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Re:	This contribution is response to call for contribution about IEEE802.16e-D2	
Abstract	This document proposes the scheme enhancing association operation with SCAN-REQ/RSP	
Purpose	Discuss and Adopt the advanced feature for periodic ranging in sleep mode in the IEEE802.16e group.	
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Enhancement of Association using SCAN-REQ/RSP

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1. Problem Statement

Currently, in many ways, MSS can get information about neighbor BS and measure SINR value of neighbor BS. MSS can get informed of neighbor BS with NBR-ADV message or by scanning another frequency directly. And MSS can measure SINR during scan interval or sleep interval without interruption of service with serving BS. According to the measured SINR values, it can decide whether it handover another BS or not. Further, MSS can get advantage expediting handover process using association with neighbor BS. Association is the process of pre-calibrating parameters needed for ranging with neighbor BS. When MSS decide handoff, MSS can try association with neighbor BS before actual handoff. After association, MSS begin actual handoff process with transmitting MOB-MSSHO-REQ. Therefore we can think association process as the pre-handoff procedure and fast association process shall effect fast handoff completion after deciding handoff.

However, at current draft 802.16e-D2, there is no specific procedure for association during Scan Interval. In addition, the MSS does not get assistance from serving BS and should access target BS through random access during scan interval despite negotiation with serving BS for allocation of scan interval.

A MSS may try to make association with as many as candidate Target BSs during the short Scan Interval, it is crucial that the MSS allows fast access to target BS in order to minimize delay time for association.

Our proposed solution can enhance the association process faster than previous algorithm using random access and we can get advantage that actual handoff time will be shortened after MSS's decision of handoff . And our solution can prevent MSS from trying association to inappropriate neighbor BS that it cannot support continuous services as serving BS provides currently.

Since serving BS can negotiate with target BS for assigning fast_ranging_IE, we can get advantage only using redundant resource of target BS to make handoff procedure easy.

2. Proposed Remedy

Therefore we propose fast access scheme for association operation in order to allow MSS fast access to target BS. A modified SCN-REQ and SCN-RSP message are proposed to enhance MSS operation of association during Scan Interval. SCN-Notification and SCN-Notification-RSP messages are also proposed to inform target BSs of the MSS information.

A MSS trying association can access to target BS with fast UL ranging IE same as handoff case with above proposed messages and scenario.

- SCN-REQ

Scan type field is proposed to indicate whether a MSS requests Scanning or Association. The Serving BS may understand what MSS does request to operate and inform target BS that the MSS is going to

try association based on Scan Type field value. Target BS lists are also needed to report which BSs the MSS is trying to associate with.

- SCN-RSP

Scan Type field is also proposed as SCN-REQ. This field may indicate which operation the Serving BS allows the MSS to do. When a serving BS orders a MSS to associate with target BS, the serving BS is able to transmit unsolicited SCN-RSP message to the MSS. In this case, the BS can indicate whether it does order to scan or associate.

- ASC-Notification

Target BS may assign fast UL ranging IE when a MSS is requesting access, it should be informed of which MSS is going to try association.

- ASC-Notification-RSP

Target BS may respond to SCN-Notification with reserved BS and QoS resources.

3. Proposed Text Changes

6.3.2.3.51 Scanning Interval Allocation Request (MOB-SCN-REQ) message

[Modify Table 92e in Page 22, Line 1 – MOB-SCN-REQ Message format as follows]

A MOB-SCN-REQ message may be transmitted by an MSS to request a scanning interval for the purpose of seeking neighbor BS, and determining their suitability as targets for HO. [An MSS may perform one of two operations allowed for Scanning Interval as indicated in Scan Type field. An MSS can perform scanning with Scan Type value '0' and association with Scan Type value '1'](#)

An MSS shall generate MOB-SCN-REQ messages in the format shown in Table 92e:

Table 92e --- MOB-SCN-REQ Message Format

Syntax	Size	Notes
MOB-SCN-REQ_Message_Format() {		
Management message type = 50		
Scan Duration	12 bits	Units are frame
Scan Type	1 bit	0: Scanning only and 1: Association
Reserved	3 bits	
For(j=0; j<N_Recommended; j++) {		N_Recommended can be derived from the length fields in the MAC header of the message
Neighbor BS-ID	48 bits	Target BS-ID for association
}		
}		

The following parameters shall be included in the MOB-SCN-REQ message,

Scan Duration

Duration (in units of frames) of the requested scanning period.

