IEEE P802.11
Wireless LANs

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| Multiple BSSID CIDs / Clarifications |
| Date: May 2, 2019 |
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 Abstract

This submission proposes resolutions for comments received for TGm LB236 (6): 2392, 2391, 2002, 2003, 2675, 2013

The submission also includes changes (without any corresponding comment) to address ambiguities or missing spec text

Revisions:

* Rev 0: Initial version of the document.
* Rev 1: minor editorial change (made on-the-fly) for CID 2391 when the doc was presented on 5/16/19 PM1
* Rev 2: a couple of updates based on offline feedback from Mark Hamilton.
	+ Added following sentence to 9.4.2.5.1 to cover the setting of TIM bit for inactive nonTxBSSIDs:
		- “A bit position corresponding to an inactive nontransmitted BSSID is reserved and set to 0 (in each page for an S1G STA).”
	+ Changed declarative sentence to normative Address 1 field of TIM frame is set to broadcast address:
		- “The Address 1 field of the TIM frame shall be set to the broadcast address.”
* Rev3: Changes made on-the-fly when the doc was presented on 6/21/19 (Telco)
	+ Updated resolution for CIDs 2003 and 2675
		- Change AID to ID since AID has a specific meaning (as suggested by Carlos).
		- Remove reference to ‘assigned’ identifier
	+ Included two more references where TIM Broadcast frame is fixed to TIM frame (as suggested by Mark Rison).
		- P2058L31 and P3689L25 of REVmd D2.1
* Rev 4: Changes based on offline feedback
	+ Per discussion with Mark Rison, resolution for CID 2013 updated to include two options for group to decide
		- Option 1: All changes local to 11.2.3.15
		- Option 2: Update clause 9.3.3.1 to specify setting of Address 2 and Address 3 fields for multiple BSSID case. The change will apply to all Management frames.
	+ Changes for item #5 include updates to 9.4.2.45 (Multiple BSSID element)
		- Delete the requirement that TIM element indicates buffered group addressed frames for nontransmitted BSSID
	+ Editorial updates to resolutions for CIDs 2002, 2003, 2675 – based on feedback from Mark Rison.
		- Highlighted in green

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 TGm Draft. This introduction is not part of the adopted material.

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

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

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| **CID** | **Commenter** | **Pg** | **Line** | **Section** | **Comment** | **Proposed Change** | **Resolution** |
| 2392 | Mark RISON | 1144.00 | 34 | 9.4.2.45 | "The SSID and multiple BSSID-index subelements are included in the Nontransmitted BSSID Profilesubelement." -- no such subelements. They are elements, and the second should be Multiple, i.e. first letter uppercase | Change the cited text at the referenced location to "The SSID and Multiple BSSID-Index elements are included in the Nontransmitted BSSID Profilesubelement." | **Revised**Agree with the comment. The 2nd bullet is updated to refer to the SSID and Multiple BSSID-Index element. Also the 1st bullet is updated to refer to appropriate tables based on the type of AP (non-DMG, DMG or S1G)**TGm editor, please make changes as shown in 11-19/0396r1 CID 2392** |

* Multiple BSSID element[2392]

***TGm Editor: Please changes to the 2nd bullet in the following paragraph in this subclause***

The Nontransmitted BSSID Profile subelement contains a list of elements for one or more APs or DMG STAs that have nontransmitted BSSIDs and is defined as follows:

* For each nontransmitted BSSID, the Nontransmitted BSSID Capability element (see 9.4.2.71 (Nontransmitted BSSID Capability element)) is the first element included, followed by a variable number of elements, in the order defined in Table 9-34 (Beacon frame body) for a non-DMG non-S1G AP, Table 9-47 (DMG Beacon frame body) for a DMG AP or Table 9-48 (Minimum and full set of optional elements) for a S1G AP.
* The SSID element (see 9.4.2.2 (SSID element)) and Multiple BSSID-Index element (see 9.4.2.73 (Multiple BSSID-Index element)) are included in the Nontransmitted BSSID Profile subelement.

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| **CID** | **Commenter** | **Pg** | **Line** | **Section** | **Comment** | **Proposed Change** | **Resolution** |
| 2391 | Mark RISON | 2285.00 | 55 | 11.10.14 | "A multiple BSSID set is characterized as follows:--- All members of the set use a common operating class, channel, Channel Access Functions, andantenna connector. " -- sounds as if they can't do MIMO | Change the cited text at the referenced location to "A multiple BSSID set is characterized as follows:--- All members of the set use a common operating class, channel, Channel Access Functions, and(set of) antenna connector(s). " | **Revised**Agree with the comment. The clause is updated to indicate multiple (plural) antennas. Also channel access functions should not be capitalized.**TGm editor, please make changes as shown in 11-19/0396r1 CID 2391** |

* **Multiple BSSID set**[2391]

***TGm Editor: Please make the following changes to this subclause***

A multiple BSSID set is characterized as follows:

* All members of the set use a common operating class, channel, channel access functions, and (set of) antenna connector(s).
* The set has a maximum range of 2n for at least one n, where 1  n  46.
* 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 (set of) antenna connector(s).

