Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**	
Title	**Revision of Hand-over Mechanism for Mobility Enhancement**	
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Re:	Response to IEEE 802.16e-03_58 (Call for Contributions on IEEE 802.16e/07r5)	
Abstract	Revision of Hand-over Mechanism for Mobility Enhancement	
Purpose	Stimulate discussion on a more completely defined, flexible model and mechanism for facilitating mobility functionality	
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Revision of Hand-over Mechanism for Mobility Enhancement

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Observations on Current IEEE 802.16e-03/07r5 Based on Criteria from Assumptions

1. **Hand-over**

Problem:

As currently defined, mechanics for hand-over are incomplete or poorly defined. Elements are out of order. Specifically, too many HO process elements are unnecessarily made 'mandatory' instead of 'optional', impose excessive amounts of overhead not providing additional functionality or security to the HO process, are excessively restrictive instead of being enabling and permissive, and fail to take advantage of opportunities for corrective or recovery actions that would streamline and increase the utility and robustness of the HO process.

Remedy:

Revise hand-over process.

Remedy Action 1:

Adding to, correcting language and structure for hand-over. Unifying hand-over/network initial entry/network re-entry into a single, rule based process with multiple correction opportunities, a more robust failure recovery mechanism, and lower air interface and backhaul overhead.

*[In **1.4.1.2.2 HO process**, page 8, paragraphs 1 thru 4, replace with:]*
'The section defines the HO process in which an MSS migrates from the air-interface provided by one BS to the air-interface provided by another BS. The HO process consists of the stages:

Cell Selection — MSS may use Neighbor BS information acquired from a decoded MOB_BEA-ADV message, or may make uninformed decision, to schedule sleep-intervals to scan, and possibly range, Neighbor BS for the purpose of evaluating MSS interest in hand-over to potential Target BS. MSS may provide results of its scanning and ranging activity to Serving BS through MOB_SS_INF-RSP.

HO Decision — a hand-over begins with a decision for an MSS to hand-over its air interface, service flow, and network attachment from a Serving BS to a Target BS. The decision may originate either at the MSS, the Serving BS, or on the network. The HO Decision consummates with a notification of MSS intent to hand-over through MOB_xxxHO-REQ. The HO notification is recommended, but not required. The HO notification may originate with either the Serving BS or MSS. Acknowledgement with MOB_xxxHO-RSP of a notification is required.

Backbone HO Notification — Serving BS may notify Target BS(s) over the backbone network of MSS intent to hand-over to Target BS (see section Backbone network HO procedures). Serving BS may also send MSS information over the backbone that can expedite hand-over. If Target BS receives a backbone notification message, subsequent backbone HO notification response and confirmation messages are recommended, but not required.

Sleep — the MSS shall use sleep-interval to establish a working 'unavailable' service window with Serving BS to conduct network re-entry with Target BS. This mechanism permits continued service with the Serving BS should the hand-over attempt fail or be aborted. The MSS shall send a MOB_SLP-REQ sleep request message, or Serving BS may send an unsolicited MOB_SLP-RSP sleep response message. The burden for message origination lies with the party that originated MOB_xxxHO-REQ hand-over request. If MSS sends MOB_SLP-REQ, then Serving BS MOB_SLP-RSP is required. An MSS may continue the HO process even if the Serving BS fails to respond to a MOB_SLP-REQ, but not if MOB_SLP-RSP denies the sleep request. If denied, the MSS may re-attempt a MOB_SLP-REQ at the appropriate interval. If an MSS operational parameter changes after MOB_HO-REQ but prior to start-frame of an approved sleep-interval, MSS must abort the hand-over attempt, return to HO Decision, and re-notify the Serving BS of intent to hand-over.

Target BS Scanning — MSS shall scan Target BS for downlink channel & synchronization and uplink channel & synchronization. If MSS had previously decoded a MOB_BEA-ADV message including Target BS ID, Physical Frequency, DCD and UCD, then the scanning and synchronization process may be shortened. If the Target BS had previously received HO notification from Serving BS over the backbone (see section Backbone network HO procedures), then Target BS may place a non-contention based Fast_UL_ranging_IE MSS Initial Ranging opportunity in the UL-MAP. MSS shall scan Target BS for UL-MAP that includes either a contention or non-contention based MSS Initial Ranging opportunity.

