Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Resource retaining time and Call recovery scheme during HO — HO Ad-Hoc Consensus Contribution**
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Re:	This contribution is for call for contribution IEEEP802.16e/D3-2004
Abstract	This contribution proposes the resource retaining time and call recovery scheme during HO. It is a result of harmonization with consensus in HO Ad Hoc of IEEE802.16e.
Purpose	Propose the enhanced call recovery scheme during HO
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Resource retaining time and Call recovery scheme during HO

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I. Introduction

At current specification, when an MSS starts actual handover process, it sends an MOB_HO-IND with HO_IND_type="00". And when a serving BS receives an MOB-HO-IND message, the serving BS may release resource or retain it in order to transfer to a target BS when it is requested in future. At the case of resource retaining, handover delay may be shortened using backbone message exchange. But resource release case may occur according to the status of resource management of serving BS and traffic type.

Furthermore, if the Serving BS retains the connection information of an MSS that has moved to Target BS and the MSS knows about that, the MSS can perform quick call recovery procedures with the Serving BS using the remaining connection information under the irregular situation during handover. (e.g. drop situation, ping-pong situation, etc.)

But because of resource management problem, serving BS cannot retain the connection information of each MSS forever. Therefore it should be allowed that the Serving BS notify to the MSS whether the Serving BS will discard the MSS's connection information or retain the information for a certain time after receiving MOB-HO-IND(HO_IND_type=00) from the MSS. And we propose the correct sentences describing BS's and MSS's actions for the serving BS to release MSS information after reception of backbone message, because the Serving BS doesn't know whether handover is completed successfully or not due to lack of feedback message from Target BS. To solve this problem, we modify the backbone message in order to inform Serving BS of the result of handover at Target BS.

II. Proposed Text Changes

We propose the following remedies in IEEE P802.16e/D3 to provide the handover enhancement method related with the resource retain timer and call recovery mechnism

[Insert or correct sentences of 6.3.20. as follows]

6.3.20.2.5 Termination with the Serving BS

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.

If the HO_IND_type field specifies Serving BS release, the BS shall start the Resource retain timer. If the timer value is set to zero, 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.. Regardless of Resource retain timer, the Serving BS shall close all connections and discard MAC state machine and MAC PDUs associated with the MSS upon reception of a backbone message from the Target BS indicating MSS Network Attachment at Target BS.

If the Serving BS determines to retain the connection information of an MSS which has sent MOB-HO-IND with HO_IND_type=00 and begun the actual HO, this connection information may be used by the MSS in order to perform an expedited re-entry operation with Target BS or the Serving BS.

The Serving BS shall notify the MSS of retention of MSS connection information through Resource Remain Type in MOB-BSHO-RSP message or MOB-BSHO-REQ message during handover request/response handshake operation. If Resource Remain Type=1 and Resource Retain Time is not included as a TLV item in the message, then the Serving BS and MSS shall use the System Resource Retain Time timer.

6.3.20.2.3 HO cancellation

After an MSS or BS has initiated an HO using MOB_MSSHO/BSHO_REQ, the MSS may cancel HO at any time. The cancellation shall be made through transmission of a MOB-HO-IND with the HO cancel option (HO_IND_type=01).

When MSS transmits and Serving BS receives MOB-HO-IND with the HO cancel option (HO_IND_type=01) during Resource Retain Time (when Resource Retain Type=1), regardless of MSS attempt at HO, the MSS and Serving BS shall resume Normal Operation communication.

6.3.20.3 Drops during HO

A drop is defined as the situation where an MSS has stopped communication with its Serving BS (either in the downlink, or in the uplink) before the normal HO sequence outlined in Cell Selection and Termination with the Serving BS has been completed.

An MSS can detect a drop by its failure to demodulate the downlink, or by exceeding the RNG-REQ retries limit allowed for the periodic ranging mechanism. A BS can detect a drop be exceeding the Number of retries on inviting Ranging Requests limit allowed for the periodic ranging mechanism.

