IEEE P802.11
Wireless LANs

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| Resolution for miscellaneous CIDs |
| Date: October 15, 2018 |
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 Abstract

This submission proposes resolutions for comments received for TGax LB233 (11):

15999, 15998, 15933, 16386, 16847, 16128, 15944, 16611, 15955, 16998, 15943

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Minor update based on offline feedback
* Rev 2: Minor updates

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** |
| 15999 | Mark RISON | 37.24 | 3.1 | There should not be so much detail in a definition | Change the definition at the referenced location to "a resource unit within an HE MU PPDU, intended for unassociated STAs or any STA associated with the BSS." | **Revised**Agree with the comment. The current definition is too detailed and not scalable if new STA\_ID values are specified in the future to represent a specific category of broadcast RU. The definition need not get in to the details of how the RUs are identified for associated/unassociated STAs for single/Multi-BSS case.**TGax editor, please make changes as showing in doc 11-18-1815r2** |
| 15933 | Mark Hamilton | 37.24 | 3.2 | This definition is getting into normative details of \_how\_, beyond just the \_what\_. | Stop the defintion of "broadcast resource unit" before (without) describing how it is identified. | **Revised**Agree with the comment. Please see resolution for CID 15999 |
| 15998 | Mark RISON | 37.24 | 3.1 | "by the STA-ID values 2045, 2047 and 0 to 2n - 1 when the AP transmits a Multiple BSSID element and n is equal to the MaxBSSID Indicator field advertised by the AP in the Multiple BSSID element" -- it is not clear whether the "when" applies to 2045 and 2047 too | Change the definition at the referenced location to "a resource unit within an HE MU PPDU, intended for unassociated STAs or any STA associated with the BSS, identified when the AP does not transmit a Multiple BSSID element by the STA-ID values 0 and 2045, and otherwise by the STA-ID values 2045, 2047 and 0 to 2n - 1, where n is the MaxBSSID Indicator field advertised by the AP in the Multiple BSSID element." | **Revised**The definition was simplified as a resolution to CID 15999. The revised definition avoids get into the details of STA-ID value for each case. This is covered in section 27.**TGax editor, please make changes as showing in doc 11-18-1815r2** |
| 16386 | Massinissa Lalam | 37.24 | 3.2 | The mapping between the STA-ID values and either an unassociated STA (2045) or any associated STA (0) is not clearly defined in the broadcast resource unit (RU) definition. Please consider clarification /reordering. Something like:"a resource unit within an HE MU PPDU, intended for any STA associated with the BSS or unassociated STAs, identified by the STA-ID values 0 and 2045, respectively when the AP does not transmit a Multiple BSSID element. A resource unit within an HE MU PPDU, intended for unassociated STAs or any STA associated with a BSS, identified by the STA-ID values 2045, 2047 and STA-ID values 0 to 2n - 1, respectively when the AP transmits a Multiple BSSID element and n is equal to the MaxBSSID Indicator field advertised by the AP in the Multiple BSSID element."or just a simple inversion:"resource unit within an HE MU PPDU, intended for any STA associated with the BSS or unassociated STAs, identified by the STA-ID values 0 and 2045 when the AP does not transmit a Multiple BSSID element, and by the STA-ID values 2045, 2047 and 0 to 2n - 1 when the AP transmits a Multiple BSSID element and n is equal to the MaxBSSID Indicator field advertised by the AP in the Multiple BSSID element. | As in comment. | **Revised**The definition was simplified as a resolution to CID 15999. The revised definition avoids get into the details of STA-ID value for each case. This is covered in section 27.**TGax editor, please make changes as showing in doc 11-18-1815r2** |
| 16847 | Song-Haur An | 37.00 | 3.2 | Is it intentional to have STA ID value 2045 appear in both conditions? If yes, please explain. | Please clarify and update accordingly if agreed. | **Reject**STA\_ID 2045 represents broadcast RU for unassociated STA case. There are two cases to handle, a single BSS AP and an AP that belongs to a multiple BSSID set. Hence the two occurrences of STA\_ID 2045. |
| 16128 | Mark RISON | 278.24 | 27.5.1.2 | "If an RU is intended for an AP, then the STA\_ID\_LIST contains only one element that is set to the 11 LSBs of the AID of the non-AP STA transmitting the PPDU." contradicts other statements like "Each element of the TXVECTOR parameter STA\_ID\_LIST identifies the STA or group of STAs that is the recipient of an RU in the HE MU PPDU." in 27.11.1 and "for an HE MU PPDU and indicates the STA or group of STAs that is the recipient of an RU" in 8.3.5.2.2 and " The STA-ID field in each User field indicates the intended recipient user of the corresponding spatial streams and the RU." in 28.3.2.5 | Add caveats of the form "except when sent to an AP" to the referenced locations. Also add text in 27.5.1.2 to describe the setting ot the STA-ID field from a non-AP STA | **Reject**Section 27.5.1 is specific to HE DL operation. Therefore, the transmitter is the AP and the TXVECTOR setting is on the AP side. Section 27.11.1 is general and describes the STA\_ID value for either case – i.e., where the AP or non-AP STA is the transmitter. |
| 15944 | Mark Hamilton | 278.35 | 27.5.1.2 | A receiving non-AP STA can't possibly know what the AP set in its TXVECTOR parameter to its PHY. | Change the wording to reference over-the-air signalling that the non-AP STA can receive, that gives it this indication. Same in the next sentence. | **Revised**Agree with the comment. The text was updated to specify action on the non-AP side with reference to RXVECTOR parameter.**TGax editor, please make changes as showing in doc 11-18-1815r2** |
| 16611 | Pooya Monajemi | 295.62 | 27.5.4 | In this language "a STA" can be interpretted as "at least one of the STAs", while the intention seems to be "any of the STAs" | Replace "a STA" with "any of the STAs" | **Revised**Agree with the comment.**TGax editor, please make changes as showing in doc 11-18-1815r2** |
| 15955 | Mark RISON | 353.01 | 27.1.1 | "The AP may include only one element with" -- I think the intent here is that it shall not include more than one, but that is not what it says | Change each of the three statements of this form on the page (lines 1, 8, 13) to start "The AP shall not include more than one element with" instead | **Revised**Section 27.5.1.2 has normative text that essentially says the same (i.e., only RU corresponding to STA\_ID 2046 may repeat). Deleted duplicate spec text.**TGax editor, please make changes as showing in doc 11-18-1815r2** |
| 16998 | Yanchun Li | 174.50 | 9.4.2.243 | When BSS Color Change Announcement element is carried in unicast Action frame (with Ack) to an HE STA, with Color Switch Countdown being set to 0, the HE STA can accept an HE PPDU with the new BSS color immediately after acknowledging this Action frame. So that the HE STA can have smooth roaming to an AP using new BSS color, without waiting for next TBTT. | Append "When BSS Color Change Announcement element is carried in unicast Action frame (with Ack) to an HE STA, with Color Switch Countdown being set to 0, the HE STA can accept an HE PPDU with the new BSS color immediately after acknowledge this Action frame." to the end of this paragraph. | **Reject**Due to processing delays, non-AP STA may not be able to switch to a new color immediately upon receiving a unicast color change announcement. Instead of picking an arbitrary value, it is best that the standard maintains a consistent behavior even for the unciast case. In addition, having the color change occur at a TBTT, provides an unambiguous expectation on both the AP and non-AP STA side. |
| 15943 | Mark Hamilton | 679.01 | T | Annex T should be updated to discuss BSS color as another method (for HE BSSs) to use for overlapping BSSs, and to give recommendations on its usage. | Add recommendations on use of BSS color to Annex T. | **Revised**Updated Annex T to provide details on the BSS color feature.**TGax editor, please make changes as showing in doc 11-18-1815r2** |