NOTE—For example, if the APs within BSSs with BSSIDs 16, 17, and 27 share the same operating class, channel and (set of) antenna connector(s), and the range of MAC addresses from 16–31 inclusive are not assigned to other STAs using a different (set of) antenna connector(s), 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 (set of) antenna connector(s).

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 (set of) antenna connector(s).

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** | **Line** | **Section** | **Comment** | **Proposed Change** | **Resolution** |
| 2002 | Abhishek Patil | 984.00 | 24 | 9.4.2.5.1 | What does 'supported nontransmitted BSSIDs' mean? The usage of the term 'supported' is incorrect since, the set can support up to 2^n BSSIDs of which a subset of them may be active at any given time. Also, the active nontransmitted BSSIDs need not be contiguous (e.g., in a set with n=3, nontransmitted BSSIDs with index 2, 5 & 6 may be active, index 0 corresponding to transmitted BSSID).In addition, the description in the first bullet is not accurate (also see Annex L). Bits 1 to 2^n-1 indicate presence of buffered group addressed frames for each BSSID where the bit position matches the BSSID Index of the active nontransmitted BSSID. While bit 0 is used to signal buffered group addressed frames for the transmitted BSSID. | Delete the text (on P984L21): ", k is the number of actually supported nontransmitted BSSIDs, and k <= (2^n - 1)"Revise the first and second bullet as:-- The bits 1 to (2^n-1) of the bitmap are used to indicate that one or more group addressed frames are buffered for each AP corresponding to a nontransmitted BSSID and are called BSS assigned identifiers (BSS AIDs). The AIDs from 1 to (2^n-1) are not allocated to a STA (in each page for an S1G STA). The remaining AIDs are shared by the BSSs corresponding to the transmitted BSSID and all nontransmitted BSSIDs.-- When the DTIM Count field is 0 for a BSS that has a nontransmitted BSSID, and one or more group addressed frames are buffered at the AP for this BSS, the corresponding bits from bit 1 to bit (2^n-1) is set to 1. | **Revised**As stated in the comment, ‘supported’ is not the correct term since the set can support up to 2^n BSSID. Further, the BSSIDs active at any given time may not be in a contiguous sequence. The text in the paragraphs is revised as suggested by the comment. Further, 2nd bullet clarifies that the DTIM count for a nontransmitted BSSID is the one carried in the Multiple BSSID-Index element. In addition, only the bit corresponding to this BSSID is set to 1.Deleted a reference to ‘k’ in Annex L.**TGm editor, please make changes as shown in 11-19/0396r4 CID 2002** |
| 2003 | Abhishek Patil | 984.00 | 18 | 9.4.2.5.1 | The term "BSS assigned identifiers (BSS AIDs)" is misleading since AID 0 (bit position 0) is used to indicate buffered group addressed frames for all STAs associated with the BSS (when it is a single BSSID case) or for STAs associated with the transmitted BSSID (when it is a multiple BSSID set). The term is valid only in case of multiple BSSID set and the intention is to identify the AIDs set aside for nontransmitted BSSIDs. | Rename to "nonTxBSSID assigned identifiers (nonTxBSSID AIDs)". Replace all occurrences with the new term. | **Revised**As pointed by the comment, BSS AID is misleading as it is applicable only to nontransmitted BSSID. Renaming the term to nonTxBSSID AID as suggested by the comment. **TGm editor, please make changes as shown in 11-19/0396r4 CID 2003** |
| 2675 | Po-Kai Huang | 984.00 |  | 9.4.2.5.1 | The term "BSS AIDs" here is confusing. For multiple BSSID technique, the official term is multiple BSSID-index. See 9.4.2.73 Multiple BSSID-Index element, 11.1.3.8 Multiple BSSID procedure, and | Clarify that BSS AIDs is equivalent to BSSID index under multiple BSSID technique or simply use BSSID index rather than BSS AIDs | **Revised**As a resolution to CID 2003, the term is changed to NonTxBSS AID to capture the intended meaning. Further a sentence is added to clarify that the bit position corresponds to the BSSID Index value (as specified in Multiple BSSID-Index element carried in the nontransmitted BSSID profile of that BSS).**TGm editor, please make changes as shown in 11-19/0396r4 CID 2675** |

* General

***TGm Editor: Please make changes as shown to the following paragraphs in this subclause***

When dot11MultiBSSIDImplemented is true, the Partial Virtual Bitmap field of the TIM element is constructed as follows, where the maximum possible number of BSSIDs is an integer power of 2, *n* = log2 (maximum possible number of BSSIDs)[2002].

