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| Project | **IEEE 802.16 Broadband Wireless Access Working Group** <http://ieee802.org/16> |
| Title | **Proposed Change on AAI-MG-IND over IEEE 802.16.1a** |
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| Re: | "IEEE 802.16n-11/0020," in response to Call for Comments on GRIDMAN AWD |
| Abstract | AAI-MG-IND message format clarification on IEEE 802.16 GRIDMAN Amendment Draft Standard |
| Purpose | To discuss and adopt the proposed text in the draft amendment document on GRIDMAN |
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# Proposed Change on AAI-MG-IND over IEEE 802.16.1a

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## 1. Introduction

In IEEE 802.16.1a[3] (i.e., over WirelessMAN-AAI[5]), AAI-MG-IND may indicate without help of MT-IND in the following cases:

- perform network entry or exit sleep mode

- perform ranging procedure with ranging purpose indication is set to HR multicast service flow update

- receiving multicast traffic

Thus, this document provides the change on the AAI-MG-IND message format in IEEE 802.16.1a[3] (i.e., over WirelessMAN-AAI[5]).

## 2. References

[1] IEEE 802.16n-10/0048r2, 802.16n System Requirement Document including SARM annex, July 2011.
[2] IEEE 802.16n-11/0024, P802.16n Draft AWD, October 2011.
[3] IEEE 802.16n-11/0025, P802.16.1a Draft AWD, October 2011.
[4] IEEE P802.16Rev3/D2, IEEE Draft Standard for Local and metropolitan area networks; Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems," October 2011.
[5] IEEE P802.16.1$^{TM}$/D2, [Draft] WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems, October 2011.

## 3. Proposed Text on the IEEE 802.16.1a Amendment Draft Standard

Note:

The text in **BLACK** or **underlined BLACK** color: the existing text in the IEEE 802.16 GRIDMAN AWD

The text in ~~**RED**~~ color: the removal of existing IEEE 802.16 GRIDMAN AWD

The text in **BLUE** color: the new text added to the IEEE 802.16 GRIDMAN AWD

[----------Start of Text Proposal----------]

***[Remedy1: Change the Table 763mc1-AAI-MG-IND message description in 6.2.3.65.49 AAI-MG-IND at page 76 in the 802.16.1a AWD as follows:]***

| Field | Size (bits) | Value/Description | Condition |
|---|---|---|---|
| Indication type | 1 | 0b0: full MGID indication<br>0b1: MGIND+MTIND indication | |
| If (Indication type == 0b0) { | | | |
| For(i=0; i<Num_MGID;i++){ | | Num_MGID is the number of multicast group to indicate multicast traffic is transmitting.<br>Range : 0 ~ 32 | |
| Multicast Group ID | 12 | | Shall be present |
| Action Code | 3 | if bit0 = 1, perform network entry or exit sleep mode<br>if bit1 = 1, perform ranging procedure with ranging purpose indication set to 00b1110<br>if bit2 = 1, receiving multicast | Shall be present |
| if (Action Code bit2 == 1) { | | | |
| Offset of multicast traffic | 4 | frame number offset in which the ABS transmits multicast traffic | Shall be present |
| } | | | |
| } | | | |
| }Else if(Indication type == 0b1) { | | | |

| | | | |
|---|---|---|---|
| MGIND bitmap | M(=64) | Indicates whether a corresponding subgroup of multicast group has multicast data to transmit, where the N-th bit of MGIND bitmap [MSB corresponds to N = 0] corresponds to MGIDs in a subgroup ~~($2^{12}$×N/M to $2^{12}$× (N+1)/M -1)~~ $\left(\left(2^{ML} \times \frac{N}{M}\right) \text{ to } \left(2^{ML} \times \frac{N+1}{M}\right) - 1\right)$, where ML is the length of MGID (i.e. 12) and length of M is 64($=2^{ML-1}$)<br>0: There is no multicast traffic for any of multicast groups in the corresponding multicast subgroup<br>1: There is multicast traffic for at least one multicast group in the corresponding multicast subgroup | Shall be present |
| For ($i$=0; $i$<L; $i$++) { | | L equals the number of bits in MGIND bitmap whose bit is set to 1. | ~~L equals the number of bits in MGIND bitmap whose bit is set to 1.~~ |
| Offset of multicast AAI-MT-IND message | 2 | frame number offset in which the ABS transmits AAI-MT-IND message<br>0b00: first frame of this superframe<br>0b01: second frame of this superframe<br>0b10: third frame of this superframe<br>0b11: fourth frame of this superframe | Shall be present |
| } | | | |
| } | | | |

