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| Project | **IEEE 802.16 Broadband Wireless Access Working Group <**<http://ieee802.org/16>**>** |
| Title | **Handover procedure for HR-MS acting as RS over IEEE 802.16.1a**  |
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| Source(s) | Won-Ik Kim, Eunkyung Kim, Seokki Kim, Sungkyung Kim, Miyoung Yun, Hyun Lee, Chulsik Yoon, Sungcheol ChangETRISeokjoo ShinChosun University  | E-mail: woniks@etri.re.krscchang@etri.re.krsjshin@chosun.ac.kr |
| Re: | “IEEE 802.16-12-271,” in response to Letter Ballot Recirc #38a on P802.16.1a/D2 |
| Abstract | This provides AWD text proposals for handover procedure for HR-MS acting as RS in IEEE p802.16.1a. |
| Purpose | To discuss and adopt the proposed text in the draft amendment document on GRIDMAN |
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**Handover procedure for HR-MS acting as RS over IEEE 802.16.1a**

Won-Ik Kim, Eunkyung Kim, Seokki Kim, Sungkyung Kim, Miyoung Yun, Hyun Lee, Chulsik Yoon, Sungcheol Chang

ETRI

Seokjoo Shin

Chosun University

# Introduction

In subsection 6.12.1.2.3.2 of IEEE P802.16.1a/D2, the scanning procedure for HR-MS acting as RS is elaborated. Therefore, it is required for specific HO procedures for HR-MS acting as RS. This document provides AWD text proposals for HO procedure of HR-MS acting as RS in P802.16.1a.

The proposed HO procedure for HR-MS acting as RS is similar to that of described for an AMS handover in section 6.2.6.3 of IEEE P802.16.1™/D6.



Figure 1. HO process for HR-MS acting as RS

When HR-MS acting as RS sends AAI-HO-REQ message to the superordinate HR-BS on the relay link, the superordinate HR-BS may perform the negotiation for RS handover and obtain the information for RS reconfiguration by exchanging the backbone messages with the target HR-BS.

If the HR-MS acting as RS can perform handover without RS configuration change, the following procedure shall be performed.

* The superordinate HR-BS initiates the handover for an HR-MS acting as RS by sending AAI-HO-CMD message with the Extended HO Mode set to 0b11 and the RS reconfiguration indicator set to 0b0.
* Upon reception of the AAI-HO-CMD message, the HR-MS acing as RS sends AAI-MM-ADV message with the Action Type set to 0b0001 and the service unavailable time (UST, UTI) to the subordinate HR-MSs.
* Before the HR-MS acting as RS completes HO execution, the subordinate HR-MSs do not perform the handover to a neighbor HR-BS or HR-RS as well as communicate with the serving HR-MS acting as RS.
* After the service unavailable time is expired, the subordinate HR-MSs shall resume communication with the HR-MS acting as RS.

If the relay link configuration of the HR-MS acting as RS need to be changed, the following procedure shall be performed.

* The superordinate HR-BS sends AAI-HO-CMD message with the Extended HO Mode set to 0b11 and the RS reconfiguration indicator set to 0b1.
* The superordinate HR-BS informs the HR-MS acting as RS of the new RS configuration information by using AAI-ARS-CONFIG-CMD message.
* The HR-MS acing as RS sends AAI-MM-ADV message with the Action Type set to 0b0000 and the service unavailable time (UST, UTI) to the subordinate HR-MSs.
* The subordinate HR-MSs shall resume communication with the HR-MS acting as RS after expiring the service unavailable time.

If the access link channel characteristics such as FA on the HR-MS acting as RS need to be changed, on receiving AAI-HO-CMD message from superordinate HR-BS, the following procedure shall be performed.

* The HR-MS acting as RS may broadcast an AAI-NBR-ADV message regardless of the AAI-NBR-ADV interval, to inform the MSs of the new access link channel characteristics. The HR-MS acting as RS itself shall be included in the neighbor station list with the IEs set according to the target access link channel characteristics.
* The HR-MS acting as RS broadcasts the AAI-MM-ADV message with Action Type set to 0b1010 and the service unavailable time (UST, UTI).
* When the handover process of the HR-MS acting as RS is completed, all the subordinate HR-MS connections are handed over to the same HR-MS acting as RS using HO procedures in section 6.2.6.

# References

[1] IEEE P802.16nTM/D2, Air Interface for Broadband Wireless Access Systems - Draft Amendment: Higher Reliability Networks, April 2012.

