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Title	Mobile Relay Station Preamble Segment Re-Assignment Scheme	
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Re:	Call for Technical Proposals regarding IEEE Project P802.16j (IEEE 802.16j-06/027)
Abstract	This contribution proposes mobile relay-station preamble and segment re-assignment scheme that mitigates system interference during mobility MRS handover.
Purpose	Propose the text regarding mobile relay-station preamble segment re-assignment for multi-hop relay systems
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Mobile Relay-Station Preamble Segment Re-Assignment Scheme

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1. Introduction

The initial network entry process for MS is defined in IEEE Std. 802.16-2004 & 802.16e-2005, Section 6.3.9. In the DL PUSC mode, any segment used in the preamble shall be allocated at least one group (default is 12 subchannels in case of OFDM-2048) in the DL First Zone that contains FCH and DL-MAP. The default allocated subchannel sets for segments 0, 1, 2 are subchannels 0-11, 20-31, and 40-51, respectively. For example, when segment 0 is detected in the DL preamble of the frame structure, the immediately followed First Zone PUSC (i.e., FCH and DL-MAP) messages shall use at least 12 subchannels 0-11 to encode the FCH and DL-MAP control signaling. Note that the First Zone PUSC subchannel does not have the DL permutation applied to mitigate the subchannel interference.

In the relay enabled system, a Mobile RS (MRS) can be turned on at anytime and anywhere. If the MRS coverage area overlaps its neighbors RSs/BSs coverage areas and the same segment values are used, then in this situation co-channel interference may arise and MS/SS (mobile station/subscriber station) may not decode Cell-IDs and control messages such as FCH and DL-MAP signals. In order to mitigate interference, we propose MRS preamble and segment re-assignment methods used as the MRS moves.

2. Mobile RS Preamble Segment Configuration

After the mobile RS has registered with the MR-BS, it may move. In this case, two RSs (nomadic/mobile/fixed RS) or BS may end up geographically close to one another and they may interfere with each other if they have the same segment value. In order to mitigate co-channel interference due to the RS mobility, we propose a preamble segment re-assignment method associated with mobility handover

2.1 Mobile RS Preamble Segment Re-Assignment

During the initial network entry procedure, the MR-BS has assigned a segment “0”, “1”, or “2” to each RS in its coverage area. MR-BS can simply re-assign a different segment value to mobile RS that is interfering with other fixed/nomadic RSs. If both RSs are mobile RS, than we can re-assign one of them. Before the mobile RS segment reassignment, the BS/RS will command all the MSs within the mobile RS’s serving coverage area to switch to the newly assigned preamble segment at pre-determined action time via MOB_BSHO_REQ and MOB_HO_IND handover procedure as shown in Figure 1. With this virtual handover process, all the MSs do not really handover to a different RS. The targeted RS is the same as the previous serving RS but re-assigned a new RS preamble segment value and all the MSs controlled by this RS switch to this newly re-assigned RS preamble segment value with the same or different IDCell. The message signaling of mobile RS preamble segment re-assignment method is shown in Figure 1. Mobile RS may simultaneously transmit both the old and newly assigned preambles, together with the associated control signaling, for some (configurable) period of time in order to support fast ranging.

