised.  The HE-SIG-A in the HE\_TRIG PPDU should be the same. Therefore the AP should send the HESIGA bits in the Trigger frame. |
| 375 | Brian Hart | 20.47 | 2xLTF and 4xLTF are technical terms not immediately understandable to the reader | | | Add a cross reference to their definition, or make them defined terms - preferably starting with an alphabetic character | Rejected. These are specified in the specification. |
| 377 | Brian Hart | 21.31 | Variable length field at end but length is unspecified | | | Probably need to add a length field somewhere (in Per User Info field or variable leng field), or a table on how the length is determined | Rejected.  Variable as the length is based on the Trigger Type. |
| 558 | EVGENY KHOROV | 21.00 | Trigger frame for random access is never defined | | | The trigger frame for random access shall be defined, e.g. as the trigger frame in which at least one User Identifier corresponds to a group of STAs | Revised .  A random RU is identified by an AID equal to 0 as defined below |
| 561 | EVGENY KHOROV | 21.39 | It is not clear whether several Trigger frames can be transmitted in one PPDU | | | Either forbid to use multiple Trigger frames in one PPDU or add a restriction that for all Trigger frames inside one PPDU, any value of User Identifier except for the value which corresponds to the random access may be used only once. | Rejected. If the Trigger information is in HE Variant of the HT Control frame then it is the same for all MPDUs in the A-MPDU. If the Trigger information is in a Trigger Frame. In section 25.5.2.2.1 "Rules for soliciting UL MU frames" it also says that the two frame Trigger frame with per user information and Trigger information field in the MAC header should not be contained in the same A-MPDU. Also the Trigger frame should be the first frame in the A-MPDU. |
| 661 | Huizhao Wang | 20.07 | Move the Trigger Type as the first subfield inside the Common Info field, so that all the other subfields can be optional | | | Change the Common Info field define as: Trigger\_Type | Length | Cascade | CS | CP/LTF |Trigger\_Dependent\_Common\_Info | Accepted. |
| 662 | Huizhao Wang | 21.22 | Trigger Random Access type is missing | | | Add Trigger Random Access type into Table 9-ax2 | Revised  There is no trigger Random accesss tuype though there is an AID that identifies a random RU (AID equal to 0 as motioned in May) |
| 663 | Huizhao Wang | 21.31 | Incosistence of AID field length: AID field is definded as 2 bytes, but throughout 11ax draft, some places it is defined as 12 bits field, some places it is defined as 11 bits field. Because the AID may be used for many different purpose: signaling a group of STAs, etc. We need to make all the AID fields to be 2 bytes, so that there will be enough bits available to serve the different purposes. | | | Make the User Identifer subfield as 16bits width | Revised. Rename AID to AID12. |
| 664 | Huizhao Wang | 21.31 | Consolidate MCS and SS Allocation into one subfield in Per User Info field (a technical contribution will be followed later) | | | A technical contribution will be followed later to consolidate MCS and SS Allocation into one subfield with encoding as SS[4bits: MSB]MCS[4bits:LSB] | Rejected. The SFD already includes SS and MCS field definition |
| 688 | Jae Seung Lee | 19.49 | Too many TBDs in the subclause. | | | Update the subclause to remove all the TBDs. | Revised.  Some TBDs have been resolved. |
| 1296 | Mark RISON | 19.42 | It says "to send UL MU" | | | Change to "to send an UL MU PPDU" | Revised  This should actually be called trigger-based PPDU. |
| 1299 | Mark RISON | 20.30 | "may be implicitly known" -- well, are they or are they not known? | | | Change "may be" to "are" | Accepted. |
| 1301 | Mark RISON | 21.33 | The max AID is 2007 so only 11 bits are needed | | | Change "11" to "10" | Rejected. The length of 12 bits was decided to be consistent with the baseline AID which is 12 bits |
| 1303 | Mark RISON | 21.33 | Only 2 values for the Coding Type are identified | | | Change "TBD" to "1" for the Coding Type subfield | Accepted. |
| 1305 | Mark RISON | 21.33 | Only 2 values for the DCM are identified | | | Change "TBD" to "1" for the DCM subfield | Accepted. |
| 1306 | Mark RISON | 21.60 | "The SS Allocation subfield of the Per User Info field indicates the spatial streams of the HE trigger-based PPDU response of the STA identified by User Identifier field." -- in what encoding/format? | | | Clarify | Revised.  The encoding format for SS is defined. |
| 1717 | Osama Aboulmagd | 20.19 | I suggest using "Cascade Trigger" indication instead of Cascade indication | | | as in comment. Just to make it clear the type of the frame to follow. | Rejected.  Indicates if there is a subsequent Trigger frame in the TxOP. |
