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| Project | **IEEE 802.16 Broadband Wireless Access Working Group <**<http://ieee802.org/16>**>** | |
| Title | **In-order Delivery in the Talk-around direct communication** | |
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| Re: | Letter Ballot #38 on P802.16.1a/D2 | |
| Abstract | This provides text proposals of in-order delivery in talk-around direct communication in IEEE 802.16.1a/D2 | |
| Purpose | To discuss and adopt the proposed text in the draft amendment document on GRIDMAN | |
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**In-order Delivery in the Talk-around direct communication**

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# Introduction

To provide in-order MAC SDU delivery for the transport connection, this contribution defines new fields in some messages related to the service flow establishment and describes how it works.

This contribution provides how in-order delivery works as the followings:

* In-order delivery operation for point-to-point link
* In-order delivery operation for point-to-multipoint link of relaying
* In-order delivery operation for relay link

# References

[1] IEEE 802.16-12-0132-00, GRIDMAN System Requirement Document including SARM annex, January 2012.

[2] IEEE P802.16.1aTM/D2, WirelessMAN-Advanced Air Interface for Broadband Access Systems - Draft Amendment: Higher Reliability Networks, April 2012.

# Proposed Text for P802.16.1a/D2

Note:

The text in **BLACK** color: the existing text in the 802.16.1a AWD

The text in **~~RED~~** color: the removal of existing 802.16.1a AWD

The text in **BLUE** color: the new text added to the 802.16.1a AWD

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

## [Remedy1: Modify the following text in Section 6.12.2.3.1.6.2 in the 802.16.1a/D2 AWD]

Link establishment

When HR-MSs need to communicate directly, the HR-MSs shall establish one of one-way unicast or two-way unicast or multicast links of direct communication. During link establishment, a transport connection shall be established so that HR-MSs communicate directly. During link establishment, multiple transport connections may be established.

Two HR-MSs establish a one-way unicast link with two-way handshake of AAI-DC-LEST-REQ/RSP messages. The AAI-DC-LEST-REQ message is piggybacked by **a** AAI-DC-RTS message, which is an initial message for dedicated channel reservation. The AAI-DC-LEST-RSP message is piggybacked by a AAI-DC-CTS message, which is in response to the AAI-DC-RTS message.

Two HR-MSs establish a two-way unicast link which consists of two one-way unicast links. One communication of a direction uses one-way unicast signaling procedure independent to the one-way unicast signaling procedure of the opposite direction.

HR-MSs establish a multicast link with one-way AAI-DC-LEST-CMD message **which is piggybacked by a AAI-DC-RTS message.**

The radio resource for a dedicated channel is allocated during link establishment. A sending HR-MS shall send QoS parameters of traffic.

**To deliver MAC SDU in-order for a service flow, HR-MS enables in-order delivery and provides SDU reordering timeout. The SDU reordering timeout is the maximum time until a SDU is received successfully in order. HR-MS at the receiver side reconstructs MAC SDU and shall deliver it to the upper layer in-order.**

## [Remedy2: Modify the following text in Section 6.12.2.3.1.11.2 in the 802.16.1a/D2 AWD]

Two links management

When an HR-MS need**s** to communicate with corresponding HR-MSs via a relaying HR-MS, a source HR-MS shall request the relaying HR-MS to establish either one-way unicast TDC link or two-way unicast TDC link. **The source HR-MS shall provide the source HR-MS with either a target HR-MS address or a target HR-MS Group address.** The relaying HR-MS responds after establishing a TDC link to destination HR-MSs. During link establishments, a transport connection shall be established and multiple transport connections may be established.

The source HR-MS sends the AAI-DC-RELAY-REQ message to the relaying HR-MS and receives the AAI-DC-RELAY-RSP message from the relaying HR-MS in response to the AAI-DC-RELAY-REQ message. The AAI-DC-RELAY-REQ and AAI-DC-RELAY-RSP messages are piggybacked by AAI-DC-RTS and AAI-DC-CTS messages, respectively.

For release of a relaying link, the source HR-MS sends the AAI-DC-LREL-CMD message to the relaying HR-MS.

When the relaying HR-MS receives the AAI-DC-RELAY-REQ message from the source HR-MS, a TDC link is established between the relaying HR-M**S**~~s~~ and one or more destination HR-MSs. The TDC link is either unicast or multicast one-way link, described in section 6.12.2.3.1.6.2.

