Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Seamless Mac Handover**
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Re:	IEEE P802.16e/D5-2004
Abstract	To prevent the loss of the PDUs at the serving BS during MAC hand-over.
Purpose	Discuss and adopt the suggestion into P802.16e/D6.
Notice	
Release	
Patent Policy and Procedures	

Seamless Mac Handover

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1. Introduction

According to 802.16e, the serving BS will discard MAC PDUs associated with the MSS if one of two conditions is met: when the serving BS receives a MOB_HO-IND MAC management message with the HO_IND_type value indicating serving BS release with expiration of the resource retain timer, and when it receives backbone message from the Target BS indicating MSS Network Attachment at Target BS. However to achieve Seamless Mac handover for the strict requirement of QoS, any PDUs should not be dropped explicitly. Currently, in IEEE802.16e/D6, there is not any description of how to redirect (forward) these PDUs to the target BS so as to prohibit the loss. In this contribution, thus, we propose to make it clear when and how to forward the PDUs to the target BS.

2. Proposed Enhancements

When the serving BS receives MOB_HO-IND MAC management message from the MSS and backbone message from the target BS indicating MSS Network Attachment at Target BS, it already knows the final target BS to which the PDUs associated with the MSS should go through backbone network. Therefore, it is possible for the serving BS to forward the PDUs instead of discarding them.

Then, the proposed mechanism is as follows: whenever the serving BS is certain that the MSS is handover to the final target BS for the MSS by receiving MOB_HO-IND MAC, it tunnels these PDUs to the target BS. For this operation, IP tunneling mechanisms, such as generic routing encapsulation (GRE) [2], can be used at each BS, due to its simplicity.

This seamless MAC HO must not be always applied. It can be optionally chosen to work according to the quality of service by either the MSS or serving BS. Thus, when the MSS decides the seamless MAC HO, then it must indicate within MAC management messages such as MOB_MSSHO-REQ and MOB_MSSHO-RSP. Here are some example operations below.

Even though this operation is enabled, other operations are the same.

MSS	BS #1 (serving)	BS #2 (target)	BS #3 (target)	BS #4 (target)

Trigger to release MSS

HO-pre-notification →

HO-pre-notification →

HO-pre-notification →

← HO-pre-notification-response

← HO-pre-notification-response

← HO-pre-notification-response

← MOB_BSHO-REQ

Neighbors Scanning

MOB_MSSHO-RSP
(Seamless HO = 1) →

HO-notification-confirm →

← MOB_BSHO-RSP

MOB_HO-Indication →

Tunneling PDUs associated the MSS to the target MSS via backbone network

Release of MSS

← Fast Ranging_IE(UL_MAP)