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

[3] EEE P802.16Rev3/D4, IEEE Draft Standard for Local and metropolitan area networks; Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems,” February 2012.

[4] IEEE P802.16.1TM/D4, IEEE Draft for WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems, February 2012.

# Proposed Text for the 802.16.1a AWD

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: Insert the following new sub-section in Section 6.12.1.2.3.2 in IEEE P802.16.1a/D2.*]**

***[Page# 109, Line# 9-10]***

**6.12.1.2.3.2 HO procedure for HR-MS acting as ~~HR-~~RS**

**6.12.1.2.3.2.1 HR-MS acting as ~~HR-~~RS scanning of neighbor HR-BSs**

**…**

**6.12.1.2.3.2.2 HO initiation and execution for HR-MS acting as RS**

The handover process of HR-MS acting as RS follows the same procedures as described for an AMS handover in section 6.2.6.3. The procedures, where certain steps are different, are described in this section.

When HR-MS acting as RS makes a decision for handover, it sends AAI-HO-REQ message to the superordinate HR-BS on the relay link. The superordinate HR-BS may perform the negotiation for RS handover and obtain the information for RS reconfiguration by exchanging the backbone messages with the target HR-BS. The backbone message definition is beyond the scope of this specification.

If the HR-MS acting as RS can perform handover without RS mode configuration change, the superordinate HR-BS initiates handover for an HR-MS acting as RS by sending AAI-HO-CMD message with the Extended HO Mode set to 0b11 and the RS reconfiguration indicator set to 0b0 on the relay link. Upon reception of the AAI-HO-CMD message, the HR-MS acing as RS sends AAI-MM-ADV message with the Action Type set to 0b0001 and the service unavailable time (UST, UTI) to the subordinate HR-MSs. During the handover process of HR-MS acting as RS, the subordinate HR-MSs do not perform the handover to a neighbor HR-BS or HR-RS as well as communicate with the serving HR-MS acting as RS. When the handover process of the HR-MS acting as RS is completed, the subordinate HR-MSs shall resume communication with the HR-MS acting as RS.

If the target HR-BS decides to change the RS configuration of the HR-MS acting as RS after the handover, it sends a new RS configuration information to the serving superordinate HR-BS over the backbone. The superordinate HR-BS initiates handover for an HR-MS acting as RS by sending AAI-HO-CMD message with the Extended HO Mode set to 0b11 and the RS reconfiguration indicator set to 0b1, and it shall use AAI-ARS-CONFIG-CMD message to inform the HR-MS acting as RS of the new RS configuration information. Upon reception of the AAI-ARS-CONFIG-CMD message, the HR-MS acing as RS sends AAI-MM-ADV message with the Action Type set to 0b0000 and the service unavailable time (UST, UTI) to the subordinate HR-MSs. The subordinate HR-MSs shall resume communication with the HR-MS acting as RS after expiring the service unavailable time.

If the access link channel characteristics such as FA on the HR-MS acting as RS need to be changed, on receiving AAI-HO-CMD message from superordinate HR-BS, the HR-MS acting as RS may broadcast an AAI-NBR-ADV message regardless of the AAI-NBR-ADV interval, to inform the MSs of the new access link channel characteristics. The HR-MS acting as RS itself shall be included in the neighbor station list with the IEs set according to the target access link channel characteristics. Then, the HR-MS acting as RS broadcasts the AAI-MM-ADV message with Action Type set to 0b1010 and the service unavailable time (UST, UTI). When the handover process of the HR-MS acting as RS is completed, all the subordinate HR-MS connections are handed over to the same HR-MS acting as RS using HO procedures in section 6.2.6.

During handover process, the HR-MS acting as RS maintains a list of subordinate HR-MSs which are served through an HR-MS acting as RS.