* Definitions specific to IEEE 802.11

***TGax Editor: Please update the following definition in this section as shown below:***

**broadcast resource unit (RU):** a resource unit within an HE MU PPDU, that is intended for either unassociated STAs or more than one associated STA in the BSS.[15999, 15933, 15998, 16386]

* RU addressing in an HE MU PPDU

***TGax Editor: Please update the following paragraphs in this section as shown below:***

An AP shall set one or more elements in the TXVECTOR parameter STA\_ID\_LIST, which represents the list of STAs that are the recipients of the transmitted HE MU PPDU as described in 27.11.1 (STA\_ID\_LIST). [15955]The AP shall not include in the TXVECTOR parameter STA\_ID\_LIST more than one STA-ID with the same value except for the value 2046. The STA-ID 2046 identifies an unallocated RU and may appear more than once. [15944]

A non-AP STA that receives an HE MU PPDU where the RXVECTOR parameter STA\_ID\_LIST includes an element that matches the 11 LSBs of the non-AP STA’s AID may disregard any broadcast RU in the same HE MU PPDU. The STA may disregard a broadcast RU with STA-ID equal to 2047 if the RXVECTOR parameter STA\_ID\_LIST includes STA-ID that is equal to the BSSID Index of the BSSID to which the STA is associated to (see 9.4.2.73).[15944]