RNG_REQ →

← RNG_RSP

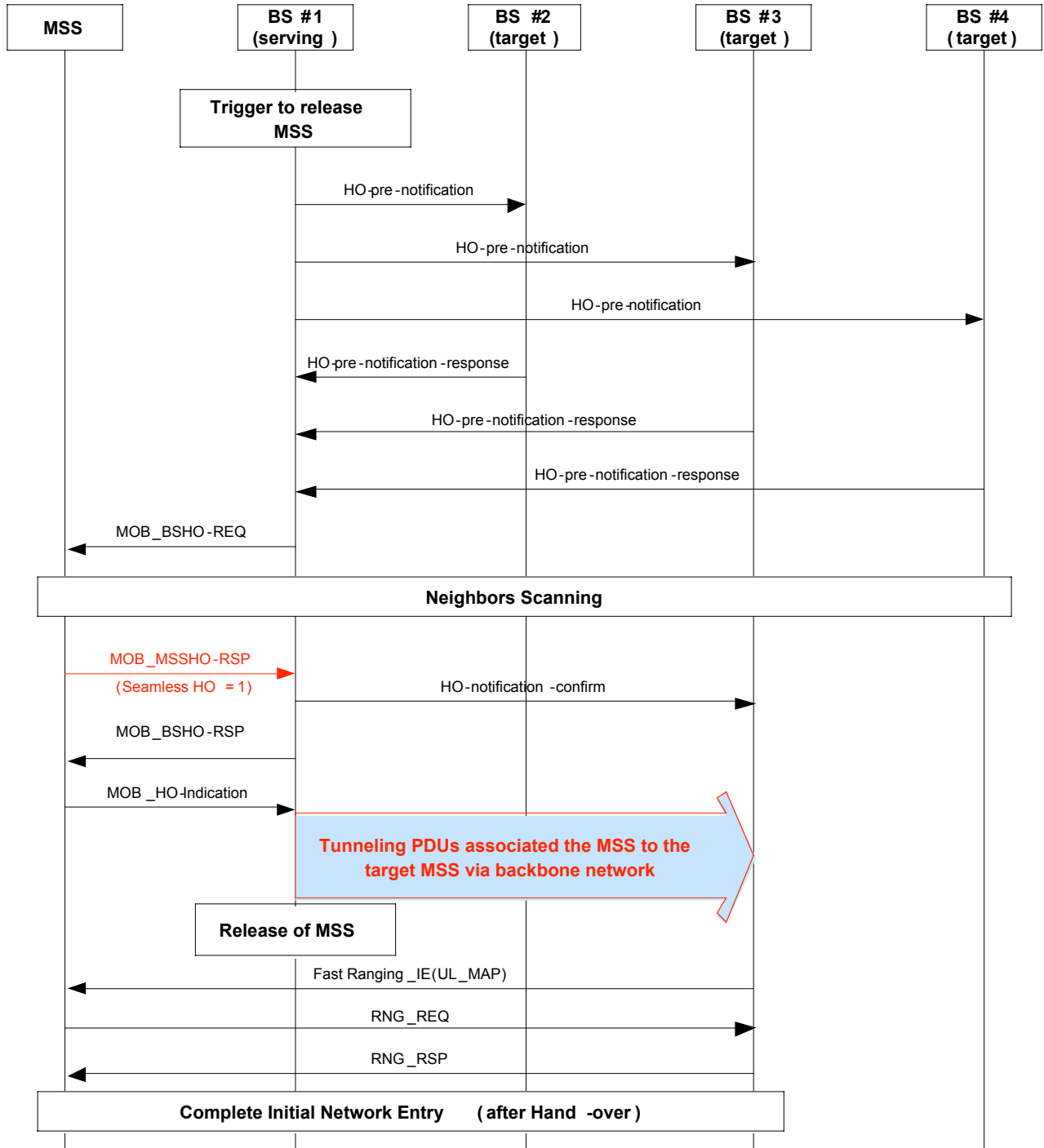**Complete Initial Network Entry   (after Hand-over)**

