Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	Initial Ranging Overhead Reduction
Date Submitted	**2004-07-07**
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Re:	IEEE P802.16e/D3-2004
Abstract	In this contribution, a method of reducing initial ranging overhead is proposed. This is revision 1 of the contribution. The additional texts are highlighted in 'green'. Deleted texts are crossed-out.
Purpose	Review and Adopt the suggested changes into P802.16e/D3
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1   Introduction

In 802.16e/D3, to accelerate the HO procedure, a Fast_Ranging_IE was introduced to provide non-contention based initial ranging when a MSS handovers to a selected target BS. The Fast_Ranging_IE is placed in the UL-MAP message. Since the UL-MAP message is a broadcast message which must be transmitted with high robustness to the MSS, the over-the-air resource required by a broadcast message is usually high. Careful design of broadcast messages is necessary to ensure the overhead can be minimized. Here we propose a method to reduce the UL and DL overhead incurred by a MSS who is performing initial ranging with the target BS.

This proposed method includes the following steps:

-   After receiving HO-pre-notification-request message, the target BS assigns a HO_ID (8 bits) to the MSS if the target BS is able to support the requested HO.

-   The target BS indicates the assigned HO_ID in the HO-pre-notification-response message

-   The serving BS then indicates this assignment to the MSS in MOB-BSHO-RSP (if the HO is initiated by the MSS) or MOB-BSHO-REQ (in the HO is initiated by the BS)

-   After the estimated HO start time, the target BS can use HO_ID, instead of the MSS' 48-bit MAC address in Fast_Ranging_IE to provide a contention-free ranging opportunity

-   The subsequent procedure is the same as in the current D3 text with one exception that the MAC address shall be replaced by the HO_ID in the RNG_REQ and RNG_RSP messages

2   Proposed Text Change

The proposed text change is based on p802.16e/D3. The text change is on the following messages: Fast_Ranging_IE, RNG_REQ, RNG_RSP and MOB_BSHO_REQ/RSP.

[Modify the Fast Ranging Information Element]

8.4.5.4.15 Fast ranging Information Element

[…]

Table 300a – OFDMA Fast Ranging IE format IE

Syntax	Size	Notes
Fast_UL_ranging_IE() {		
Extended UIUC	4 bits	
Length	4 bits	
HO_ID indicator	1 bit	1: HO_ID is present 0: MAC Address is present
If (HO_ID_indicator == 1) {		
HO_ID	8 bits	
}		
else {		
MAC Address	48 bits	
}		
UIUC	4 bits	
OFDM Symbol offset	10 bits	

Subchannel offset	6 bits	
No. OFDM symbols	10 bits	
No. subchannels	6 bits	
Reserved	7 bits	
}		

[…]

HO_ID_indicator – an indicator to indicate whether HO_ID or MAC Address is being used to identify a MSS during HO

HO_ID – An identifier assigned to a MSS for use during initial ranging to the selected target BS

[…]

[Modify BS-BSHO-RSP message]

6.3.2.3.56 BS HO Response (MOB-BSHO-RSP) message

[…]

Table 92j- MOB-BSHO-RSP Message Format

Syntax	Size	Notes
MOB-BSHO-RSP_Message_Format() {		
Management Message Type = 54	8 bits	
Network Assisted HO supported	1 bit	Indicate that the BS supports Network assisted HO
For (i= 0;i<N_Recommended; i++) {		
Neighbor BS_ID	48 bits	Base station ID
Service level prediction	8 bits	
HO_ID_included_indicator	1 bit	To indicate if the field HO_IND is included
If (HO_ID_included_indicator == 1) {		
HO_ID	8 bits	ID assigned for use in initial ranging to the target BS once this BS is selected as the target BS
}		
}		
Reserved	Variable	As required
HMAC tuple	21 bytes	
}		

[…]

HO_ID_included_indicator – an indicator to indicate whether HO_ID is included or not in this message

