IEEE P802.11
Wireless LANs

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| Comment Resolution on trigger frame for random access |
| Date: 2017-05-09 |
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Abstract

This submission proposes resolutions of comments received from TGax comment collection (TGax Draft 1.0).

* CIDs:3215, 9333, 9969

Revisions:

* Rev 0: Initial version of the document.

Interpretation of a Motion to Adopt

A motion to approve this submission means that the editing instructions and any changed or added material are actioned in the TGax Draft. This introduction is not part of the adopted material.

***Editing instructions formatted like this are intended to be copied into the TGax Draft (i.e. they are instructions to the 802.11 editor on how to merge the text with the baseline documents).***

***TGax Editor: Editing instructions preceded by “TGax Editor” are instructions to the TGax editor to modify existing material in the TGax draft. As a result of adopting the changes, the TGax editor will execute the instructions rather than copy them to the TGax Draft.***

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| CID | Page Number | Line Number | Comment | Proposed Change | Resolution |
| 3215 | 172 | 33 | Identfying each RU for RA by a subfield with AID12=0 is too redundant particularly considering tha 5-byte (out of 6-byte) User Info would practically be the same for all RA RUs. Suggest to allow indication of multiple RA RUs using a single Per-User Info. "An RU for random access shall be identified by an AID12 subfield equal to 0 contained in a User Info field of a Trigger frame." | As in the comment | Revised.Paragraphs are added to specify how to reduce the redundancy. |
| 9333 | 41 | 34 | Most of the User Info subfields in the Trigger frame can be the same for RUs for UL OFDMA-based random access. This means the Trigger frame can be shorter and more efficient.  | Limit the RU size that can be used for UL OFDMA-based random access in each Trigger frame and reduce the redundancy.  | Revised.Paragraphs are added to specify how to reduce the redundancy. |
| 9969 | 45 | 36 | Random access RUs have to be allocated one by one by setting AID12 field to 0. If plenty of random access RUs need to be allocated, then lots of user info fields are needed, which is a large overhead.  | Devise a mechanism to allocate multiple random access RUs in an efficient way.  | Revised.Paragraphs are added to specify how to merge multiple user info fields into one to indicate OFDMA random access.  |

Discussion:

The commenters point out the inefficiency of the current trigger frame format to support OFDMA based random access transmission. Most of the subfields in the user info field of the trigger frame are duplicated, hence multiple user info fields can be combined into one to save overhead.

**9.3.1.23 Trigger frame format**

***TGax editor: make the following changes in 9.3.1.23:***

The User Info field is defined in Figure 9-52f (User Info field).

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Figure 9-52f – User Info field

The AID12 subfield of the User Info field carries the 12 LSBs of the AID of the STA for which the User Info field is intended. An AID12 subfield that is 0 or 2045(#3074) indicates that the User Info field allocates(# Ed) one or more continuous RUs ~~an RU~~ (#3215, #9333, #9969) for random access (see 27.5.4 (UL OFDMA-based random access (UORA)))(#3074, #5018, #5019, #5020, #5021, #5022, #5023, #5035, #5066, #5714, #5986, #5999, #6167, #7648, #8156, #8279, #8554, #9100, #9121, #9122, #9123, #9591, #9904, #9975, #9708, #10168). User Info fields with AID12 not equal to 0 and not equal to 2045 appear before User Info fields with AID12 equal to 0 or equal to 2045 (if any present).(#7745, #9630, #9827, #7329, #9997, #9998, #9826)

When the value of the AID12 field is not equal to 0 or 2045, the(#3215, #9333, #9969) RU Allocation subfield of the User Info field indicates the RU used by the HE TB PPDU of the STA identified by the AID12 subfield. The RU Allocation subfield is 8 bits in length. The first bit, B12, indicates the allocated RU is located in the primary or non-primary 80 MHz (zero for primary and one for non-primary). The mapping of the subsequent 7 bits, B19-B13, indices to the RU allocation is defined in Table 9- 25g (The encoding of B19–B13 of the RU Allocation subfield).

