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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 for an RS which can support handover initiation, but cannot support handover process and decision in an IEEE 802.16j network.	
Purpose	The document is submitted for review by 802.16 Working Group members.	
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## RS-initiated Handover Procedure for Handover-unmanageable RS

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### 1 Introduction

This contribution covers the issues related to MAC layer handover procedures defined in Table of Contents of Task Group Working Document [1]. In this proposal, we describe the needs for RS-initiated handover. We also present RS-initiated handover procedures and related messages for an RS which can support handover initiation, but cannot support handover process and decision.

#### 1.1 RS Types

In an MMR network, an RS has various features according to its target service and vendor requirements. Handover procedure and related messages depend on the capability of an RS. In this proposal, we assume that an RS supports synchronous broadcast frame structure. When it receives a broadcast frame from MR-BS, it re-broadcasts the frame to MS's using the same preamble. According to the capability of handover initiation and decision, we also divide an RS into two types as follows:

- **Handover-unmanageable RS:** The handover-unmanageable RS indicates the RS, which can initiate handover but cannot support handover process and decision. This type of RS just relays handover messages between MS and MR-BS.
- **Handover-manageable RS:** The handover-manageable RS indicates the RS, which can initiate, process, and decide handover. This type of RS can issue MOB\_BSHO-REQ message to start handover and manage handover request from MS's.

In this proposal, we discuss RS-initiated handover procedure for handover-unmanageable RS.

#### 1.2 Problem Statements

IEEE 802.16e defined that both MS and BS initiate handover. In an MMR network, it is required that an RS also be able to initiate handover because of several special cases. Service end event of RS is one of the cases. When service end event of an RS is occurred, all MS's connected to the RS should be handed over to another RS or MR-BS. So, the RS should trigger MS handover. Another situation is that an RS reassigns some of connected MS's to another RS or MR-BS due to the change of link quality between the MR-BS and the RS, or the results of resource and QoS managements. In this situation, the RS should trigger handover of a specific MS subset.

In 802.16e legacy handover procedure, a BS triggers MS handover using MOB\_BSHO-REQ message. But in the MMR network which consists of handover-unmanageable RS, an RS should request handover triggering to an MR-BS when MS handover is needed. To support this RS-initiated handover, handover messages and procedure (between MR-BS/RS and RS/MS) should be defined. The handover message and procedure should cover specific MS subset

### 1.3 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 and RS-initiated handover for MBS are not covered in this proposal.

## 2 RS-initiated Handover Procedure

In an MMR network which consists of handover-unmanageable/synchronous RS, an MR-BS can change current access RS of an MS implicitly using ranging process between the MR-BS and the MS. Therefore, the RS shall request handover initiation to the MR-BS, when it wants to trigger MS handover. For this RS-initiated handover, we define two messages: MOB\_RSHO-REQ and MOB\_RSHO-RSP. MOB\_RSHO-REQ contains information such as a list of MS triggered handover by the RS and a reason of triggering. MOB\_RSHO-RSP contains information about acceptance/rejection of the handover request. Figure 1 shows an example of RS-initiated handover procedure for service end event of handover-unmanageable/synchronous RS. The general RS-initiated handover procedure for handover-unmanageable/synchronous RS is described as follows:

1. An RS shall transmit MOB\_RSHO-REQ to an MR-BS so that it initiates handover of specific MS subsets. 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 MOB\_BSHO-REQ to the RS. MOB\_BSHO-REQ is relayed to each MS of interest. And the MR-BS starts handover procedure with MS's of interest 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 transmits MOB\_BSHO-IND to the RS. Upon receiving MOB\_BSHO-IND, the RS performs service end process or deletes the information of the specific MS subset according to the purpose of handover initiation.

