Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Fix broken message flow in HO decision & initiation**
Date Submitted	**2005-07-18**
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Re:	Call for contribution and comments.
Abstract	Fix broken message flow in HO decision & initiation
Purpose	Adoption
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Fix broken message flow in HO decision & initiation

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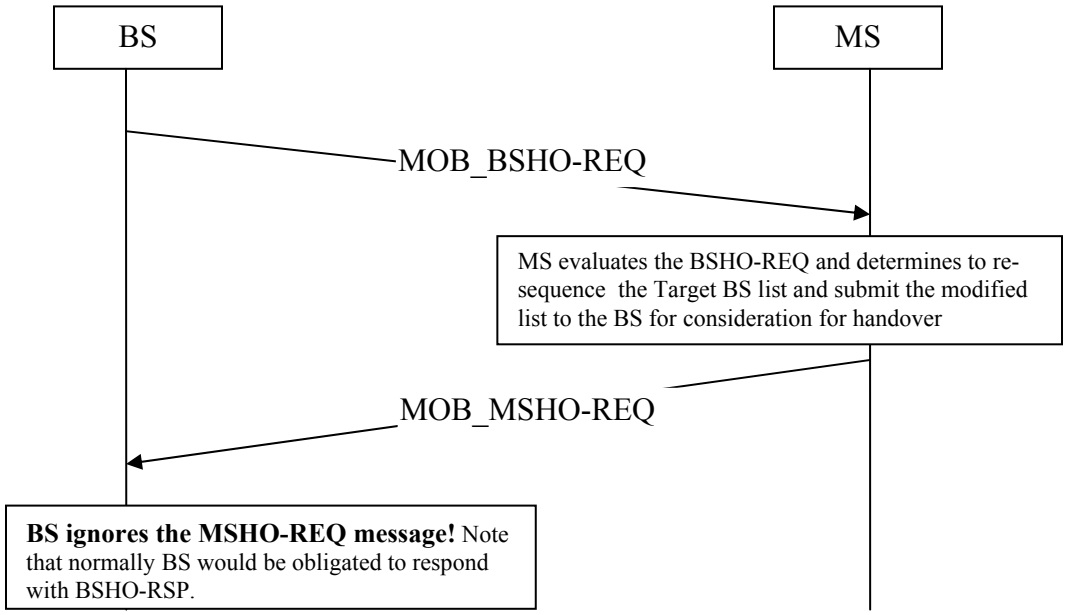
Problem Definition

There is a problem in HO decision & initiation.

A change to the D8 document on handover race condition mitigation has broken the normal messaging sequencing. More specifically, a change to 6.3.21.2.2 HO decision & initiation, page 178, paragraph 2 was changed to:

> If an MS that transmitted a MOB_MSHO-REQ message detects an incoming MOB_BSHO-REQ message, it may respond with a MOB_MSHO-REQ or a MOB_HO-IND message and ignore its own previous request. A BS that transmitted a MOB_BSHO-REQ message and detects an incoming MOB_MSHO-REQ message from the same MS shall ignore its **MOB_MSHO-REQ [emphasis added]**. A BS that transmitted a MOB_BSHO-REQ message and detects an incoming MOB_HO-IND message from the same MS shall ignore its own previous request.