Network Re-entry — MSS and Target BS shall conduct Ranging per 6.2.9.5 to begin network re-entry. If MSS RNG-REQ includes an unexpired Serving BS ID and Target BS had not previously received MSS information over the backbone (see section Backbone network HO procedures), then Target BS may make an MSS information request of Serving BS over the backbone network and Serving BS may respond. Regardless of having received MSS information from Serving BS, Target BS may request MSS information from an Authorizing Station via the backbone network. Network re-entry proceeds per 6.2.9.5 except as may be shortened by Target BS possession of MSS information obtained from Serving BS over the backbone network. Network re-entry process completes with establishment of MSS normal operations.

Termination of Service — The final step in hand-over is any termination of MSS services with previous Serving BS. If Target BS had received a HO notification from Serving BS over the backbone (see section Backbone network HO procedures), or MSS RNG-REQ included an unexpired Serving BS ID,

then Target BS may send a HO complete/Serving BS notification message over the backbone network to the Serving BS and any Authorizing Station. HO acknowledgement is recommended, but not required. Upon receipt of a HO complete/Serving BS notification message, Serving BS shall terminate all connections belonging to the MSS and the context associated with them (i.e. information in queues, ARQ state-machine, counters, timers, etc…, is discarded). Target BS now becomes the new Serving BS for all purposes.

The HO process, and its similarity to the initial network entry process, is depicted in Figure 0f.'

Remedy Action 2:

*[In **1.4.1.2.2.1 Cell Selection**, pages 10&11, paragraph 1, replace with:]*

'Cell selection refers to the process of an MSS Scanning and/or Ranging one or more BS in order to determine suitability, along with other performance considerations, for network connection or hand-over. MSS may incorporate information acquired from a MOB_NBR-ADV message to give insight into available Neighbor BS for cell selection consideration. If currently connected to a Serving BS, an MSS shall schedule sleep-intervals to conduct Cell Selection for the purpose of evaluating MSS interest in hand-over to potential Target BS. Such procedure does not involve termination of existing connections to a Serving BS and their re-opening in a Target BS. If ranging a Target BS for hand-over, any newly assigned basic and primary CIDs are specific to the Target BS and do not replace or supplant the basic and primary CIDs the MSS employs in its communication with its Serving BS.'

Remedy Action 3:

*[In **1.4.1.2.2.2 HO initiation**, pages 11&12, paragraph 1 thru 4, replace with:]*

'Either an MSS or a BS may initiate a HO by transmitting the MOB_MSSHO-REQ or MOB_BSHO-REQ MAC messages. Transmission of the MOB_xxxHO-REQ MAC message is recommended, but not required.

When MOB_MSSHO-REQ is sent by an MSS, the MSS may indicate one or more possible Target BS. When MOB_BSHO-REQ is sent by a Serving BS, the Serving BS may indicate one or more recommended Target BS. Serving BS criteria for recommendation of Target BS may include factors like expected Target BS QoS performance to MSS requirements. The MOB_MSSHO-REQ message may include an indication of the estimated time for performing the HO. Acknowledgement with MOB_xxxHO-RSP of a MOB_xxxHO-REQ notification is required. MSS actual pursuit of hand-over to Target BS in MOB_xxxHO-RSP is recommended, but not required. MSS may elect to attempt hand-over to a different Target BS, a Target BS that may or may not have been included in MOB_xxxHO-RSP, with the understanding that the different Target BS may not receive notification of the pending hand-over from the Serving BS over the backbone network prior to MSS initial Ranging of Target BS (see section Backbone network HO procedures). If the MSS signals rejection of Serving BS instruction to HO through HO_type field in the MOB_MSSHO-RSP set value of 10 (HO reject option), the BS may reconfigure the Target BS list and retransmit MOB_BSHO-RSP message including a new Target BS list.

