IEEE P802.11
Wireless LANs

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| Partial AID  |
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Abstract

This document provides resolution for the comments listed below

Comments are from: 11-11-0907-0x-00ac-lb178-comments-tgac-d1-0.xlsx

Comments refer to: Draft P802.11ac\_D1.0.pdf

**Comments**

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| 2167 | 79.14 | 9.17a | Change to "A STA that transmits a VHT PPDU to an AP or that transmits a VHT NDP PPDU following an NDPA frameaddressed to an AP, shall set the TXVECTOR parameter PARTIAL\_AID to the higher 9 bits of the BSSID (BSSID[39, 47])." | As proposed. | AGREE  | MAC |
| 3088 | 79.14 | 9.17a | A STA that transmits a VHT PPDU to an AP or that transmits a VHT NDP PPDU following an NDPA frameaddressed to an AP, shall set the TXVECTOR parameter PARTIAL\_AID to the lower 9 bits of the BSSID. | that should be 9 MSBs according to the definition used in the formula in the same section | See 2167 | MAC |
| 3496 | 79.14 | 9.17a | Bit ordering is not clear with "set to lower 9 bits of the BSSID". | Clarify that the low order bit of the second last octet is sent first, i.e. B39 of BSSID is mapped to B0 of Partial AID. | See 2167 | MAC |
| 3089 | 79.23 | 9.17a | A mesh STA that transmits a VHT PPDU that carries individually addressed MPDUs to mesh STA, shall setthe TXVECTOR parameter PARTIAL\_AID to the 9 LSB bits of the recipient MAC address. | that should be 9 MSBs according to the definition used in the formula in the same section | AGREE | MAC |

Discussion

An exemplary address allocation to APs in OBSSs may be of the kind (hexadecimal representation)

BSS1 = 00:11:22:33:44:56

BSS2 = 00:11:22:33:44:57

BSS3 = 00:11:22:33:44:58

In the Partial AID referred by the comment the intent was to use the portion of the BSSID address hosting 55, 56, 57 in above examples, so as to maximize the entropy

In the following we identify the bits indicating 55, 56, 57 with reference to a specific representation of the BSSID address; we chose to refer to the representation as appearing in the Address field of a MAC frame.

When written in a Address field of a MAC frame, the bit representation of above hexadecimal addresses appears as a LSB-first representation within an octet (also called bit-reverse in 802-2001; see an example in the below picture), i.e. the octets are in the same relative position as in the hexadecimal representation, but the bit ordering within each octet is reversed;

 



In a Address field, for our purposes, we refer to the leftmost (first transmitted) bit as B0 and the rightmost (last transmitted bit) as B47 as commonly assumed for other MAC fields; note that index B0 maps to the I/G bit (this is also consistent with REVmb\_D7.02 (8.2.2 Convention));

Assuming this representation , the value 5 of the hexadecimal representation in the initial example corresponds to 5 = bin\_to\_hex(Address\_field[44:47]) and the value 6 corresponds to 6=bin\_to\_hex(Address\_field[B40:B43])

Hence, assuming ‘BSSID[]’ indicates the representation of the BSSID address as appearing in a Address field of a MAC frame, it is correct to use BSSID[39:47].

See also similar discussion in 11/587r2

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| 2171 | 78.49 | 9.17a | Partial AID for NDP is not complete. |  | AGREE IN PRINCIPLE | MAC |
| 3370 | 78.50 | 9.17a | What is the PARTIAL\_AID set to for NDP PPDUs following an NDPA frame addressed to a non-AP, non-IBSS STA ((T)DLS peer STA or not)? | Clarify | AGREE IN PRINCIPLE | MAC |

Discussion`

DCN 11/587r2 discussed this topic and proposed to set the Partial AID for the NDP to the same value as the partial AID of the preceding NDPA; Somehow the case mentioned by the commenter was not included; Propose to include the case.

