IEEE P802.11
Wireless LANs

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| Resolution for CIDs related to Multiple BSSID – Part 2 |
| Date: July 5, 2019 |
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 Abstract

This submission proposes resolutions for comments received for TGax LB238 (8):

20293, 20413, 21042, ~~21164, 21166,~~ 20709, 20259, 21537, 21168, 21157

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: Updated based on discuss when the doc was presented 7/12 MAC ad-hoc
	+ CIDs 21164 and 21166 were withdrawn
	+ Resolutions for CIDs 21042 updated to include definition for EMA AP
	+ Resolution for CID 21537 is unchanged – definition for co-hosted BSSID set already exists.
	+ Resolution for CID 20259 was updated on-the-fly when the doc was presented
	+ Minor update to resolution for CID 20709 (on-the-fly when the doc was presented)
	+ Added resolution for CIDs 21168, 21157
* Rev 2: CIDs 21168 & 21157 are deferred and reassigned
	+ CID 21042 and 21537 are no longer deferred and SP passed
	+ Minor editorial changes (marked in blue) when the doc was presented.

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** |
| 20293 | kaiying Lv | 164.49 | 9.4.2.237 | The format of the Multiple BSSID Configuration element is shown in Figure 9-763(Active BSSID Count Multiple BSSID Configuration element format) | As comment. | **Revised**Doc 11-19/512r2 moved ‘Active BSSID Count element’ from REVmd to 11ax as ‘Multiple BSSID Configuration element’. With this change, the issue pointed by the comment no longer exists in D4.2.**TGax editor, no further changes are needed.** |
| 21042 | Massinissa Lalam | 273.20 | 11.1.3.8 | Add definition of an EMA AP in the correct clause (3.1 for instance). | As in comment | **Revised**Added a definition for EMA AP to clause 3.2**TGax editor, please make changes as shown in doc 11-19/1148r1** |
| 20413 | Liwen Chu | 273.09 | 11.1.3.8 | It is not good for a STA that already knew all non-transmitted BSS profiles to transmit Probe Request with non-transmitted BSSID as RA. | Add the rules per the comment | **Reject**A STA could have retrieved information some time ago and later made a choice to associate with a particular nonTxBSSID. In such case, it would need to probe again to retrieve the latest information. In addition, from a power point of, it would make sense to allow for STAs to send directed Probe Request to the nonTxBSSID that it wishes to associate with. |
| ~~21164~~ | ~~Po-Kai Huang~~ | ~~274.07~~ | ~~11.1.3.8~~ | ~~The profile periodicity field in the the MultipleBSSID Configuration element helps the non-AP STA to understand the minimum beacons to receive all the profiles. Since unsolicited probe response also has the same problem of spreading profiles across different unsolicited probe responses. It is also useful to have similar indications for the unsolicited probe response.~~ | ~~Have some indication in the MultipleBSSID Configuration element to help the non-AP STA understand the minimum number of unsolicited probe responses needed for seeing all the profiles.~~ | **~~Revised~~**~~Agree with the comment. Similar rules should apply for unsolicited broadcast probe response frames. The spec is updated to include rules on profile advertisement when AP sends unsolicited broadcast probe response frames at period intervals. Further the description for the field Profile Periodicity is updated to separately cover the case when the element is transmitted in a Beacon or Probe Response frame~~**~~TGax editor, please make changes as shown in doc 11-19/1148r0~~** |
| ~~21166~~ | ~~Po-Kai Huang~~ | ~~274.14~~ | ~~11.1.3.8~~ | ~~Due to the increased amount of information to be carried in a probe response frames, a probe response frame may not be able to carry all the information requested by a probe request. The spec should allow AP to send a serious of probe responses for a probe request to carry all the information and minimize the need for request from the non-AP STA~~ | ~~A proposal will be submitted by the commenter.~~ | **~~Reject~~**~~The existing frame provides sufficient tools for a STA to gather information about the nonTxBSSIDs. For example, an EMA AP is required to advertise a count of active BSSID and the profile periodicity, a scanning STA can inform the AP which BSSIDs it has already discovered (Known BSSID element).~~ |
| 20259 | Jarkko Kneckt | 164.54 | 9.4.2.237 | The Profile Periodicity should be a small number to reduce the duration of the passive scanning STAs. A not should hint this.To ensure that PS STAs receive the non-transmitted BSS information without additional wake ups, the non-transmitted BSSID information shall be present in multiple of the DTIM periods of the non-tarnsmitted BSS. This should be clearly stated in the normative text. | Please change the note to standard text by including to the end of the line 12: "The AP shall send a non-transmitted BSSs information in a beacon that is multiple of the non-transmitted BSS's DTIM beacons. Change the Note in p274,l33 to read: NOTE--It is recommended that an AP selects a small value to Profile Periodicity field to make make non-transmitted BSS information fast available for passive scannnign devices. | **Revised**Agree with the comment. However, the group discussed this CID and decided to keep the note. Further a new note was added recommending that the profile periodicity be a small value to aid fast discovery of nonTxBSSIDs. Several other minor editorial fixes were added to clause 11.1.3.8 as part of resolution to this CID**TGax editor, please make changes as shown in doc 11-19/1148r1** |
| 21168 | Pooya Monajemi | 329.64 | 26.5.3.2.4 | Multi-SSID deployments are very common in both enterprise and home environments (eg with guest SSIDs). 6GHz is expected to widely utilize the multi-BSSID feature. Lack of device support for multi-BSSID triggers will significantly reduce 11ax's UL efficiency. | Make Rx Control Frame To MultiBSS mandatory for HE STAs in 6GHz. | **Rejected**Whether to support Rx of multi-BSS Control frame should be a STA implementation choice. An AP has already provides multiple modes for soliciting control response frames from STAs associated with nonTxBSSID. Trigger frame with TA set to nonTxBSSID, TRS Control field sent by an AP corresponding to a nonTxBSSID, and so on.Control response frame generation by STAs associated with nonTxBSSID in response to a trigger frame sent by TXBSSID is yet another mode to achieve the same functionality. There is no need to have multiple mandatory modes for the same purpose in the 6 GHz band. Besides the gains depend on the configuration of the network. If the number of nonTxBSSIDs or number of associated STAs in nonTxBSSIDs is small, the gains won’t be much. Further, 11ax already provides mechanism which would give the same efficiency gains as expected by mandating this behavior – a multi-BSS AP can send a DL MU PPDU with BSS specific broadcast RUs carrying TFs soliciting UL from STAs associated with each nonTxBSSID. |