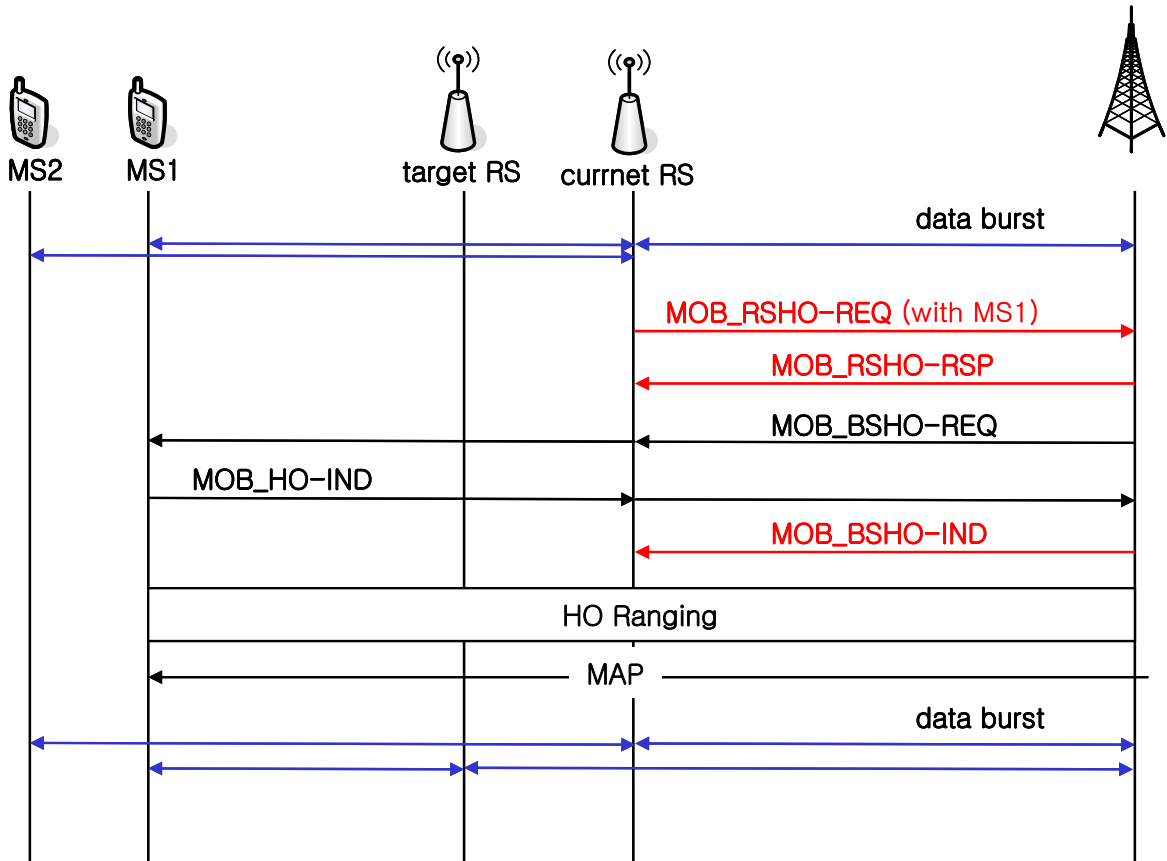


Figure 1 Example of RS-initiated handover procedure with handover-unmanageable RS

### 3. Text Proposals

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

In an MMR network, RS can initiate MS handover for service end event, resource management, and QoS guarantee. This RS-initiated handover is performed by interactions between an MR-BS and an RS using MOB\_RSHO-REQ and MOB\_RSHO-RSP messages. 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 using MOB\_RSHO-RSP. The RS-initiated handover has different procedures according to the RS handover capabilities. If an RS can support handover initiation, but cannot support handover process and decision, the RS just requests handover initiation to an MR-BS and the MR-BS performs handover process and decision. After handover completion of all MS that are requested by the RS, the MR-BS transmits MOB\_BSHO-IND.

*[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 initiating 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>RS_Mode</u>	<u>1</u>	<u>This parameter indicates that</u> <u>0: RS can not support</u> <u>handover process and decision</u> <u>1: RS can support handover</u> <u>process and decision</u>
<u>If(RS_Mode != 0x01){</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

**RS Mode**

Indicate the capability of RS

- 0: RS can not support handover process and decision
- 1: RS can support handover process and decision

For RS Mode is not 01, the following parameters shall be included:

**MS Number**

Indicate the number of MS that handover is requested

**Mobile Station ID**

Indicate the ID of mobile station

**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>
<u>MOB_RSHO-RSP Message Format() {</u>		
<u>Management Message Type=XX</u>	<u>XX</u>	
<u>RSP Type</u>	<u>2</u>	<u>This parameter indicates that</u> <u>00: RS request is accepted</u> <u>01: RS request is rejected</u> <u>partially</u> <u>02: RS request is rejected</u> <u>generally</u> <u>03: Reserved</u>
<u>If(RSP Type == 01){</u>		
<u>MS Number</u>	<u>XX</u>	<u>Number of rejected MS</u>
<u>For(i=0; i&lt;MS Number; i++) {</u>		
<u>Mobile Station ID</u>	<u>48</u>	
<u>}</u>		

}		
<b><u>TLV Encoding Information</u></b>	<b><u>variable</u></b>	<b><u>optional</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 which type is for this response

- 00: RS request is accepted
- 01: RS request is rejected partially
- 02: RS request is rejected generally
- 03: Reserved

For RSP Type is 01, the following parameters shall be included:

**MS Number**

Indicate the number of rejected MS

**Mobile Station ID**

Indicate the ID of mobile station

**6.3.2.3.XX MOB\_BSHO-IND**

An MR-BS shall transmit an MOB\_BSHO-IND message, upon reception of MOB\_HO-IND messages of all MS that are requested by RS. 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>
<b><u>MOB_BSHO-IND Message Format() {</u></b>		
<b><u>Management Message Type=XX</u></b>	<b><u>XX</u></b>	
<b><u>MS Number</u></b>	<b><u>XX</u></b>	<b><u>Number of indicating MS</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>HO_CPL_Indication</u></b>	<b><u>1</u></b>	<b><u>This parameter indicates that</u></b> <b><u>0: HO failure</u></b> <b><u>1: HO success</u></b>
}		
}		

<u>TLV Encoding Information</u>	<u>variable</u>	<u>optional</u>
1		

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 indicating MS

**Mobile Station ID**

Indicate the ID of mobile station

**HO CPL Indication**

Indicates whether MS handover is successful or not

0: HO failure

1: HO success

## 4. Reference

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