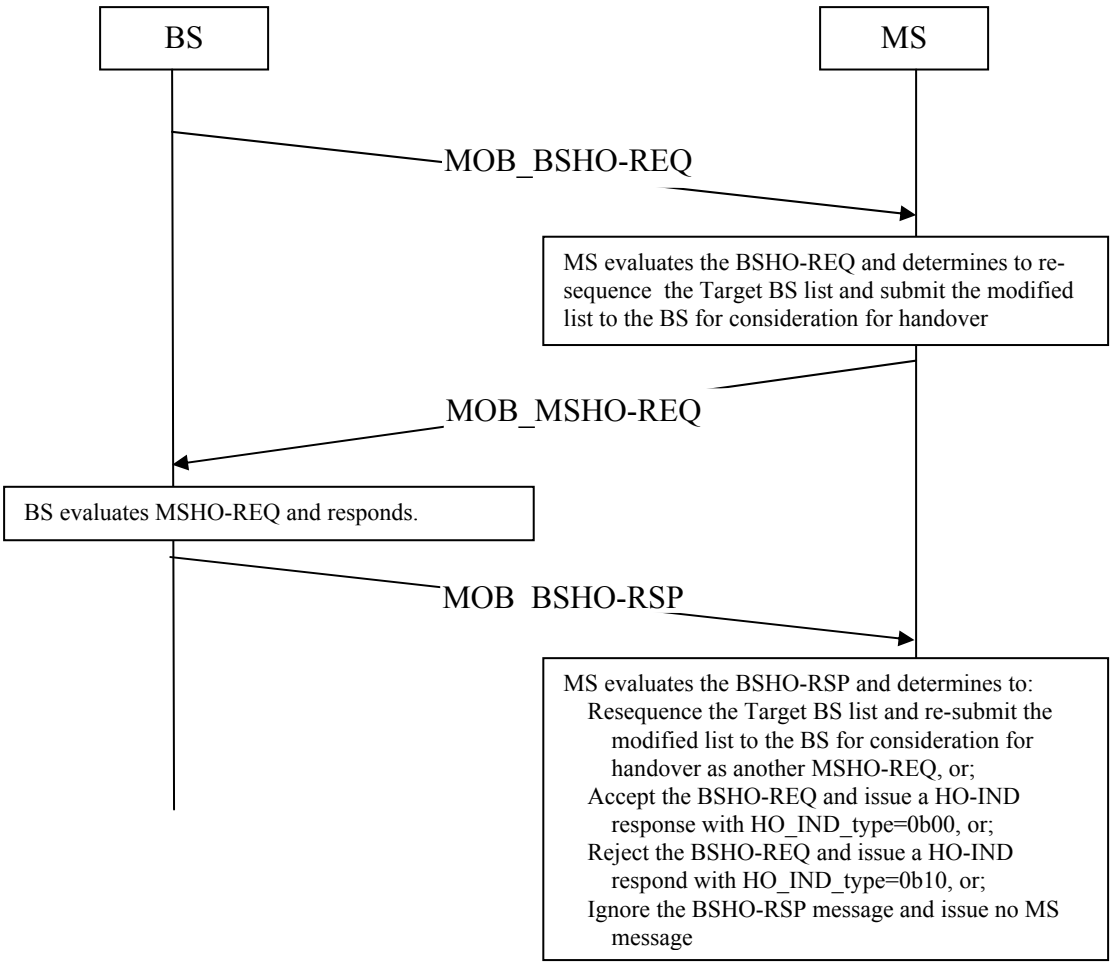
The change of the message (in bold in the text) from MOB_BSHO-REQ to MOB_MSHO-REQ has disastrous results as can be seen in the following diagram.



