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Re:	This contribution is a response to "IEEE 802.16j-07/007r2 Call for Technical Comments and Contributions regarding IEEE Project 802.16j" (2007-02-19) .	
Abstract	This contribution describes a proposed association procedure in a centralized MR system.	
Purpose	This document is provided in response for Call for Technical Comments and Contributions regarding IEEE Project 802.16j .	
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Association Procedure in a Centralized MR System with Distributed Scheduling

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1. Introduction

This contribution proposes a method for RS to support 802.16e compliant MS scanning with association in a centralized multi-hop relay (MR) network with distributed scheduling.

2. Problem Statement

As in IEEE 802.16e-2005, the MR-BS may send the MOB_SCN-RSP message unsolicited or as a response of the MOB_SCN-REQ message from the MS. However, in a centralized MR system with distributed scheduling, when the serving MR-BS decides to recommend the MS to scan neighbor stations with association level 1 or 2, it should obtain association parameters allocated by the neighbor stations before sending the MOB_SCN-RSP message. If the neighbor station is a MR-BS, the association procedure follows IEEE 802.16e-2005. Otherwise, the method for the MR-BS to obtain the association parameters from a neighbor RS needs to be defined.

After the association parameter acquisition procedure, the MS may scan the neighbor RSs with association. There is no change for the MS, while the RS and MR-BS's function should be defined according to legacy standard and MS network entry procedure for a non transparent RS with distributed scheduling [1].

3. Suggested Remedy

3.1 Association parameter acquisition

As in IEEE 802.16e-2005, the association parameters acquisition procedure between the serving MR-BS and

the neighbor MR-BS occurs over the backbone when the recommended neighbor RS stations are in different MR-cells. Then, the neighbor MR-BS may obtain the association parameters of its subordinate recommended RSs and respond to the serving MR-BS. If the neighbor RSs are served by the serving MR-BS, the serving MR-BS can directly request the scan parameters from the neighbor RSs.

The MR-BS may respectively send an association request (ASC_REQ) message to its subordinate recommended neighbor RS, requesting the association level. The recommended neighbor RS shall response with a scanning response (ASC_RSP) message to indicate the association level allocated to the MS. If the allocated association level is 1 or 2, the ASC_RSP should include the association parameters (i.e. Rendezvous time, CDMA code, and Transmission_opportunity offset) and further. Figure 1 is an example of association parameter acquisition procedure.

The association parameters in the ASC_RSP will be delivered to the serving MR-BS on a multi-hop link and for inter-MR-BS scanning, via the backbone network, which leads to the time delay. The Rendezvous Time in the MOB_SCN-RSP message will be determined by the serving MR-BS to compensate the time delay between the neighbor RS and the serving MR-BS.

The serving BS (of the associating MS), will coordinate to assure that the neighboring station do not assign overlapping or too close in time to each other ranging regions. The serving MR-BS may determine whether the responded association parameters are satisfied or not. If not, the serving MR-BS may request the association parameters for once more.

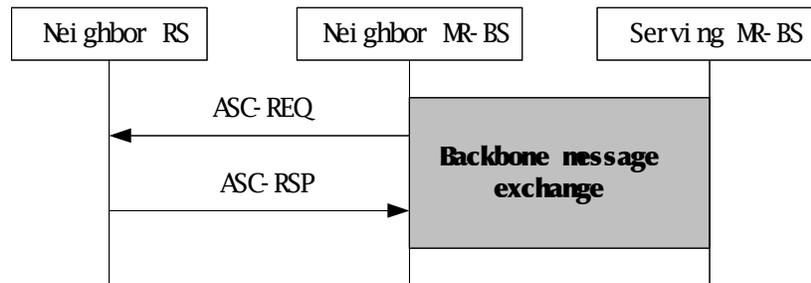


Figure 1-An example of association parameter acquisition procedure

3.2 Association level 0

When this association level is chosen by the network, the MS may perform association with level 0.

After the scanned RS successfully receives the ranging code, it will provide uplink allocation of adequate size for the MS to transmit RNG-REQ message with TLV parameters (Serving BS ID, MS MAC address) related to the association ranging. The RNG-REQ message is sent by the MS and relayed to the MR-BS, then the MR-BS responds with RNG-RSP message, which is relayed to the MS.