* 1. Definitions specific to IEEE 802.11 [21042]

***TGax Editor: Please add a new definition to this subclause as shown below (while maintaining the alphabetical order)***

**Enhanced Multiple basic service set identifier (BSSID) Advertisement (EMA) Access Point (AP):** An AP with dot11MultiBSSIDImplemented set to true that supports enhancements related to discovery of nontransmitted BSSIDs.

* **Multiple BSSID procedure**

***Insert a subclause heading before the 1st paragraph:***

* **General**

***Change the 1st and 2nd paragraphs as follows:***

***TGax Editor: Please make changes to this paragraph as shown below:***

A STA that supports the Multiple BSSID capability has dot11MultiBSSIDImplemented equal to true and shall set to 1 the Multiple BSSID field of the Extended Capabilities elements that it transmits. Support for the Multiple BSSID capability is mandatory for a FILS STA and non-AP HE STA. An AP that supports enhancements related to the discovery and advertisement of a nontransmitted BSSID shall set the Enhanced Multi-BSSID Advertisement Support bit in the Extended Capabilities element to 1 and is referred to as an EMA AP. [#20259]A 6 GHz AP with dot11MultiBSSIDImplemented equal to true and advertising a partial list of nontransmitted BSSID profiles shall operate as an EMA AP. When an AP that does not operate in the 6 GHz band, has dot11MultiBSSIDImplemented equal to true and advertises a partial list of nontransmitted BSSID profiles intends a non-AP STA to discover the complete list of nontransmitted BSSID profiles, where a complete list of nontransmitted BSSID profile comprises only BSSIDs that are discoverable, the AP shall operate as an EMA AP.

***Insert new subclauses 11.1.3.8.2 and 11.1.3.8.3 as follows:***

***TGax Editor: Please fix typo in the title of clause 11.1.3.8.2 as shown below:***

* **Nontransmitted BSSID profile**[#20259]
* **Discovery of a nontransmitted BSSID profile**

***TGax Editor: Please make changes to the 2nd and 3rd paragraphs in this sub-clause as shown below:***

An EMA AP advertising a partial list of BSSID profiles, shall include the Multiple BSSID Configuration element (see 9.4.2.253 (Multiple BSSID Configuration element)) in its Beacon frame, S1G Beacon frame, or DMG Beacon frame and in any Probe Response frame it sends to indicate the configuration of the multiple BSSID set.[# 20259]

[#20259] An AP shall set the BSSID Count field of the Multiple BSSID Configuration element to indicate the number of active BSSIDs in the multiple BSSID set, and shall set the Profile Periodicity field to indicate the number of beacons a scanning STA is required to receive in order to discover all the active nontransmitted BSSIDs in the set. An AP corresponding to the transmitted BSSID shall send a Probe Response frame carrying Multiple BSSID element that includes, at a minimum, the nontransmitted BSSID profiles requested by the soliciting Probe Request frame.

