IEEE P802.11  
Wireless LANs

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| CID 11001 | | | | |
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Abstract

This submission proposes resolution for CID 11001 received for TGax LB230

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Updated based on offline feedback
  + Text revised to D2.3

Interpretation of a Motion to Adopt

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

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

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

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| **CID** | **Commenter** | **Pg / Ln** | **Section** | **Comment** | **Proposed Change** | **Resolution** |
| 11001 | Abhishek Patil | 85.10 | 9.3.1.23 | Random access for unassociated STAs is broken. In case of random access for unassociated STAs (AID12=2045), the most likely case is that an unassociated STA wishing to use the random access RU has not received any other frames from the AP sending the Trigger frame. As a result, the unassociated STA has no knowledge of the reference channel (primary 20). Since the RU indexing is with respect to the primary20 of the AP, how would an unassociated non-AP STA know the RU mapping of the Trigger frame? | As in comment | **Revised**    An unassociated STA may not have received any mgmt. frame from the AP before it hears a TF with AID12=2045. In such case, the STA would need to know the primary channel to identify operating channel of the AP and the location where expect a response from the AP.  **TGax editor, please make changes as shown in doc 11-18/0364r1** |

**Discussion**

An unassociated non-AP STA may not have received any frames from an AP before it receives a Trigger frame from that AP containing RA-RUs with AID12=2045. Typically, an unassociated STA scans in 20MHz-only mode to conserve power. An AP can sprinkle RA-RUs for unassociated STAs anywhere within its operating BW. Therefore, it is possible for an unassociated STA to access an RU which is not located on the AP’s primary channel. When a STA sends Probe Request frame to an AP in a TB PPDU, the Probe Response frame is sent on the AP’s primary channel. Since a STA has no clue on where to look for the response, it will miss the response if RU it used was not on the AP’s primary channel. In such a situation, the AP will end up retrying several times leading to inefficient medium usage.

**AP sends Probe Response frame in non-HT Duplicate on all channels**

HT Operation element carries Primary channel information. Probe response in a non-HT Duplicate will confuse legacy (11a/b/g) clients who would incorrectly conclude that the AP is operating on the channel it receives the response frame. In such scenarios, the legacy client may make several attempts to associate with the AP on the channel. This leads to unnecessary (association) frames and wastage of medium resources. This is one of the reason why beacon is not transmitted in non-HT Duplicate.

**Non-AP STAs use an RA-RU only after hearing the AP’s beacon**

A STA that is scanning one of the secondary channels will not hear the AP’s beacon as it is sent on the primary channel. Also waiting to hear a beacon would mean lost opportunity since the STA would ignore RA-RUs located in the channel it is currently scanning. Therefore, there is no benefit in assigning RA-RUs for unassociated STAs in the AP’s secondary. Which further implies that the STA doesn’t need to wait for the beacon since it is already on the primary.

**AP transmits Probe Response in the same RU location as the STA’s UL TB PPDU [special STA\_ID]**

This option would require defining a new ‘special’ RU. Current spec does not allow repeating an RU more than once in a DL MU PPDU (unless the RU is an unassigned RU). An exception rule would need to allow a special RU meant for unassociated STAs who have sent a Probe Request frame to an AP in a TB PPDU. Also, the spec would need additional rules to prohibit an AP from assigning STA\_ID=2045 in the same DL MU PPDU which is carrying the special RU. This will be a new feature with several ‘exception’ rules added to the spec.

**Disallow UORA for unassociated STAs**

TGax should not propose a broken feature and another option would be to limit random access feature to associated STAs only. If approved, this will have a major impact to the spec. There are several sections in the spec that provide rules for UORA for unassociated STA or discuss/differentiate between associated and unassociated STAs (e.g., 9.3.1.9.7, 9.3.1.23, several portions of clause 27). Such major changes at this stage of the project is very risky and we don’t recommend going this route.

We propose two options to solve the problem:

**Option 1: Limit RA-RUs for unassociated STAs to the primary 20 of the AP**

Reasoning: Unassociated STAs would naturally know where to expect the response frame.

Concerns: In a 20MHz channel, an AP can assign a maximum of 9 RUs (the number is lower when higher RU tone size is used). This puts an artificial limit on the number of RA-RUs for unassigned STAs. Further, it limits the RUs available for associated STAs when TF assigns RU for unassociated STAs.

* We don’t prefer this option as it limits the total available RUs

**Option 2: Trigger Dependent User Info field of Basic Trigger carries information on the AP’s primary**

Reasoning: Only Basic Trigger frame can carry RA-RUs for unassociated STAs. Further, an unassociated STA is only permitted to send a single MMPDU in an HE TB PPDU. Therefore, the subfields of Trigger Dependent User Info field of a Basic Trigger frame are not applicable when the RA-RU is assigned for unassociated STAs and can be used to indicate the primary channel of an AP.

Concerns: Change to TF format

* We recommend this option since it is a direct way to inform an unassociated STA about the AP’s primary channel without artificially limiting the number of RUs or the RU location or requiring to define a new STA\_ID with special exception

**Option 1: Limit all RA-RUs for unassociated STAs within the AP’s primary channel**

**27.5.5.6 Additional considerations for unassociated STAs**

***TGax Editor: Please modify the 1st in this section as shown below (11ax D2.3 P292L22):***

An AP shall transmit a Trigger frame in an HE PPDU when the frame allocates one or more RA-RUs with AID12 set to 2045 to enable an unassociated STA determine the BSS Color of the AP. An AP shall not allocate any RA-RUs with AID12 set to 2045 outside its primary 20MHz channel.