B12 is set to 0 for 20 MHz, 40 MHz and 80 MHz PPDUs(#6302). For the 2996-tone RU case, B12 is set to 1. The mapping of subsequent 7 bits indices B19-B13 to RU index in each row depends on the BW sub-field(#7256) in Common Info field:

* For a 20 MHz PPDU, the mapping of B19-B13 to RU allocation follows the RU index in Table 28-5 (Data and pilot(#8603) subcarrier indices for RUs in a 20 MHz HE PPDU) in increasing order(#6329). The value 0000000 indicates 26-tone RU1 [121: 96], the value 0001000 indicates 26-tone RU9 [96: 121], and the values 0001001-0100100 are not used(#5322). The value 0100101 indicates 52-tone RU1 [121: 70], the value 0101000 indicates 52-tone RU4 [70: 121], and the val-ues 0101001-0110100 are not used. The value 0110101 indicates 106-tone RU1 [122: 17], the value 0110110 indicates 106-tone RU2 [17: 122], and the values 0110111-0111100 are not used. The value 0111101 indicates 242-tone RU1 [122: 2, 2:122], and the values 0111110-1000000 are not used.(#5322)
* For a 40 MHz PPDU, the mapping of B19-B13 to RU allocation follows the RU index in Table 28-6 (Data and pilot(#8603) subcarrier indices for RUs in a 40 MHz HE PPDU) in increasing order(#6329). The value 0000000 indicates 26-tone RU1 [243: 218], the value 0010001 indicates 26-tone RU18 [218: 243], and the values 0010010-0100100 are not used. The value 0100101 indi-cates 52-tone RU1 [243: 192], the value 0101100 indicates 52-tone RU8 [192: 243], and the val-ues 0101101-0110100 are not used. A similar ordering is followed for 106-tone RU, 242-tone RU and 484-tone RU.(#5322)
* For an 80 MHz, 160 MHz and 80+80 MHz PPDU, the mapping of B19-B13 to RU allocation fol-lows the RU index in Table 28-7 (Data and pilot(#8603) subcarrier indices for RUs in an 80 MHz HE PPDU) in increasing order(#6329). The value 0000000 indicates 26-tone RU1 [499: 474], and the value 0100100 indicates 26-tone RU37 [474: 499]. The value 0100101 indicates 52-tone RU1 [ 499: 448], and the value 0110100 indicates 52-tone RU16 [448: 499]. A similar ordering is fol-lowed for 106-tone RU, 242-tone RU, 484-tone RU and 996-tone RU. For a 160 MHz and 80+80 MHz PPDU, B19-B13 are 1000100 indicates 2996-tone RU.(#5322)

When the value of the AID12 field is equal to 0 or 2045, the RU Allocation subfield indicates the first RU of one or more continuous random access RUs. If there are more than one random access RUs, the sizes of all random access RUs are the same and equal to the size of the first RU. Further all the subfields of the User Info field apply to all the random access RUs. (#3215, #9333, #9969)

The Coding Type subfield of the User Info field indicates the code type of the HE TB PPDU that is the response to the Trigger frame(#9993). The Coding Type subfield is set(#5323) to 0 to indicate BCC and set to 1 to indicate LDPC(#10000).

The MCS subfield of the User Info field indicates the MCS of the HE TB PPDU that is the response to the Trigger frame(#9993). The encoding of the MCS field is defined in 28.3.7 (HE modulation and coding schemes (HE-MCSs)).

The DCM subfield of the User Info field indicates dual carrier modulation of the HE TB PPDU that is the response to the Trigger frame(#9993). The DCM subfield is set to 1 to indicate that DCM is used the HE TB PPDU that is the response to the Trigger frame as defined in 28.3.11.15 (Dual carrier modulation). The DCM subfield is set to 0 to indicate that DCM is not used.(#7257)

When the value of the AID12 field is not equal to 0 or 2045, the SS Allocation/Random Access RU Information(#3215, #9333, #9969)~~The SS Allocation~~ subfield of the User Info field indicates the spatial streams of the HE TB PPDU that is the response to the Trigger frame(#9993). When the value of the AID12 field is not equal to 0 or 2045, t~~T~~he (#3215, #9333, #9969)format of the SS Allocation/Random Access RU Information(#3215, #9333, #9969) subfield is defined in Figure 9-52g (~~SS Allocation~~ SS Allocation/Random Access RU Information subfield format when the value of the AID12 field is not equal to 0 or 2045). (#3215, #9333, #9969)



**Figure 9-52g—SS Allocation/Random Access RU Information subfield format when the value of the AID12 field is not equal to 0 or 2045**(#3215, #9333, #9969)

The Starting Spatial Stream subfield indicates the starting spatial stream, STARTING\_SS\_NUM, and is set to STARTING\_SS\_NUM - 1.

