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Re:	MRS Paging Group Update, http://www.ieee802.org/16/relay/contrib/C80216j-07_030.pdf
Abstract	This document provides another MRS paging group update process, which remedy the procedure defined in 6.3.24.10 of the baseline document 802.16j-06/026r2
Purpose	
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MRS Paging Group Update Remedy

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1 Introduction

When Mobile RS moves along with its subordinate MSs from one paging group area to another, all the attached MSs in idle mode detects the change in paging group and performs location update procedure almost simultaneously. This would increase the signaling load, congestion and contention on the access link and relay link.

In IEEE 802.16j-026r2, it has defined the concepts of Paging Group Update, which update the PG-ID list of target MMR-BS in RNG-REQ/RNG-RSP messages. This behavior corresponds to the usage scenario where RS attached to Bus, ferry or train moves together with MSs attached to Mobile RS.

The Paging Group Update procedure may avoid location update storm and reduce signaling load. But updating PG_ID in RNG-REQ/RNG-RSP messages is too late. After the MRS lost the old link and before it finished ranging procedure, all the paging message for its subordinate idle-mode MSs would be send to the old BS. In other words, all the idle-mode MSs in this MRS are unreachable during this time gap. The time length depends on MRS re-entry ~~procedure~~ and paging information updating procedure in ASN-~~/~~GW/PC. It's unacceptable for the operators and subscribers in commercial network. Also special procedure is needed to remove the MRS PG_ID in the PG_ID list of the old MMR-BS.

This contribution proposes another Paging Group Update procedure, which could avoid the drawbacks aforementioned with less modification on the air interface and achieve the ~~same~~ better advantages.

2 Proposal

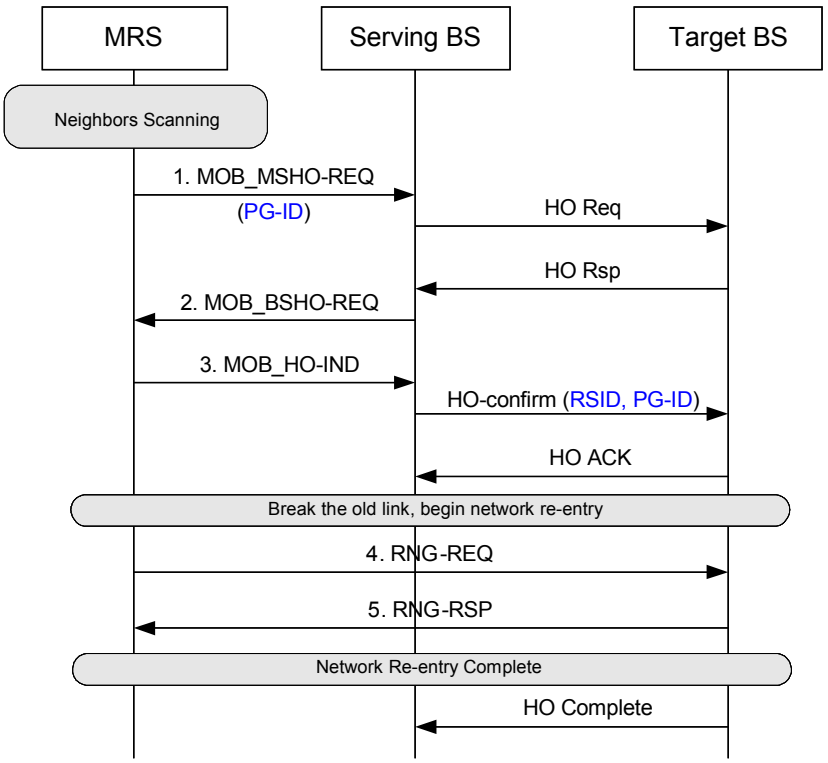
It is agreed that mobile RS ~~will~~won't enter ~~have~~ an idle mode. Therefore there is neither location update procedure nor initial network entry procedure for the RS moving, but always handover procedure. When MRS moves from one BS to another, it would be possible that the corresponding context (including MRS PG-ID) is transferred in handover signaling, instead of RNG-REQ/RNG-RSP messages.

This section describes another Mobile RS paging Group Update procedure, which is different from the current one. The former we suggested is more suitable for normal MRS HO, and the latter is more suitable for unpredictive handover.

In WiMAX NWG stage 3 documents, an unpredictive handover occurs when an MS starts ranging at a target network that wasn't previously notified of an impending handover from an MS and didn't finish the Handover Preparation Phase. This may occur due to suboptimal radio planning conditions or MS behavior (MS moves with much high speed or handover notification to the network by the BS is optional).

The following figure shows the procedure of MRS updating the paging group information. The serving BS communicates with target BS through backbone network, and the corresponding procedure and messages are

defined in WiMAX Stage 3 document. Modifications are shown in BLUE.