After TDC link establishment from the relaying HR-MS to one or more destination HR-M**S**s, the relaying HR-MS shall send the AAI-DC-RELAY-RSP message in response to the AAI-DC-RELAY-REQ message. The relaying HR-MS may send multiple AAI-DC-RELAY-RSP messages with Confirmation Code == 0x02 to the source HR-MS until it sends the AAI-DC-RELAY-RSP message with Confirmation Code == 0x00 or 0x01.

**If in-order delivery indicator of either the AAI-DC-RELAY-REQ message or the AAI-DSA-CMD message is set, the destination HR-MSs reconstruct MAC SDU and shall deliver it to the upper layer in-order.**

**If in-order delivery of the relaying HR-MS is set, it reconstructs MAC SDU and sends it to one or more destination HR-MSs. Otherwise, the relaying HR-MS sends MAC PDUs to the destination HR-MSs on receipt of the source HR-MS only for the same SFID. In case of the different SFID, the relaying HR-MS should change SFID of MAC PDU headers.**

## [Remedy3: Modify the following updates from Section 6.2.3.65.21 in the 802.16.1a/D2 AWD]

6.2.3.65.21 AAI-DC-LEST-REQ

An HR-MS transmits a AAI-DC-LEST-REQ message to establish a one way peer-to-peer TDC link.

Table 106a – AAI-DC-LEST-REQ message field description

| **Field** | **Size (bits)** | **Value/Description** | **Condition** |
| --- | --- | --- | --- |
| Link Change Count | 4 | The change count of this transaction assigned by the sender. If new transaction is started, Link Change Count is incremented by one (modulo 16) by the sender. | Shall always be present |
| For (i=0; i<N\_Flow\_Est; i++) { |  | N\_Flow\_Est is the number of flows on which the sender of this message sends MAC PDUs.  Range [0..1] |  |
| FID | 4 | Flow identifier assigned by the sink of packets on the flow |  |
| Traffic Priority | 3 | 0 to 7: Higher numbers indicate higher priority  Default: 0 |  |
| CS Specification Parameters | 8 | 0–15: *Reserved*  16: Voice Codec G.729A  17: Voice Codec AMR  18–255: *Reserved* |  |
| MAC Header Type | 1 | Indicates whether AGMH or SPMH is presented at the start of MAC PDUs of the service flow.  0 : AGMH (Advanced Generic MAC Header)  1 : SPMH (Short-Packet MAC header)  default value is 0. |  |
| **In-order Delivery Indicator** | **1** | **Indicate whether or not the order of delivery in the connection is preserved by the MAC.**  **0: Not preserved**  **1: Preserved** |  |
| **SDU Reordering Timeout** | **5** | **0 > and <= 16, Unit is DC frame** | **Present if In-order Delivery Indicator is set 1** |
| **Reserved** | **2** |  |  |
| } |  |  |  |
| *Reserved* |  |  |  |

## [Remedy4: Modify the following updates from Section 6.2.3.65.29 in the 802.16.1a/D2 AWD]

* + - * 1. AAI-DC-LEST-CMD

An HR-MS transmits an AAI-DC-LEST-CMD message to establish a point-to-multipoint link.

Table 106b – AAI-DC-LEST-CMD message field description

| **Field** | **Size (bits)** | **Value/Description** | **Condition** |
| --- | --- | --- | --- |
| Link Change Count | 4 | The change count of this transaction assigned by the sender. If new transaction is started, Link Change Count is incremented by one (modulo 16) by the sender. | Shall always be present |
| For (i=0; i<N\_Flow\_Est; i++) { |  | N\_Flow\_Est is the number of flows on which the sender of this message sends MAC PDUs.  Range [0..1] |  |
| FID | 4 | Flow identifier assigned by the source of packets on the flow |  |
| Traffic Priority | 3 | 0 to 7: Higher numbers indicate higher priority  Default: 0 |  |
| CS Specification Parameters | 8 | 0–15: *Reserved*  16: Voice Codec G.729A  17: Voice Codec AMR  18–255: *Reserved* |  |
| MAC Header Type | 1 | Indicates whether AGMH or SPMH is presented at the start of MAC PDUs of the service flow.  0 : AGMH (Advanced Generic MAC Header)  1 : SPMH (Short-Packet MAC header)  default value is 0. |  |
| **In-order Delivery Indicator** | **1** | **Indicate whether or not the order of delivery in the connection is preserved by the MAC.**  **0: Not preserved**  **1: Preserved** |  |
| **SDU Reordering Timeout** | **5** | **0 > and <= 16, Unit is DC frame** | **Present if In-order Delivery Indicator is set 1** |
| **Reserved** | **2** |  |  |
| } |  |  |  |

## [Remedy5: Modify the following updates from Section 6.2.3.65.31 in the 802.16.1a/D2 AWD]

6.2.3.65.31 AAI-DC-DSA-CMD

An HR-MS transmits an AAI-DC-DSA-CMD message to create a new service flow on one-way point-to-point and point-to-multipoint TDC links.