The Number Of Spatial Streams subfield indicates the number of spatial streams, NUM\_SS and is set to NUM\_SS -1.(#3015, #3016, #3165, #7487, #8660, #8661, #9262, #9263, #9633)

When the value of the AID12 field is equal to 0 or 2045, the SS Allocation/Random Access RU Information subfield of the User Info field indicates the random access RU information. When the value of the AID12 field is equal to 0 or 2045, the format of the SS Allocation/Random Access RU Information subfield is defined in Figure 9-52ga (SS Allocation/Random Access RU Information subfield format when the value of the AID12 field is equal to 0 or 2045). (#3215, #9333, #9969)



**Figure 9-52ga—SS Allocation/Random Access RU Information subfield format when the value of the AID12 field is equal to 0 or 2045**(#3215, #9333, #9969)

The Random Access RU Number subfield indicates the number of conntinuous RUs allocated for UORA. The value of the Random Access RU Number subfield is equal to the number of continuous random access RUs minus one. The starting spatial stream and the number of spatial streams of the HE TB PPDU transmitted on each random access RU are 1. (#3215, #9333, #9969)

***TGax editor: make the following changes in 27.5.4.1:***

UORA(#8142) is a mechanism for HE STAs to randomly select resource units (RUs) assigned by an AP in a soliciting Trigger frame that contains RUs for random access. An RU for random access is(#Ed) identified by an AID12 subfield and the Random Access RU Number subfield(#3215, #9333, #9969) contained in a User Info field of a Trigger frame that is equal to one of the following: — 0 to indicate ~~a~~ one or more(#3215, #9333, #9969) random access RUs(#3215, #9333, #9969) ~~RU~~(#10173) that is intended for associated STAs — 2045 to indicate one or more(#3215, #9333, #9969) ~~a~~ random access RUs(#3215, #9333, #9969) ~~RU~~(#10173) that is intended for unassociated STAs(#3074)

***TGax editor: make the following changes in 27.5.4.2:***

In the example shown in Figure 27-5 (Illustration of the UORA(#8142) procedure(#7103, #7413)), HE STA 1 and HE STA 2, both associated with the AP and that has(17/646r4) a pending frame for the AP, decrement their nonzero OBO counters by the number of eligible random access RUs indicated(#3215, #9333, #9969) ~~User Info fields~~ in the Trigger frame where the AID12 subfield is 0(#9103). HE STA 3, which is not associated with the AP but has a pending frame for the AP, decrements its nonzero OBO counter by the number of eligible random access RUs indicated(#3215, #9333, #9969) ~~User Info fields~~ in the Trigger frame where the AID12 subfield is 2045(#9103). HE STA 4, which is associated with the AP and has a pending frame for the AP, is assigned RU6 and does not decrement its nonzero OBO counter. HE STA 4 will transmit its pending frame in an HE TB PPDU using the assigned RU6. HE STA 4 still has pending frame for the AP so it maintains OBO counter and resumes random access in next Trigger frame.

A non-AP HE STA can determine the number of eligible random access RUs based on the SS Allocation/Random Access RU Information subfield belonging to all the User Info fields corresponding to eligible random access RUs. A non-AP HE STA can determine the number of eligible random access RUs by adding the values of the Random Access RU Number subfields plus one belonging to all the User Info fields corresponding to eligible random access RUs. The eligible random access RUs for a non-AP HE STA are the K continous RUs starting from the RU indicated in the RU allocation subfield belonging to all the User Info fields corresponding to eligible random access RUs where K equals to the value of the Random Access RU Number subfields plus one. (#3215, #9333, #9969)