Serving BS may notify one or more Target BS over the backbone network of MSS intent to hand-over to Target BS (see section Backbone network HO procedures). Serving BS may also send MSS information to Target BS over the backbone that can expedite hand-over. If Target BS receives a backbone notification message, subsequent backbone HO notification response and confirmation messages, including expected post- hand-over MSS performance levels, are recommended, but not required.

After an MSS or BS has indicated intent to HO using MOB_xxxHO-REQ, the MSS may cancel the HO at any time prior to transmission of MOB_SLP-Rxx. The cancellation may be made through transmission of a MOB_HO-IND with the HO cancel option (HO Type=01) or through the transmission of a new MOB_xxxHO-REQ message.'

Remedy Action 4:

*[In **1.4.1.2.2.3 HO cancellation**, page 12, relocate text to **1.4.1.2.2.2 HO initiation**, replace entire section with:]*

'**1.4.1.2.2.3 Sleep and Hand-over**

The MSS shall use sleep-interval to establish a working 'unavailable' service window with Serving BS to conduct scanning, initial ranging and HO/network re-entry with Target BS. This mechanism permits continued service with the Serving BS should the hand-over attempt fail or be aborted. The MSS shall send a MOB_SLP-REQ sleep request message, or Serving BS may send an unsolicited MOB_SLP-RSP sleep response message. The burden for message origination lies with the party that originated MOB_xxxHO-REQ hand-over request. If no MOB_xxxHO-REQ message was issued, then the requirement falls to the MSS. If MSS sends MOB_SLP-REQ, then Serving BS MOB_SLP-RSP is required. An MSS may continue the HO process even if the Serving BS fails to respond to a MOB_SLP-REQ, but not if MOB_SLP-RSP denies the sleep request. If denied, the MSS may re-attempt a MOB_SLP-REQ at the appropriate interval.

If an MSS operational parameter changes after MOB_xxxHO-REQ but prior to start-frame of an approved sleep-interval, MSS must abort the hand-over attempt, return to HO Decision, and re-notify the Serving BS of intent to hand-over.

MSS may abort the hand-over attempt at any time, for any reason, by aborting the sleep-interval and returning to Normal Operation with its Serving BS.

Serving BS shall treat any uplink PDU from MSS after BS transmittal of an activating MOB_SLP-RSP as cancellation of any pending MSS HO as if the MSS had transmitted MOB_HO-IND with the HO cancel option.'

Remedy Action 5:

*[In **1.4.1.2.2.4 Termination with the serving BS**, page 12, relocate text to **1.4.1.2.2.2 HO initiation**, replace entire section with:]*

‘**1.4.1.2.2.4 Scanning of Target BS**

During the sleep-interval attributed to hand-over, MSS shall scan Target BS for downlink channel & synchronization and uplink channel & synchronization. If MSS had previously decoded a MOB_NBR-ADV message including Target BS ID, Physical Frequency, DCD and UCD, then the scanning and synchronization process may be shortened. If the Target BS had previously received HO notification from Serving BS over the backbone (see section Backbone network HO procedures), then Target BS may place a non-contention based MSS Initial Ranging opportunity using the PHY dependent Fast_UL_ranging_IE() (see 8.3.1.5.5.3.3 Fast ranging (Paging) Information Element, 8.4.6.3.4 Fast ranging (Paging) Information Element, and 8.5.5.3.5 & 8.5.5.3.6 Fast ranging (Paging) Information Element) in the UL-MAP. MSS shall scan Target BS for UL-MAP that includes either a contention or non-contention based MSS Initial Ranging opportunity.’

Remedy Action 6:

*[Add new section **1.4.1.2.2.5 Network Entry/Re-entry**:]*

‘**1.4.1.2.2.5 Network Entry/Re-entry**

Unless otherwise excepted in this section, MSS mobile network entry/re-entry is processed according to **6.4.9 Network entry and initialization**. For purposes of this process, MSS network re-entry and hand-over are synonymous.

