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| Source(s) | Young-uk Chung, Yong-Hoon Choi, Woosin Lee, Hyukjoon Lee<br><br>KWU<br>447-1 Wolgye-Dong, Nowon-Gu<br>Seoul, 139-701, Korea<br><br>Junhong Hui, Yong Su Lee, Young-il Kim<br><br>ETRI<br>161, Gajeong-dong, Yuseong-Gu,<br>Daejeon, 305-350, Korea<br><br>Aik Chindapol, Jimmy Chui<br><br>Siemens<br>755 College Road East, Princeton, NJ, USA | Voice: +82-2-940-5476<br>Fax:   +82-2-915-3168<br>yuchung@kw.ac.kr<br>yhchoi@kw.ac.kr<br>wlee@kw.ac.kr<br>hlee@kw.ac.kr<br><br>junhonghui@etri.re.kr<br>L7856@etri.re.kr<br>yikim@etri.re.kr<br><br><br><br>Voice: +1 609 734 3364<br>aik.chindapol@siemens.com |
| Re: | This is a response to Call for Technical Proposals regarding IEEE Project P802.16j. |
| Abstract | This document proposes RS-initiated handover procedures and related messages in an IEEE 802.16j network. |
| Purpose | The document is submitted for review by 802.16 Working Group members. |
| Notice | |
| Release | |
| Patent Policy and Procedures | |

RS-Triggered Handover Procedure

*Young-uk Chung, Yong-Hoon Choi, Woosin Lee, Hyukjoon Lee, Junhong Hui\*, Yong Su Lee\*, Young-il Kim\*, Aik Chindapol\*\* and Jimmy Chui\*\**

*KWU, ETRI\*, Siemens\*\**

# 1 Introduction

This contribution covers the issues related to MAC layer handover procedure defined in Table of Contents of Task Group Working Document [1]. In this proposal, we present RS-initiated handover procedure and related MAC management messages.

## 1.1 Problem Statements

IEEE 802.16e defined that both MS and BS are able to initiate handover. With introducing relay station (RS), an additional handover procedure which we call RS-triggered HO need to be defined. The RS-triggered HO is useful when an RS want to reassign one or some of connected MS's to another RS or MR-BS. This situation can happen when status of the RS is changed: for example, the link quality between the MR-BS and the RS changes according to movement of the RS, or the RS want to end its service. Therefore, new handover triggering messages and procedure (between MR-BS/RS and RS/MS) need to be defined to support RS-triggered HO in the MMR network.

## 1.2 Assumptions

In this proposal, we assume the followings:

1. We follow all the handover procedures in 802.16e for backward compatibility.
2. MR-BS maintains link quality information for RS's and MS's directly connected to it. The link quality information is used for intra-cell handover decision. To obtain the information, network topology acquisition scheme can be employed.
3. RS maintains address information for MS's directly connected to it. The address information contains MAC address, SFID, CID and so on.
4. MDHO/FBSS handover triggering for MBS are not covered in this proposal.

# 2 Handover Procedure

In an MMR network, an RS needs to trigger HO for some reason such as RS service end, load balancing, resource management and so on. For RS-triggered HO, we define three messages: MOB_RSHO-REQ MOB_RSHO-RSP and MOB_BSHO-IND. MOB_RSHO-REQ contains information such as a list of MS to be handovered and a reason of triggering. MOB_RSHO-RSP contains information about acceptance/rejection of the handover request. Figure 1 shows a general handover procedure triggered by an RS. The general RS-triggered handover procedure is described as follows:

1. An RS shall transmit MOB_RSHO-REQ to an MR-BS so that it triggers handover of specific MS subsets or all MS's connected to it. MOB_RSHO-REQ contains ID's of MS subset.

2. Upon receiving MOB_RSHO-REQ, the MR-BS decides whether it accepts the request or not. If the request is accepted, MR-BS transmits MOB_RSHO-RSP and starts handover process for the requested MS's through the RS.

3. If MR-BS rejects the request, MR-BS transmits MOB_RSHO-RSP to the RS. Then, the RS modifies MOB_RSHO-REQ messages according to MOB_RSHO-RSP, and retransmits the modified MOB_RSHO-REQ to the MR-BS.