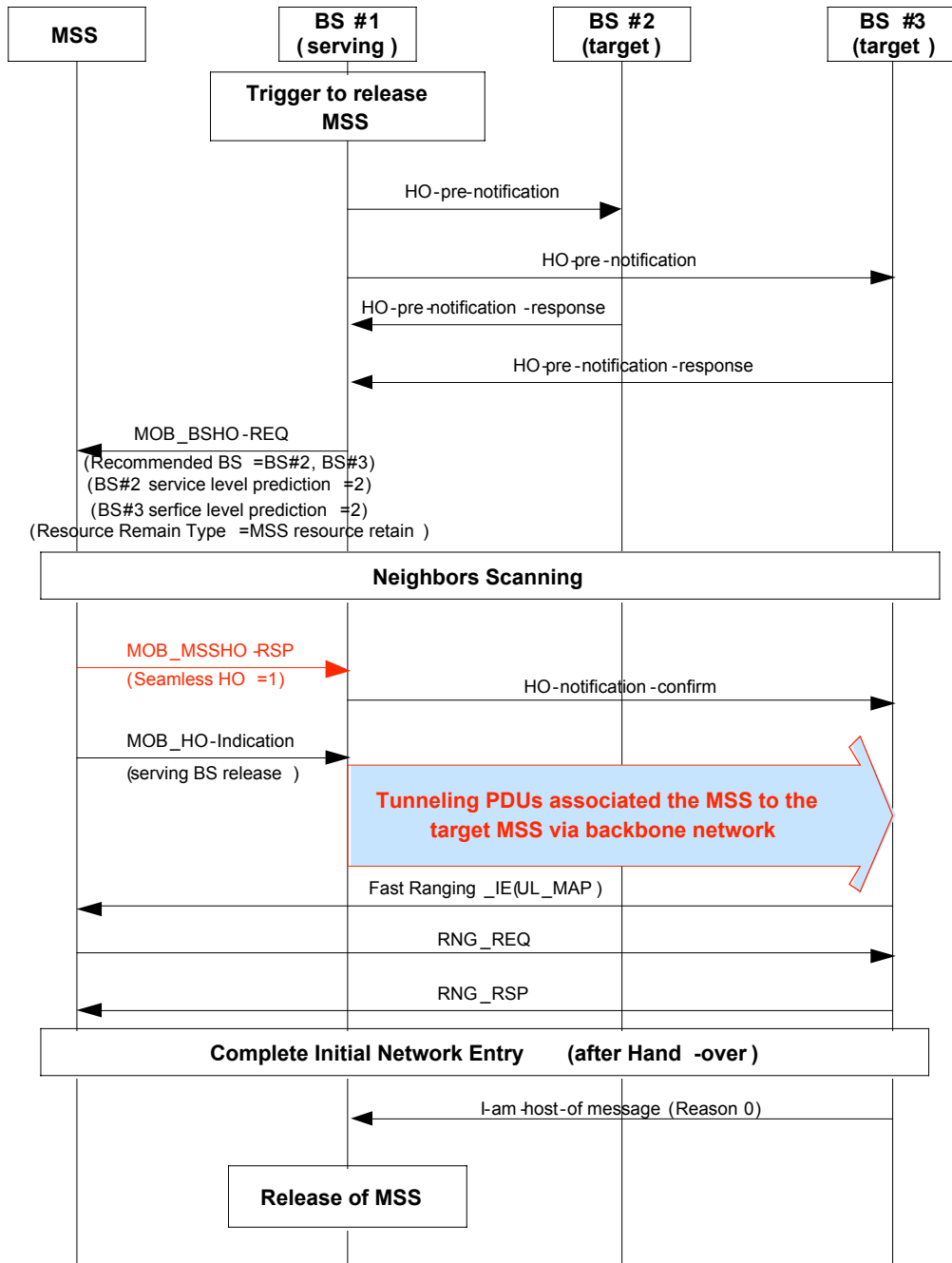**Fig. 1 Example Seamless MAC HO process by BS request**

Fig. 2 Example Seamless MAC HO process with MSSs Resource Retain by BS Request

3. Proposed Changes

[*Modify the table 106k by inserting one parameter after line 56 on Page 78*]

Syntax	Size	Notes
MOB-MSSHO-REQ_Message_Format() {		
…	…	…
HMAC Tuple	21 bytes	See 11.1.2
Seamless HO	1 bit	Indicates if the serving BS can discard PDUs associated with the MSS or not.
}		

[*Insert the following text after line 14 on page 79*]
   Seamless HO
        It indicates whether the serving BS can tunnel the PUDs, assocated with the MSS which is about to handover to the target BS, toward the target BS. When it is set 1, it means that it will support Seamless MAC HO.

[*Insert the following text after line 46 on page 119*]
When Seamless HO is set to work, the serving BS must forward all PDUs associated with the MSS to the target BS using IP tunneling mechanism through backbone network.

[*In Page 119, line 38, change the context as below*]
After the hand-over request/response handshake has completed, the MSS may begin the actual HO. At some stage during the HO process, the MSS terminates service with the serving BS. This is accomplished by sending a MOB_HO-IND MAC Management message with the HO_IND_type value indicating serving BS release. In case the serving BS has received the MOB-MSSHO-REQ MAC management message with Seamless HO set before, it should forward the PDUs associated with the MSS to the target BS. For this operation, IP tunneling mechanisms, such as generic routing encapsulation (GRE), can be used at each BS, due to its simplicity.

If the HO_IND_type field specifies Serving BS release, the BS shall start the Resource retain timer. If the resource retain type value is set to zero and the MOB-MSS-REQ MAC management message with Seamless HO set has been received before, the Serving BS shall close all connections and discard MAC state machines and MAC PDUs associated with the MSS immediately, otherwise the Serving BS shall retain the connections, MAC state machine and PDU associated with the MSS for service continuation until the expiration of Resource retain timer.

Reference

[1] IEEE P802.16e/D5, September 2004 "Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems,"
[2] D. Fariancci, T. Li, S. Hanks, D. Meyer, and P. Traina, "Generic Routing Encapsulation (GRE)," RFC2784, Mar. 2000.