* The bits 1 to [2002](2n – 1) of the bitmap are used to indicate that one or more group addressed frames are buffered for each AP corresponding to a nontransmitted BSSID and are called [2003, 2675]NonTxBSS identifiers ([2003, 2675]NonTxBSS IDs). [2003, 2675]The NonTxBSS ID equals the value carried in the BSSID Index field of the Multiple BSSID-Index element carried in its nontransmitted BSSID profile (see 9.4.2.45 (Multiple BSSID element)). The AIDs from 1 to [2002](2n – 1) are not allocated to a STA (in each page for an S1G STA). [2002]A bit position corresponding to an inactive nontransmitted BSSID is reserved and set to 0 (in each page for an S1G STA). The remaining AIDs are shared by the BSSs corresponding to the transmitted BSSID and all nontransmitted BSSIDs.
* When the DTIM Count field carried in a Multiple BSSID-Index element[2002] is 0 for a BSS that has a nontransmitted BSSID, and one or more group addressed frames are buffered at the AP for this BSS, the corresponding [2003, 2675]NonTxBSS ID bit [2002]is set to 1.

***TGm Editor: Please replace all remaining instances of “BSS AIDs” with “NonTxBSS IDs” in clause 9.4.2.5.1 –*** [2003, 2675]

* Examples

***TGm Editor: Please make changes as shown below to the following paragraph in this subclause (P4516L25 of D2.1)***

[2002]In the third example, there are sixteen BSSIDs and the lowest possible AID that can be assigned to any STA is 16 (*n*=4, see 9.4.2.5 (TIM element). There are no group addressed frames buffered at the AP for the transmitted BSSID, and the DTIM Count field in the TIM element of the transmitted BSSID is 0. The nontransmitted BSSID Index 3 also has the DTIM Count field set to 0 and has group addressed frames buffered at the AP. All other nontransmitted BSSIDs have no buffered group addressed frames. In addition, the STA with AID 39 has individually addressed frames buffered at the AP. Figure L-6 (Partial Virtual Bitmap example #6, Method A) and Figure L-7 (Partial Virtual Bitmap example #6, Method B) show the values of the Bitmap Control and Partial Virtual Bitmap fields that would be part of the TIM element for this example when Method A (*N2*=4, see 9.4.2.5 (TIM element)) and Method B (*N0*=2, *N1*=4, *N2*=4, see 9.4.2.5 (TIM element)) are used, respectively.

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| CID | Commenter | Pg | Line | Section | Comment | Proposed Change | **Resolution** |
| 2013 | Abhishek Patil | 2168.00 | 48 | 11.2.3.15 | Declarative text in clause 11 | Change to normative text. Same comment applies to paragraph starting on line 52 | **Revised**The text was revised to separate multi-BSS and single BSS case. Further changes were made to clarify that in a multiple BSSID set, only the TxBSSID transmits the TIM frame.**TGm editor, please make changes as shown in 11-19/0396r4 CID 2013** |

**Option 1: Keep all changes local to 11.2.3.15**

* TIM Broadcast[2013]

***TGm Editor: Please make changes as shown below to the following paragraphs in this subclause***

The Address 1 field of the TIM frame shall be set to the broadcast address.

When dot11MultiBSSIDImplemented is true, the Address 2 field and the Address 3 field are set to the transmitted BSSID.

In a multiple BSSID set, the APs that do not correspond to the transmitted BSSID shall not transmit a TIM frame.

**Option 2: In addition to changes to 11.2.3.15, update clause 9.3.3.1 to specify setting of Address 2 and Address 3 field. This change will apply to all Management frames.**

* TIM Broadcast[2013]

***TGm Editor: Please make changes as shown below to the following paragraphs in this subclause***

The Address 1 field of the TIM frame shall be set to the broadcast address.

In a multiple BSSID set, the APs that do not correspond to the transmitted BSSID shall not transmit a TIM frame.