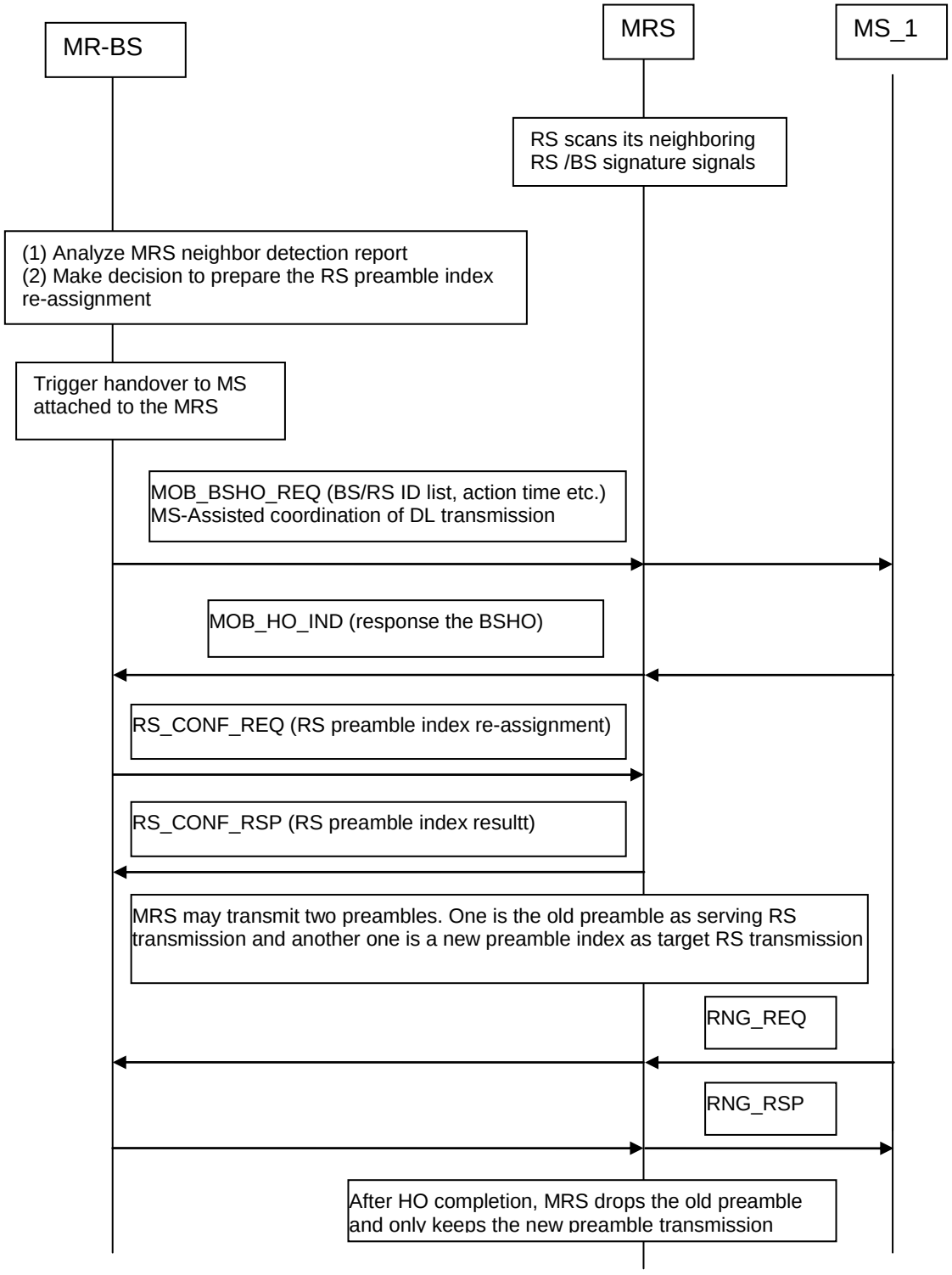

Figure 1. The message signaling for the mobile RS preamble segment re-assignment.

3. Changes to the specification

Insert the following text at the end of 6.3.2.3.7

For a MR-BS operation, the REG-REQ shall contain the following TLV.

RS_capability_support TLV (11.7.27)

Insert new subclause at the end of 6.3.9

During the network entry and registration process, the MRS acts as a MS/SS and use REG-REQ message to inform the MR-BS that it has relay capability to MR-BS.

3.1 Insert new subclause (6.3.2.3.64)

*** Note: The same messages of RS_CONF-REQ and RS_CONF-RSP have been used in the proposal of FRS preamble segment assignment.

