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Title	**Proposal for Fast Ranging Support Considering Non-Transparent RSs in Distributed Scheduling Mode**	
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Re:	This contribution is a response to "IEEE 802.16 Working Group Letter Ballot Recirc #28b: anouncement".	
Abstract	This contribution proposes a method for supporting fast ranging when considering non-transparent RSs operating in Distributed Scheduling Mode.	
Purpose	Text proposal for 802.16j Draft Document 3.0.	
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Proposal for Fast Ranging Support Considering Non-Transparent RSs in Distributed Scheduling Mode

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Introduction

After an MS scans neighbor RSs with association, a serving MR-BS of the MS may trigger the HO decision about the MS and notify the MS of recommended HO target station(s) as well as Action Time through a MOB_BSHO-REQ/RSP message. When the associated RS is a non-transparent RS operating in distributed scheduling mode, the operation of determining Action Time as well as providing Fast Ranging allocation for the MS may require the support of the RS. However, this is not defined in Draft 3.0.

Proposal

The following steps may be needed in order to support Fast Ranging for the MS at the non-transparent RS operating in distributed scheduling mode:

- During the MS scanning the RS with association, the associated RS may report the MS's link quality to its serving MR-BS. When the RS's serving MR-BS is the MS's neighbor MR-BS, it may forward the MS's link quality reported by the RS to the MS's serving MR-BS.
- During the HO decision and initialization stage, the MS's serving MR-BS may take the MS's link quality reported by the RS as a factor for recommendation of target station(s). Meanwhile, if necessary, when the RS is served by the MS's serving MR-BS, the MS's serving MR-BS may send a MOB_INF-REQ message with MS MAC Address to the RS, requesting the recommended action time when the RS provides Fast Ranging allocation for the MS; when the RS is served by the MS's neighbor MR-BS, the MS's serving MR-BS may send a HO info request to the MS's neighbor MR-BS via the network backbone, then the MS's neighbor MR-BS may send a MOB_INF-REQ message with MS MAC Address to the RS, requesting the recommended action time when the RS provides Fast Ranging allocation for the MS.
- When the RS receives a MOB_INF-REQ, it shall respond a MOB_INF-RSP message with MS MAC Address as well as the recommended action time when it can provide Fast Ranging allocation for the MS. When the RS is served by the MS's neighbor MR-BS, the MS's neighbor MR-BS may forward info in the MOB_INF-RSP to the MS's serving MR-BS via the network backbone.
- The MS's serving MR-BS determines Action Time and notifies the MS of it by sending a MOB_BSHO-REQ/RSP message to the MS. If the MS's serving MR-BS determines the RS to be the recommended HO target station, when the RS is served by it, it shall send a MOB_INF-IND message to the RS, notifying the RS of MS MAC Address and Action time; when the RS is served by the MS's neighbor MR-BS, the MS's serving MR-BS may send a HO provision indication to the MS's neighbor MR-BS via the network backbone, then the MS's neighbor MR-BS shall send a MOB_INF-IND message to the RS, notifying the RS of MS MAC Address and Action time.
- When the RS receives the MOB_INF-IND message, it shall provide Fast Ranging allocation for the MS based on Action Time by inserting Fast Ranging IE in UL-MAP at the appropriate frame.

- Additionally, when the MS's serving MR-BS receives MOB_HO-IND indicating rejecting or cancelling HO from the MS, it may send another MOB_INF-IND message to the RS when the RS is served by it, indicating the RS to cancelling providing Fast Ranging allocation for the MS; when the RS is served by the MS's neighbor MR-BS, the MS's serving MR-BS may a HO cancellation indication to the MS's neighbor MR-BS via the network backbone, then the MS's neighbor MR-BS shall send another MOB_INF-IND message to the RS, indicating the RS to cancelling providing Fast Ranging allocation for the MS.
- When the RS receives the MOB_INF-IND message indicating cancellation, it shall not provide Fast Ranging allocation for the MS.