***[Remedy2: Change the Table 763mc2-AAI-MT-IND message description in 6.2.3.65.50 AAI-MT-IND at page 77 in the 802.16.1a AWD as follows:]***

| Field | Size (bits) | Value/Description | Conditions |
|---|---|---|---|
| for(i=0;i<*L*;i++){ | - | *L* equals the number of bits in MGIND bitmap whose bit is set to 1 and whose offset is the current frame. The bits are ordered by the shortest MSB of MGIND bitmap. | ~~*L* equals the number of bits in MGIND bitmap whose bit is set to 1 and whose offset is the current frame. The bits are ordered by the shortest MSB of MGIND bitmap.~~ |
| **MTIND bitmap** | *K*(=64) | Indicates whether a corresponding multicast group has multicast data to transmit, where the *Q*-th bit of MTIND bitmap [MSB corresponds to *Q* = 0] corresponds to MGID in the subgroup (*Q* is the value of log*K* LSB of multicast group and MSB log*M* of multicast group is defined by AAI-MG-IND message. Length of K is $2^{ML-1}$ that is the same as length of M.).<br><br>0: There is no multicast traffic for the corresponding multicast group<br>1: There is multicast traffic for the corresponding multicast group | Shall be present |
| for(j=0;j<*P*;j++){ | - | *P* equals the number of bits in MTIND bitmap whose bit is set to 1. | ~~*P* equals the number of bits in MTIND bitmap whose bit is set to 1.~~ |

| | | | |
|---|---|---|---|
| **Action code** | 3 | if bit0 = 1, perform network entry or exit sleep mode<br>if bit1 = 1, perform ranging procedure with ranging purpose indication set to 0b1110~~is set to HR multicast service flow update (=0b1110)~~<br>if bit2 = 1, receiving multicast traffic | Shall be present |
| if (action code bit2 == 1) { | - | - | |
| **offset of multicast traffic** | 4 | frame number offset in which the BS transmits multicast traffic | Shall be present |
| } | - | - | |
| } | - | - | |
| } | - | - | |
| | | | |

**[*Remedy3: Change from line 9, page 165 to line 4, page 166 in the 802.16.1a AWD as follows:*]**

HR-BS providing multicast service transmits multicast indication cycle using AAI-SCD and AAI-DSA/AAI-DSC messages. The multicast indication cycle is unique to HR multicast group zone and it consists of multicast available interval and multicast unavailable interval. Multicast available interval is the first frame of each multicast indication cycle. In the multicast available interval, the HR-BS providing multicast service transmits AAI-MG-IND message described in 6.2.3.65.49 and AAI-MT-IND message described in 6.2.3.65.50 during multicast available interval of HR multicast group zone. AAI-MG-IND and AAI-MT-IND message are used to indicate

- multicast service establishment/change/release
- whether the multicast traffic is transmitted after those messages are transmitted
- to perform network entry or exit sleep mode to transmit multicast related message to change/ release multicast service and update multicast security key.
- to perform multicast service flow update using ranging procedure

Multicast indication cycle included in AAI-SCD message is used for multicast service establishment.

During multicast service establishment/change using AAI-DSA/AAI-DSC message, new multicast indication cycle may be transmitted.

During multicast available interval, HR-BS transmits AAI-MG-IND message in the beginning of available interval to indicate multicast traffic of one or more specific multicast groups will transmit. AAI-MG-IND message includes an indication whether AAI-MT-IND message will be transmitted. If the AAI-MT-IND message is transmitted after transmitting AAI-MG-IND using frame offset, MGIND bitmap indicates a multicast subgroup which is included in the AAI-MT-IND message. Multicast group is divided into some subgroups (i.e., length of MGIND bitmap) and each subgroup has following number of multicast groups:

$$\text{Number of multicast group in a subgroup} = \frac{2^{ML}}{M},$$

where *ML* is the length of Multicast Group ID, *M* is the length of MGIND bitmap and *N*-th bit in MGIND bitmap indicates a subgroup of multicast groups from $\left(2^{ML} \times \frac{N}{M}\right)$ to $\left(2^{ML} \times \frac{N+1}{M}\right) - 1$.

AAI-MT-IND message is transmitted in the offset included in AAI-MG-IND message after transmitting AAI-MG-IND message and it indicates whether multicast traffic of specific multicast group will transmit. The multicast group is indicated based on the MGIND bitmap in HR-MG-IND message and MTIND bitmap in AAI-MT-IND message.

*N*-th bit in MGIND bitmap indicates the value of log*M* MSB of Multicast Group ID and *Q*-th bit in MTIND bitmap indicates the value of log*K* LSB of Multicast Group ID. For the indicated Multicast Group ID, according to the action code, HR-MSs, member of the Multicast Group, perform network entry or receive multicast traffic.

[----------End of Text Proposal----------]