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Re:	IEEE P802.16e/D3 Letter Ballot
Abstract	This document suggests the improvement of scanning method using preambles from BSs.
Purpose	The document is contributed to support certain comment on IEEE P802.16e/D3 Letter Ballot.
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The Improvement of Scanning Method Using Preambles in IEEE 802.16e

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1. Problem Statement

The current method of scanning is executed to one neighbor BS at a time. Therefore, it takes a lot of time when several neighbor BSs are scanned. However, MSS can execute several scanning simultaneously by receiving each preamble from several neighbor BSs included in MOB-NBR-ADV. Thus, it is inefficient to scan one neighbor BS at a time just as current method.

If association is executed after scanning, the MSS could know the Timing Adjust value of correspondent neighbor BS by receiving RNG-RSP message from each neighbor BS. Moreover, the distance between the MSS and the BS can be approximated by analyzing this Timing Adjust value. Therefore, if the MSS share the Timing Adjust value of neighbor BSs which is obtained in the course of association, with serving BS, target BS can be selected more efficiently in Handover.

2. Proposed Remedy

In this contribution, all BSs should be time synchronized to a common timing signal such as GPS. MSS cannot scan several target BSs simultaneously. Therefore, the scanning is executed in a frame for several neighbor BSs in the case of no association. After completing scanning, MSS notify the result to serving BS by MOB-SCN-REQ message. Then, the serving BS respond with MOB-SCN-RSP message. In this case, the value of duration field shall be "0."

The MSS which tries to associate with neighbor BSs requests the allocation of scan duration to the serving BS by sending MOB-SCN-REQ message which has the preferred scan duration((0) in the duration field. Then, the serving BS assigns the scan duration by MOB-SCN-RSP message. After that, the MSS execute the scan and association process.

When serving BS requests scanning, duration field shall have the value of "0" in the case of no association and have some value((0) in the case of association.

BS Timing Adjust field is inserted in MOB-MSSHO-REQ message. In the current Handover method, serving BS select target BS by considering CINR mean and neighbor BSs'HO-pre-notification-response message. Then the serving BS send MOB-HO-RSP to MSS. In the case of association, the MSS receive Timing Adjust value from associated BS. This value has information about the distance from MSS to BS because this value is propagation delay. Therefore, in this contribution, the MSS which wishes to handover provide distance information between the MSS and BS besides CINR by sending MOB-MSSHO-REQ message which includes formerly associated neighbor BSs'CINR mean and Timing Adjust value to the serving BS. Then, serving BS can send MOB-HO-RSP which includes the best suitable target BS to the MSS by considering neighbor BSs' CINR mean and Timing Adjust value, and neighbor BSs'HO-pre-notification-response message.

3. Proposed Text Changes

[Blue letters shall be inserted in the draft]

6.3.2.3.51 Scanning Interval Allocation Request (MOB-SCN-REQ) message
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 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	8 bits	
Scan Duration	12 bits	Units are frames.
HMAC Tuple	21 bytes	See 11.4.11
reserved	4 bits	
}		

The following parameters shall be included in the MOB-SCN-REQ message,
Scan Duration
Duration (in units of frames) of the requested scanning (only associating) period.
If MSS is permitted only to synchronize and measure CINR, a value of duration is zero.
HMAC Tuple (see 11.4.11 in IEEE Standard P802.16-REVd/D3-2004)
The HMAC Tuple Attribute contains a keyed Message digest (to authenticate the sender).

6.3.2.3.52 Scanning Interval Allocation Response (MOB-SCN-RSP) message
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. The message shall be transmitted on
the basic CID.
The format of the MOB-SCN-RSP message is depicted in Table 92f.

Table 92f—MOB-SCN-RSP Message Format

Syntax	Size	Notes
MOB-SCN-RSP_Message_Format() {		
Management Message Type = 51	8 bits	
Duration	12 bits	in frames
Start Frame	4 bits	
HMAC Tuple	21 bytes	See 11.4.11
}		

The following parameters shall be included in the MOB-SCN-RSP message:
Duration
Duration (in units of frames) where the MSS may scan (only association) for neighbor BS.
If MSS is permitted only to synchronize and measure CINR, a value of duration is zero.
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. If MSS is permitted only to synchronize and measure CINR, a value of start frame is zero.
HMAC Tuple (see 11.4.11 in IEEE Standard P802.16-REVd/D3-2004)
The HMAC Tuple Attribute contains a keyed Message digest (to authenticate the sender).