Scan Type

Operation that an MSS intend to for Scanning Interval

Neighbor BS-ID

Target BS list for association

6.3.2.3.51 Scanning Interval Allocation Response (MOB-SCN-RSP) message

[Modify Table 92e in Page 22, Line 1 – MOB-SCN-RSP Message format as follows]

A MOB-SCN-RSP message shall be transmitted by the BS in response to an MOB-SCN-REQ message sent by an MSS. In addition, BS may send an unsolicited MOB_SCN_RSP. If a BS transmits unsolicited MOB_SCN_RSP, Scan_Type should have '0' for scanning and '1' for association to indicate which operation the BS intends to order. The message shall be transmitted on the basic CID.

The format of the MOB-SCN-RSP message is depicted in Table 92f[S1].

Table 92f --- MOB-SCN-RSP Message Format

Syntax	Size	Notes
MOB-SCN-REQ_Message_Format() {		
Management message type = 51	8 bits	
CID	16 bits	Basic CID of the MSS
Duration	12 bits	<u>Units are</u> frame
Start Frame	4 bits	
<u>Scan_Type</u>	<u>1 bit</u>	<u>[0] Scanning</u> <u>[1] Association</u>
<u>Reserved</u>	<u>7 bits</u>	
<u>For(j=0; j<N_Recommended; j++) {</u>		<u>N_Recommended can be derived from the length fields in the MAC header of the message</u>
<u>Neighbor BS-ID</u>	<u>48 bits</u>	
<u> }</u>		
<u>}</u>		

The following parameters shall be included in the MOB-SCN-RSP message:

CID

Basic CID of the MSS that have sent MOB-SCN-REQ message.

Duration

Duration (in units of frames) where the MSS may scan for neighbor BS.

