Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Network initiated Mandatory HO**
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Re:	Call for contribution and comments.
Abstract	This contribution brings the consideration of the practical situation which a Mandatory HO initiated by network, and provides a efficient handle procedure for BS and MSS for this situation.
Purpose	Adoption
Notice	
Release	
Patent Policy and Procedures	

Network Initiated Mandatory HO

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1. Problem

In current standard, BS initiated HO uses a peer-to-peer mechanism where the BS sends an HO request to MS (or MS sends an HO request), the MS based on its own condition decides to ignore, accept, reject or cancel the HO and may send a corresponding response back to the BS. Since the BS represents the network from the MS perspective, and since the BS is the ultimate arbiter as network resource gatekeeper, sometimes the BS needs to force direct the MS to handover to another BS without negotiation with the MS, such as when a Serving BS needs to be taken offline for maintenance and all the MS connected to that BS need to handover to alternative BS(s); due to network resource optimization or management, the current BS can't satisfy MS' service needs, and MS must handover to another BS to achieve its service requirements; or other network related situations.

In the current standard, there is no HO priority or HO reason indication in the HO request sent by network, so MS can't distinguish different HO situations which should associate different response actions; instead MS treats all HO request from the network as the same priority. Therefore the MS may ignore or reject/cancel the HO request or re-negotiate the handover configuration which includes the candidate BSs due to some dissatisfaction with the proposed handover, entirely due to its own determination. By doing that, it may cause the following problem:

- MS loses connection with the whole network while the MS may be able to handover but rejects because of lack of knowledge of the criticality or necessits to conduct the HO;
- MS keeps on exchanging messages with the BS to re-negotiate the HO configuration, which increases the HO process time while considering recommended handover;
- MS experiences a rapid performance decrease or gap in continuous service due to failure to conduct a recommended handover in a timely manner.

There is a current mechanism that permits BS to direct MS to disconnect from the BS and attempt connection at another BS. Though not intended for this purpose, the method could be construed as forcing handover. The method is for the BS to send a DREG-CMD including Action Code 0x00, 'SS shall leave the current channel and attempt to access another channel'. However, this mechanism is problematic. The mechanism is not joined to the handover process, so any handover accomplished through this method would be generally through the 6.3.21.2.6 Drops during HO rules. Performance would not be similar to negotiated handover. Yet negotiated handover is entirely possible and reasonable even under forced handover situations.

2. Remedy

Add an appropriate message element to the BSHO-REQ and BSHO-RSP to indicate a required HO. Modify text in the 6.3.21 handover section to include support of the required handover field.

3. Proposed Text Changes

[In 6.3.2.3.52 BS HO Request (MOB_BSHO-REQ) message, page 112, Table 108l—MOB_BSHO-REQ message format, Insert the following entry to the Table, immediately after the 'Mode' field; adjust first instance of 'Padding' in the Table to have a Size of '3' as seen in the Table edit:]

Syntax	Size	Notes

…		
HO operation mode	1	0: Recommended HO request. 1: Mandatory HO request.
Padding	43	Shall be set to zero.
...		

[In 6.3.2.3.52 BS HO Request (MOB_BSHO-REQ) message, page 118, Insert after line 40:]

HO operation mode

Indicate the operation mode of this HO request as initiated and prescribed by BS.

0: Recommended HO request

1: Mandatory HO request. If HO operation mode is set to 1, BS shall include at least one recommended BS in the message (N_Recommended >= 1).

[In 6.3.2.3.54 BS HO Response (MOB_BSHO-RSP) message, page 124, Table 108n—MOB_BSHO-RSP message format, Insert the following entry to the Table, immediately after the 'Mode' field; adjust first instance of 'Reserved' in the Table to have a Size of '4' as seen in the Table edit:]

Syntax	Size	Notes
…		
HO operation mode	1	0: Recommended HO response. 1: Mandatory HO Response.
Reserved	~~5~~4	Shall be set to zero.
...		

[In 6.3.2.3.54 BS HO Response (MOB_BSHO-RSP) message, page 130, Insert before line 31:]

HO operation mode

Indicate the operation mode of this HO response as prescribed by BS.

0: Recommended HO response.

1: Mandatory HO response. If HO operation mode is set to 1, BS shall include at least one recommended BS in the message (N_Recommended >= 1).

[In 6.3.21.2.2 HO decision & initiation, page 178, line 55; Insert the following text:]

In some instances the BS may need to force the MS to conduct handover. The BS shall include a value of HO operation mode=1 in either the MOB_BSHO-REQ or MOB_BSHO-RSP to signal to the MS that the MS must conduct handover. Upon receiving a message with HO operation mode=1, the MS should treat the handover request as required and shall respond with a HO-IND. MS should send HO-IND with option HO_IND_type = 0b00 indicating commitment to HO unless MS is unable to handover to any of the recommended BSs in the message, in which case MS may respond with HO-IND with option HO_IND_type=0b10 indicating HO reject. An MS required to conduct handover is not restricted to conducting handover to those BS included in the notifying message. In other words, the MS may attempt handover to a different BS that may or may not have been included in either the MOB_BSHO-REQ or MOB_BSHO-RSP.

[In 6.3.21.3.1 SHO decision and initiation, page 188, line 6; Insert the following text:]

In some instances the BS may need to force the MS to update the Active Set or Anchor BS. The BS shall include a value of HO operation mode=1 in either the MOB_BSHO-REQ or MOB_BSHO-RSP to signal to the MS that the MS must update the Active Set or Anchor BS. Upon receiving a message with HO operation mode=1, the MS should treat the request to update the Active Set or Anchor BS as required and shall respond with a HO-IND indicating commitment to update the Active Set or Anchor BS. MS should send HO-IND with option HO_IND_type = 0b00 indicating commitment to update the Active Set or Anchor BS unless MS is

unable to update the Active Set or Anchor BS to any N_Recommended BS in the message, then MS may respond with HO-IND with option HO_IND_type=0b10.

[In 6.3.21.3.2 FBSS Decision and Initiation, page 189, line 6; Insert the following text:]

In some instances the BS may need to force the MS to update the Active Set or Anchor BS. The BS shall include a value of HO operation mode=1 in either the MOB_BSHO-REQ or MOB_BSHO-RSP to signal to the MS that the MS must update the Active Set or Anchor BS. Upon receiving a message with HO operation mode=1, the MS should treat the request to update the Active Set or Anchor BS as required and shall respond with a HO-IND indicating commitment to update the Active Set or Anchor BS. MS should send HO-IND with option HO_IND_type = 0b00 indicating commitment to update the Active Set or Anchor BS unless MS is unable to update the Active Set or Anchor BS to any N_Recommended BS in the message, then MS may respond with HO-IND with option HO_IND_type=0b10.

[In 6.3.21.3.4.1 HO MAC management message method, page 190, line 25; Insert the following text:]

In some instances the BS may need to force the MS to update the Anchor BS. The BS shall include a value of HO operation mode=1 in either the MOB_BSHO-REQ or MOB_BSHO-RSP to signal to the MS that the MS must update the Anchor BS. Upon receiving a message with HO operation mode=1, the MS should treat the request to update the Anchor BS as required and shall respond with a HO-IND indicating commitment to update the Anchor BS. MS should send HO-IND with option HO_IND_type = 0b00 indicating commitment to update the Anchor BS unless MS is unable to update the Anchor BS to any N_Recommended BS in the message, then MS may respond with HO-IND with option HO_IND_type=0b10.