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Re:	This contribution is for call for contribution IEEE802.16e/D2-2004		
Abstract	This contribution proposes the newly added Resource Remain type in the existing handover MAC management messages for fast call recovery of drop-experienced MSS or ping pong-experienced MSS during handover.		
Purpose	Propose the type field in handover MAC management message for drop or ping pong call recovery for the IEEE802.16e Handoff Ad hoc group		
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# Resource Retain time for Handover or Ping Pong Call Recovery

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## Introduction

At current IEEE802.16e/D2 draft, when an MSS start actual handover process, it send HO-IND with HO\_IND\_type="00". And when a serving BS receive 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. 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 which has moved to Target BS and the MSS knows about that, the returning MSS, because of ping pong effect, can perform quick call recovery procedures using the remaining connection information with the Serving BS.

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 upon receiving MOB-HO-IND(HO\_IND\_type=00) from the MSS.

Especially, the proposed scheme can be applied to the dropped call recovery, in terms of avoiding unnecessary re-entry procedures and prompt call recovery.

## Proposed Mechanism

For the purpose, we propose mechanisms by which MSS can know that the Serving BS retains the connection information of the MSS trying to move to other BS. By setting Resource\_Retain\_Time in MOB-BSHO-REQ message or MOB-BSHO-RSP message, the Serving BS notifies to the MSS whether the Serving BS will retain the connection information during some duration or release it. The MSS, upon receiving these messages, can recognize connection information's status after sending MOB-HO-IND(HO\_IND\_type=00) and beginning the actual HO. And when the MSS transmit RNG-REQ to target BS, it can imply serving BS ID according to Resource\_Retain\_Time.

When ping pong-experienced MSS returns to the former Serving BS and tries to resume the normal communication with the Serving BS, the MSS can perform initial ranging procedure according to the status of the connection information. If the MSS knows that the connection information remains in Serving BS, the MSS sends ranging request containing its Basic CID previously allocated from the BS. The Basic CID can be used for notifying that the Serving BS retains the connection information of the MSS. And then the MSS and the Serving BS can quickly resume the normal communication with the remaining connection information.

In the case that the MSS experiences drop during handover procedure and knows the status of connection information, the drop-experienced MSS can also perform initial ranging procedure with newly found Target BS using the status information. If the drop-experienced MSS knows that the Serving BS will retain the MSS's connection information, the MSS sends ranging request with serving BS ID. The Target BS, upon receiving the ranging request with serving BS ID from the MSS, can recognize that the Serving BS retains the dropped MSS's connection information. And the Target BS can request the Serving BS to transfer the MSS's connection information and quickly enter the call recovery procedure using the forwarded connection information.

The decision the Serving BS will remain or delete the connection information of the MSS and how long it can retain the information depend on the BS's capacity and may vary from time to time. Therefore the time during which the resource remains for the MSS moving to other BS should be determined by the Serving BS during handover request/response handshake according to the condition of the Serving BS.

Therefore we propose the remedies as followings:

- Add “the operation that the Serving BS informs MSS of the status of connection information which is determined upon receiving MOB-HO-IND message, by sending modified MOB-BSHO-REQ or modified MOB-BSHO-RSP” to section 6.3.20.2.5, page 47
- Modify MOB-BSHO-REQ message in page 23 and MOB-BSHO-RSP message in page 24 by adding the following fields.
  - Resource\_Retain\_Time

#### Proposed Text Changes

We propose the following remedies in IEEE P802.16e/D2 to provide the handover enhancement method related with the fast call recovery

*[Add the following after line 23 page 47]*

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 quickly re-entry operation with Target BS or the former Serving BS at the ping pong case. Whether the Serving BS retains or discards the connection information of the MSS shall be informed by the Serving BS with Resource\_Retain\_Time in MOB-BSHO-RSP message or MOB-BSHO-REQ message during handover request/response handshake operation and this timer is a predefined value or a proposed value by the Serving BS.

[Change the table 92g in page 23]

Table 92g – MOB-BSHO-REQ Message Format

Syntax	Size	Notes
MOB-BSHO-REQ_Message_Format(){		
Management Message Type = 52	8bits	
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	
}		
<a href="#">Resource Retain Time</a>	<a href="#">8bits</a>	
}		

[Add the following parameter descriptions in line 32 page 23]

[Resource Retain Time](#)

[Time duration for MSS's connection information that will be retained in Serving BS. This value is measured in frame.](#)

[If this value is set to 0, the Serving BS will immediately discard resources allocated to the MSS.](#)

[If this value is set to non zero, the Serving BS will propose a ResourceRetain Time and retain the MSS's connection information during that time after reception of MOB-HO\\_IND message.](#)

[Change the table 92i in page 24]

Table 92i – 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 least recommended. N_Recommended can be derived from the known length of the message
Neighbor BS-ID	48bits	
Service level prediction	8bits	
}		
<a href="#">Resource Retain Time</a>	<a href="#">8bits</a>	
}		

*[Add the followings after parameter description of "Estimated HO start" in page 25]*

#### Resource Retain Time

Time duration for MSS's connection information that will be retained in Serving BS. This field is measured in frame.

If this value is set to 0, the Serving BS will immediately discard resources allocated to the MSS.

If this value is set to non zero, the Serving BS proposes Resource Retain Time and will retain the MSS's connection information during that time after reception of MOB\_HO-IND message.