* **STA\_ID\_LIST**

Each element of the TXVECTOR parameter STA\_ID\_LIST identifies the STA or group of STAs that is the recipient of an RU in the HE MU PPDU. An individually addressed RU is an RU addressed to an associated non-AP STA and the STA\_ID\_LIST element for that RU is set to the 11 LSBs of the AID of the STA receiving the PSDU contained in that RU. If an RU is intended for one or more unassociated non-AP STAs, then the STA\_ID\_LIST element for that RU is set to 2045. If an RU is intended for no user, then the STA\_ID\_LIST element for that RU is set to 2046. If an RU is intended for an AP, then the STA\_ID\_LIST contains only one element that is set to the 11 LSBs of the AID of the non-AP STA transmitting the PPDU. If an RU is intended for multiple STAs for MU-MIMO then multiple STAs identified by STA-IDs in the STA\_ID\_LIST will use the same resource unit (see 27.5.3 (UL MU operation)). If an RU is intended for multiple associated STAs and carries a single A-MPDU then the STA\_ID\_LIST element is set as follows:

* For an AP with dot11MultiBSSIDActivated equal to false, if the RU is intended for more than one associated STA in the BSS that is not a recipient of an individually addressed RU, the STA\_ID\_LIST element is set to 0. [15955]
* For an AP with dot11MultiBSSIDActivated equal to true, if the RU is intended for more than one associated STA in any of its BSSs that is not a recipient of an individually addressed RU, the STA\_ID\_LIST element is set to 0 for transmitted BSSID or to the value of the BSSID Index field corresponding to that BSS (see 9.4.2.74 (Multiple BSSID-Index element)) for a nontransmitted BSSID. The number of such elements shall not exceed the maximum number of BSSs of the multiple BSSID set.[15955]
* For an AP with dot11MultiBSSIDActivated equal to true, if the RU is intended for more than one associated STA on all its BSSs, the STA\_ID\_LIST element is set to 2047. [15955]

The STA\_ID\_LIST element values between 2008 and 2044 are reserved.

* MU cascading sequence

***TGax Editor: Please update the following paragraphs in this section as shown below:***

An AP shall not transmit an A-MPDU to a non-AP STA that includes an Ack or BlockAck frame together with a Trigger frame or a frame carrying a TRS Control subfield unless [#ed]both the AP and the non-AP STA have indicated support by setting the MU Cascading Support subfield to 1 in the MAC Capabilities Information field in the HE Capabilities element it transmits. The A-MPDU may additionally contain one or more MPDUs and is constructed following the rules defined in 27.10 (A-MPDU operation).

[#ed]If an AP does not receive an immediate response from any of the non-AP STAs, addressed by a Trigger frame or frame carrying a TRS Control subfield contained in the HE MU PPDU sent at the beginning of the TXOP, then the AP follows the backoff procedure described in 10.24.2.2 (EDCA backoff procedure).[16611]

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**Overlapping BSS (OBSS) management**

* **Introduction**

***TGax Editor: Please update the following paragraphs in this section as shown below:***

When two or more BSSs overlap, the available bandwidth is shared and hence reduced for each BSS. The basic access mechanism, such as DCF, is able to work across OBSSs. Similarly, if EDCA is used, the OBSS might be considered a larger network, and access to the WM is basically shared according to the EDCA access mechanism. Note that for both DCF and EDCA overlapping networks, the sharing is affected by the relative traffic; and if more than two APs are sharing, the problem of “neighbor capture” might occur. The neighbor capture effect might occur when a BSS is in the middle of two other BSSs that are hidden from each other, where it might suffer a disproportionate degradation in throughput, relative to the total traffic in all three BSSs. A particular problem arises when there is some expectation of QoS. If EDCA admission control is in use, then it can be used to regulate the QoS traffic on its own BSS, but it might not take into account the EDCA admitted traffic on an OBSS. The result is that the QoS is compromised if each BSS admits traffic up to its local maximum. Similarly a BSS using HCCA might schedule traffic in its own BSS, to “guarantee” a service, but, if not controlled, this might suppress overlapping EDCA admission control BSS. Furthermore, if two HCCA BSSs overlap and they do not coordinate their scheduled TXOPs, then a degradation of QoS might result. [15943]An HE BSS advertises BSS color information which is a value between 1-63 that identifies the BSS. Based on the BSS color information, a receiving STA can make decisions on whether to access the medium while there is on-going transmission on the medium or go to doze state until the end of the received PPDU or update the NAV. The features described in this annex have been introduced in order to allow a degree of management for OBSSs and for mitigation of the basic problems outlined above.

***TGax Editor: Please add a new section after section T.5 as shown below:***

[15943]

T.6 BSS color and Spatial Reuse

The BSS color is an identifier of the BSS and is used to assist a receiving STA in identifying the BSS from which a PPDU originates so that the STA can follow the channel access rules to perform spatial reuse. The objective of HE spatial reuse operation is to allow the medium to be reused more often between OBSSs in dense deployment scenarios by the early identification of signals from overlapping basic service sets (OBSSs) and interference management. Section 27.9 provides details on how the spatial reuse mechanism works.