6.3.2.3.64 RS preamble configuration request (RS_CONF-REQ) message

Syntax	Size	Notes
RS_CONF-REQ_Message_Format() {		
Management Message Type = TBD	8 bits	
N_Preamble	2 bits	N_Preamble=0 specifies NULL preamble (e.g., Transparent RS) N_Preamble=1 assigns one preamble to the RS N_Preamble=2 assigns two preambles on different segments to the RS N_Preamble=3 assigns three preambles on different segments to the RS
Reserved	6 bits	
For (i=0, i<N_Preamble; i++){		
Preamble index	8 bits	Assign a preamble index value to the potential RS
}		
TLV Encoded Information	Variable	TLV Specific
}		

N-Preamble
N_Preamble is the number of preamble index assigned to the potential RS. For example, N-Preamble=0 means the potential RS does not transmit preamble acting as a Transparent RS. If N-Preamble=1 means the potential

RS transmit one preamble index (i.e., the RS transmit one segment value and one IDCell) acting as a Non-Transparent RS. If N-Preamble=2 means the potential RS transmit two preamble index (i.e.,the RS transmit two different segment values and IDCells) acting as a Non-Transparent RS.

The RS_CONF-REQ shall contain the following TLVs:
HMAC/CMAC Tuple (see 11.1.2)
The HMAC/CMAC Tuple shall be the last attribute in the message.

3.2 Insert new subclause (6.3.2.3.65)

6.3.2.3.65 RS preamble configuration response (RS_CONF-RSP) message

Syntax	Size	Notes
RS_CONF-RSP_Message_Format() {		
Management Message Type = TBD	8 bits	
Result	1 bits	Result =0 Failure Result = 1 Success
Reserved	7 bits	
TLV Encoded Information	Variable	TLV Specific
}		

The RS_CONF-RSP shall contain the following TLVs:
HMAC/CMAC Tuple (see 11.1.2)
The HMAC/CMAC Tuple shall be the last attribute in the message.

3.3 Insert new subclause (6.3.22.4)

6.3.22.4.1 MRS Handover with preamble index changes
When MRS coverage area overlaps with another infrastructure stations coverage area, MR-BS may initiate MRS preamble reassignment procedures as define in section 9.4. If MRS preamble is changed then all the active MS connections are handed over to the same physical MRS after the RS preamble is changed using procedures in 6.3.22. The MRS segment reassignment procedure is executed during or after handover decision and initiation stage. All the MSs within the MRS's serving coverage are switched to the newly assigned preamble segment at pre-determined action time via MOB_BSHO_REQ/RSP.

The MRS may simultaneously transmit both the old and newly assigned preambles, which have different segment values, together with the associated control signaling, for some (configurable) period of time in order to facilitate association needed before fast ranging. After handover completion, MRS drops the old preamble and only keeps the new preamble transmission.

3.4 Insert new subclause (9.4)

9.4 RS configuration

After the measurement report from RS neighborhood discovery process, MR-BS may send a RS preamble configuration request (RS_CONF-REQ) message (6.3.2.3.64) to the RS for configuring the preamble segment and ID-Cell values. MR-BS may assign NULL preamble to the RS, thereby configuring it as a Transparent RS. Also, an RS may be assigned multiple preambles in order to proceed with the MS virtual handover process as defined in section 6.3.22.4.1. The RS sends a RS_CONF-RSP message to the MR-BS for responding the preamble assignment result.

The same TLV of RS_capability_support has been used in the proposal of FRS preamble segment assignment.

3.5 Insert new subclause 11.7.27

11.7.27 RS_capability_support

The “RS_capability_support” field indicates the potential RS capability. A bit of 1 indicates “support RS capability”.

Type	Length	Value	Scope
TBD	1	Bit #0=1; Support FRS capability. Bit #1=1; Support MRS capability Bit#2- bit #7; Reserved	REG-REQ