4. After handover procedure between the MR-BS and all MS's of interest is completed, MR-BS informs the RS that handover is completed by transmitting MOB_BSHO-IND.

Figure 1 RS-triggered handover procedure.
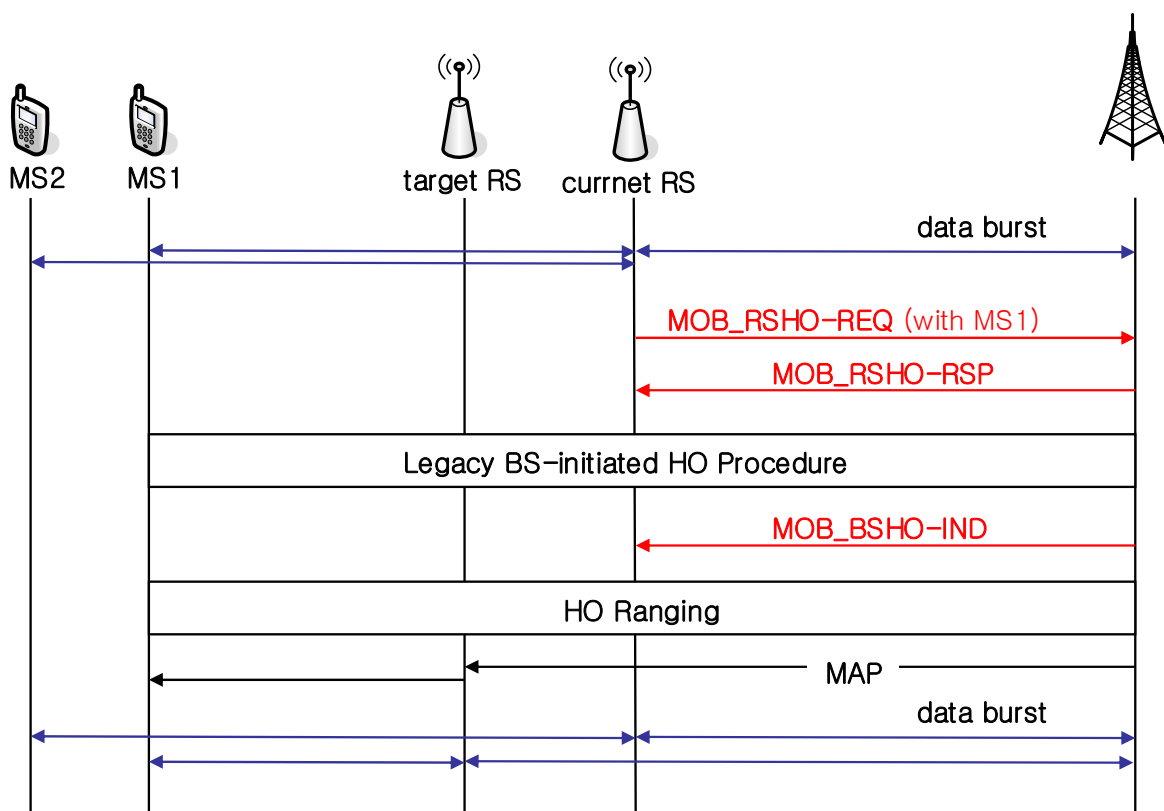
## 3. Text Proposals

[*Insert the following at the end of subclause 6.3.22.2.2*]

In an MMR network, an RS can trigger MS handover to take care of its movement or service end, to support resource management, and to guarantee QoS. An RS requests handover by transmitting MOB_RSHO-REQ which includes handover mode, request reason and IDs of MS of interest. Upon receiving MOB_RSHO-

REQ, the MR-BS responses with MOB_RSHO-RSP. After handover completion, the MR-BS transmits MOB_BSHO-IND to the RS.

[*Insert the following text after 6.3.2.3.XX*]

## 6.3.2.3.XX MOB_RSHO-REQ

An RS shall transmit MOB_RSHO-REQ message to MR-BS for triggering handover of specific MS subset. After receiving this message, the MR-BS determines whether to accept the request and responds to the RS with MOB_RSHO-RSP message. The message shall be transmitted on the basic CID.