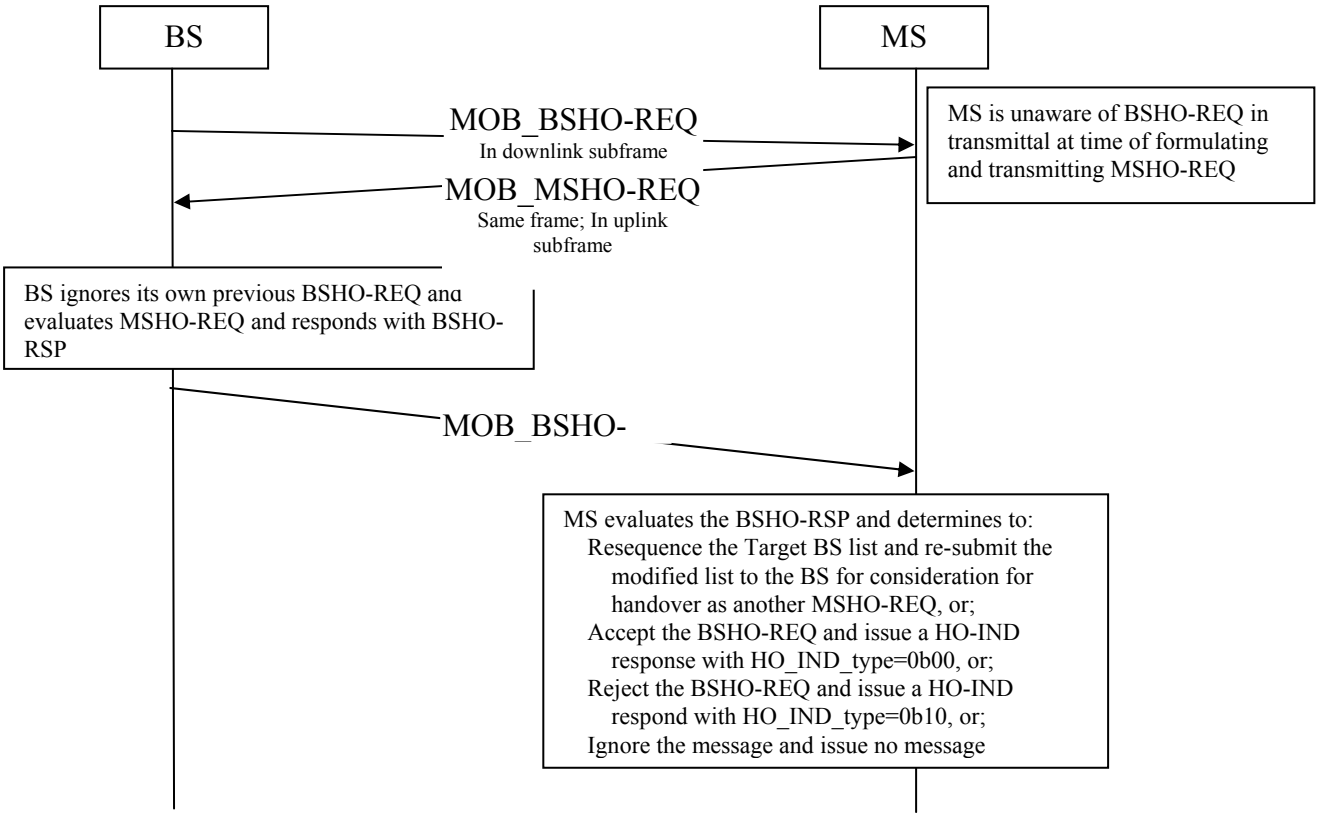
According to the revised language in D8 (and carried forward in D9), the BS will ignore any MSHO-REQ following a BSHO-REQ. So MS loses the ability to respond to a BSHO-REQ by modifying the selection and submitting a revised selection via a MSHO-REQ. I am sure that this change was made originally to express BS precedence in concurrent MSHO-REQ/BSHO-REQ transmissions. Of course that decision was in error since

there is no requirement that MS even respond to BSHO-REQ or BSHO-RSP, but there is requirement that BS respond to MSHO-REQ. So perception of precedence is really irrelevant. MS messaging is, in fact, independent of BS handover messaging, even if MS uses information obtained from the BS handover messages to construct MS handover messages.

Changing the instance back to BSHO-REQ does not create a problem as the following diagrams demonstrate:



The figure above shows the normal function of the messaging when the race condition constraint is reinstated as BSHO-REQ in place of MSHO-REQ. Note that this was the intended sequence and performance.



The figure above shows same frame transmission (concurrent transmission) of mutual HO-REQ messages. Note that even in this instance, due to the subdivision of the frame into downlink and uplink subframes, the BSHO-REQ always occurs first in time in concurrent transmission. As is shown in the figure, message flow works normally when the race condition constraint is reinstated as BSHO-REQ in place of MSHO-REQ.

In summary, reversion to BSHO-REQ from MSHO-REQ in the condition constraint repairs the message flow to proper function and does not injure performance in any race condition.

Remedy

Revert language in 6.3.21.2.2 HO decision & initiation, page 178, paragraph 2 back to original text.

[Phil Barber 2205-7-18] Revised in harmonization to resolve comments 6133, 6089, 6356

Proposed Text Changes

[In 6.3.21.2.2 HO decision & initiation, page 178, lines 5-18, modify paragraph as:]
A handover begins with a decision for an MS to hand-over from a serving BS to a target BS. The decision may originate either at the MS, the serving BS, or on the network. The HO may proceed with a notification through either MOB_MSHO-REQ or MOB_BSHO-REQ messages. The HO notification is recommended, but not required. Acknowledgement of MOB_MSHO-REQ with MOB_BSHO-RSP ~~of a notification~~ is required. After MS transmits MOB_MSHO-REQ, MS shall not transmit any MOB_MSHO-REQ prior to expiration of timer

MS_handover_retransmission_timer. MS shall deactivate timer MS_handover_initiation_timer on MS transmit of MOB_HO-IND or MS receipt of MOB_BSHO-RSP.

If an MS that transmitted a MOB_MSHO-REQ message detects an incoming MOB_BSHO-REQ message, it shall ignore that MOB_BSHO-REQ message~~may respond with a MOB_MSHO-REQ or a MOB_HO-IND message and ignore its own previous request~~. A BS that transmitted a MOB_BSHO-REQ message and detects an incoming MOB_MSHO-REQ message from the same MS shall ignore its ~~MOB_MSHO-REQ~~ MOB_BSHO-REQ. A BS that transmitted a MOB_BSHO-REQ message and detects an incoming MOB_HO-IND message from the same MS shall ignore its own previous request.