***TGax Editor: Please add a new bullets as shown below to the following paragraph in this section (11ax D2.3 P292L30):***

A non-AP STA that sends an HE TB PPDU by following the UORA procedure in response to a Trigger frame from an AP it is not associated with allocating RA-RU(s):

* shall set the TXVECTOR parameter BSS\_COLOR to the value of the RXVECTOR parameter BSS\_COLOR of the soliciting Trigger frame (see 27.5.5.2 (UORA Procedure) and 27.5.3.3 (STA behavior for UL MU operation)).
* shall include at most one MMPDU in the HE TB PPDU.
* shall set the RA field of the frame carried in the HE TB PPDU to the TA address of the soliciting Trigger frame or to the address of a nontransmitted BSSID if the soliciting BSS corresponds to transmitted BSSID.

**27.5.3.4 A-MPDU contents in an HE TB PPDU**

***TGax Editor: Please add a new paragraph after the 2nd paragraph in this section as shown below (11ax D2.3 P282L38):***

An unassociated STA shall include at most one Management frame in the HE TB PPDU that is sent in response to a Basic Trigger frame that contains RA-RU(s) with AID12 subfield set to 2045.

**Option 2: Trigger frame carries AP’s primary channel (by overloading Trigger Dependent User Info field of Basic TF)**

**27.5.5.6 Additional considerations for unassociated STAs**

***TGax Editor: Please add new paragraph after the 2nd paragraph in this section as shown below (11ax D2.3 P292L29):***

An AP that transmits a Basic Trigger frame containing a User Info field having AID12 subfield set to 2045 shall indicate the primary operating channel for the BSS in the Trigger Dependent User Info subfield of the User Info field (see 9.3.1.23.1 Basic Trigger variant).

***TGax Editor: Please add two new bullets as shown below to the following paragraph in this section (11ax D2.3 P292L30):***

A non-AP STA that sends an HE TB PPDU by following the UORA procedure in response to a Trigger frame from an AP it is not associated with allocating RA-RU(s):

* shall set the TXVECTOR parameter BSS\_COLOR to the value of the RXVECTOR parameter BSS\_COLOR of the soliciting Trigger frame (see 27.5.5.2 (UORA Procedure) and 27.5.3.3 (STA behavior for UL MU operation)).
* shall obtain the primary channel of the BSS from the Trigger Dependent User Info subfield that corresponds to that RA-RU.
* shall include at most one MMPDU in the HE TB PPDU.
* shall set the RA field of the frame carried in the HE TB PPDU to the TA address of the soliciting Trigger frame or to the address of a nontransmitted BSSID if the soliciting BSS corresponds to transmitted BSSID.
* **Basic Trigger variant**

***TGax Editor: Please make the following changes to this section as shown below (11ax D2.3 P103L38):***

The Trigger Dependent Common Info subfield is not present in the Basic Trigger frame. If the AID12 subfield of the User Info field is not set to 2045, the Trigger Dependent User Info subfield of the Basic Trigger frame is as defined in Figure 9-52j (Trigger Dependent User Info subfield for the Basic Trigger variant when AID12 subfield is not 2045).

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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 subfield(#7324) for the Basic Trigger variant when AID12 subfield is not 2045** | | | | |

The MPDU MU Spacing Factor subfield is used for calculating *MSF*, the value by which the minimum MPDU start spacing is multiplied (see 10.13.3 (Minimum MPDU Sstart Sspacing field rules)). *MSF* is equal to 2MPDU MU Spacing Factor.

The TID Aggregation Limit subfield indicates the MPDUs allowed in an A-MPDU carried in the HE TB PPDU and the maximum number of TIDs that can be aggregated by the STA in the A-MPDU and is set as defined in 27.5.3.2.3 (Allowed settings of the Trigger frame fields and UMRS Control subfield).

The value in the TID Aggregation Limit subfield in Trigger frame is less than or equal to *MT* + 1, where *MT* is the value indicated in the Multi-TID Aggregation Tx Support subfield in the HE MAC Capabilities Information field in the HE Capabilities element transmitted by the non-AP STA that is the intended receiver of the User Info field.

The Preferred AC subfield indicates the lowest AC that is recommended for aggregation of MPDUs in the A-MPDU contained in the HE TB PPDU sent as a response to the Trigger frame. The encoding of the Preferred AC subfield as defined in Table 9-136 (ACI-to-AC encoding).

If the AID12 subfield of the User Info field is set to 2045, the Trigger Dependent User Info subfield of the Basic Trigger frame is as defined in Figure 9-52jj (Trigger Dependent User Info subfield for the Basic Trigger variant when AID12 subfield is 2045).

|  |  |
| --- | --- |
|  | Primary Channel |
| Octet: | 1 |
| **Figure 9-52jj – Trigger Dependent User Info subfield(#7324) for the Basic Trigger variant when AID12 subfield is 2045** | |

The Primary Channel field is as defined in 9.4.2.57 (HT Operation element) and indicates the channel number of the primary channel of the AP.

Note: The MPDU MU Spacing Factor, TID Aggregation Limit and Preferred AC subfields do not apply to the case when AID12 is set to 2045 since the response is a single MMPDU (see 27.5.3.4 (A-MPDU contents in an HE TB PPDU) and 27.5.5.6 (Additional considerations for unassociated STAs)).

**27.5.3.4 A-MPDU contents in an HE TB PPDU**

***TGax Editor: Please add a new paragraph after the 2nd paragraph in this section as shown below (11ax D2.3 P282L38):***

An unassociated STA shall include at most one Management frame in the HE TB PPDU that is sent in response to a Basic Trigger frame that contains RA-RU(s) with AID12 subfield set to 2045.