***TGax Editor: Please make changes to the 5th paragraph and the following note in this sub-clause as shown below:***

An EMA AP that includes a partial list of nontransmitted BSSID profiles in its Beacon frame, S1G Beacon frame, or DMG Beacon frame, shall advertise a particular nontransmitted BSSID profile in a repeating pattern such that the profile is present in at least one beacon in a sequence of beacons indicated by the Profile Periodicity field of the Multiple BSSID Configuration element unless the membership of the multiple BSSID set changes. If there is a change in a particular nontransmitted BSSID's profile (i.e., set of elements that belong to the profile or the element values), the EMA AP shall include the profile in the next DTIM beacon of that BSS so that STAs with that BSS become aware of the change immediately.

[#20259]NOTE—It is recommended that an AP select the periodicity in which a nontransmitted BSSID’s profile repeats to be a multiple of the DTIM interval of the BSS with that nontransmitted BSSID so that STAs in PS mode that are associated with that BSSID don't have to wake for additional beacons.

[#20259]NOTE – In order to aid fast discovery of nontransmitted BSSIDs via passive scanning, it is recommended that an AP select a small value for the Profile Periodicity field.

***Insert a new subclause heading:***

* **Inheritance of element values**

***Change the 4th paragraph as follows:***

***TGax Editor: Please make changes to the 1st paragraph in this sub-clause as shown below:***

~~When a station receives a Beacon frame or DMG Beacon frame with a Multiple BSSID element that consists of a nontransmitted BSSID profile with only the mandatory elements, it may inherit the complete profile from a previously received Beacon frame, DMG Beacon frame, or Probe Response frame, or it may send a Probe Request frame to obtain the complete BSSID profiles. Each Beacon element not transmitted in a nontransmitted BSSID subelement is inherited from previous Beacon, DMG Beacon, or Probe Response frame in which the element is present, except for the Quiet element, which shall take effect only in the Beacon frame or DMG Beacon frame that contains it and not carry forward as a part of the inheritance. An AP or PCP is not required to include all supported nontransmitted BSSID profiles in a Probe Response frame, and may choose to only include a subset based on any criteria.~~ When a nontransmitted BSSID profile is present in ~~the~~ one or more Multiple BSSID elements of ~~the~~ a Probe Response frame or a Beacon frame, the AP or PCP shall include all elements that are specific to this BSS. An element is considered to be specific to a BSS if its value is different from the corresponding element advertised by the transmitted BSSID or if the nontransmitted BSSID satisfies the condition as specified in the Table 9-34 (Beacon frame body) for a non-DMG non-S1G AP, Table 9-47 (DMG Beacon frame body) for a DMG AP [#20259]or Table 9-48 (Minimum and full set of optional elements) for a S1G AP for that element to be present while the transmitted BSSID does not satisfy the corresponding condition. If any of the ~~optional~~ elements carried in the Probe Response frame, Beacon frame or DMG Beacon frame of the transmitted BSSID are not present in a nontransmitted BSSID profile, the ~~corresponding values are the element~~ values to use for the nontransmitted BSSID are the values of the corresponding element of the transmitted BSSID unless the element is listed in the Non-Inheritance element (if included) in the nontransmitted BSSID profile for that BSS.

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| **CID** | **Commenter** | **Pg/Ln** | **Section** | **Comment** | **Proposed Change** | **Resolution** |
| 20709 | Mark RISON | 281.39 | 11.10.14 | "BSSIDs in the range 0x00000000001X" -- BSSIDs are not hex numbers | Reword to refer to specific bits being "X" | **Revised**The issue pointed by the comment applies to baseline spec too. The commenter agrees that this needs to be fixed in REVmd and is being addressed in doc 11-19/396r5. Further based on the definition of antenna connector (which is a logical entity) and the resolution in doc 11-19/551, clause 11.10.14 is updated to remove the changes that were made to pluralize the word connector in antenna connector.**TGax editor, please make changes as shown in doc 11-19/1148r1.** |

* **Radio measurement procedures**
* **Multiple BSSID set**

A multiple BSSID set is characterized as follows:

* All members of the set use a common operating class, channel, Channel Access Functions, and antenna connector.
* The set has a maximum range of 2n for at least one n, where ~~1 ≤ n ≤ 46~~
* 1 ≤ n ≤ 8 if dot11MultiBSSIDImplemented is true
* 1 ≤ n ≤ 46 if dot11MultiBSSIDImplemented (if present) is false and dot11RMMeasurementPilotActivated is nonzero
* Members of the set have the same 48-n bits (BSSID[0:(47-n)]) in their BSSIDs.
* All BSSIDs within the multiple BSSID set are assigned in a way that they are not available as MAC addresses for STAs using a different operating class, channel or antenna connector.