6.3.2.3.55 MSS HO Request (MOB-MSSHO-REQ) message
The MSS may transmit an MOB-MSSHO-REQ message when it wants to initiate an HO. The message shall
be transmitted on the basic CID.

Table 92i—MOB-MSSHO-REQ Message Format

Syntax	size	Notes
MOB-MSSHO-REQ_Message_Format() {		

Management Message Type = 53	8 bits	
For (j=0; j<N_Recommended; j++) {		N_Recommended can be derived from the known length of the message
Neighbor BS-ID	48 bits	
BS CINR mean	8 bits	
BS Timing Adjust	8 bits	Tx timing offset adjustment (signed 32-bit). The time required to advance SS transmission so frames arrive at the expected time instance at the BS. Units are PHY specific. (Using RNG-RSP message of target BS.)
Service level prediction	8 bits	
}		
Estimated HO start	8 bits	The estimated HO time shall be the time for the recommended target BS.
HMAC Tuple	21 bits	See 11.4.11
}		

An MSS shall generate MOB-MSSHO-REQ messages in the format shown in Table 92i. The following parameters shall be included in the MOB-MSSHO-REQ message:

HMAC Tuple (see 11.4.11 in IEEE Standard P802.16-REVd/D3-2004) – The HMAC Tuple Attribute contains a keyed Message digest (to authenticate the sender).

For each recommended neighbor BS, the following parameters shall be included,

Neighbor BS-ID

Same as the **Base Station ID** parameter in the DL-MAP message of neighbor BS

BS CINR mean

This parameter indicates the carrier to noise and interference ratio measured by the MSS from the particular BS. The value shall be interpreted as an unsigned byte with units of 1dB.

BS Timing Adjust

This parameter indicates the timing adjustment value in RNG-RSP message received by the MSS from the particular BS.

Service level prediction

This value indicates the level of service the MSS can expect from this BS. The following encodings apply:

0 = No service possible for this MSS

1 = Some service is available for one or several Service Flows authorized for the MSS.

2 = For each authorized Service Flow, a MAC connection can be established with QoS specified by the AuthorizedQoSParamSet.
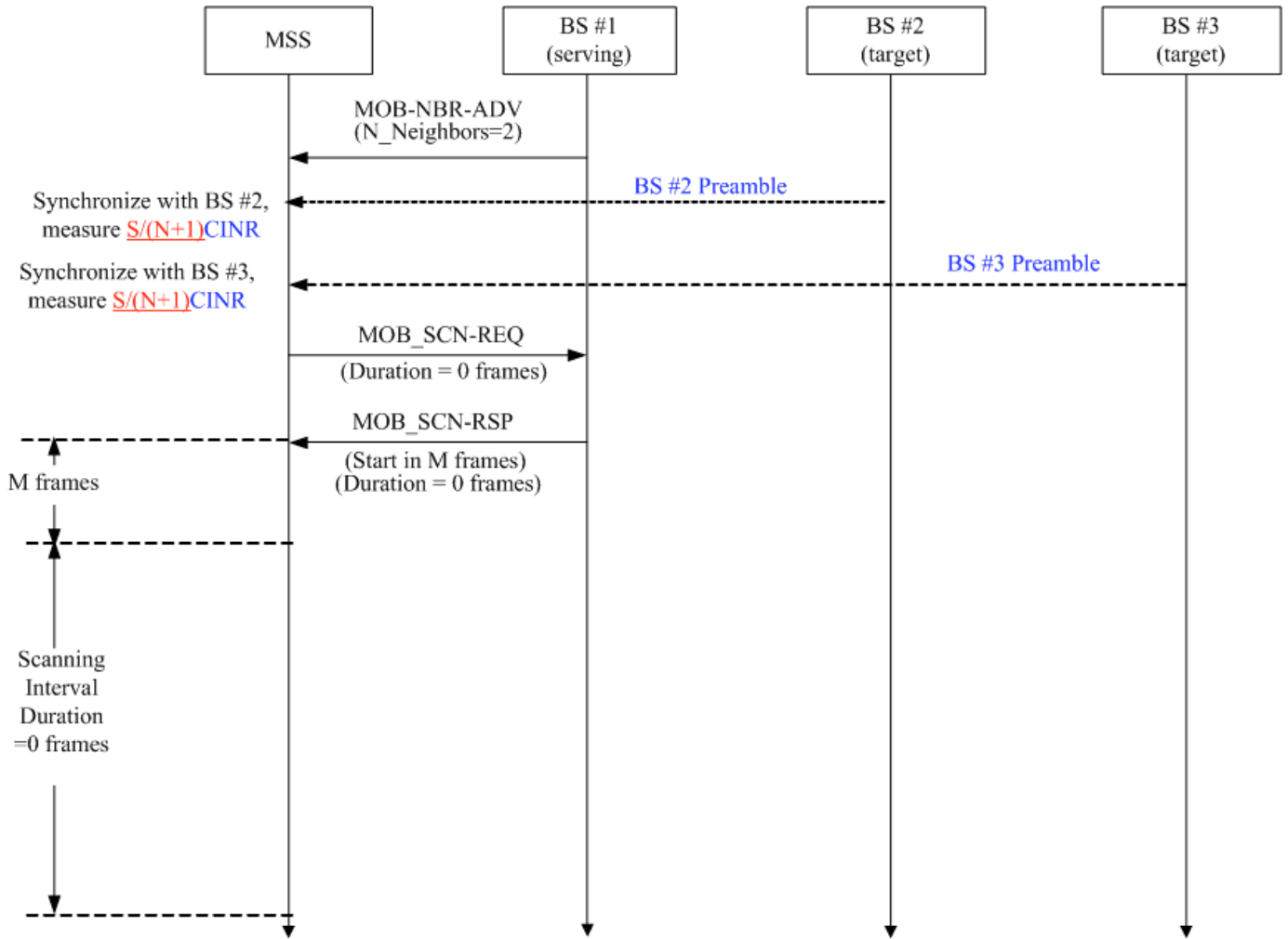
3 = No service level prediction available.

