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Re:	This contribution is a response to ” IEEE 802.16j-06/034 Call for Technical Proposals regarding IEEE Project 802.16j” (2006-12-12) .	
Abstract	This contribution describes the proposed association procedure in 802.16j system.	
Purpose	This document is provided in response for Call for Technical Proposals regarding IEEE Project 802.16j .	
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Association Procedure in 802.16j

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1. Introduction

This contribution proposes a method for RS to support 802.16e compliant MS scanning with association in the multi-hop relay (MR) network. The RS mentioned in this contribution is supposed to be able to transmit its own control message.

In order to facilitate the incorporation of this proposal into IEEE 802.16j standard, specific changes to the baseline working document IEEE 802.16j-06/026 are listed in Section 4.

2. Problem Statement

As in IEEE 802.16e-2005, the access station of the MS may send the MOB_SCN-RSP message unsolicited or as a response after receiving the MOB_SCN-REQ message. However, when the access station decides to recommend the MS to scan one or more 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. Thus, the method for the access station to obtain the association parameters for the MS needs to be defined. Furthermore, when the MS scans one or more neighbor stations with association level 2, the method for the access station to obtain RNG-RSP information from the scanned neighbor stations should also be defined.

3. Suggested Remedy

3.1 Association parameter acquisition

When the MS scans the neighbor station with association level 0, the access station does not need to request the neighbor station to allocate the association parameters to the MS.

However, when the access station recommends the neighbor station to be scanned by the MS with association level l or 2, the association parameter acquisition procedure is necessary. In the MR network, we suggest that the serving MR-BS or the access RS may obtain the association parameters (i.e. rendezvous time, CDMA code and Transmission_opportunity offset) from the neighbor stations to be scanned with association level l or 2. Thus, we propose the association parameter acquisition procedure in the following cases.

- Case 1: The access station is the MR-BS

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 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.

When the recommended neighbor station is an RS and if the MR-BS does not know the allocation detail at the recommended RS, the association parameters can be obtained over relay links. The MR-BS may respectively send an association request (ASC -REQ) message to its subordinate recommended neighbor RS, requesting the association parameters. The recommended neighbor RS shall response with an association response (ASC -RSP) message to indicate the association parameters it decides to allocate to the MS.

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

- Case 2: The access station is the RS

The access RS may send an association request (ASC-REQ) message to the serving MR-BS to indicate the neighbor stations it intends to recommend the MS to scan with association level 1 or level 2. The serving MR-BS shall request association parameters in a fashion similar to case 1. If the serving MR-BS obtains satisfied association parameters from one or more recommended neighbor stations, it shall send an association response (ASC-RSP) message to the access RS to indicate all of the satisfied association parameters. If access and recommended RSs can communicate directly over the 1-hop relay link between them, the access RS may send and receive ASC-REQ and ASC-RSP messages directly to and from the recommended RS.
Figure 1 describes an example of the association acquisition flow in the case when both the access station and the recommended neighbor station are RSs.

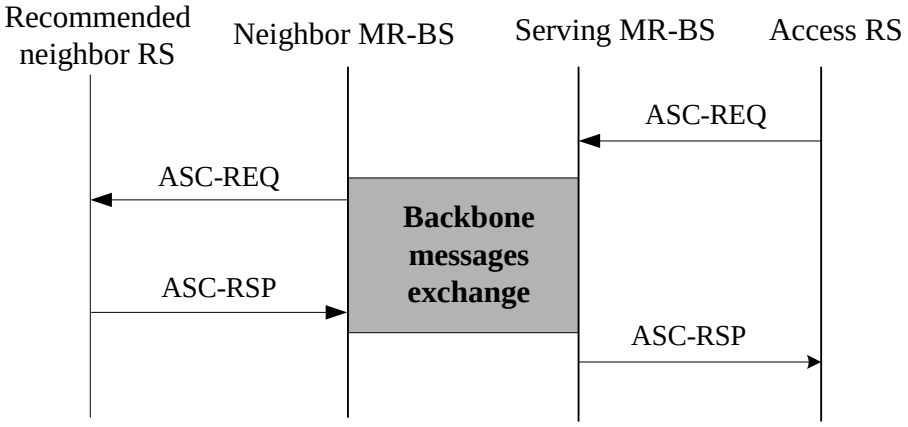

Figure 1-An example of association parameter acquisition

3.2 RNG-RSP information incorporation

During the scanning with association level 2, the MS is required to transmit the CDMA ranging code to the scanned neighbor station. Then the MS does not have to wait for RNG-RSP from the scanned neighbor station. Instead, the serving MR-BS shall incorporate the RNG-RSP information from the neighbor MR-BS or the neighbor RS into a single MOB_ASC_REP message. When the access station is the serving MR-BS, it shall

send the MOB_ASC_REP message to the MS. When the access station is an RS, the MOB_ASC_REP message shall be transmitted by the serving MR-BS to the access station and then be relayed to the MS.

