
Project **IEEE 802.16 Broadband Wireless Access Working Group** <<http://ieee802.org/16>>

Title **MRS Handover**

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Source(s) Yousuf Saifullah, Shashikant Maheshwari, Haihong Zheng
 Nokia
 6000 Connection Drive, Irving, TX

Voice: 972 894 5000
 Fax:
Yousuf.saifullah@nokia.com,
shashikant.maheshwari@nokia.com,
haihong.l.zheng@nokia.com

Sungkyung Kim
 Sungcheol Chang
 Chulsik Yoon
 ETRI
 161, Gajeong-dong, Yuseong-Gu,
 Daejeon, 305-350, Korea

cyrano@etri.re.kr

Hyunjeong Kang, Sungjin Lee, Hyoung Kyu
 Lim and Jungje Son
 Samsung Electronics

hyunjeong.kang@samsung.com

Aik Chindapol

Voice: + 1 609 734 3364

Siemens Corporate Research

Email: aik.chindapol@siemens.com

755 College Road East, Princeton, NJ

[Kyu Ha Lee, Jae Hyung Eom, Young-jae Kim](#)
[Samsung Thales San 14, Nongseo-Dong, Giheung-Gu, Yongin, Gyeonggi-Do, Korea 449-712](#)

Voice: [+82-31-280-9917](tel:+82-31-280-9917)
 Fax: [+82-31-280-1620](tel:+82-31-280-1620)
kyuha.lee@samsung.com

Re: This is a response to the call for proposals 80216j-07_007r2.pdf

Abstract This contribution proposes Mobile RS handover procedure.

Purpose	Add proposed spec changes in P802.16j Baseline Document (IEEE 802.16j-06/026r2)
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MRS Handover

Yousuf Saifullah, Shashikant Maheshwari, and Haihong Zheng
Nokia

Sungkyung Kim, Sungcheol Chang, and Chulsik Yoon
ETRI

Hyunjeong Kang, Sungjin Lee, Hyoung Kyu Lim and Jungje Son
Samsung Electronics

Aik Chindapool

Siemens Corporate Research

Kyu Ha Lee, Jae Hyung Eom, Young-jae Kim

Samsung Thales

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Mobile RS (MRS) handover introduces a new mobility issue. The MRS moves along with the MSs attached with it. When a MRS moves from one BS to another, the following two scenarios are possible:

- MRS preamble is re-assigned
- MRS keeps the same preamble

In the former case, all the subordinate MSs of the MRS may need to initiate network re-entry. This contribution is not covering this part. Please refer to [1] and [2].

In the later case, the MR-BS may trigger handover for all the subordinate MSs of the MRS, in order to establish connection. This will increase signaling load. Also, it increases chance of failure as too many MSs are contending for the medium at the same time.

This contribution suggests an efficient handover procedure for MRS for the later case. When MRS moves from source BS to the target BS, it exchanges messages on behalf of all the attached MSs with the source BS for initiating handover. The BS moves all of the MSs together with one set of messages with RS, instead of individual set of handover messages with each MS.

The following figure illustrates the proposed mobile RS handover procedure along with its attached MSs. The figure assumes two MSs attached to an RS.