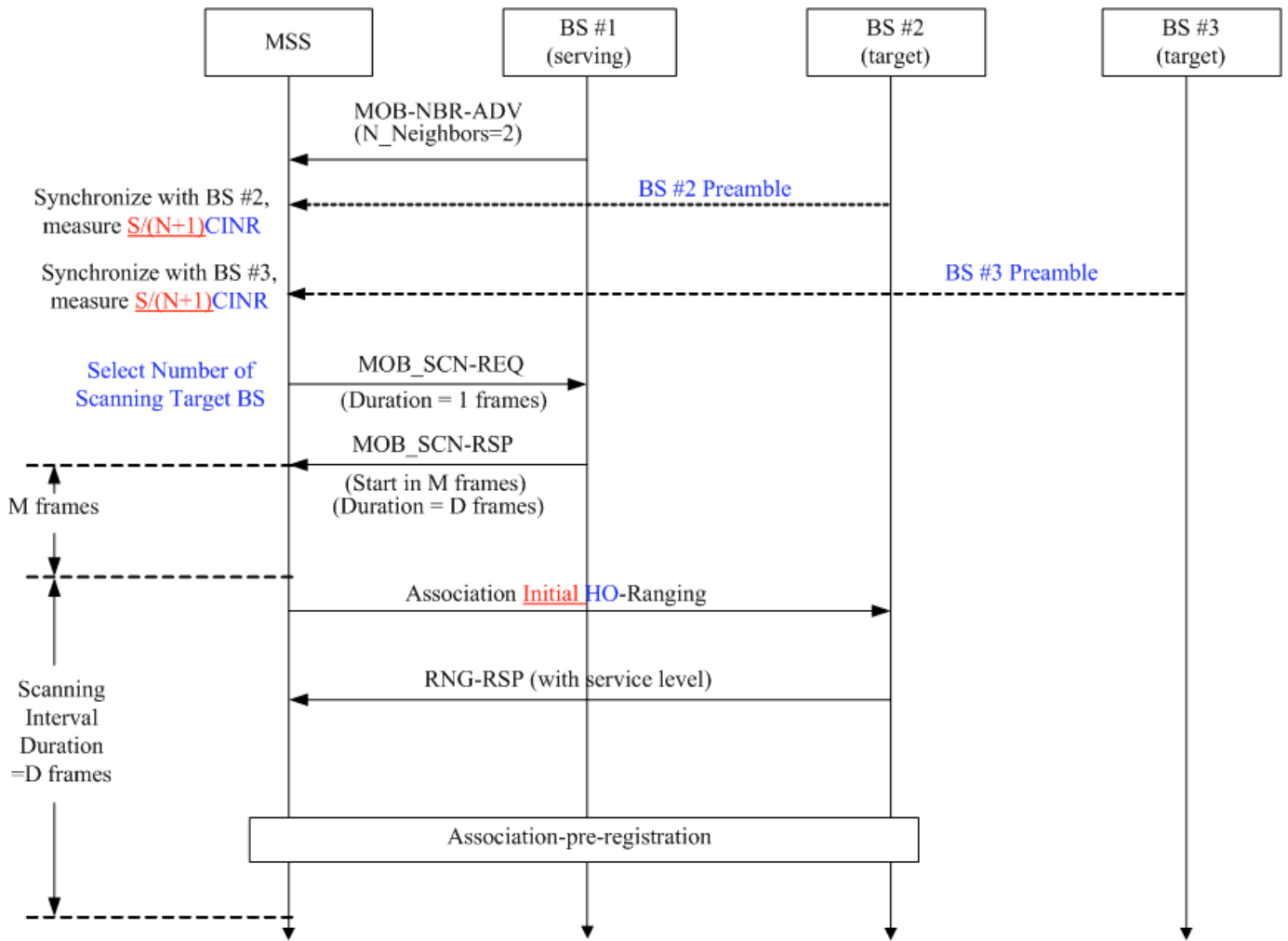**Figure E.1—Example BS advertisement and scanning (without association)by MSS request**