[In 6.3.21.3.1 SHO decision and initiation, page 187, line 60 through page 188, line 5, modify paragraph as:]
The decision to update the Active Set ~~or Anchor BS~~ begins with a notification by the MS through the MOB_MSHO-REQ message or by the BS through the MOB_BSHO-REQ management message. The process of Anchor BS update may begin with MOB_MSHO-REQ from MS or MOB_BSHO-REQ from the Anchor BS Acknowledgement of MOB_MSHO-REQ with MOB_BSHO-RSP ~~of a notification~~ is required~~, but one with MOB_BSHO-RSP is recommended by not required.~~. After MS transmits MOB_MSHO-REQ, MS shall not transmit any MOB_MSHO-REQ prior to expiration of timer MS_handover_retransimssion_timer. MS shall deactivate timer MS_handover_retransmission_timer on MS transmit of MOB_HO-IND or MS receipt of MOB_BSHO-RSP. Process of Anchor BS update may also begin with Anchor switching indication via Fast Feedback channel.

If an MS that transmitted a MOB_MSHO-REQ message detects an incoming MOB_BSHO-REQ message, it shall ignore that MOB_BSHO-REQ message~~may respond with a MOB_MSHO-REQ or MOB_HO-IND message and ignore its own previous request~~. ~~Similarly, a~~A BS that transmitted a MOB_BSHO-REQ message and detects an incoming MOB_MSHO-REQ or MOB_HO-IND message from the same MS shall ignore its own previous request.

[In 6.3.21.3.2 FBSS Decision and Initiation, page 188, line 60 through page 189, line 5, modify paragraph as:]
Process of updating Active Set begins with MOB_MSHO-REQ from MS or MOB_BSHO-REQ from the Anchor BS. The process of Anchor BS update may begin with MOB_MSHO-REQ from MS or MOB_BSHO-REQ from the Anchor BS. Acknowledgement of MOB_MSHO-REQ with MOB_BSHO-RSP is required. After MS transmits MOB_MSHO-REQ, MS shall not transmit any MOB_MSHO-REQ prior to expiration of timer MS_handover_retransmssion_timer. MS shall deactivate timer MS_handover_initiation_timer on MS transmit of MOB_HO-IND or MS receipt of MOB_BSHO-RSP. Process of Anchor BS update may also begin ~~with MOB_MSHO-REQ from MS or MOB_BSHO-REQ from the Anchor BS or it may begin~~ with Anchor switching indication via Fast Feedback channel.

If an MS that transmitted a MOB_MSHO-REQ message detects an incoming MOB_BSHO-REQ message, it shall ignore that MOB_BSHO-REQ message~~may respond with a MOB_MSHO-REQ or MOB_HO-IND message and ignore its own previous request~~. ~~Similarly, a~~A BS that transmitted a MOB_BSHO-REQ message and detects an incoming MOB_MSHO-REQ or MOB_HO-IND message from the same MS shall ignore its own previous request.

[In 6.3.21.3.3 Active Set Update for SHO/FBSS, page 189, line 42 through page 189, line 5, modify paragraph as:]

MS actual update of Active Set~~, as listed in MOB_BSHO-RSP~~ is recommended, but not required. However,

the actual Active Set chosen by the MS shall be a subset of those listed in MOB_BSHO-RSP or in MOB_BSHO-REQ and shall be indicated in MOB_HO-IND, with SHOFBSS_IND_type field in MOB_HO-IND set to 0b00 (confirm Active Set update).

[Insert new Section 11.7.12.3]

11.7.12.3 MS Handover Retransmission Timer

After a MS transmits MOB-MSHO_REQ to initiate a handover process, it shall start MS Handover Retransmission Timer and shall not transmit another MOB-MSHO_REQ until the expiration of the MS Handover Retransmission Timer.

Type	Length	Value	Scope
30	1	frames	REG-RSP

[RemoveT41 timer from Table 342 on page 502, lines 3, 4]

Type	Length	Value	Scope
~~MS~~	~~T41~~	~~Time the MS waits for~~	~~MOB_BSHO-RSP message~~

[Change all instances of 'T4'1to 'MS Handover Retransmission Timer' in the document; including in all Figures]