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-07/007r2)
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

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 can cause interference with the same segment value.

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. . However, once a preamble re-assignment occurs, its associated MSs are required to do handovers, even in the case where no relative movement between the MRS and MSs. The simultaneous MS handover may cause service interruptions and excess amount of overhead over the MR-BS and MRS link. Therefore, it is desirable to avoid the frequent update of cell ID and preamble.

We propose that a small set of preamble indexes are reserved (network-wide) for moving relay station. The benefit is the elimination of preamble collision of a moving RS with fixed RS(s) or MR-BS during movement of a moving RS, by which handover of MS(s) caused by preamble change can be fully avoided. The possibility of collision of preambles of two moving RS(s) is very low. When either preamble collision or high co-channel interference events happen, we suggest that two moving RSs form a temporary virtual RS grouping. Once two moving RSs move apart, it can then go back to individual RS station. By doing so, the preamble reassign procedure can be avoided entirely, so does the handover of all associated MSs. The virtual RS grouping forming or deletion process are described in the baseline document.

In case that RS or MR-BS do not support virtual RS grouping, then it is desirable to have a mechanism for preamble reselection. When either preamble collision or high co-channel interference events happen, we

suggest that a moving RS changes its preamble only when some conditions are met. The strength and the duration of strong interference will be used as the factors for the preamble/segment reselection (i.e., preamble reselection thresholds). By doing so, the possibility of preamble reselection (hence MS handover) during movement of a moving RS can be reduced.

Depending on a deployment scenario, it is not necessary to have moving RS in a network; therefore, we should allow MR-BS to configure these operations.

We propose that MR-BS(s) broadcast the reserved preamble indexes for moving RS(s).

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, then 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.

