	IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>
Title	**MS handover support by RS**
Date Submitted	**2006-11-07**
Source(s)	Hyunjeong Kang, Sungjin Lee, Hyoung Kyu Lim, Jaeweon Cho, Jungje Son, Panyuh Joo Samsung Electronics [mail to: hyunjeong.kang@samsung.com hk03.lim@samsung.com] Rakesh Taori Samsung Advanced Institute of Technology [mail to: rakesh.taori@samsung.com]
Re:	Call for technical proposals regarding IEEE project P802.16j
Abstract	This contribution proposes a scheme using which an RS can trigger as well as control the MS handover.
Purpose	Discussion and Adoption in IEEE 802.16j
Notice	
Release	
Patent Policy and Procedures	

MS handover support by RS

Hyunjeong Kang, Sungjin Lee, Hyoung Kyu Lim, Jaeweon Cho, Jungje Son, Panyuh Joo
Samsung Electronics

Rakesh Taori
Samsung Advanced Institute of Technology

Introduction

In 802.16j, an RS that is functioning as an access station as well as an MMR-BS should support MS handover operation. We assume that the extent to which an RS is able to support MS handover depends on the RS capability, which can be quite different. In some cases, RSs may be capable of performing the whole handover process including negotiation procedures with MSs, while in some other instances RSs may execute the whole, or a part of the, process according to commands from MMR-BSs. In this contribution, we consider the messages and protocols that would facilitate the RS to perform a complete handover operation on its own. The case whereby the handover is performed by the RS under the direction of MMR-BS is discussed in [1].

Problem Statement

In current 802.16e MS handover operation, an MS initiates a handover by transmitting the MOB_MSHO-REQ message to its serving BS and receives the MOB_BSHO-RSP message as a response from the serving BS. On the other hand, the serving BS may also initiate MS handover by transmitting MOB_BSHO-REQ message. In either case, the serving BS indicates the recommended target BSs, for instance, from the message exchanges with its neighboring BSs via backbone network. The messages also contain information on the expected service level of the MS, at each target BS, in case the handover takes place. An MS sends MOB_HO-IND with HO_IND_type=0b00 as a commitment to perform handover to a certain BS. Otherwise, the MS may send MOB_HO-IND with HO_IND_type=0b10 to refuse to handover. In that case, the serving BS may reconfigure the neighbor BS list and retransmit MOB_BSHO-RSP message. An MS may cancel performing handover at any time by transmitting MOB_HO-IND with HO_IND_type=0b01.

In this contribution, we assume that RS has the capability to trigger MS handover and generate appropriate responses when the handover request is initiated by an MS. We also assume that RS can decide to initiate the handover of its MS, compose handover request or response messages with the relevant information, including possible HO target MMR-BSs or RSs, just as legacy BSs do. Though the handover operation is carried out by the RS itself, it is required that RS should exchange some control messages with the MMR-BS to obtain the information of neighbor MMR-BS or RS. Furthermore, the RS informs the result of handover negotiation to its MMR-BS.

Suggested Remedy

Using the scheme described below, an RS can trigger and control MS handover.

When an access RS determines the necessity of MS handover, it transmits MOB_BSHO-REQ message to the MS. To configure the MOB_BSHO-REQ message, the access RS chooses candidate target access station(s) based on the report of MS scanning, in a way similar to that of a legacy BS. The access RS may obtain from its serving MMR-BS more information about the candidate target access station(s) including expected service level of MS at each target access station. Upon receipt of the MOB_MSHO-REQ message from an MS, an access RS shall reply with MOB_BSHO-RSP containing a recommended target access station list. When an access RS receives MOB_HO-IND with HO_IND_type=0b10 indicating HO reject, the access RS reconfigures recommended target access station list and sends a new MOB_BSHO-RSP with the new list.

An MMR-BS may provide an access RS with the information of recommended target access stations that may be needed to build a MOB_BSHO-RSP message. On the other hand, the access RS may explicitly request that information by sending a message, e.g., MMR_MSHOINFO-REQ message to its serving MMR-BS. The MMR-BS in turn can respond with an MMR_MSHOINFO-RSP message. The MMR_MSHOINFO-REQ message may include the identifiers of candidate target access stations as well as the MS on handover. The MMR_MSHOINFO-RSP message may contain the information on HO process optimization as well as expected service level of MS at each recommended target access station. The access RS can send an MMR_MSHO-IND message to the MMR-BS when the access RS receives MOB_HO-IND message indicating MS commitment to handover, and MMR_MSHO-IND message informs the MMR-BS of the fact that the MS handovers to a certain target access station.

Therefore we propose the remedies as follows:

- Define a new message flow between an access RS and its MMR-BS to support MS handover operation.
- Define new management messages used in the message flow to request and obtain required information for MS handover
  - MMR_MSHOINFO-REQ message to request the information about recommended target access stations
  - MMR_MSHOINFO-RSP message as a response to MMR_MSHOINFO-REQ
  - MMR_MSHO-IND message to inform MMR-BS of MS’s commitment to perform handover

Proposed Text Change

[Remedy1: Insert the followings at the end of section 6.3.22.2.2]

[Insert the followings at the end of section 6.3.22.2.2:]

An access RS may initiate handover of an MS by sending a MOB_BSHO-REQ message to the MS, and reply to an MS' MOB_MSHO-REQ by generating and sending a MOB_BSHO-RSP message. The MOB_BSHO-RSP message contains the recommended target access station list which may be created by the access RS based on the information that is either gathered on its own, or received from its serving MMR-BS. In order to obtain the information, the access RS may send a MMR_MSHOINFO-REQ message to its serving MMR-BS. When MMR-BS receives a MMR_MSHOINFO-REQ message from an access RS, it responds with a MMR_MSHOINFO-RSP message which may contain a possible target access station list and HO process optimization information as well as the expected service level of an MS at each target access station. The aforementioned information can be obtained, for instance, over the backbone network.