When the MSS has detected a drop, it shall resume communication with the Serving BS by sending MOB-HO-IND message with HO_IND type = 01 (HO cancel). If resuming communication fails with the Serving BS then the MSS shall attempt network re-entry with its preferred Target BS as outlined in Section 6.3.20.4. When the Serving BS has detected a drop, it shall react as if a MOB-HO-IND MAC Management message has been received with HO_IND_type indicating Serving BS release.

6.3.20.4 Network entry/re-entry

[Add the following after line 47 page 52]

When the Target BS has detected a failed HO entry/re-entry attempt, it may inform the Serving BS of HO failure through a backbone message indicating Handover Failure.

[Add the following paragraph after Line 17 on Page 108]

11.87.*10.3 HO Support

11.87.*10.13.1 System Resource_Retain_Time

The Resource_Retain_Time is the duration for MSS's connection information that will be retained in Serving BS. BS shall start Resource_Retain_Time timer at MSS notification of pending HO attempt through MOB_HO-IND or by detecting an MSS drop. ‑The unit of this value is 100msec.

Type	Length	Value	Scope
X	1	multiple of 100msec. 200msec is recommended as default	SBCREG-RSP

[Change the table 92h in page 25]

Table 92h – MOB-BSHO-REQ Message Format

Syntax	Size	Notes
MOB-BSHO-REQ_Message_Format(){		
Management Message Type = 52	8bits	
Network Assisted HO supported	1bit	Indicates that the BS supports Network Assisted HO
For(j=0;j<N_Recommended;j++){		N_Recommended can be derived from the known length of the message
Neighbor BS-ID	48bits	
Service level prediction	8bits	
}		
Resource Remain Type	81bits	0 : MSS resource release 1: MSS resource retain 2~255 : reserved
reserved	67 bits	
TLV encoded information	Variable	TLV Specific
}		

[Add the following parameter descriptions in line 21 page 26]

Resource Remain Type

This flag indicates whether the Serving BS will retain or delete the connection information of the MSS upon receiving MOB_HO-IND with HO_IND_type=00. If the flag is set to 1, the Serving BS will retain the MSS's connection information during the time in Resource Retain Time field. If Resource Remain Type=1 and Resource Retain Time is not included as a TLV item in the message, then the Serving BS and MSS shall use the System Resource Retain Time timer. If the flag is set to 0, the Serving BS will discard the MSS's connection information.

The MOB-BSHO-REQ may contain the following TLVs :

Resource Retain Time(11.15.1)

[Change the table 92j in page 27]

Table 92j – MOB-BSHO-RSP Message Format

Syntax	Size	Notes
MOB-BSHO-RSP_Message_Format(){		
Management Message Type = 54	8bits	
Estimated HO Start	8bits	
For(j=0;j<N_Recommended;j++){		Neighbor base stations shall be presented in an order such that the first presented is the one most recommended and the last presented is the lease recommended. N_Recommended can be derived from the known length of the message
Neighbor BS-ID	48bits	
Service level prediction	8bits	
}		
Resource Remain Type	~~8~~1bits	0 : MSS resource release 1: MSS resource retain
reserved	7 bits	
TLV encoded information	Variable	TLV Specific
}		

[Add the followings after parameter description of "Estimated HO start" in page 28]

Resource Remain Type

This flag indicates whether the Serving BS will retain or delete the connection information of the MSS upon receiving MOB_HO-IND with HO_IND_type=00. If the flag is set to 1, the Serving BS will retain the MSS's connection information during the time in Resource Retain Time field. If Resource Remain Type=1 and Resource Retain Time is not included as a TLV item in the message, then the Serving BS and MSS shall use the System Resource Retain Time timer. If the flag is set to 0, the Serving BS will discard the MSS's connection information.

The MOB-BSHO-REQ may contain the following TLVs :

Resource Retain Time(11.15.1)

[Add the following parameter descriptions after line 60 page 113]

11.145 Handover management encodings

11.145.1 Resource_Retain_Time

The Resource_Retain_Time is Time duration for MSS's connection information that will be retained in Serving BS. This value is measured in 100msecs. If this value is set to 0, the Serving BS will retain the MSS's connection information during Resource Retain Time negotiated at early registration stage.