3.3 Association level 1

When the MS performs the association with level 1, it shall synchronize to the neighbor RS at the first frame immediately following the rendezvous time, read the UL-MAP transmitted at this frame and determine the specific region used for transmission of the dedicated CDMA code, based on information from the UL-MAP and Transmission opportunity offset” field in MOB_SCN-RSP. In case the neighbor RS decides to provide a regular (non-dedicated) ranging region with Dedicated ranging indicator set to 0, the MS may transmit the allocated CDMA code in the regular ranging region. If the MS could not obtain UL_MAP at the first frame immediately following the rendezvous time, it may perform the Level 0 association with this RS.

After the scanned RS successfully receives the ranging code, it will provide uplink allocation of adequate size for the MS to transmit RNG-REQ message with TLV parameters (Serving BS ID, MS MAC address) related to the association ranging. The RNG-REQ message is sent by the MS and relayed to the MR-BS, then the MR-BS responds with RNG-RSP message, which is relayed to the MS.

3.4 Association with level 2

During the scanning with association level 2, the MS is required to transmit the CDMA ranging code to the scanned neighbor RS. The MS does not have to wait for RNG-RSP from the scanned neighbor RS. Instead, the neighbor RS shall send the RNG-RSP message to its serving MR-BS (the MS’s neighbor MR-BS). The neighbor MR-BS should send the ranging information to the serving MR-BS via backbone network. Then the MS’s serving MR-BS shall incorporate the RNG-RSP information from all the neighbor MR-BSs into a single MOB_ASC_REP message. If the neighbor RS is served by the serving MR-BS, it will directly send the RNG-RSP to the serving MR-BS. Figure 2 is an example of scanning with association level 2.

When the MS’s access station is the serving MR-BS, it shall send the MOB_ASC_REP message to the MS. Otherwise, the MOB_ASC_REP message shall be relayed to the MS.

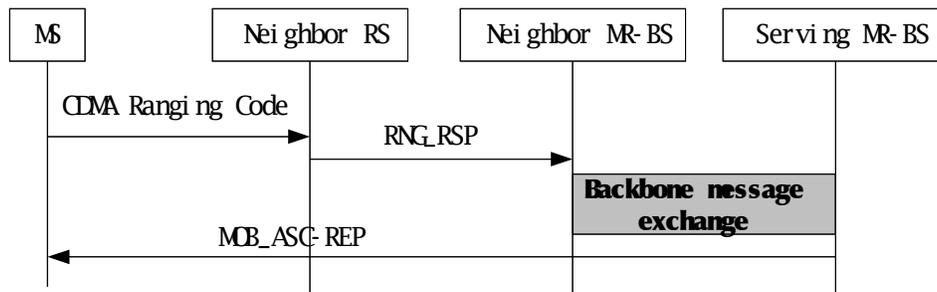


Figure 2-An example of scanning with association level 2

4. Proposed text

6.3.2.3 MAC management message

[Add two rows into Table 14:]

<u>Type</u>	<u>Message Name</u>	<u>Message Description</u>	<u>Connection</u>
<TBD>	<u>ASC_REQ</u>	<u>Association Request</u>	<u>Basic</u>
<TBD>	<u>ASC_RSP</u>	<u>Association Response</u>	<u>Basic</u>

[Insert new subclause 6.3.2.3.xx]

6.3.2.3.xx ASC-REQ

A MR-BS sends this message to negotiate the association parameters over relay links.

Table xx ASC-REQ Message format

<u>Syntax</u>	<u>Size</u>	<u>Notes</u>
<u>ASC_REQ_Message_format () {</u>	<u>=</u>	
<u>Management Message Type=TBD</u>	<u>8bits</u>	
<u>MS MAC Address</u>	<u>48bits</u>	
<u>Association Level</u>	<u>2 bits</u>	<u>0b00: Scanning with Association level 0;</u> <u>0b01: Scanning with Association level 1;</u> <u>0b10: Scanning with Association level 2;</u> <u>0b11: Reserved</u>
<u>Padding</u>	<u>Variab</u> <u>le</u>	<u>If needed for alignment to byte boundary.</u>
<u>}</u>		

The following parameters shall be included in the ASC_REQ:

MS MAC Address

Association Level

[Insert new subclause 6.3.2.3.xx]

6.3.2.3.xx ASC-RSP

A RS transmits this message to respond to the ASC -REQ message.

