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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), additional handover procedures need to be defined. For example, nomadic RS is useful for extending service area temporarily (e.g., conference, campaign, etc.). After the temporary event, nomadic RS may disappear. Before it disappears, all MS's connected to the RS should be handed over to another RS or MR-BS. For that purpose, an RS needs to trigger HO procedure. RS-initiate HO can be useful for some other cases. 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. In this situation, the RS should trigger handover of a specific MS subset.

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 and 2 show handover procedures triggered by an RS: Figure 1 shows a general handover procedure and Figure 2 shows an example of a nomadic RS's service end. 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.

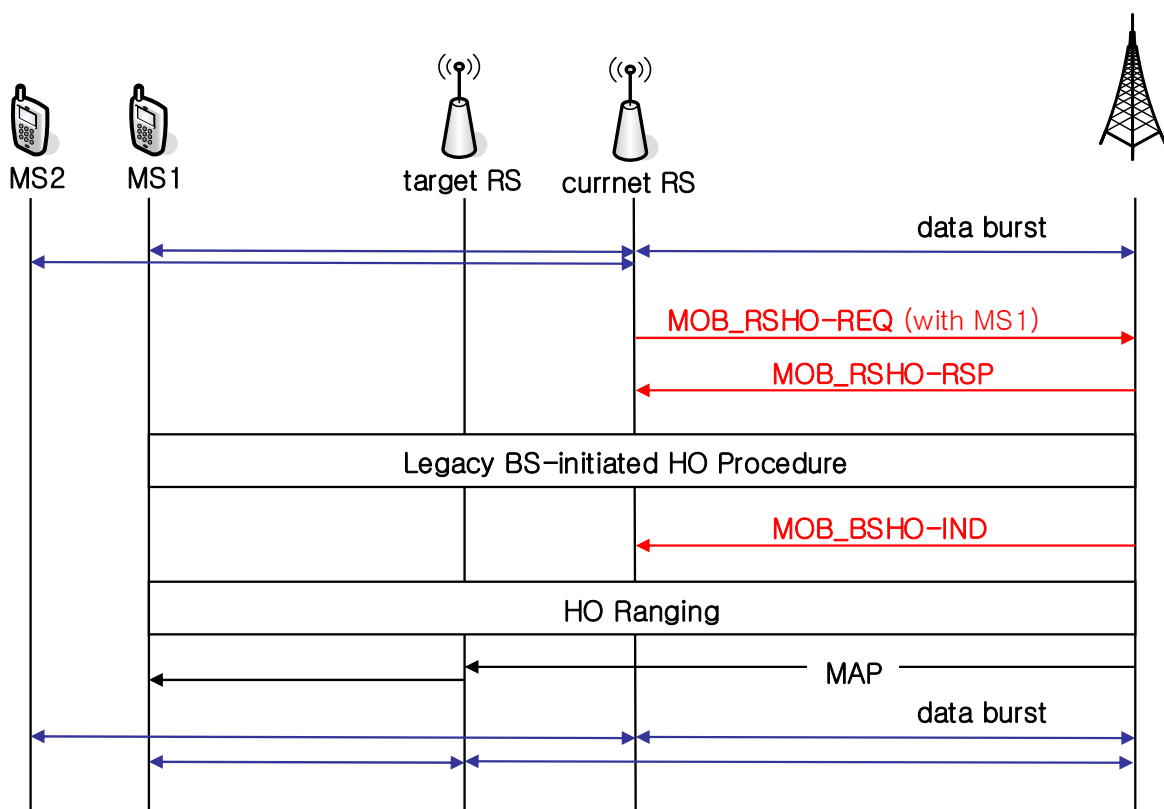


Figure 1 RS-triggered handover procedure.

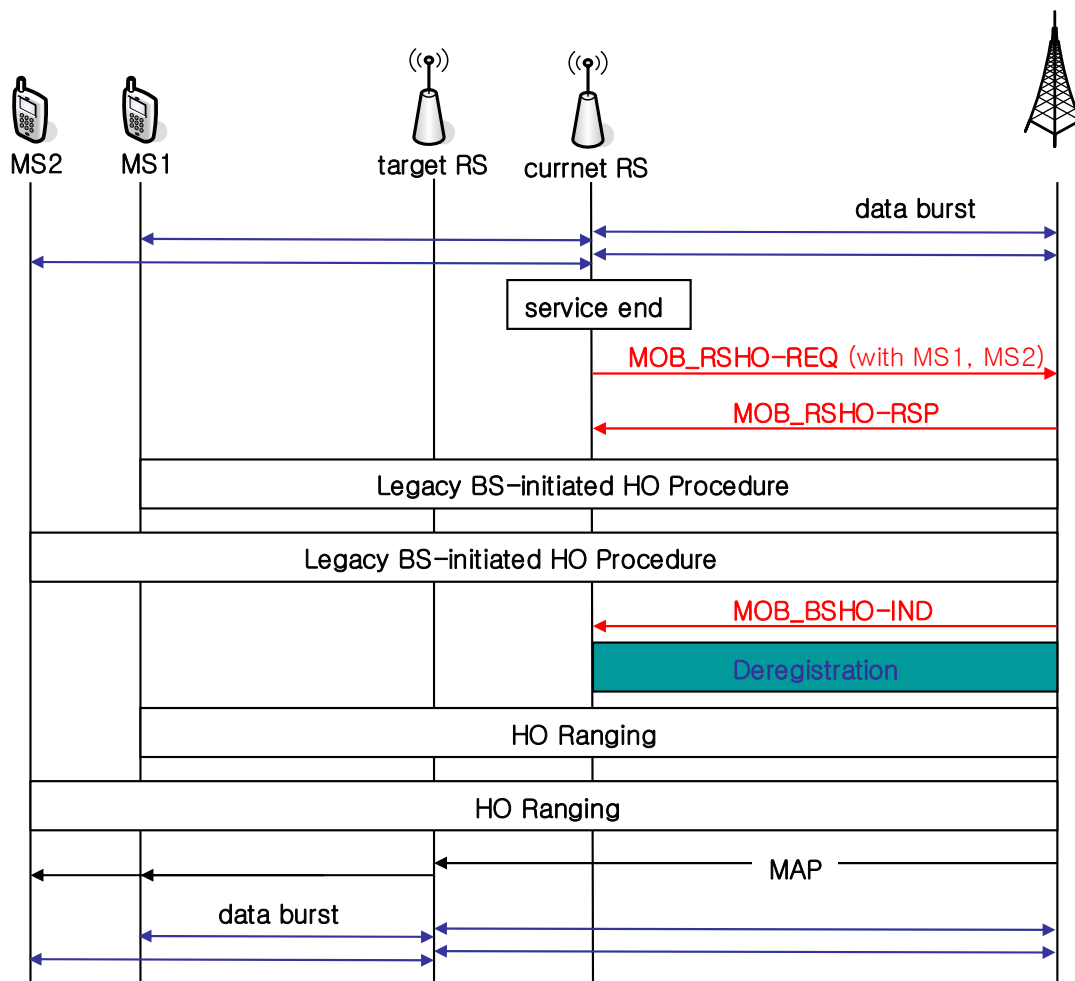


Figure 2 An example of RS-triggered handover procedure (service end case).

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 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<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>
<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 partially</u> <u>rejected</u> <u>02: RS request is rejected</u> <u>03: Reserved</u>
<u>If(RSP Type == 01){</u>		
<u>MS Number</u>	<u>XX</u>	<u>Number of rejected MS's</u>
<u>For(i=0; i<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 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<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 handed over or not

0: HO failure

1: HO success

4. Reference

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