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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.	
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## RS-Triggered Handover Procedure

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## 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 handed over 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.

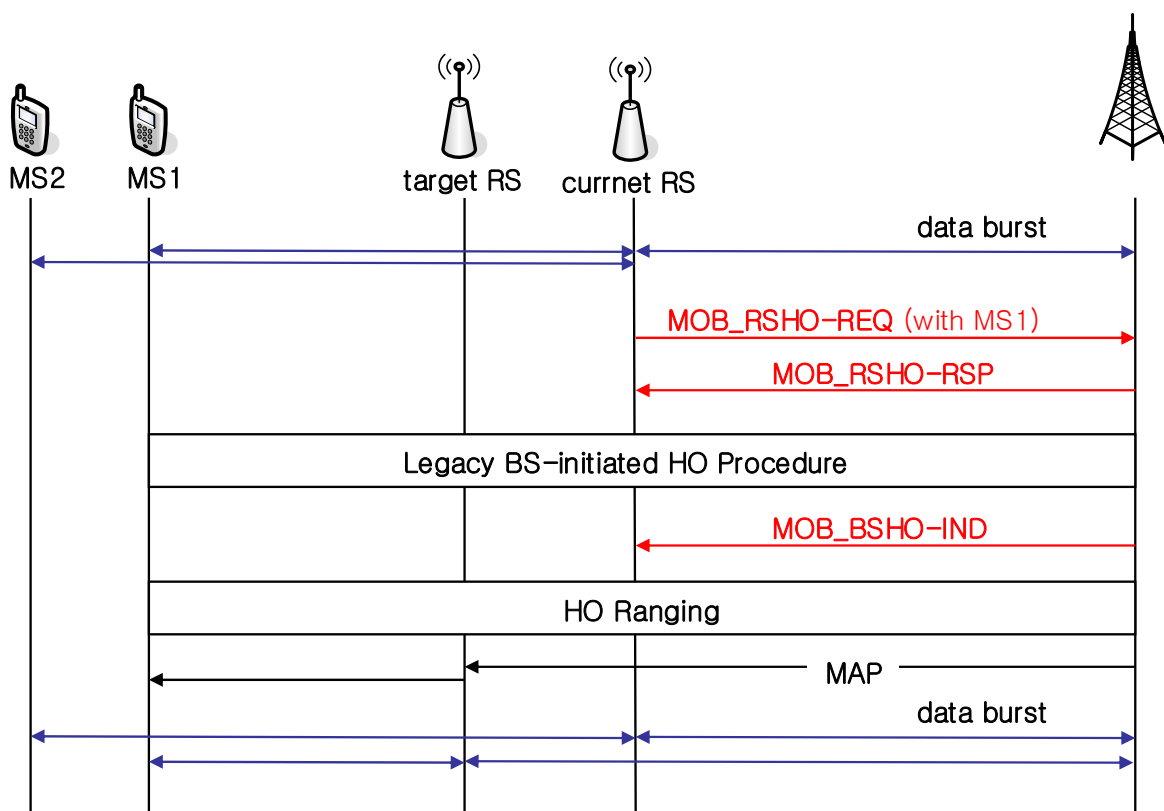


Figure 1 RS-triggered handover procedure.

### 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

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

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

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

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

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

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"