Table XX−MOB_RSHO−REQ message format

| Syntax | Size (bits) | Notes |
|---|---|---|
| MOB-RSHO-REQ_Message_Format() { | | |
|   Management Message Type=XX | XX | |
|   REQ_Type | 3 | This parameter indicates that 00: RS ends service 01: MR-BS/RS link quality is low 02: Resource management is required 03: QoS of MS's will not be guaranteed 04~07: Reserved |
|   If(REQ_Type != 0x00){ | | |
|     MS_Number | XX | Number of requested MS |
|     For(i=0; i<MS_Number; i++) { | | |
|       Mobile Station ID | 48 | |
|       } | | |
|     } | | |
|   TLV Encoding Information | variable | optional |
| } | | |

An RS shall generate MOB_RSHO-REQ messages in the format shown in Table XX. The following parameters shall be included in the MOB_RSHO-REQ message:

    **REQ_Type**

        Indicates the purpose of this handover request

00: RS ends service

01: MR-BS/RS link quality is low

02: Resource management is required

03: QoS of MS will not be guaranteed

04~07: Reserved

For REQ_Type is not 00, the following parameters shall be included:

**MS_Number**

Indicate the number of MS's that handover are requested

**Mobile Station ID**

Indicate the ID of MS

## 6.3.2.3.XX MOB_RSHO-RSP

The BS shall transmit an MOB_RSHO-RSP message upon reception of MOB_RSHO-REQ message. The message shall be transmitted on the basic CID.

Table XX–MOB_RSHO–RSP message format

| Syntax | Size (bits) | Notes |
|---|---|---|
| **MOB_RSHO-RSP_Message_Format() {** | | |
| **Management Message Type=XX** | **XX** | |
| **RSP_Type** | **2** | **This parameter indicates that** **00: RS request is accepted** **01: RS request is partially rejected** **02: RS request is rejected** **03: Reserved** |
| **If(RSP_Type == 01){** | | |
| **MS_Number** | **XX** | **Number of rejected MS's** |
| **For(i=0; i<MS_Number; i++) {** | | |
| **Mobile Station ID** | **48** | |
| **}** | | |
| **}** | | |
| **TLV Encoding Information** | **variable** | **optional** |
| **}** | | |

An MR-BS shall generate MOB_RSHO-RSP messages in the format shown in Table XX. The following parameters shall be included in the MOB_RSHO-RSP message:

**RSP_Type**
Indicates the type of this response
00: RS request is accepted
01: RS request is partially rejected
02: RS request is rejected
03: Reserved

For RSP_Type is 01, the following parameters shall be included:

**MS_Number**
Indicate the number of rejected MS's
**Mobile Station ID**
Indicate the ID of MS

## 6.3.2.3.XX MOB_BSHO-IND

An MR-BS shall transmit an MOB_BSHO-IND message, after RS-triggered handover is completed. The message shall be transmitted on the basic CID.

Table XX–MOB_BSHO-IND message format

| Syntax | Size (bits) | Notes |
|---|---|---|
| **MOB_BSHO-IND_Message_Format() {** | | |
| **Management Message Type=XX** | **XX** | |
| **MS_Number** | **XX** | **Number of indicating MS** |
| **For(i=0; i<MS_Number; i++) {** | | |
| **Mobile Station ID** | **48** | |
| **HO_Result** | **1** | **This parameter indicates that**<br>**0: HO failure**<br>**1: HO success** |
| **}** | | |
| **}** | | |
| **TLV Encoding Information** | **variable** | **optional** |
| **}** | | |

An MR-BS shall generate MOB_BSHO-IND messages in the format shown in Table XX. The following parameters shall be included in the MOB_BSHO-IND message:

**MS_Number**
>   Indicate the number of handovered MS's

**Mobile Station ID**
>   Indicate the ID of MS

**HO_Result**
>   Indicates whether each MS is successfully handovered or not
>>      0: HO failure
>>      1: HO success

# 4. Reference

[1] IEEE 802.16j-06/017r2, "Table of Contents of Task Group Working Document"