If this value is set to non-zero, it is the proposed Resource Retain Time by ~~s~~Serving BS and the ~~s~~Serving BS will retain the MSS's connection information during that time after reception of MOB-HO_IND message.(HO_IND_type=00)

Type	Length	Value	Scope
[XXX/YYY].z	1	0 : The Serving BS will retain the MSS's connection information during Resource Retain Time negotiated at registration stage. 1~255: Resource Retain Time [100msec unit]	MOB-BSHO-REQ MOB-BSHO-RSP

[Modify the table D5 and D.2.2]

D.2.2 I-am-host-of message

This message is sent by a BS to notify other BS (or the ASA server) that a certain MSS is registered with it. The message shall be sent upon MSS registration, and periodically (TBD period). The message might trigger a neighbor BS to request more information on the MSS (either directly from the sender BS, or from the ASA server). This message may be sent by a BS to notify the former Serving BS of handover results.   The message contains the following information

Table D5 I-am-host-of Message

Field	Size	Notes
Global Header	152-bit	
For(j=0; j<Num Records; j++) {		
MSS Unique Identifier	48-bit	48-bit unique identifier used by MSS (as provided by the MSS or by the I-am-host message)
Reason	8-bit	#0 : Network Attached #1 : Successful Handover #2 : Handover Failure #3 ~ 7 : Reserved
}		
Security field	TBD	A means to authenticate this message

[Modify the table D6]

Table D6 – MSS-info-request Message

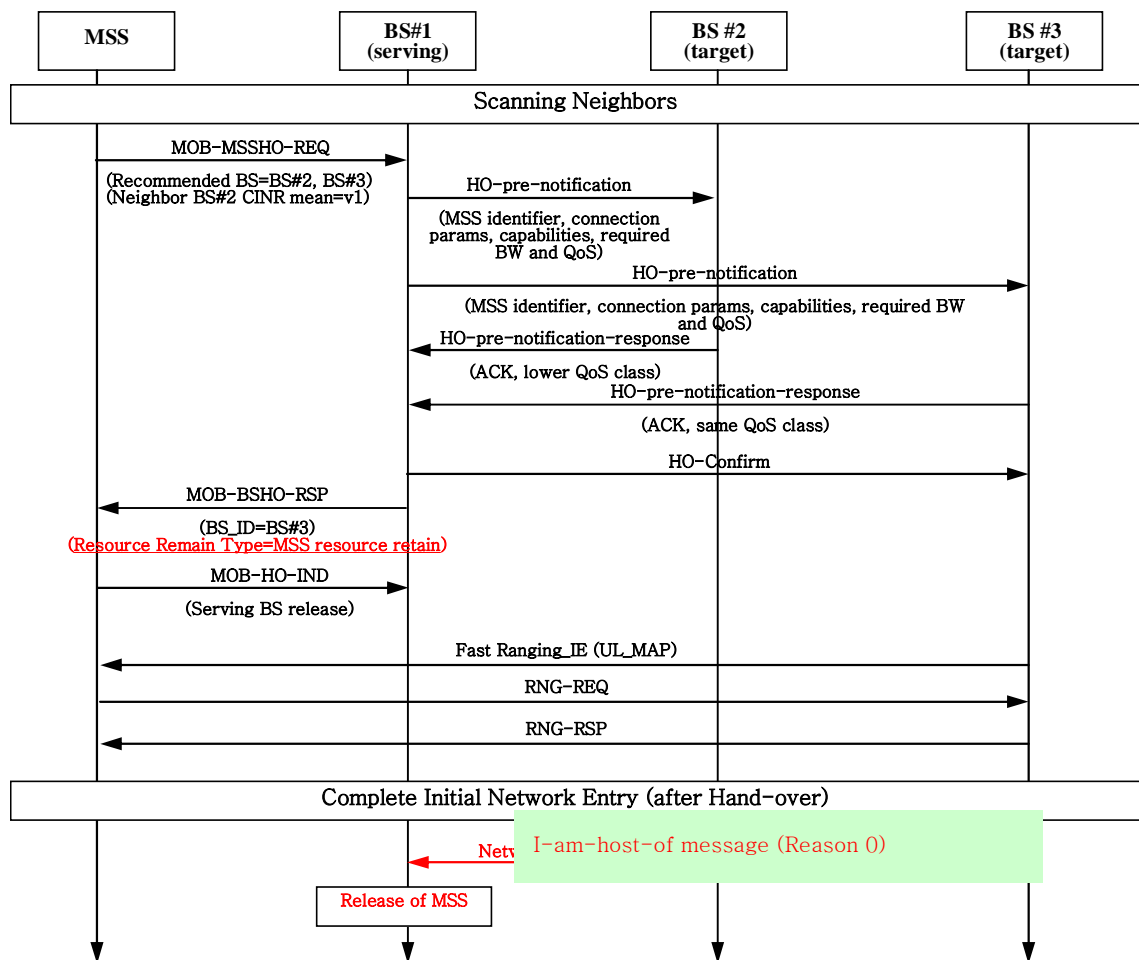| Field	Size	Notes
Global Header	152-bit	
For(j=0; j<Num Records; j++) {		
MSS unique identifier	48-bit	48-bit unique identifier used by MSS (as provided by the MSS or by I-am-host-of message)
Action Flag	8-bit	0 – Request information 1 – MSS arrived from Idle mode 2 – MSS has transmitted to another paging group 3 – MSS request handover 4 ~ 7 : Reserved
}		
Security field	TBD	