Table xx ASC-RSP message format

<u>Syntax</u>	<u>Size</u>	<u>Notes</u>

<u>ASC_RSP_Message_format () {</u>	=	
<u>Management Message Type=TBD</u>	<u>8bits</u>	
<u>MS MAC Address</u>	<u>48bits</u>	
<u>Association Level</u>	<u>2 bits</u>	<u>0b00: Scanning with Association level 0;</u> <u>0b01: Scanning with Association level 1;</u> <u>0b10: Scanning with Association level 2;</u> <u>0b11: Reserved</u>
<u>if (Association Level > 0){</u>		
<u>Rendezvous time</u>	<u>8 bits</u>	<u>The offset is calculated from the frame</u> <u>where ASC_RSP is transmitted by the</u> <u>neighbor RS.</u>
<u>CDMA code</u>	<u>8 bits</u>	
<u>Transmission_opportunity offset</u>	<u>8 bits</u>	
<u>}</u>		
<u>Padding</u>	<u>Variable</u>	<u>If needed for alignment to byte boundary.</u>
<u>}</u>		

The following parameters shall be included in the ASC-RSP:

MS MAC Address

Association Level

[Insert new subclause 6.3.22.1.4]

6.3.22.1.4 Association procedure in an MR network

In a centralized MR system with distributed scheduling

6.3.22.1.4.1 Association parameter acquisition

In a centralized MS system with distributed scheduling, when the serving MR-BS decides to recommend the MS to scan neighbor stations with association level 1 or 2, it should obtain association parameters allocated by the neighbor stations before sending the MOB_SCN-RSP message.

If the neighbor stations are in different MR-cells, the serving MR-BS shall request association parameters from the neighbor MR-BS via backbone network. Then the neighbor MR-BS can obtain the association parameters of its subordinate recommended RSs and respond to the serving MR-BS. If the neighbor RSs are served by the

servicing MR-BS, the servicing MR-BS can directly request the association parameters from the neighbor RSs.

The MR-BS may respectively send an association request (ASC-REQ) message to its subordinate recommended neighbor RS, requesting the association level. The recommended neighbor RS shall response with an association response (ASC-RSP) message to indicate the association level allocated to the MS. If the allocated association level is 1 or 2, the ASC-RSP should include the association parameters (i.e. Rendezvous time, CDMA code, and Transmission opportunity offset) and further.

The servicing MR-BS may determine whether the responded association parameters are satisfied or not. If not, the servicing MR-BS may request the association parameters for more times.

6.3.22.4.3.1 Association level 0

When this association level is chosen, the MS may perform association with level 0.

After the scanned RS successfully receives the ranging code, it will provide uplink allocation of adequate size for the MS to transmit RNG-REQ message with TLV parameters (Serving BS ID, MS MAC address) related to the association ranging. The RNG-REQ message is sent by the MS and relayed to the MR-BS, then the MR-BS responds with RNG-RSP message, which is relayed to the MS.

6.3.22.4.3.2 Association level 1

When this association level is chosen, the MS may perform association with level 1.

After the scanned RS successfully receives the ranging code, it will provide uplink allocation of adequate size for the MS to transmit RNG-REQ message with TLV parameters (Serving BS ID, MS MAC address) related to the association ranging. The RNG-REQ message is sent by the MS and relayed to the MR-BS, then the MR-BS responds with RNG-RSP message.

6.3.22.4.3.4 Association level 2

During the scanning with association level 2, the MS is required to transmit the CDMA ranging code to the scanned neighbor RS. The MS does not have to wait for RNG-RSP from the scanned neighbor RS. Instead, the neighbor RS shall send the RNG-RSP to its serving MR-BS (the MS's neighbor MR-BS). The neighbor MR-BS should send the ranging information to the servicing MR-BS via backbone network. Then the MS's servicing MR-BS shall incorporate the RNG-RSP information from all the neighbor MR-BSs into a single MOB_ASC_REP message. If the neighbor RS is served by the servicing MR-BS, it will directly send the RNG-RSP to the servicing MR-BS.

References

- [1] IEEE 802.16j-07/024r2, MS network entry for non-transparent Relay Station with Distributed Scheduling
- [2] IEEE 802.16j-07/199r1, MDHO and FASS for MMR Networks – Topology Acquisition