When an access RS receives a MOB_HO-IND with HO_IND_type=0b00, it may send a MMR_MSHO-IND message to its serving MMR-BS indicating that the MS declares performing handover to a specific target access station. When the access RS receives a MOB_HO-IND message with HO_IND_type=0b10, indicating a handover rejection, it may reconfigure the recommended target access station list and transmit a new MOB_BSHO-RSP message including the new list.

[Remedy 2: Insert the followings after section 6.3.2.3.61 at page 172]

[Insert new subclauses from 6.3.2.3.xx to 6.3.2.3.zz after section 6.3.2.3.61:]

6.3.2.3.xx MSHO Information Request (MMR_MSHOINFO-REQ) message

A MMR_MSHOINFO-REQ message may be transmitted by an access RS to its serving MMR-BS to request information on possible target access stations for an MS. The access RS may include a list of possible target access stations based on the scan report or the candidate list in the MOB_MSHO-REQ message received from an MS.

An access RS shall generate MMR_MSHOINFO-REQ messages in the format shown in Table x.

Table x – MMR_MSHOINFO-REQ message format

Syntax	Size	Notes
MMR_MSHOINFO-REQ_Message_format() {	-	
Management Message Type=TBD	8 bits	-
CID	16bits	Basic CID of MS
N_Neighbors	8bits	Number of candidate access stations

For(i=0;i<N_Neighbors;i++) {		
Neighbor Station ID	48bits	MAC address of the access station
}		
}		

The following parameters shall be included:

CID

Basic CID of MS

Neighbor Station ID

Same as the Base Station ID parameter in the DL-MAP message of the access station.

6.3.2.3.yy MSHO Information Response (MMR_MSHOINFO-RSP) message

A MMR_MSHOINFO-RSP message shall be transmitted by an MMR-BS in response to a MMR_MSHOINFO-REQ message. The MMR-BS may include the information about HO process optimization as well as expected service levels of MS at the possible target access stations in a MMR_MSHOINFO-RSP message.

An MMR-BS shall generate MMR_MSHOINFO-RSP messages in the format shown in Table y.

Table y – MMR_MSHOINFO-RSP message format

Syntax	Size	Notes
MMR_MSHOINFO-RSP_Message_format() {	-	
Management Message Type=TBD	8 bits	-
CID	16bits	Basic CID of MS
N_Neighbors	8bits	Number of candidate access stations
For(i=0;i<N_Neighbors;i++) {		
Neighbor Station ID	48bits	MAC address of the access station
Service level prediction	2bits	
HO process optimization	8bits	
HO_ID_included_indicator	1bit	Indicates if the field HO_ID is included

If(HO_ID_included_indicator==1){	-	-
HO_ID	8bits	ID assigned for use in initial ranging to the target access station once this access station is selected as the target access station.
}		
}		
}		

The following parameters shall be included:

CID

Basic CID of MS

Neighbor Station ID

Same as the Base Station ID parameter in the DL-MAP message of the access station.

Service level prediction

The service level prediction value indicates the level of service the MS can expect from this access station. The following encodings apply:

0 = No service possible for this MS

1 = Some service is available for one or several service flows authorized for the MS.

2 = For each authorized service flow, a MAC connection can be established with QoS specified by the AuthorizedQoSParamSet.

3 = No service level prediction available.

HO process optimization

HO process optimization is provided as part of this message is indicative only. HO process requirements may change at time of actual HO. For each Bit location, a value of '0' indicates the associated reentry management messages shall be required, a value of '1' indicates the reentry management message may be omitted.

Bit #0: Omit SBC-REQ/RSP management messages during re-entry processing

Bit #1: Omit PKM authentication phase except TEK phase during current reentry processing

Bit #2: Omit PKM TEK creation phase during reentry processing

Bit #3: Omit REG-REQ/RSP management during current reentry processing

Bit #4: Omit Network Address Acquisition management messages during current reentry Processing

Bit #5: Omit Time of Day Acquisition management messages during current reentry processing

Bit #6: Omit TFTP management messages during current reentry processing

Bit #7: Full service and operational state transfer or sharing between serving station and target station (ARQ, timers, counters, MAC state machines, etc.)

HO_ID_included_indicator

Indicates whether or not HO_ID is included in this message.

6.3.2.3.zz MS Handover Indication (MMR_MSHO-IND) message

A MMR_MSHO-IND message may be transmitted by an access RS to inform its serving MMR-BS of the fact that the access RS received MOB_HO-IND message with HO_IND_type=0b00 from an MS.
An access RS shall generate MMR_MSHO-IND messages in the format shown in Table z.

Table z – MMR_MSHO-IND message format

Syntax	Size	Notes
MMR_MSHO-IND_Message_format() {	-	
Management Message Type=TBD	8 bits	-
CID	16bits	Basic CID of MS
Target Station ID	48bits	MAC address of the target access station
}		

The following parameters shall be included:

CID

Basic CID of MS

Target Station ID

Same as the Base Station ID parameter in the DL-MAP message of target access station.

References

[1] C80216j-06_0xx_MS-handover support directed by MMR-BS