Table 106c – AAI-DC-DSA-CMD message field description

| **Field** | **Size (bits)** | **Value/Description** | **Condition** |
| --- | --- | --- | --- |
| FID Change Count | 4 | The change count of this transaction assigned by the sender. If new transaction is started, FID Change Count is incremented by one (modulo 16) by the sender. | Shall always be present |
| For (i=0; i<N\_Flow\_Est; i++) { |  | N\_Flow\_Est is the number of flows on which the sender of this message sends MAC PDUs. |  |
| FID | 4 | Flow identifier assigned by the source of packets on the flow |  |
| Traffic Priority | 3 | 0 to 7: Higher numbers indicate higher priority  Default: 0 |  |
| CS Specification Parameters | 8 | 0–15: *Reserved*  16: Voice Codec G.729A  17: Voice Codec AMR  18–255: *Reserved* |  |
| MAC Header Type | 1 | Indicates whether AGMH or SPMH is presented at the start of MAC PDUs of the service flow.  0 : AGMH (Advanced Generic MAC Header)  1 : SPMH (Short-Packet MAC header)  default value is 0. |  |
| } |  |  |  |
| **In-order Delivery Indicator** | **1** | **Indicate whether or not the order of delivery in the connection is preserved by the MAC.**  **0: Not preserved**  **1: Preserved** |  |
| **SDU Reordering Timeout** | **5** | **0 > and <= 16, Unit is DC frame** | **Present if In-order Delivery Indicator is set 1** |
| **Reserved** | **2** |  |  |

## [Remedy6: Modify the following updates from Section 6.2.3.65.41 in the 802.16.1a/D2 AWD]

6.2.3.65.41 AAI-DC-RELAY-REQ

An HR-MS transmits a AAI-DC-RELAY-REQ message to request a relaying HR-MS to establish a unicast TDC link

Table 106d – AAI-DC-RELAY-REQ message field description

| **Field** | **Size (bits)** | **Value/Description** | **Condition** |
| --- | --- | --- | --- |
| Link Change Count | 4 | The change count of this transaction assigned by the sender. If new transaction is started, Link Change Count is incremented by one (modulo 16) by the sender. | Shall always be present |
| For (i=0; i<N\_Flow\_Est; i++) { |  | N\_Flow\_Est is the number of flows on which the sender of this message sends MAC PDUs.  Range [0..1] |  |
| FID | 4 | Flow identifier assigned by the sink of packets on the flow |  |
| Traffic Priority | 3 | 0 to 7: Higher numbers indicate higher priority  Default: 0 |  |
| CS Specification Parameters | 8 | 0–15: *Reserved*  16: Voice Codec G.729A  17: Voice Codec AMR  18–255: *Reserved* |  |
| MAC Header Type | 1 | Indicates whether AGMH or SPMH is presented at the start of MAC PDUs of the service flow.  0 : AGMH (Advanced Generic MAC Header)  1 : SPMH (Short-Packet MAC header)  default value is 0. |  |
| **In-order Delivery Indicator** | **1** | **Indicate whether or not the order of delivery in the connection is preserved by the relaying HR-MS.**  **0: Not preserved**  **1: Preserved** |  |
| **Reordering Timeout** | **3** | **0 > and <= 8, Unit is DC frame** | **Present if In-order Delivery Indicator is set 1** |
| **Reserved** | **4** |  |  |
| } |  |  |  |
| Target DCTID or DCGID | 24 | Indicates a receiving HR-MS (Group) address. |  |
| **Target Address Type** | **1** | **Indicates type of destination address.**  **0: DCTID**  **1: DCGID** |  |
| **In-order Delivery Indicator** | **1** | **Indicate whether or not the order of delivery in the connection is preserved by the MAC.**  **0: Not preserved**  **1: Preserved** |  |
| **SDU Reordering Timeout** | **5** | **0 > and <= 16, Unit is DC frame** | **Present if In-order Delivery Indicator is set 1** |
| **Reserved** | **2** |  |  |

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