| 1718 | Osama Aboulmagd | 21.30 | What is "Trigger Dependent Per User Info" field in Figure 9-51c? | | | I guess this field needs to be deleted | Revised  The Trigger dependent per user information is required if a Trigger Type has specific per user information. |
| 1882 | Sigurd Schelstraete | 20.40 | Table 9-ax1 is missing 1x LTF + 0.8 usec | | | Add entry. Also, keep numbering assignment of the different modes consistent with numbering used in HE-SIG-A | Rejected. UL response with 1x LTF + 0.8us is not allowed |
| 2113 | Sriram Venkateswaran | 20.07 | Missing elements from Common Info Field | | | Add: - A factor - Padding disambiguation bit - Number of HE-LTF - Pilot mode for HE-LTF: SSP or Masking | Revised.  This information is included in the Packet extension f |
| 2114 | Sriram Venkateswaran | 20.47 | Add 1x LTF to CP LTF size | | | 0: 1xLTF + 1.6us CP for full BW UL MU MIMO 2-4: current elements 1-3 | Rejected. UL response with 1x LTF + 1.6us is not allowed |
| 2174 | stephane baron | 21.14 | Basic trigger type is undefined | | | Define Basic trigger type (wich type of traffic is allowed). | Rejected.  This is defined in the section UL MU operation. |
| 2216 | Tomoko Adachi | 21.01 | It says "The Trigger Type subfield indicates the type of the Trigger frame. The Trigger frame can include an optional type-specific Common Info and optional type-specific Per User Info. Table 9-ax2 (Trigger Type field encoding) defines the valid Trigger Type." Is the second sentence explaining the Trigger Dependent Common Info in the Common Info field and the Trigger Dependent Per User Info in the Per User Info field that they are optional? If so, use the same names which appear in the Figures 9-51b and 9-51c. Also explain the one in the Per User Info field after the SS Allocation subfield to appear in the same order with Figure 9-51c. | | | As in comment. | Revised.  The fields are “Type-Dependent Common Info” and and “Type dependent per user info” |
| 2217 | Tomoko Adachi | 21.25 | Clarify that one or more Per User Info fields are carried in the Trigger frame. | | | As in comment. | Rejected.  The diagram in 9-51a shows there are multiple Per Use Info fields. |
| 2302 | Yasuhiko Inoue | 19.37 | Clause 9.3.1.23 is very confusing. I do not understand why trigger dependent per-user information is contained in the common information field of the trigger frame. It shall be contained the per-user information field of the trigger frame. I guess some figures and figure captions are not correct. | | | Please double check entire subclause | Revised.  Text modified. |
| 2421 | Yongho Seok | 21.25 | The HE trigger-based PPDU is either a beamformed PPDU or a non-beamformed PPDU. Because the HE-SIG-A field of the HE trigger-based PPDU does not have a beamformed status information, the receiver (i.e., AP) of the HE trigger-based PPDU can not decide whether the channel smoothing is allowed or disallowed. So, the Per User Info field of the Trigger frame needs to indicate the beamformed status of the HE trigger-based PPDU. When the beamformed status information of the Per User Info field of the Trigger frame is enabled, the HE trigger-based PPDU can be a beamformed PPDU. Otherwise, the HE trigger-based PPDU can not be a beamformed PPDU. | | | As per comment | Rejected.  1) The AP cannot dictate the use of beamformed PPDU transmissions at the non-AP STA.    2) The AP can rely on advanced algorithms for determining use of channel smoothing without knowledge of UL trigger-based PPDU is beamformed or not. |
| 227 | Alfred Asterjadhi | 39.31 | Suppose a STA received a Trigger Frame, allocating an RU for HE\_TRIG PPDU transmission. The Trigger Frame says Nss = 2 and Nss,offset = 0. How does the STA know whether it is being allocated an "SU" transmission in the RU, or that it is being allocated the first two streams of an UL MU-MIMO together with other STAs? | | | Add a bit in the per user field of Trigger Frame indicating whether the allocated RU is an "SU RU" or "MU RU". | Revised.  Text was added to the specification “The MU MIMO LTF Mode subfield of the Common Info field indicates LTF mode of the UL MU-MIMO trigger-based PPDU response. The AP shall set the MU MIMO LTF to Single Stream pilot if the triggered UL PPDU contains partial or full UL OFDMA allocation” |
| 720 | Jarkko Kneckt | 20.26 | It is not clear does triggered STAs receiving a trigger with CS Required field set to 0 sense if the medium is idle. | | | It should be clear is the medium sensing performed or not. This affects to STA operations. | Accepted.  Text was added as part of Motion 55. |