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| 3371 | 79.26 | 9.17a | And what if it does? Wouldn't that be bad? | Change "should" to "shall" | DISAGREE. The effect would not break the network operation | MAC |

Discussion

If AID assignment results in a partial AID equal to 0 the STA will not be able to take advantage of the power save, but network operations are not compromised; A good AP implementation should make sure power save is enabled for all STAs

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| 3704 | 78.51 | 9.17a | The all group addressed frames have partial AID field set to 0. This mechanism does not enable the receiver to detect the TA of the group addressed frames. Thus: - the receivers need to receive every single group addressed frame that consumes a lot of power. - the group addressed frames use different principle to set the AID field than SU individually addressed frames. The SU individually addressed frames have BSSID present in the partial AID field. - Presentations to describe this comment more precisely have been given. Please see: 11-11-0313-02-00ac-SU-MIMO-type-for-group-addressed-frames.ppt or 11-11-0314-01-00ac-SU-MIMO-type-for-group-addressed-frames-text.doc. | Please enable the receivers of SU group addressed frames transmissions to detect TA and RA of the transmission. For RA it could be enough to simply indicate that the transmitted frame is individually addressed or group addressed. For instance use the same logic to set Parital AID field for group addressed frames as used for individually addresssed frames, i.e. Partial AID of group addressed could be in form: AID = 0 and BSSID= BSSID.  | DISAGREE | MAC |

Discussion

Including the transmitter address.

Note that a straw poll was run regarding this topic on March (11/826r0) and the results indicated that group was not in favor of including the transmitter address in the partial AID of broadcast frames

* **Are you in favor of having a part of the transmitter address present in the Partial AID of the SU VHT PPDU that carries group addressed MPDUs?**

**Y: 2**  **N: 8 A: 14**

Further discussion:

Broadcast messages, especially management ones, are likely to be transmitted by using non-HT format, in which case the Partial AID is not present.

Also, the Partial AID is mainly useful in reducing the energy consumption in case of A-MPDU; In case of single MPDU the benefit is limited; Broadcast frames are likely single MPDUs;

Special MAC mechanisms targeted are improving the power saving in case of broadcast/multicast transmission already exist, and should be implemented and supported whenever there is a concern related to power saving;

STAs operating in power save mode will wake up only at the intended DTIM and receive broadcast traffic from the AP in the time immediately following the DTIM. In other moments in time the STA should be in Doze state.

Adding the transmitter address would not provide additional power saving opportunities

Moreover directed Multicast Service (DMS) allows a STA to instruct the AP to convert certain multicast frames into unicast frames for the STA. This allows the STA to go back to sleep after every beacon that does not have the STA's TIM bit set. Clearly, DMS is much more effective than receiving every PHY header of the multicast frames that are sent after each DTIM beacon.

DMS is effective in reducing the power consumption related to control/management multicast frames; it clearly may lead to some overhead in some cases; please note that converting frames from multicast to unicast allows the use of higher data rates and in some cases may even improve efficiency

Flexible Multicast Service (FMS) allows a STA to negotiate a delivery schedule for certain multicast traffic that is a multiple of the DTIM period. This is especially useful when multiple multimedia streams are active at the same time: a STA can be awake only for the streams it needs to decode.

When these mechanisms are used, the additional benefit of including the transmitter address in a PLCP header brings no benefits.

Including the receiver address.

Note that a straw poll was run regarding this topic on March (11/826r0) and the results indicated that group was not in favor of including the receiver address in the partial AID of broadcast frames

* **Are you in favor of having a part of the receiver address (Group address) present in the Partial AID of the SU VHT PPDU that carries group addressed MPDUs?**

**Y:2**  **N:9**  **A:11**

Further discussion

Inserting the receiver multicast MAC address in the computation of the partial AID is a significant difference from the existing approach for unicast frames

Multicast MAC address is derived from IP address, hence it is inherently dynamic, requiring an instantaneous computation of the Partial AID per each sent packet;

The reason for introducing a PLCP based power save for unicast frames is that most of the MAC payload of unicast frames cannot be decode by STAs other than the intended recipient (due to high MCS or BF); PLCP header instead is likely to be decoded by all STAs.

In case of multicast frames, the transmission rate has to be low, in order to allow for decoding at all recipients; in this case the MAC address can also be decoded correctly, allowing for efficient power saving; in this case the additional benefit from a PLCP header based power save is limited.