* Format of Management frames

The address fields for all Management frames except Multihop Action frames are as follows:

* The Address 1 field of the Management frame is the RA (=DA) and is determined as the destination of the frame.
* The Address 2 field of the Management frame is the TA (=SA) and is determined as the address of the STA transmitting the frame.
* If the STA is an AP with dot11MultiBSSIDImplemented set to false, then this address field is the BSSID.
* If the STA is an AP with dot11MultiBSSIDImplemented set to true and the Address 1 field is not set to the broadcast address, then this address is the BSSID of the AP’s BSS.
* If the STA is an AP with dot11MultiBSSIDImplemented set to true and the Address 1 field is set to the broadcast address, then this address is the transmitted BSSID.
* The Address 3 field of the Management frame is set and determined as follows:
* In Probe Request frames, the Address 3 field is the BSSID. The BSSID is either a specific BSSID as described in item 4) below or the wildcard BSSID as defined in the procedures specified in 11.1.4 (Acquiring synchronization, scanning).
* In Public Action frames, the Address 3 field is the BSSID. The BSSID value is set according to 11.18 (Public Action frame addressing).
* If dot11OCBActivated is true, the Address 3 field is the wildcard BSSID.
* Otherwise:
* If the STA is an AP, the Address 3 field is the same as the Address 2 field.
* If the STA is transmitting the Management frame to an AP, the Address 3 field is the BSSID. If the STA is associated with the AP and the AP is in a multiple BSSID set, the BSSID is that of the BSS in which the STA is associated, either the transmitted BSSID or a non-transmitted BSSID.
* If the STA is transmitting the Management frame to one or more members of an IBSS, the Address 3 field is the BSSID of the IBSS.
* If the STA is a mesh STA, the Address 3 field is the TA.

The address fields for Multihop action frames are described in 9.3.5 (Frame addressing in an MBSS).

**Discussion: There are no comments associated with the proposed changes shown beyond this point. These changes are necessary to address any ambiguities or missing content in the spec. Each change is discussed in the bullets below:**

1. **There are several instances throughout the spec that mention a S1G Beacon carrying Multiple BSSID element. However, Table 9-48 in clause 9.3.4.3, doesn’t list the element.**
* S1G Beacon frame format

***TGm Editor: Please make the following addition to Table 9-48 in this sub-clause***

|  |
| --- |
| * Minimum and full set of optional elements
 |
| Order | Information | Notes | Allowed in minimum set | Allowed in full set |
| <ANA> | Multiple BSSID | One or more Multiple BSSID elements are present if dot11MultiBSSIDImplemented is true; otherwise not present. | No | Yes |
| Last–1 | One or more elements can appear in this frame. | These elements are optionally present and follow all other elements that are not vendor-specific elements and precede all other elements that are vendor-specific elements that are part of the Last field in the frame. | No | Yes |
| Last | Vendor Specific | One or more vendor-specific elements are optionally present. These elements follow all other elements. | No | Yes |

1. **The format of Nontransmitted BSSID Capability element is different for DMG and non-DMG STA. It would be much cleaner and clearer if the description and figures for DMG and non-DMG case are handled separately. In addition, to avoid any ambiguity, it would be better to point out that the format of Nontransmitted BSSID Capability field (non-DMG case) is the same as the Capability Information field (clause 9.4.1.4).**
* Nontransmitted BSSID Capability element

***TGm Editor: Please make the following changes to this subclause***

The format of the Nontransmitted BSSID Capability element when transmitted by a non-DMG STA is shown in Figure 9-443 (Nontransmitted BSSID Capability element format (non-DMG STA)).

The format of the Nontransmitted BSSID Capability element when transmitted by a DMG STA is shown in Figure 9-443a (Nontransmitted BSSID Capability element format (DMG STA)).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Element ID | Length | Nontransmitted BSSID Capability |  |  |
| Octets: | 1 | 1 | 2 |  |  |
| * **Nontransmitted BSSID Capability element format (non-DMG STA)**
 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Element ID | Length | Reserved | DMG BSS Control | Nontransmitted BSSID DMG Capabilities Element |
| Octets: | 1 | 1 | 2 | 1 | 19 |
| **Figure 9-443a – Nontransmitted BSSID Capability element format (DMG STA)** |

When transmitted by a DMG STA, the Nontransmitted BSSID Capability element includes the DMG BSS Control and the Nontransmitted BSSID DMG Capabilities Element fields.

The Element ID and Length fields are defined in 9.4.2.1 (General).

The Nontransmitted BSSID Capability field contains the contents of the Capability Information field (defined in 9.4.1.4 (Capability Information field)) in beacons for the BSS.

The Nontransmitted BSSID Capability element is included in the Nontransmitted BSSID Profile subelement of the Multiple BSSID element defined in 9.4.2.45 (Multiple BSSID element). The use of the Multiple BSSID element is described in 11.10.14 (Multiple BSSID set) and Nontransmitted BSSID advertisement procedures are described in 11.1.3.8 (Multiple BSSID procedure).