When MRS enters into the coverage of a new BS and decides to make handover, if it find it's necessary to update paging group in Target BS, it will send the serving BS MOB_MSHO-REQ message with ~~Mode parameter which requests serving BS to transfer the RS PG_ID to the target. If needed, the MOB_HO-REQ maybe contains~~ RS PG-ID parameter which requests serving BS to transfer the RS PG_ID to the target. After HO-Req/HO-Rsp message exchange with the target BS, the Serving BS responds with MOB_BSHO-RSP message. The MRS uses MOB_HO-IND to commit handover. Upon receipt of MOB_HO-IND, the serving BS sends HO-confirm (including RS ID and RS PG_ID), which inform the target BS to add the RS PG-ID to its PG_ID list.

The target BS updates its PG_ID list using RS PG-ID in HO-confirm message. And the target BS would also notify other network entity e.g. ASN-GW/PC about the location of MRS.

The previous BS may also remove~~s~~ the RS PG_ID from its PG list when it receives HO Complete message from the target. Possibly the serving BS sets a timer upon receiving MOB_HO-IND, and deletes the RS PG-ID when the timer expires.

This procedure ensures that the network can know the location of MRS and page the idle mode MS in the MRS at any time needed.

In some unusual cases (e.g. the MRS moves with high speed), the MRS can't finish the whole HO initiation process (step 1 ~ step 3~~5~~). The MRS may perform Paging Group Update procedure via RNG-REQ/RNG-RSP messages, which is the current definition of Paging Group Update procedure (section 6.3.24.10).

3 Advantages

The proposed MRS Paging Group Update procedure has the following advantages:

Avoid necessary idle-mode MS location update procedure.

Reduces the overall latency for MRS network re-entry because of context transfer while handover.

The idle-mode MS is reachable at any time while MRS moving.

No special procedure is needed to remove RS PG-ID in old BS.

Required very minimum changes on the air interface (one TLV in ~~both~~ MOB_MSHO_REQ ~~and MOB_HO_RSP~~).

4 Specs changes for MRS Paging Update Procedure

Insert following sections/subsection in new sub clause in 6.3.22.4 Mobile relay station handover

6.3.24~~2~~.12~~4~~.1 ~~Handover with~~ MRS Paging Group Update during handover

When MRS enters into the coverage of a new ~~M~~MR-BS and decides to make handover, it ~~will~~may send the ~~serving BS~~ MOB_MR~~S~~HO-REQ message with ~~Mode~~Paging Group ID parameter to serving MR-BS. ~~which requests~~ serving MR-BS may exchange backbone messages with the other BSs in new PG to request the addition of RS PG_ID to their PG_ID list. Upon successful response from all of the BSs, the target BS shall reply with the ~~BS to transfer the RS PG_ID to the target. And the Serving BS responds with~~ MOB_BSHO-RSP message, which contain the Paging Group Response parameter informing whether the ~~serving BS would transfer the PG-ID to the target~~Paging Group Update request is accepted. If the MRSN can't finish the whole HO initiation process, or this update request is refused, ~~and~~ the MRS ~~shall~~needs to perform Paging Group Update procedure while network re-entry (as defined in section 6.3.24.10).

~~The MRS uses MOB_HO-IND to commit handover. Upon receipt of MOB_HO-IND, the serving BS inform the target BS to add the RS PG-ID to its PG_ID list via backbone network.~~

~~The target BS updates its PG_ID list using RS PG-ID, and the previous BS also removes the RS PG_ID from its PG list when it know the handover completes from the target. Possibly the serving BS sets a timer upon receiving MOB_HO-IND, and deletes the RS PG-ID when the timer expires.~~

Insert following sections/subsection in new sub clause in 6.3.24 MS Idle Mode (Optional) section

6.3.2.3.53 ~~RS~~MS HO Request (MOB_MS~~RS~~HO-REQ) message

The following parameter may be included in the MOB_MS~~RS~~HO-REQ message when the MRS Paging Group ID is changed and is attempting to perform handover:

~~Mode~~

~~Indicates which HO mode is for this handover request.~~

~~0b000: HO request~~

~~0b001: HO request and Paging Group Update~~

~~0b010-0b111: Reserved~~

Paging Group ID

One or more logical affiliation grouping of MRS (see 6.3.2.3.56)

6.3.2.3.54 BS HO Response (MOB_BSHO-RSP) message

When a MMR-BS sends MOB_BSHO-RSP message in response to a MOB_MRSHO-REQ message ~~with~~containing MRS PGID ~~the Mode parameter set to 0b001,~~ the MMR-BS shall include the following TLV parameter in the RNG-RSP message:

Paging Group Update Response

0b00=Failure of Paging Group Update. The MRS shall perform Network Re-entry
0b01=Success of Paging Group Update
0b10, 0b11: Reserved ~~Response to Paging Group Update Request:~~

~~0b00=Failure~~Refuse ~~of Paging Group Update. The MRS shall perform~~ this procedure while ~~Network Re-entry~~

~~0b01=Success~~Accept ~~of Paging Group Update~~

~~0b10, 0b11: Reserved~~