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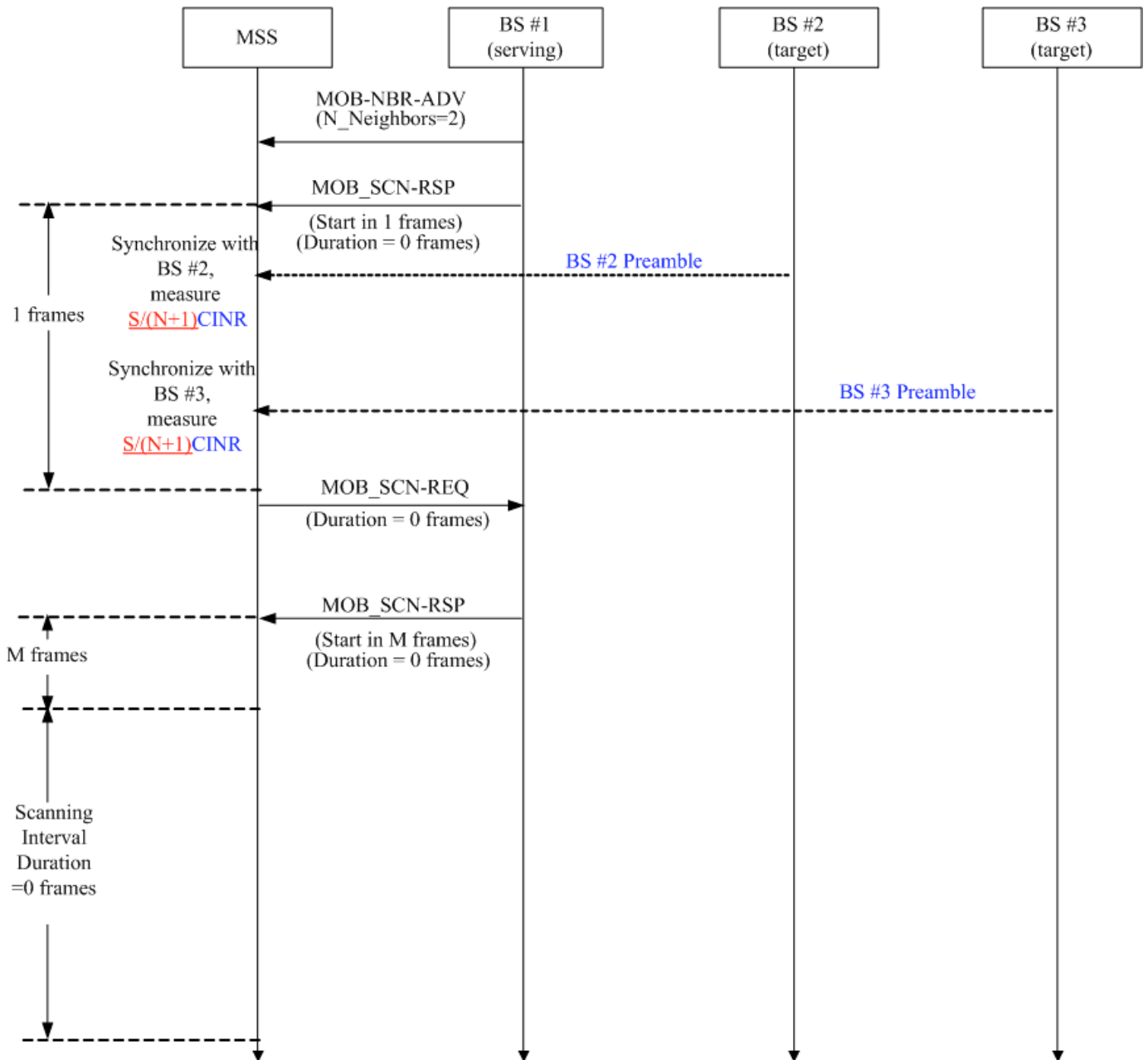**Figure E.2—Example BS advertisement and scanning (with association) by MSS request**