Start Frame

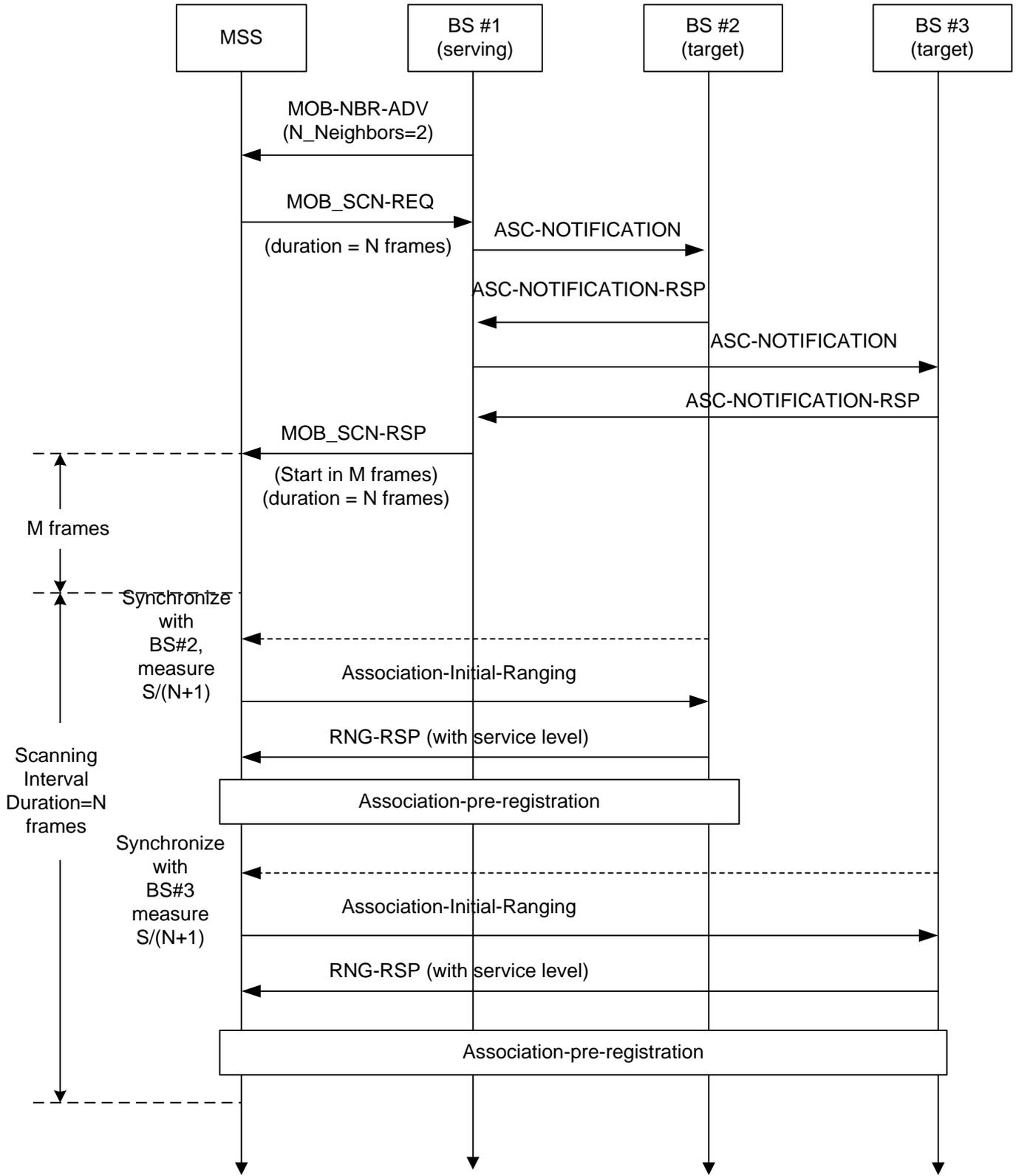
Measured from the frame in which this message was received. A value of zero means that it will start in the next frame.

Scan Type

0: The BS allows Scanning operation requested by SCN-REQ or lets an MSS perform scanning neighbor BS

1: The BS allows Association operation requested by SCN-REQ or lets an MSS perform association with listed Neighbor_BS-ID during Scanning Interval

**Figure E.2—Example BS advertisement and scanning (with association)
by MSS request**



D.2.11 Association-notification (ASC-NOTIFICATION) message

This message is sent from one BS to another BS, typically to request information about a MSS. Typically the message will be sent as a reaction to reception of a SCN-REQ message with Scan_Type=1 or in case where a BSS is trying to order a MSS to make association.

[The message contains the following information](#)

<u>Field</u>	<u>Size</u>	<u>Notes</u>
Global Header	152 bits	
For (j=0; j<Num_Records;j++){	8 bits	
MSS unique ID	48 bits	MAC Address of MSS
Estimated time to start Association	12 bits	Units are frame
Required BW	4 bits	
For (i=0; i<Num_SFID_Records: i++){		Num SFID Records can be derived from the length field in MAC header of message
SFID	32 bits	
Required QoS	Variable	
}		
}		
Security Field	TBD	

[D.2.11 Association-notification response \(ASC-NOTIFICATION-RSP\) message](#)

[This message is sent from one BS to another BS, typically in response to a SCN-NOTIFICATION message. It does inform the BS of the level of service the MSS could expect when it associate. The message contains the following information.](#)

<u>Field</u>	<u>Size</u>	<u>Notes</u>
Global Header	152 bits	
For (j=0; j<Num_Records;j++){	8 bits	Num Records can be derived from the length fields in the MAC header of the message
MSS unique ID	48bits	MAC Address of MSS
BW estimated	8 bits	
QoS estimated	variable	
}		
Security Field	TBD	