The DMG BSS Control field is defined in Figure 9-444 (DMG BSS Control field format).

|  |  |  |
| --- | --- | --- |
|  | B0 B1 | B2 B7 |
|  | BSS Type | Reserved |
| Bits: | 2 | 6 |
| * **DMG BSS Control field format**
 |

The BSS Type field is as defined in 9.4.1.46 (DMG Parameters field).

The Nontransmitted BSSID DMG Capabilities Element field contains the DMG Capabilities element of the DMG STA.

1. **Bug in computation of N0 in clause 9.4.2.5.1.**

Discussion**:** The spec has a typo wherein the N0 value for Method B is computed as a the ‘smallest’ positive integer that satisfies the equation N0x8 – 2^n < 8. Due to this bug, N0=1 will always satisfy the specified condition regardless of the ‘n’ value. This is not the intention as the octets corresponding to bits for nontransmitted BSSIDs will not be included in the TIM bitmap (note: Octets 0 thru N0-1 represent bits to signal group address traffic for nonTxBSSIDs). Also see examples in Annex L (Figure L7 and associated discussion on pg 4516 of REVmd D2.1). The value should be determined based on the largest positive integer that satisfies the specified condition. Another alternative would be to determine the value of N0 as ceil(2^n/8). See table below:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **n** | **N0** | **N0\*8** | **2^n** | **(N0\*8-2^n)** | **ceil(2^n/8)** |
| 0 | 1 | 8 | 1 | 7 | 1 |
| 1 | 1 | 8 | 2 | 6 | 1 |
| 2 | 1 | 8 | 4 | 4 | 1 |
| 3 | 1 | 8 | 8 | 0 | 1 |
| 4 | 2 | 16 | 16 | 0 | 2 |
| 5 | 4 | 32 | 32 | 0 | 4 |
| 6 | 8 | 64 | 64 | 0 | 8 |
| 7 | 16 | 128 | 128 | 0 | 16 |
| 8 | 32 | 256 | 256 | 0 | 32 |

* General

***TGm Editor: Please replace ‘smallest’ with ‘largest’ on P984L62 and P985L25 of REVmd D2.1***

***P984L62:*** where N0 is the largest positive integer such that N0 × 8 – 2n < 8

***P985L25:*** is the largest positive integer such that (*N*0 × 8 – 2n< 8).

1. **The reference to ‘TIM broadcast frame’ is incorrect and can be misleading. The intended frame is the TIM frame (9.6.14.2) which carries timestamp information.**
* Beacon reception

***TGm Editor: Please make the change as shown below to the following paragraph in this subclause***

A non-AP STA in which dot11MultiBSSIDImplemented is true shall support frame filtering for up to two BSSIDs; one for the transmitted BSSID and one for the nontransmitted BSSID. The STA, when associated with a BSS corresponding to a nontransmitted BSSID, shall discard all Data and Management frames that use the transmitted BSSID as the transmit address, except for Beacon, FILS Discovery, Probe Response, and TIM frames.

***TGm Editor: Please delete ‘Broadcast’ from on P2058L31 and P3689L25 of REVmd D2.1:***

***P2058L31:*** “… most recently transmitted TIM frame, if any was …”

***P3689L25:*** TIM frame

1. **Clarify that the FMS Descriptor element is carried in the nonTxBSSID profile in the Multiple BSSID element. It helps clarify that there could be more than one FMS Descriptor element carried in the Multiple BSSID element (for different nonTxBSSIDs that support the feature and satisfy the condition).**
* **FMS general procedures**

***TGm Editor: Please make the change as shown below to the following paragraph in this subclause***

When dot11FMSActivated is true at the AP, the AP shall include the FMS Descriptor element in every Beacon frame. The FMS Descriptor indicates the FMS group addressed buffered BUs at the AP. If there are no buffered BUs for FMS streams accepted by the AP, the AP shall set the Length field in the FMS Descriptor element to 1. The AP shall include the FMS Descriptor element for a nontransmitted BSSID in the corresponding Nontransmitted BSSID Profile subelement carried in a Multiple BSSID element sent in a Beacon frame.

***Additional changes for discussion with the group***

**9.4.2.45 Multiple BSSID element**

***TGm Editor: Please make the change to the 7th paragraph in this subclause as shown below:***

The Nontransmitted BSSID Profile subelement contains a list of elements for one or more APs or DMG STAs that have nontransmitted BSSIDs and is defined as follows:

* The FMS Descriptor element is included in the Nontransmitted BSSID Profile subelement if the Multiple BSSID element is included in a Beacon frame.