**[*Remedy2: Adopt the following change in Section 6.2.3.12 in IEEE P802.16.1a/D2.*]**

***[Page# 24, Line# 4]***

1. **—AAI-HO-CMD message field description**

| **Field** | **Size (bits)** | **Value/Description** | **Condition** |
| --- | --- | --- | --- |
| Mode | 2 | 0b00: HO command;0b01: Zone switch commandfrom MZone to LZone;0b10: AMS HO request rejected (ABS in list unavailable). In this case, AAI-HO-CMD message shall not include any T-ABS. However, if the requested ABSs in list available but MAC information is not shared, those ABSs may be included candidate T-ABS and serving ABS transfers MS information via backbone network or relay link in HR-Network~~0b11:~~ *~~Reserved~~*~~.~~0b11: HO command for HR-Network | N/A |
| If (Mode == 0b00 or 0b11) { |  |  |  |
| If(Mode == 0b11) { |  |  |  |
| Extended HO Mode | 2 | 0b00 : Alternative Path0b01 : FBIS Initiation0b10 : FBIS Termination~~0b11 : Reserved~~0b11 : HO command of HR-MS acting as RS |  |
| If (Extended HO Mode == 0b00 ) { |  |  |  |
| Role | 1 | 0b0: Stay as HR-MS;0b1: Change to HR-RS; |  |
| } else if (Extended HO Mode == 0b01) { |  |  |  |
| Primary Serving ABS | 1 | 0b0 : the AMS shall set its primary serving ABS as S-ABS (Degraded HR-BS) after network reentry0b1 : the AMS shall set its primary serving ABS as T-ABS (Target HR-BS) after network reentry |  |
| Switched Access Mode | 1 | 0 : Switched Access with fixed Switched Access Windows1 : Switched Access with variable Switched Access Windows |  |
| If(Switched Access Mode==0 ) { |  |  |  |
| Switched Access Window Size | 8 | The size of fixed Switched Access Window in unit of frame |  |
| } else if ( Switched Access Mode == 1) { |  |  |  |
| Maximum Switched Access Window Size | 8 | Maximum size of Switched Access Window in unit of frame |  |
| } |  |  |  |
| Switching Access Start Time offset | 8 | Difference between Switching Access Start time and Action time in units of frames. The value of Switching Access Start time shall be calculated by adding this value with the value of Action time specified for this T-ABS. |  |
| } else if (Extended HO Mode == 0b10) { |  |  |  |
| Termination Reason | 2 | 0b00 : Backbone recovery0b01 : No connection for FBIS0b10 : Link failures0b11 : reserved |  |
| ~~} // end of if (Extended HO Mode == 0b10)~~ |  |  |  |
| } else if(Extended HO Mode == 0b11) { |  |  |  |
| RS reconfiguration indicator | 1 | 0b0 : No change RS configuration0b1: Change RS configuration |  |
| } // end of if (Extended HO Mode == 0b11) |  |  |  |
| } // end of if (HO Mode == 0b11) |  |  |  |
|  |  |  |  |
| …… | … | …… | … |

**[*Remedy3: Adopt the following change in Section 6.2.3.65.1 in IEEE P802.16.1a/D2.*]**

***[Page# 52, Line# 6]***

**Table 106a – AAI-MM-ADV message field description**

| **Field** | **Size (bits)** | **Value/Description** | **Condition** |
| --- | --- | --- | --- |
| Action Type | 4 | Used to indicate the purpose of this message0b0000: Reconfiguration of HR-BS/RS including multimode ~~BS/RS~~ station0b0001: Restart of HR-BS/RS including multimode ~~BS/RS~~ station0b0010: Power down (including FA down) of HR-BS/RS including multimode ~~BS/RS~~ station0b0011: Power reduction of HR-BS/RS including multimode ~~BS/RS~~ station0b0100: Backhaul link down of HR-BS0b0101: Backhaul link up of HR-BS0b0110: FA change of HR-BS/RS including multimode ~~BS/RS~~ station0b0111: Multimode service end of HR-MS0b1000: Scanning operation for HR-MS acting as ~~relay~~ RS to maintain synchronization with the serving HR-BS0b1001: Neighbor cell scanning ~~0b1010 – 0b1111: reserved~~0b1010 : Handover of multimode station with access link reconfiguration0b1011 – 0b1111: reserved | Mandatory |
| If (Action Type == 0b0000) { |  |  | // reconfiguration |
| New IDcell | 10 | New IDcell that the ABS will use after the reconfiguration process. | Optional |
| Frame configuration index | 6 | New mapping between value of this index and frame configuration is listed in Table 149, Table 150, and Table 151. | Optional |
| Unavailable Start Time (UST) | 8 | Start of unavailable time in unit of frame | Mandatory |
| Unavailable Time Interval (UTI) | 8 | Interval of unavailable time in unit of superframe | Mandatory |
| ~~} else if (Action Type == 0b0001) {~~ |  |  | ~~// restart~~ |
| } else if (Action Type == 0b0001 || 0b1010) { |  |  | // restart |
| Unavailable Start Time (UST) | 8 | Start of unavailable time in unit of frame | Mandatory |
| Unavailable Time Interval (UTI) | 8 | Interval of unavailable time in unit of superframe | Mandatory |
| … | … | … | … |
|  |  |  |  |