Power save based on the recipient address filtering is already possible at MAC; whenever this mechanism can be used, it already provides an efficient power saving; the MAC address is present in each MPDU, hence in case of A-MPDU, power saving is already possible after the first MPDU; PLCP based power save in most of the cases (high 11ac rates) only gives few us of extra power saving;

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| 2294 | 79.10 | 9.17a | extraneous comma | change "peer STA, obtains" to "peer STA obtains" | AGREE. EDITORIAL | MAC |
| 2680 | 79.01 | 9.17a | It is not clear what 'b is scaled by 2^0 and c by 2^(c-b)' means. | Please clarify. | AGREE | MAC |
| 3674 | 79.01 | 9.17a | "dec(A[b:c]) is the cast to decimal operator where b is scaled by 2^0 and c by 2^(c-b)" is not very clear. Probably it is meant that bit b is scaled by 2^0, not b itself and, likewise, that bit c is scaled by 2^(c-b), not c itself.  | Clarify as suggested in comment. | 2680 | MAC |

Discussion

See revised text

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| 3350 | 78.59 | 9.17a | Why is the formula the way it is? Why a mix of exclusive or and modulo addition? Why does the BSSID only get mixed into the top 4 bits? | Clarify | Ans:  | MAC |

Discussion

The intent of the formula is to provide a value for the Partial AID that is

* Unique within the BSS: this is achieved by including the AID value, which is unique per STA within a BSS
* Not overlapping with the ones used by OBSSs; this is partially achieved by including a Hash of the BSSID; BSSID[40:47] id the portion of the MAC address that is most likely going to be different across different APs, hence likely providing more differentiation

Further discussion

The text has been modified to explicitly state the Partial AID settings for

* Sent by a non-AP STA to the AP with which it is associated
* Sent by a Mesh STA to a Mesh STA
* Sent by an AP to an associated non-AP STA
* Sent by a DLS or TDLS STA in the direct path to a DLS or TDLS STA

All the other cases are covered by the “otherwise”; that that includes

* broadcast, multicast,
* IBSS,
* frames sent before association or TDLS link setup

and may include other cases not explicitly listed.

Editing instructions

Replace section 9.17a with the following text

**9.17a Partial AID and Group ID in VHT PPDUs**

When transmitting a VHT SU PPDU, a STA shall set the TXVECTOR parameters PARTIAL\_AID and GROUP\_ID as shown in Table 9-YYY and further described in this section. Within the scope of this clause, the intended recipient for an NPD is the same as for the immediately preceding NDPA.

For a MU-MIMO PPDU the Group ID is set as in 22.3.11.3 (Group ID).

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| **Condition** | **PARTIAL\_AID** | **GROUP\_ID** |
| Sent by a non-AP STA to the AP with which it is associated | BSSID[39:47] | 0 |
| Sent by a Mesh STA to a Mesh STA | RA[39:47] | 0 |
| Sent by an AP to an associated non-AP STA  | $$\left(dec\left(AID\left[0:8\right]\right)+ dec\left(BSSID\left[44:47\right]⨁BSSID\left[40:43\right]\right)×2^{5}\right)mod 2^{9}$$ | 63 |
| Sent by a DLS or TDLS STAin the direct path to a DLS or TDLS STA | 63 |
| **Otherwise** | **0** | **63** |

**Table 9-YYY—TXVECTOR PARTIAL\_AID and GROUP\_ID settings for SU VHT PPDUs**

NOTE— In Table 9-YYY the last row includes the cases of PPDU carrying MPDUs

* addressed to broadcast or multicast address
* sent By an IBSS STA to an IBSS STA
* sent by an AP to a non associated STA

and any other case not explicitly listed in Table 9-YYY.

In Table 9-YYY

-      AID[b:c] represents bits b through c inclusive of the AID of the recipient STA with bit 0 being the first

transmitted;

-      BSSID[*b:c*] represent bits *b* through *c* inclusive of the BSSID, with bit 0 being the Individual/Group bit; In this representation, the Individual/Group bit is BSSID[0] and BSSID[47] is the last transmitted bit.

-- RA[*b:c*] represent bits b through c inclusive of the RA field, with bit 0 being the Individual/Group bit; In this representation, the Individual/Group bit is RA[0] and RA[47] is the last transmitted bit.

In formula (9-1) in Table 9-YYY

-          $⨁$ is a bitwise exclusive OR operation;

-          mod X indicates the X-modulo operation;

-          dec(A[*b:c*]) is the binary to decimal cast operator of A[*b:c*] where A[*b*] is the LSB and A[*c*] is the MSB

A STA that transmits a VHT PPDU to a DLS or TDLS peer STA obtains the AID for the peer STA from the

DLS Setup Request, DLS Setup Response, TDLS Setup Request or TDLS Setup Response frame.

An AP should not assign an AID to a STA that results in the PARTIAL\_AID value, as computed using

Equation (9-1), being equal to 0.