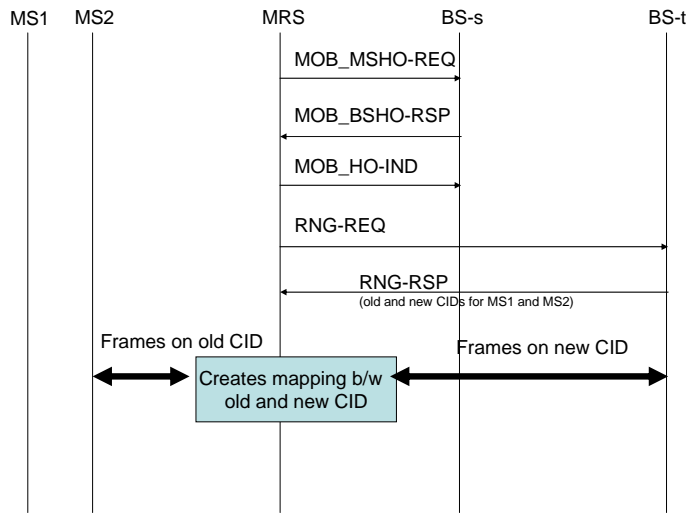


Figure 1: MRS Handover

1. MRS sends MOB_MSHO-REQ message to the serving MR-BS on its basic CID for initiating handover.
2. The serving MR-BS sends MOB_BSHO-RSP message to the MRS. The serving MR-BS sends the MAC addresses, SFIDs and CIDs of the MSs under MRS to the target MR-BS over the backbone. It receives HO_ID and sends HO_ID in the MOB_BSHO-RSP message.
3. The MRS sends MOB_HO-IND message to the serving MR-BS.
4. The MRS performs network re-entry by sending RNG-REQ containing HO_ID . If the MRS shares a security association with the target BS, it sends HMAC/CMAC in the message. The MRS may not be able to receive HO_ID from the serving BS, if the MOB_BSHO-RSP message is not received by the MRS. The MRS sends the serving BS ID to the target BS. The target MR-BS uses the serving BS ID to contact the serving BS and retrieves the MAC addresses and CIDs of the MSs using backbone procedures.
5. The BS may assign new CIDs for MS1 and MS2, and sends it to MRS in RNG-RSP. If new CIDs are assigned, then MRS shall create mapping between old and new CID for each MS. It swaps them for UL/DL traffic and signaling. In this way no signaling procedure is initiated for MS1 and MS2.

During swapping of CID in the MPDU header, MRS may also need to recalculate and replace CRC, which is a minor calculation. CMAC digest is calculated using CID. The MR-BS calculates CMAC on the old CID. Figure 1 shows RS initiated handover. An MR-BS initiated HO for MRS is similar to the MRS initiated HO.

The target MR-BS may not allocate new CIDs to the MSs during step 5. This is possible, when T-CID (tunneling) is used for routing MPDUs between MR-BS and access MRS. If T-CID is not used, the target MR-BS first attempts to keep the same old CID assigned to the MSs. If an old CID from serving MR-BS is already assigned, the target MR-BS assigns a new CID.

Advantages

The proposed MRS handover procedure has the following advantages:

- The handover is faster, as only one station (RS) is involved instead of multiple MS. Easier and faster to schedule one station for the fast ranging.
- The handover is bandwidth efficient. There is only one set of signaling message over the RS-BS link for all the MS attached through the RS.
- Less complexity for RS. The contribution introduces minor changes to the existing mobility related messages from 802.16e-2005. Existing messages are used with the addition of few TLVs.

Spec Changes

Insert new subclause as section 6.3.22.4.1

6.3.22.4.1 Mobile RS Handover Process without Preamble Change

The MRS Handover process hands off all the MS attached to itself, along with the MRS, to a target BS. It follows the same procedures as described for an MS handover in section 6.3.22.2. The procedures, where certain steps are different, are described in this section.

6.3.22.4.1.1 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. The backbone message definition is beyond the scope of this specification.

The serving MR-BS initiates handoff for a MRS by sending MOB_BSHO-REQ message on the MRS basic CID.

6.3.22.4.1.2 Network Entry/re-Entry

During network entry/re-entry MRS informs the MR-BS that it is a MRS. The serving MR-BS may exchange 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.

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.

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:

CID List TLV (see 11.5)

Insert new subclause (11.6.3):

11.6.3 CID List

The CID List carries a list of the CIDs of the MSs attached to an MRS. It provides a mapping between old CID (assigned by the old MR-BS) and new CID (assigned by the new MR-BS).

Type	Length	Value
-	Variable	See the following table

Field	Length	Note
Number of CIDs	2 bytes	The next two fields will be repeated number of MS times
Old CID	2 bytes	
New CID	2 bytes	

References

[1] Mobile Relay-Station Preamble Segment Re-Assignment Scheme, C80216j-07_041r4.doc; Peter Wang et. al.

[2] Group Handover on the Mobile RS, C80216j-07_122r3.doc, Sungkyung Kim, Sungcheol Chang, and Chulsik Yoon; ETRI