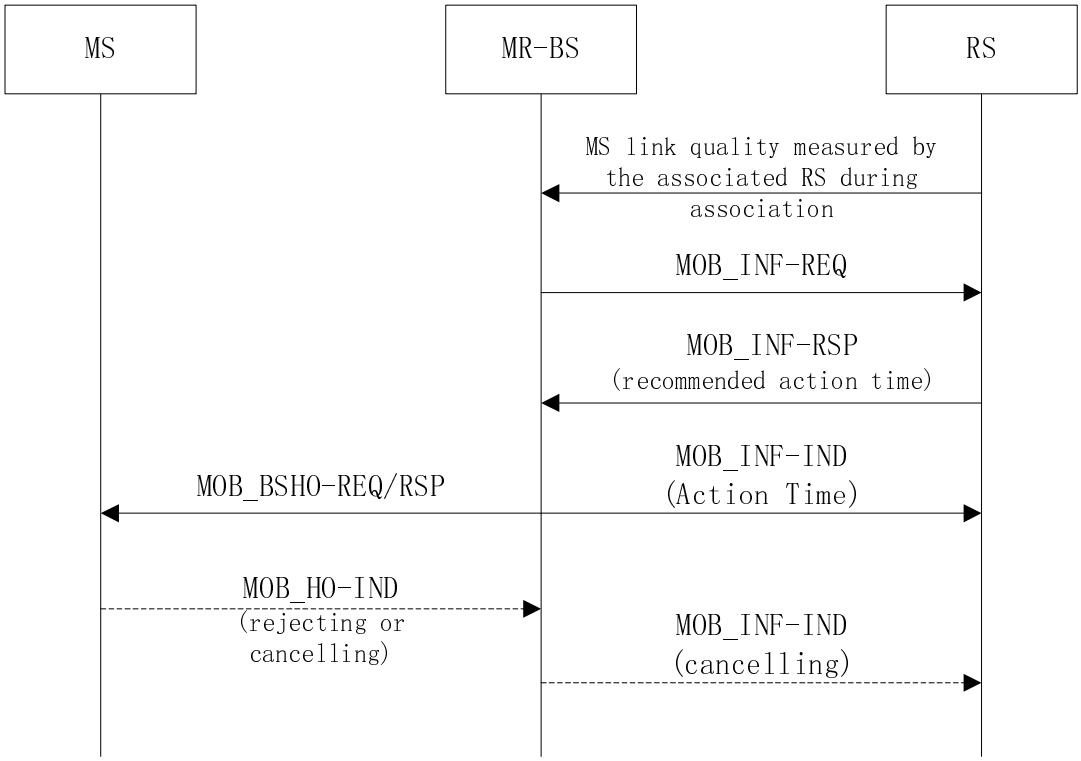

Figure-Fast Ranging support involving Non-Transparent RS operating in Distributed Scheduling Mode and served by the MS's MR-BS

Proposed Text

[Insert a new paragraph following the paragraph on P147, L57 in subclause 6.3.22.2.11:]

In centralized control MR network, MR-BS shall control handover process. An RS shall relay handover associated messages between an MS and the MR-BS when operating in centralized scheduling or distributed scheduling mode.

During the stage of HO Decision and Initialization, for an RS operating in distributed scheduling mode, its serving MR-BS may send a MOB_INF-REQ message with MS MAC Address to the RS, requesting the time when the RS could provide Fast Ranging allocation for the MS. When the RS receives the MOB_INF-REQ message, it may respond a MOB_INF-RSP message with MS MAC Address as well as the recommended time when it could provide Fast Ranging IE for the MS, to its serving MR-BS.

[Modify the third paragraph in subclause 6.3.10.3.3:]

Alternatively, if the BS~~/MR-BS~~ is prenotified of the upcoming HO MS, it may provide bandwidth for the MS to send a RNG-REQ by using the Fast Ranging IE. If the MR-BS is prenotified of the upcoming HO MS and the MS's superordinate station is operating in centralized scheduling mode, it may provide bandwidth for the MS to send a RNG-REQ by using the Fast Ranging IE. If the MS's superordinate station is a non-transparent RS with unique BSID and scheduling is centralized, the MR-BS shall insert this IE in the UL-MAP that it sends to the RS to broadcast on the access link. The MR-BS shall also provide bandwidth along the relay path on which to forward the RNG-REQ to the MR-BS. If the MS's superordinate station is a transparent RS, the MR-BS shall insert the Fast-Ranging_IE in the UL-MAP, and if management messages are relayed, the MR-BS shall precede the Fast Ranging IE with an UL_Burst_Receive_IE assigned to the RS basic CID. When a transparent RS finds its RS basic CID in an UL_Burst_Receive_IE, it shall listen for the RNG-REQ on the burst specified by the Fast Ranging IE that follows the UL_Burst_Receive_IE and relay the RNG-REQ to the MR-BS on the RS basic CID. If the MR-BS is prenotified of the upcoming HO MS and the MS's superordinate station is the non-transparent RS operating in distributed scheduling mode, it may send a MOB_INF-IND message with Action_Indicator=0 to the RS indicating the RS to provide bandwidth for the MS to send an RNG-REQ by using a Fast_Ranging IE and indicating when the RS may provide the Fast_Ranging IE. When the RS receives the MOB_INF-IND message with Action_Indicator=0, it may provide Fast Ranging IE for the MS based on the Action Time in the MOB_INF-IND message. Afterward, if the MR-BS is notified that the MS has rejected HO to the RS, it may send a MOB_INF-IND message with Action_Indicator=1 to the RS. When the RS receives the message, it may cancel providing bandwidth for the MS to send an RNG-REQ.

[Insert new subclause 6.3.2.3.XX:]

6.3.2.3.XX MOB_INF-REQ message

This message may be used for the MR-BS to request recommended action time to the non-transparent RS during HO. It is applicable to the distributed scheduling mode.

Table X—MOB_INF-REQ message format

Syntax	Size	Note
MOB_INF-REQ_Message_Format(){		
Management Message Type = TBD	8bits	
MS MAC Address	48bits	
TLV encoded information	variable	HMAC/CMAC Tuple

[Insert new subclause 6.3.2.3.XX:]

6.3.2.3.XX MOB_INF-RSP message

This message may be used for the non-transparent RS to return recommended action time to its serving MR-BS in response to receiving the MOB_INF-REQ message. It is applicable to the distributed scheduling mode.

Table X—MOB_INF-RSP message format

Syntax	Size	Note
MOB_INF-RSP_Message_Format(){		

Management Message Type = TBD	8bits	
MS MAC Address	48bits	
Action Time	8bits	Action time (in Frames) when the non-transparent RS recommends to provide Fast_Ranging IE for the MS.
TLV encoded information	variable	HMAC/CMAC Tuple

[Insert new subclause 6.3.2.3.XX:]

6.3.2.3.XX MOB_INF-IND message

This message may be used for the MR-BS to notify the non-transparent RS to provide or cancel bandwidth allocation for the MS to send an RNG-REQ message during HO. It is applicable to the distributed scheduling mode.

Table X—MOB_INF-IND message format

Syntax	Size	Note
MOB_INF-IND_Message_Format(){		
Management Message Type = TBD	8bits	
MS MAC Address	48bits	
Action_Indicator	1bit	0: Allocating; 1: Cancelling
If (Action_Indicator == 0) {		
Action time	8bits	Action time when the non-transparent RS provides Fast_Ranging IE for the MS.
}		
Reserved	7bits	
TLV encoded information	variable	HMAC/CMAC Tuple