Figure E.3—Example BS advertisement and scanning (without association) by BS request
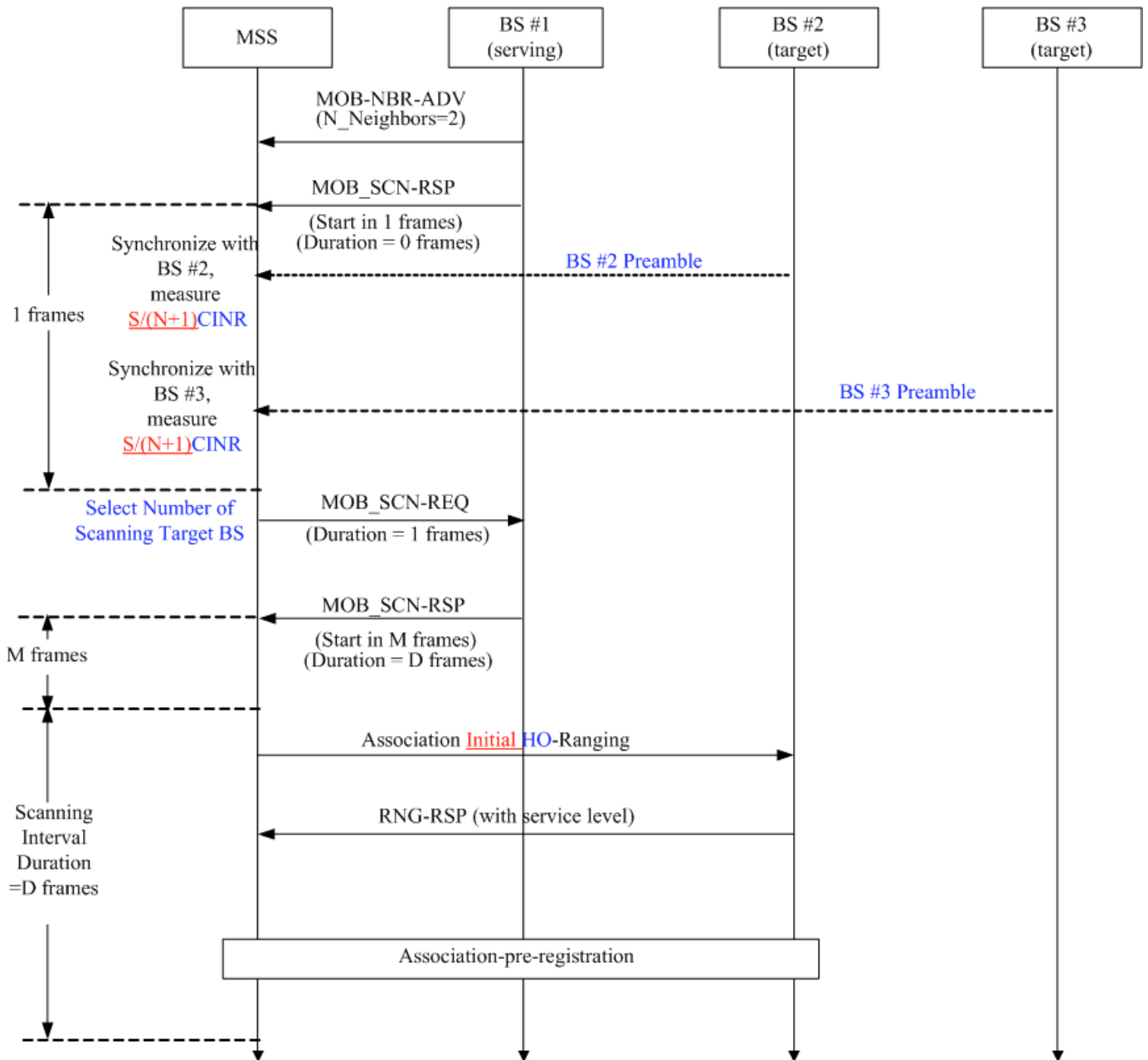
Figure E.4—Example BS advertisement and scanning (with association) by BS request