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.

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. This option allows the MSs to reduce the switching time from the old to the new preamble. It also alleviates the need for performing handover switching at the same time for all the MSs associated with the MRS. The RS_Config-REQ/RSP message is exchanged for indicating to the MRS the new preamble. The MRS runs a timer, Multiple

Preamble Duration, during which both old and new preambles are transmitted enough to allow association with the new preamble, while the MS is still connected to the old preamble; and handover completion.

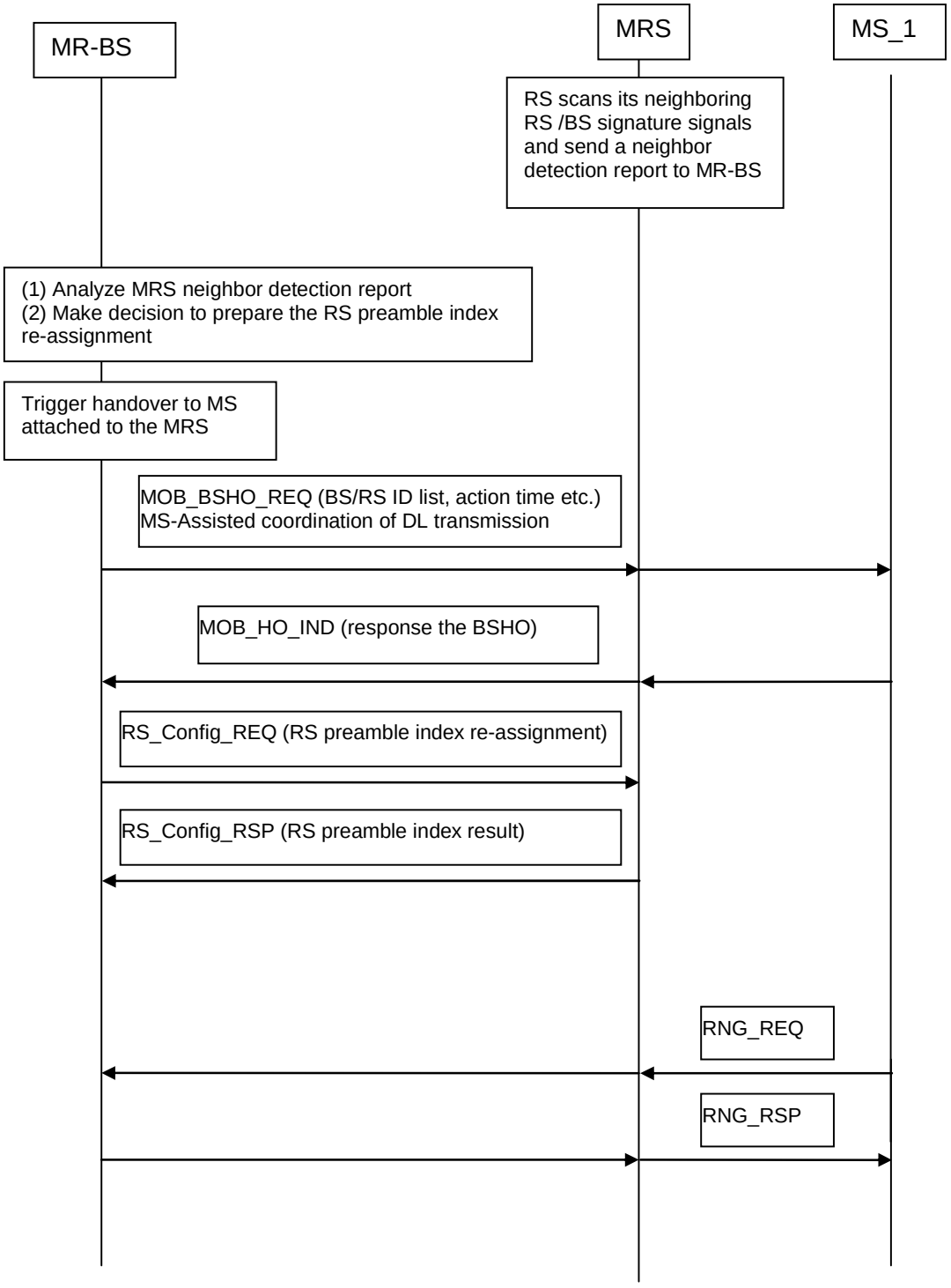

Figure 1. The message signaling for the mobile RS preamble segment re-assignment.

3. SOME OBSERVATIONS

We are addressing here some issues that may arise when the old and new preambles may be transmitted simultaneously.

Transmitting two preambles simultaneously require a dual-MAC implementation?

We think that this is not required. The MAC of RS generates the MAPs for all the MSs, as they would be served by one segment. After that, it duplicates the MAPs transmission for the other segment. Note that, it is not necessary to change the CIDs of the MSs, because this is an intra-BS handover. This may create some small overhead for a short period of time when the preambles are transmitted simultaneously. The implementation allows for an MS to receive/transmit the data irrespective of its segment, during the RS preamble change.

Transmission power may not be enough?

A mobile RS has a small coverage area that does not require too much power. The RS may require more power for UL than for DL transmission. Therefore, transmitting in two segments is feasible.

How the Action Time is used during changing of preambles?

It is obvious that the MSs are already in sync both on DL and UL with the RS. Therefore fast ranging can be used to expedite the transfer of the MS from the old preamble to the new preamble. In 16e spec, action time is used for indicating to the MS the frame number where the Target BS allocates a dedicated transmission opportunity for RNG-REQ message using Fast Ranging-IE. This parameter is sent by the BS in the MOB_BSHO-REQ/RSP message. We will use the same mechanism of action time is used for handing over the MSs from the old preamble to the new preamble. The Action Time allows network to distribute MSs for handover preparation and network re-entry on different frames.

4. CHANGES TO THE SPECIFICATION

[Insert new subclause (6.3.22.4.4)]

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

When MRS coverage area overlaps with another ISs 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. The MRS segment reassignment procedure is executed during or after handover decision and initiation stage. All the associated 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 transmit two preambles for the Multiple Preamble Duration, in order to help the associated MSs in performing association and handover with the new preamble. The Multiple Preamble Duration is sent in RS_Config-REQ message. When the two

preambles are transmitted during the handover session, the old preamble power should be lowered while the new preamble power should be increased to its nominal value.

[Add the following text at the end of subclause 9.4 RS Configuration]

When MRS moves to another segment within the MR-cell, its essential control information such as FCH and MAP may interfere with the MR-BS or RS allocated the same segment. In order to mitigate co-channel interference due to the RS mobility, the RS configuration procedure shall be executed.
Also, an RS may use both preambles from the old and new configurations during the Multiple Preamble Duration as sent in the RS_Config-REQ message. It may transmit the preambles with different power in order to proceed with the MS virtual handover process as defined in section 6.3.22.4.4.

[Add the following text at the end of subclause "6.3.2.3.x RS configuration request message"]
The following parameter shall be included for MRS:

Multiple Preamble Duration TLV (see 11.xx)

[Insert new subclause11.xx]

11.xx. RS_Config-REQ message encodings

Name	Type	Length	Value
Multiple Preamble Duration	TBA	1	The number of frames, the MRS transmits new and old preamble simultaneously