4. Proposed text

[Insert new subclause 6.3.22.1.3.4]

6.3.22.1.3.4 Association in an MR network

In the MR system, when the access station of the MS is a RS, before the access RS transmits the MOB_SCN-RSP unsolicited or in response to an MOB_SCN-REQ sent by an MS, the access RS may exchange an ASC-REQ and ASC-RSP message with its serving MR-BS or with the recommended access RS in order to obtain the association parameters of the neighbor stations with association level 1 or 2 .

The serving MR-BS may ask for the association parameters from the neighbor MR-BS via backbone network when the recommended neighbor stations are in different MR-cells. The neighbor MR-BS can obtain the association parameters of its subordinate recommended RSs and responds to the serving MR-BS.

When the recommended neighbor station is a RS and if the MR-BS does not know the allocation detail at the recommended access RS, the MR-BS may send a ASC -REQ message to its subordinate recommended neighbor RS in order to request the association parameters (i.e. Rendezvous time, CDMA code, and Transmission_opportunity offset). The recommended neighbor RS shall reply with a ASC -RSP message, indicating the association parameters allocated to the MS.

The serving MR-BS may coordinate the association parameters allocated by the neighbor stations to assure that the neighbor stations do not assign overlapping or too close in time to each other ranging regions.

In the case that association level 2 is chosen, when the access station is the serving MR-BS, it shall incorporate the RNG-RSP information from the neighbor MR-BS or the RS served by the neighbor MR-BS into a single MOB_ASC_REP message and send the message to the MS. When the access station is the RS, the serving MR-BS shall incorporate the RNG-RSP information from the neighbor MR-BS or the RS served by the neighbor MR-BS into a single MOB_ASC_REP message and send the message to the access RS. Then the access RS shall relay the MOB_ASC_REP message to the MS.

6.3.2.3 MAC management message

Add two rows into Table 14:

Type	Message Name	Message Description	Connection
<TBD>	ASC-REQ	Association Request	Basic
<TBD>	ASC-RSP	Association Response	Basic

[Insert new subclause 6.3.2.3.xx]

6.3.2.3.XX ASC-REQ

An infrastructure station sends this message to negotiate the association parameters over relay links.

Syntax	Size	Notes
ASC-REQ_Message_format () {	-	

Management Message Type=TBD	8bits	
MS ID	48bits	
N_Recommended_Station_Index	8 bits	Number of neighboring stations to be associated.
for(j=0; j< N_Recommended_Station_Index; j++){		
Neighbor_Station_Index	48bits	Station MAC addresses
Requested Scanning Type	2 bits	0b00: Scanning with Association level 1; 0b01: Scanning with Association level 2; 0b10,0b11: Reserved
}		
Padding	Variable	If needed for alignment to byte boundary.
}	-	

The following parameters shall be included in the ASC_REQ:

MS_ID

MS's MAC address

N_Recommended_Station_Index

Number of neighboring stations to be associated..

Neighbor_station_Index

Station MAC addresses.

Requested Scanning Type

Requested Scanning Type depending on the association level

[Insert new subclause 6.3.2.3.xx]

6.3.2.3.XX ASC-RSP

An infrastructure station transmits this message to respond to the ASC -REQ message.

Syntax	Size	Notes
ASC-RSP_Message_format () {	-	
Management Message Type=TBD	8bits	
MS ID	48bits	
N_Recommended_Station_Index	8 bits	Number of neighboring stations to be associated. .

For(j=0; j< N_Recommended_Station_Index; j++){		
Neighbor_Station_Index	48 bits	Station MAC addresses
Scanning Type	2 bits	0b00: Scanning with Association level 0; 0b01: Scanning with Association level 1; 0b10: Scanning with Association level 2; 0b11: Reserved
if (Scanning Type > 0){		
Rendezvous time	8 bits	
CDMA code	8 bits	
Transmission_opportunity offset	8 bits	
}		
}		
Padding	Variable	If needed for alignment to byte boundary.
}	-	

The following parameters shall be included in the ASC_RSP:

MS_ID

MS's MAC address

N_Recommended_Station_Index

Number of neighboring stations to be associated.

Neighbor_station_Index

Station MAC addresses

Scanning Type

Scanning Type allocated by the neighbor station to the MS

References

[1] IEEE 802.16mmr-06/002r1, " Draft P802.16j PAR and Five Criteria: Mobile Multi-hop Reply "
[2] IEEE 802.16j-06/016r1, " Proposed Technical Requirements Guideline for IEEE 802.16 Relay TG "
[3] IEEE 802.16j-06/017r2, " Table of Contents of Task Group Working Document "