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Re:	IEEE 802.16j-07/007r2:"Call for Technical comments and contributions regarding IEEE Project P802.16j"
Abstract	This document presents a MRS handover mechanism in tunneling case.
Purpose	Add proposed spec changes in P802.16j Baseline Document (IEEE 802.16j-06/026r2)
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MRS Handover in Tunneling Case

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Introduction

Usually, when a MRS performs handover, all attached MS(s) would also perform handover at the same time. This procedure incurs a lot overhead and signaling storm. When a MRS moves from one MR-BS to another, if the MRS keeps the same preamble, an efficient handover procedure for MRS has been suggested [2]. When MRS moves from source MR-BS to the target MR-BS, it exchanges messages on behalf of all the attached MSs with the source MR-BS for handover initialization. The MR-BS can handle the handover (MRS and its subordinate MSs) with the assistance of MRS, without the involvement of MSs attached to this RS.

Connection management in tunnel case is proposed in [1]. In this case, the MS MAC PDU is routed according to the combination of Tunnel CID and MS CID. As a result, all the tunnels must be re-established when MRS handover to new MR-BS. In addition, the QoS of these tunnels in new MR-BS should also be configured.

In C802.16j-07/037, the MRS handover scheme in non-tunneling case is proposed. The mapping between the new and old CIDs of MSs is created in MRS in non-tunneling case. In this proposal, we present another MRS handover scheme in tunneling case, which can coexist with that in non-tunneling case.

In this proposal, tunnel mentioned are mainly traffic tunnel.

MRS Handover procedure

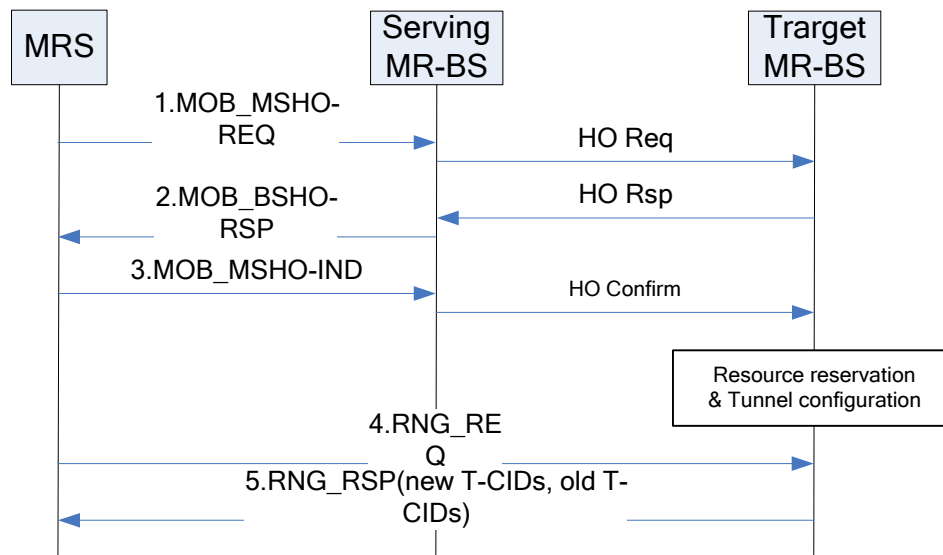If the MRS keeps the same preamble, the following figure shows the MRS HO procedure in tunneling case.

Figure 1 MRS Handover procedure

1. MRS sends MOB_MSHO-REQ message to the serving MR-BS for handover initialization. The serving MR-BS may send MRS info and tunnels info to the target MR-BS over the backbone for handover preparation.

MRS info includes MRS MAC address. Tunnel info includes CID and QoS parameters of a tunnel, SFIDs and CIDs of the MSs who attach to the MRS in tunneling case.

2.   After receiving the response from target MR-BS, the serving MR-BS responds with MOB_BSHO-RSP message.

3.   The MRS uses MOB_HO-IND to commit handover. Upon receipt of MOB_HO-IND, the serving MR-BS sends HO-confirm, which inform the target MR-BS to reserve resource and configure tunnels.

4.   The MRS performs network re-entry by sending RNG-REQ to the target MR-BS.

5.   The MR-BS assigns new tunnel CIDs, and sends them to MRS in RNG-RSP together with the old tunnel CIDs.

This procedure ensures that when the MRS attaches to the new MR-BS, it could transfer MAC PDU of MS immediately, which would reduce the handover latency. And also the MS attached to the MRS is not involved, i.e. no extra signaling is required for these MSs.

Advantages beyond proposal [2]

When MRS attaches to a new MR-BS, it could transfer MAC PDU of MS immediately, which would reduce the handover latency obviously.

Not like CID mapping, whether the security association is established between MS and RS, this mechanism does work.

The message length of RNG-RSP could be reduced observably, which would decrease the overhead in the air-interface.

Specific Text change

Insert new subclause as section 6.3.22.4.2

6.3.22.4.2.1 HO Decision and Initiation

When MRS makes a decision for handover, it sends MOB_MSHO-REQ message on its basic CID to the Serving MR-BS. The MR-BS, knowing that the basic CID belongs to a MRS, sends MOB_BSHO-RSP message. The serving MR-BS may send the MAC address of the MRS, along with the MAC addresses, SFIDs and CIDs of the MSs attached to the MRS, to the target MR-BS using the backbone message. In tunneling case, the tunnel info should also be carried, which includes CID(s) and QoS parameter(s) of the tunnel(s). The backbone message definition is beyond the scope of this specification.
The serving MR-BS initiates handover for a MRS by sending MOB_BSHO-REQ message.

6.3.22.4.2.2 Network Entry/re-Entry

During network entry/re-entry MRS informs the MR-BS that it is a MRS. The serving MR-BS may exchanges the backbone messages with the target MR-BS to retrieve the MAC addresses, SFIDs and CIDs of all the MSs attached to the MRS. The details of the backbone messages are beyond the scope of this specification. In non-tunneling case, the target MR-BS may allocate new CIDs to MSs during ranging procedure with the MRS. If new CIDs are assigned, then MR-BS shall send old and new CID pairs to the MRS in RNG-RSP. The

MRS creates mapping between old and new CID. It replaces old CID with the new CID in the UL MPDUs. Similarly, it replaces new CID with the old CID in the DL MPDUs.
In tunneling case, the target MR-BS may allocate new CIDs to tunnels instead of MSs during ranging procedure, and then send old and new tunnel CID pairs to the MRS in RNG-RSP. After getting the relationship of old and new tunnels, MRS can route MS MAC PDU according to the combination of Tunnel CID and MS CID.

6.3.2.3.6 Ranging response (RNG-RSP) message

Add the following text at the end:

The following parameter may be included in the RNG-RSP message when the MRS is attempting to perform network re-entry or handover:
Tunnel CID List TLV (see 11.5)

Insert new subclause (11.6.3):

11.6.3 Tunnel CID List
The Tunnel CID List carries a list of the CIDs of the tunnels between an MRS and the MR-BS. It provides a mapping between old tunnel CID (assigned by the old MR-BS) and new tunnel CID (assigned by the new MR-BS) in tunneling case.

Type	Length	Value
—	variable	See the following table

Field	Length	Note
Number of CIDs	2Bytes	The next two fields will be repeated number of tunnels associated with the MRS
Old CID	2Bytes	
New CID	2Bytes	

References
[1] IEEE C802.16j-06/274r5 Proposal on addresses, identifiers and types of connections for 802.16j
[2] IEEE C802.16j-07/037r3 MRS Handover