HO_ID - ID assigned for use in initial ranging to the target BS once this BS is selected as the target BS

[Modify MOB_BSHO_REQ message]

6.3.2.3.54 BS HO Request (MOB-BSHO-REQ) message

[…]

Table 92h- MOB-BSHO-REQ message Format

Syntax	Size	Notes
MOB-BSHO-REQ_Message_Format() {		
Management Message Type = 52	8 bits	

Network Assisted HO supported	1 bit	Indicate that the BS supports Network assisted HO
For (i= 0;i<N_Recommended; i++) {		
Neighbor BS_ID	48 bits	Base station ID
Service level prediction	8 bits	
HO_ID_included_indicator	1 bit	To indicate if the field HO_IND is included
If (HO_ID_included_indicator == 1) {		
HO_ID	8 bits	ID assigned for use in initial ranging to the target BS once this BS is selected as the target BS
}		
}		
Reserved	Variable	As required
HMAC tuple	21 bytes	
}		

[…]

HO_ID_included_indicator – an indicator to indicate whether HO_ID is included or not in this message

HO_ID – Assigned an identifier to a MSS for use during initial ranging to the selected target BS

[…]

[Insert the following to the end of section 6.3.2.3.5]

6.3.2.3.5. Ranging Request (RNG_REQ) message

[…]

The following TLV parameter may be included in RNG_REQ message when a MSS is performing initial ranging to the selected target BS:

     HO_ID.

[Insert the following to the end of section 6.3.2.3.6]

6.3.2.3.6 Ranging Response (RNG_RSP) message

[…]

When a BS sends RNG-RSP message as a reply to the RNG-REQ message from a MSS who is performing initial ranging during HO, the RNG-RSP message may include the following TLV parameter:

     HO_ID.

[Modify RNG-REQ message encoding. Add the following row to Table 318a]

11.5 RNG-REQ message encoding

Table 318a – RNG-REQ Message Encoding

Name	Type (1byte)	Length	Value
HO_ID	5	1	The identifier assigned to a MSS during HO by a target BS

[*Modify RNG-RSP Encoding. Add the following row to Table 320a*]

11.6 RNG-RSP message encoding

Table 320a- RNG-RSP Message Encoding

Name	Type (1byte)	Length	Value
HO_ID	TBD	1	The identifier assigned to a MSS during HO by a target BS

[Modify the second paragraph of 6.3.20.4 as follows. This includes the proposed text change in contribution C802.16e-04/144: HO Optimization Flags – HO Ad-Hoc Consensus Contribution, page 4, remedy 1]

MSS and Target BS shall conduct Ranging per 6.3.9.5 to begin network entry/re-entry management message handshaking process except as MSS may take advantage of a non-contention based MSS initial Ranging opportunity if present. Non-contention based MSS initial Ranging, as part of the MSS re-entry process, shall be considered the same as Invited Initial Ranging as defined in 6.3.9.5, except that the MSS RNG-REQ management message will use HO_ID, if HO_ID is assigned in MOB-BSHO-REQ or MOB-BSHO-RSP, or MSS MAC Address if HO_ID is not assigned in MOB-BSHO-REQ or MOB-BSHO-RSP, instead of Basic CID, which will not have been sent at the time of the RNG-REQ management message, and the Target BS shall return the MSS Basic CID and Primary CID in the RNG-RSP management message. Just as in the Invited Initial Ranging request/response sequence, the non-contention based MSS Initial Ranging sequence need only be comprised of a single RNG-REQ/RSP management message pair. However, additional RNG-REQ/RSP management message sequence, as part of a subsequent non-contention based initial ranging allocation or normal bandwidth allocation, may be necessary as defined in 6.3.9.5. Unlike Initial Ranging, in 6.3.9.5, the Target BS may elect to delay additional refinement of the physical link quality parameter settings through additional RNG-REQ/REP sequencing in order to expedite HO processing.