NOTE—For example, if the APs within BSSs with BSSIDs 16, 17, and 27 share the operating class, channel and antenna connector, and the range of MAC addresses from 16–31 inclusive are not assigned to other STAs using a different antenna connector, then the BSSIDs 16, 17, and 27 are members of a multiple BSSID set. The set is described by n = 4 (2n = 16) with BSSIDs in the range 0x00000000001X. The set cannot be described by n = 8 for instance since at least one of the BSSIDs in the range 0x0000000000XX might be used as a BSSID by an AP that does not share the same operating class, channel, and antenna connector.

When the multiple BSSID set contains two or more members, the transmission of Measurement Pilots is constrained as described in 11.10.15 (Measurement Pilot frame generation and usage).

A Multiple BSSID element, with or without optional subelements, indicates that all APs and PCPs within the indicated range of BSSIDs transmit using a common class, channel, and antenna connector.

A single Beacon frame may contain elements for the multiple BSSID set members; see 11.1.3.8 (Multiple BSSID procedure).

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| **CID** | **Commenter** | **Pg/Ln** | **Section** | **Comment** | **Proposed Change** | **Resolution** |
| 21537 | Yongho Seok | 438.56 | 26.17.7 | "An AP that belongs to a co-hosted BSSID set shall perform the following operations:"Similar to the dot11MultiBSSIDImplemented, please define the MIB variable for this optional feature. | As in comment. | **Revised**Added a MIB variable to indicate if a STA supports Co-Hosted BSSID operation.**TGax editor, please make changes as shown in doc 11-19/1148r1.** |
| 21157 | Po-Kai Huang | 438.50 | 26.17.7 | Due to the reason that multiple BSSID element is not mandatory support by the no-HE non-AP STA, Co-hosted BSSID set is introduced to enable Intra-BSS identification when virtual AP concept is still used. However, the concept of one control like Trigger frame that can be sent to associated STAs of different VAP is not enabled under Co-hosted BSSID set. Given that Trigger frame is one of the core concept introduced in 11ax to improve efficiency, enabling similar concept in Co-hosted BSSID is beneficial for efficiency improvement. | Except the Max Co-LocatedBSSID Indicator for intra-BSS identification, enable the concept of one control frame with a transmitted BSSID like MAC address that can be sent to STAs associated with BSSs in the same Co-hosted BSSID set. AP can indicate the n LSBs of the MAC address in HE operation element. The 48-n MSB of the MAC address can be the same as the BSSID of the AP that sends the HE operation elements. An HE extended MAC Capabiltieis element can be introduced to indicate the capability for the STA to receive this Trigger frame. | **Rejected**Multiple BSSID and Co-hosted BSSID are separate features/concepts. In a Co-hosted BSSID set, each BSS is treated independent and as a result, each BSS sends a beacon or mgmt. response frames. Management frames are sent a low MCS and have very high medium occupancy (see studies presented for 11ai). This results in a lot of mgmt. frame overhead. Majority of the gains in a multi-BSS set come from mgmt. frame aggregation. Extending multi-BSS Control frame concept to Co-hosted BSSID set will introduce unnecessary complexities (new signaling, etc) with very little gains. Further, enabling control frame aggregation in a Co-hosted set, would discourage AP vendors from moving towards the more efficient multiple BSSID set alternative. |

* **Co-hosted BSSID set**

***TGax Editor: Please the following sentence as the 2nd paragraph in this clause as shown below:***

A STA that supports co-hosted BSSID capability shall have dot11CoHostedBSSIDImplemented equal to true.

* MIB Detail

***TGax Editor: Please add a new entry to dot11HEStationConfig table as shown below:***

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-- \* dot11HEStationConfig TABLE

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Dot11HEStationConfigEntry ::=

 SEQUENCE {

 …

 dot11MUEDCAParametersActived TruthValue,

 dot11CoHostedBSSIDImplemented TruthValue

 }

***TGax Editor: Please add a new entry to as shown below:***

dot11CoHostedBSSIDImplemented OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This is a capability variable.

Its value is determined by device capabilities.

This attribute, when true, indicates that the station implementation is capable of supporting Co-Hosted BSSID."

 DEFVAL { false }

 ::= { dot11HEStationConfigEntry <ANA>}