#### 9.3.1.23 Trigger frame format

**TGax Editor: *Add the subclause below as resolution to Trigger Type (#CID):101,104,374,661,688, 2113,2216***

Editor: Change TBD in Figure 9.51b from TBD to Variable.



Figure 9‑51b –Common Info field

The BW bits indicate the bandwidth in the HE-SIG-A of the HE Trigger based PPDU and is defined in Table X-XX

**Table X-XX Bandwidth in the HE-SIG-A**

|  |  |
| --- | --- |
| **BW** | **Description** |
| 0 | 20 MHz |
| 1 | 40 MHz |
| 2 | 80 MHz |
| 3 | 80 + 80 or 160 MHz |

Table 9‑ax1 – GI and LTF Type subfield

|  |  |
| --- | --- |
| **CP and LTF field value** | **Description** |
| 0 | 1xLTF + 1.6 us CP |
| 1 | 2x LTF + 0.8 µs CP |
| 2 | 2x LTF + 1.6 µs CP |
| 3 | 4x LTF + 3.2 µs CP |
| 4-TBD | Reserved |

The MU MIMO LTF Mode subfield of the Common Info field indicates LTF mode of the UL MU-MIMO trigger-based PPDU response. The AP shall set the MU MIMO LTF to Single Stream pilot if the triggered UL PPDU contains partial or full UL OFDMA allocation. The MU MIMO LTF Mode subfield encoding is defined in Table X-X

**Table X-X MU MIMO LTF Mode subfield encoding**

|  |  |
| --- | --- |
| MU MIMO LTF Mode subfield value | Description |
| 0 | Single-stream pilot |
| 1 | Mask LTF sequence of each spatial stream by a distinct orthogonal code |

The number of HE-LTFs subfield of the Common Info field indicates the number of HE-LTF symbols present in the HE trigger-based PPDU response. The number of HE-LTF symbols is a function of the total number of space-time streams. The number of HE-LTF subfield encoding is defined in Table 22-13.

The STBC subfield of the Common Info field indicates the status of STBC encoding of the HE trigger-based PPDU response. It is set to 1 if STBC encoding is used and set to 0 otherwise.

The LDPC Extra Symbol subfield of the Common Info field indicates the status of LDPC Extra Symbol. It is set to 1 when LDPC extra symbol is present and set to 0 otherwise.

The AP Tx Power subfield of the Common Info field indicates the combined average power per 20 MHz bandwidth of all transmit antennas used to transmit the trigger frame at the HE AP. The resolution for the transmit power reported in the Common Info field is 1dB. The AP Tx Power subfield encoding is defined in Table X-XX

**Table X-X AP Tx Power subfield encoding**

|  |  |
| --- | --- |
| AP Tx Power subfield value | Description |
| 0 to 60 | Values 0 to 61 maps to -20 dBm to 40 dBm |
| 61,62, 63 | Reserved |

The Packet Extension subfield of the Common Info field indicates the packet extension duration of the trigger-based PPDU response. The first two bits indicate the “a-factor” and the third bit indicates the PE-Disambiguity.

The Spatial Reuse bits indicates the value of the Spatial Reuse in the HE-SIGA of the HE\_TRIG PPDU transmitted as a response to the Trigger frame. For HE trigger-based PPDU, 4 SR fields are signaled:

* For 20MHz one SR field corresponding to entire 20MHz (other 3 fields indicate identical values)
* For 40MHz two SR fields for each 20MHz (other 2 fields indicate identical values)
* For 80MHz four SR fields for each 20MHz
* For 160MHz four SR fields for each 40MHz

The exact location of each 20MHz for 80MHz BW is TBD.

One bit is used to indicate high doppler mode of transmission.

The ‘HE-SIGA reserved’ bits indicate the values of the reserved bits in the HE-SIGA of the HE\_TRIG PPDU transmitted as a response to the Trigger frame. The number of reserved bits is 9.

The 1 reserved bits align the Common Info Field to octets.

The Per User Info field is defined in Figure 9‑51c.





Figure 9‑51c - Per User Info field

**TGax Editor: *Add the subclause below as resolution to Trigger Type (#CID):663,688,1303,1305,1306,***

The AID12 subfield of the Per User Info field indicates the LSB 12 bits of the AID of the STA allocated the RU to transmit the MPDU(s) in the HE trigger-based PPDU, except for an AID equal to 0 which identifies a wildcard RU for random access.

The SS Allocation subfield of the Per User Info field indicates the spatial streams of the HE trigger-based PPDU response of the STA identified by User Identifier field. SS Allocation in Per User Info field is defined in Figure X-XX (SS Allocation subfield in Per User info field).



**Figure X-XX SS Allocation subfield in Per User Info field**

The Target RSSI subfield of the Per User Info field indicates the target received signal power of the the HE trigger-based PPDU response. The resolution for the Target RSSI in the Per User Info field is 1dB. The Target RSSI subfield encoding is defined in Table X-XXX.

Table X-XXX Target RSSI subfield encoding

|  |  |
| --- | --- |
| Target RSSI subfield value | Description |
| 0 to 90 | Values 0 to 90 maps to -110 dBm to -20 dBm |
| 91 to 127 | reserved |