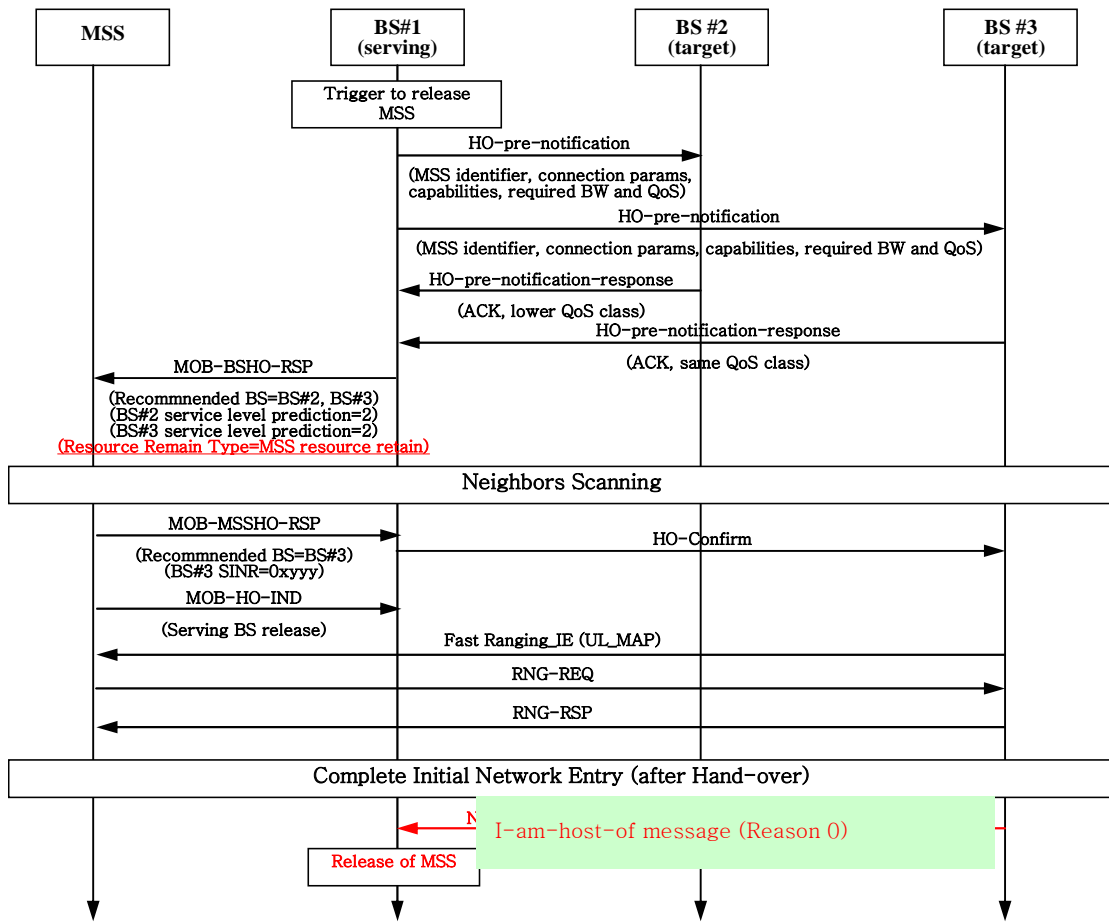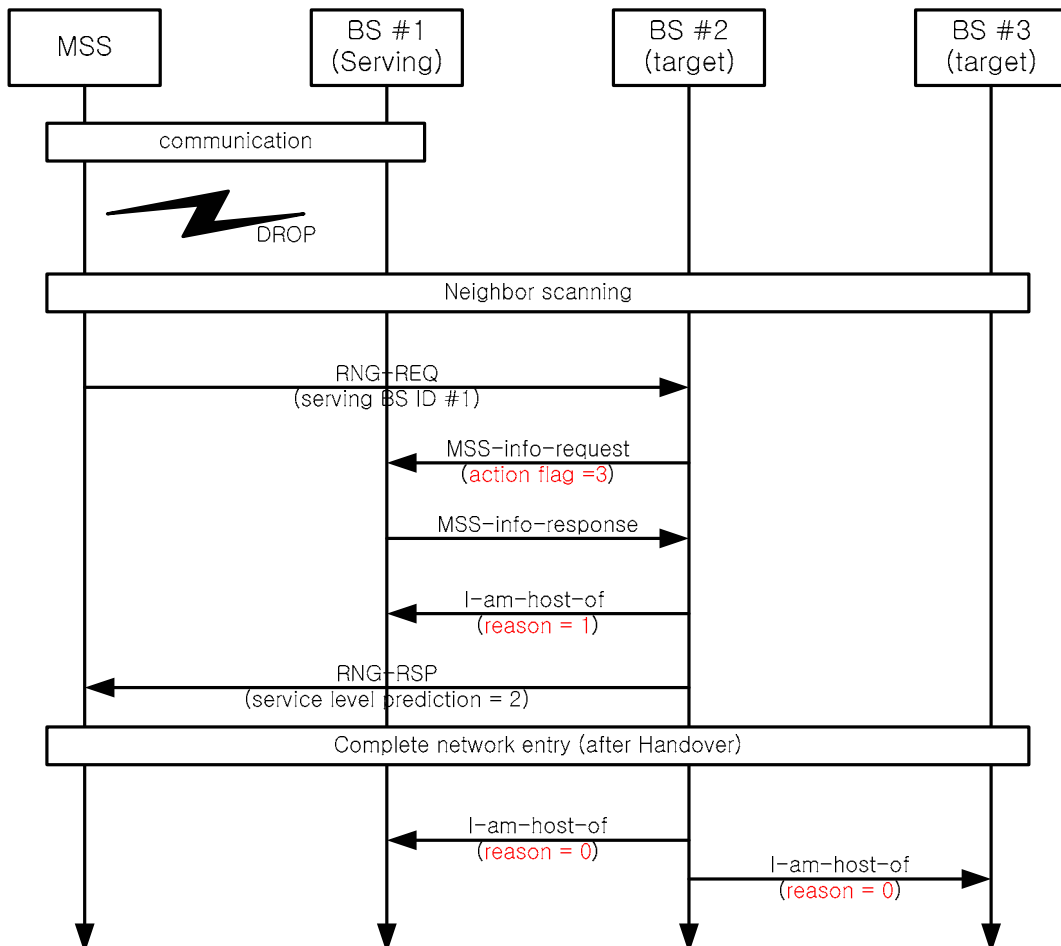Figure E.X1 – Example HO process with MSS's Resource Retain by MSS request

Figure E.X2 – Example HO process with MSS's Resource Retain by BS request

Figure E.X3 – Example HO process after drop