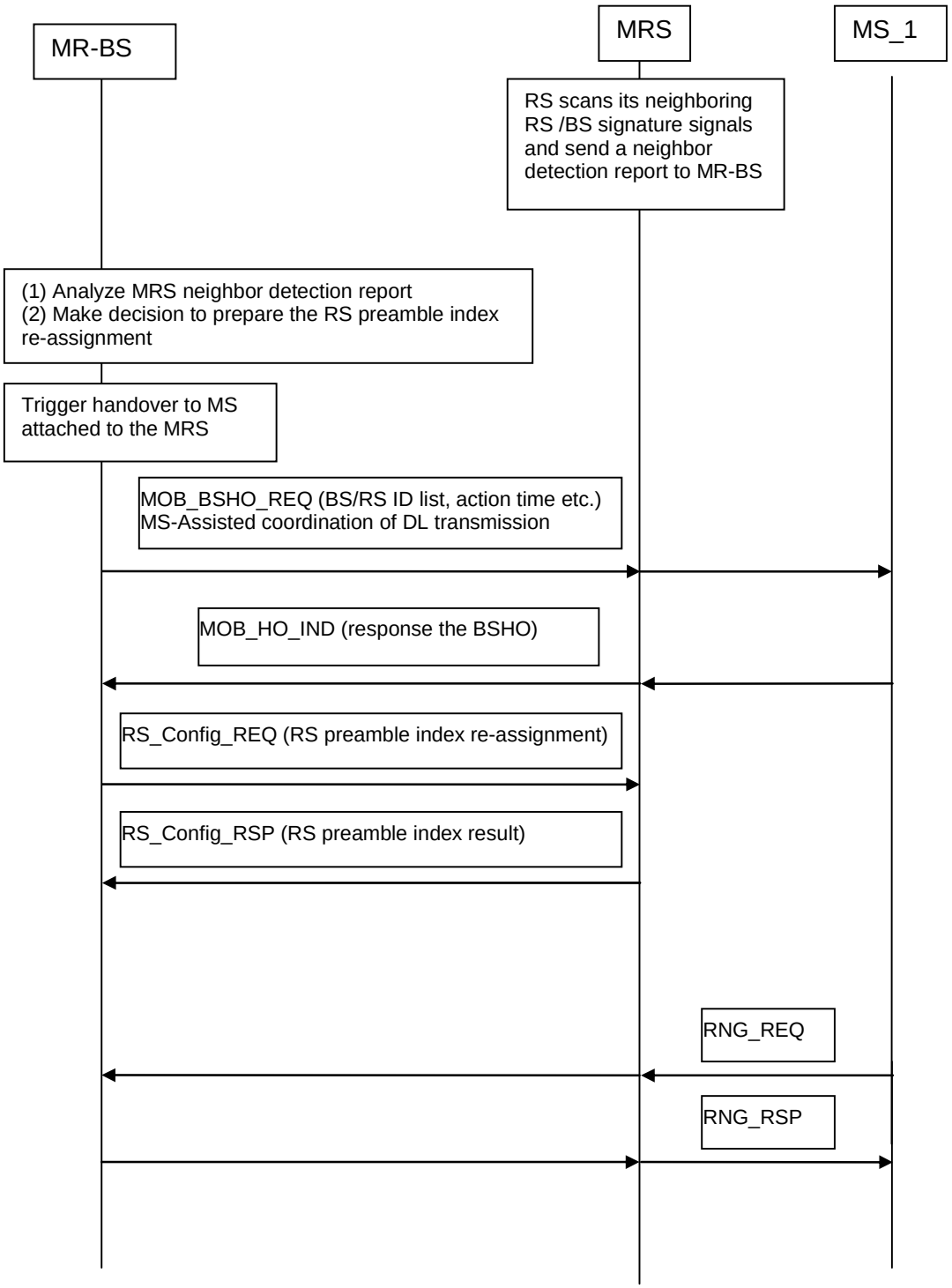

Figure 1. The message signaling for the mobile RS preamble segment re-assignment.

3. CHANGES TO THE SPECIFICATION

[Insert following text into XXX]

6.3.9.16.3 RS network entry and initialization

6.3.9.16.3.1 Fixed RS Preamble selection

6.3.9.16.3.2 Moving RS preamble selection

During the initial network entry, a moving RS shall obtain parameter “preamble indexes reserved for moving RSs’ from MR-BS broadcast RS_CD message. The moving relay station shall measure the strength of preambles reserved for moving RS and report to MR-BS through RS_NBR-MEAS-REP (see 6.3.2.3.68) message the preamble index with the least signal strength. MR-BS shall assign the preamble index based on the report from the moving RS and any additional available information.

[Insert new subclause (6.3.22.4.4)]

6.3.22.4.4 MRS handover with preamble index changes (Intra MR-BS)

During the movement of a moving RS, if there is a preamble collision or co-channel interference strength measured is higher than the preamble (segment) reselection threshold and the interference lasts longer than the duration threshold, the moving RS may re-select the preamble (segment) within the preamble-reselection window. The parameters governing the preamble (segment) reselection procedure of moving RSs is broadcasted in the RS configuration description (RS_CD) message as TLV of Preamble (segment) reselection threshold.

When MRS coverage area overlaps with another RSs/BSs coverage area, MR-BS may initiate MRS preamble reassignment procedures as define in section 9.4, using RS_Config_REQ/RSP. If MRS preamble is changed then all the active MS connections are handed over to the same physical MRS using procedures in 6.3.22. All the associated MSs within the MRS’s serving coverage are switched to the newly assigned preamble index at pre-determined action time via MOB_BSHO_REQ/RSP. The action time allows MRS time to switch newly assigned preamble index.
The MOB_BSHO-REQ message may carry the same BSID as the serving BS ID in the “Neighbor BSID” field while the “Preamble index/Subchannel index” field is changed to the newly preamble index, under mode=0b000.

After sending out MOB_BSHO-REQ message, the MRS segment reassignment procedure is executed using RS_Config-REQ/RSP messages.

Alternatively, one MRS may request to join another MRS with the same preamble to form a virtual RS group. The virtual RS group then serves all the MSs which are served by these two MRSs. The procedure to form or delete a virtual RS group is explained Section 6.3.9.16.3.1.

[Insert following text into XXX]
11. xxx RS_CD message TLV encoding

11.xxx.1 Preamble indexes reserved for moving relay station

This field may be used by a MR-BS to broadcast to relay stations the preamble indexes reserved for moving relay station.

Type	Length	Value	Scope
1	Variable	Bits#0-#3: number of preamble indexes (N) Bit#4-#(7N+3): List of N preamble indexes (7 bits each)	RS_CD

11. xxx Preamble reselection thresholds

This field may be used by a MR-BS to broadcast the preamble reselection thresholds for moving relay station.

Type	Length	Value	Scope
2	2	Bits #0 -#7: Interference signal strength threshold Bits#8-#11: Interference duration threshold in number of Frames Bits #12-#15: Window for reselecting the preamble (segment) in unit of 10 frames	RS_CD