During its sleep-interval or at MSS initial entry, MSS and Target BS shall conduct Ranging per **6.4.9.5 Initial ranging and automatic adjustments** to begin network entry/re-entry except as MSS may take advantage of a non-contention based MSS Initial Ranging opportunity if present. If MSS RNG-REQ includes an unexpired Serving BS ID and Target BS had not previously received MSS information over the backbone (see section Backbone network HO procedures), then Target BS may make an MSS information request of Serving BS over the backbone network and Serving BS may respond. Regardless of having received MSS information from Serving BS, Target BS may request MSS information from an Authorizing Station via the backbone network. Network re-entry proceeds per **6.4.9.5 Initial ranging and automatic adjustments** except as may be shortened by Target BS possession of MSS information obtained from Serving BS over the backbone network.

If Target BS had previously received an MSS-Info response message (see section Backbone network HO procedures) containing MSS information, Target BS may use the embedded TLV SBC-REQ information to build and send an unsolicited SBC-RSP message to MSS. Target BS may ignore only the first SBC-REQ message received if it sends an unsolicited SBC-RSP message. MSS is not required to send an SBC-REQ if it receives an unsolicited SBC-RSP prior to MSS attempt to send SBC-REQ.

If MSS RNG-REQ included an unexpired Serving BS ID and Target BS had previously received an MSS-Info response message (see section Backbone network HO procedures) containing MSS information, MSS and Target BS shall use the embedded TLV PKM-REQ information and the re-authorization process as defined in **7.2 PKM protocol**.

If Target BS had previously received an MSS-Info response message (see section Backbone network HO procedures), Target BS may use the embedded TLV REG-REQ & DSA-REQ information to build and send an unsolicited REG-RSP message. The REG-RSP message may include the SFID, New_CID, and Connection_Info TLVs. Target BS may ignore only the first REG-REQ message received if it sends an unsolicited REG_RSP message. MSS is not required to send an REG-REQ if it receives an unsolicited REG-RSP prior to MSS attempt to send REG-REQ.

If Target BS had previously received an MSS-Info response message (see section Backbone network HO procedures) that included the MSS Network Address in the embedded TLV, and provided that MSS Network Address is compatible with Target BS network addressing scheme, Target BS may skip most of the Network Address allocation process and re-provision the same address through an unsolicited Network Address Response. Target BS may ignore only the first Network Address discover message received if it sends an unsolicited Network Address response message. MSS is not required to send an Network Address discover if it receives an unsolicited Network Address response prior to MSS attempt to send Network Address discover.

If MSS RNG-REQ included an unexpired Serving BS ID, MSS and Target BS may skip Time of day process.

If MSS RNG-REQ included an unexpired Serving BS ID, MSS may skip the MSS configuration file download procedure.

If MSS received a REG-RSP message that included the SFID, New_CID, and Connection_Info TLVs, MSS and Target BS may skip the establish connections procedure.

Network entry/re-entry process completes with establishment of MSS normal operations.'

Remedy Action 7:

*[Add new section **1.4.1.2.2.6 Termination of Service**:]*

'**1.4.1.2.2.6 Termination of Service**

The final step in hand-over/network re-entry is any termination of MSS services with previous Serving BS. If Target BS had received a HO notification from Serving BS over the backbone (see section Backbone network HO procedures), or MSS RNG-REQ included an unexpired Serving BS ID, then Target BS may send a HO complete/Serving BS notification message over the backbone network to the Serving BS and any Authorizing Station. HO acknowledgement is recommended, but not required. Upon receipt of a HO complete/Serving BS notification message, Serving BS shall terminate all connections belonging to the MSS and the context associated with them (i.e. information in queues, PDUs, ARQ state-machine, counters, timers, etc…). Regardless of transmittal of a HO complete/Serving BS notification message or its acknowledgment, Target BS now becomes the new Serving BS for all purposes.'

Remedy Action 8:

*[In **6.4.2.3.6 Ranging Response (RNG-RSP) message**, page 17, lines 43-58, modify, relocate and insert as new paragraph prior to line 19, IEEE P802.16-REVd/D1-2003 "Part 16: Air Interface for Fixed Broadband Wireless Access Systems", **6.4.2.3.8 Registration Response (REG-RSP) message**:]*

'For mobile networks, Target BS shall include CID_Update, and Connection_Info TLVs in the REG-RSP for MSS recognized by the Target BS as performing HO or network re-entry by the presence of an unexpired Serving BS ID in the RNG-REQ. CID_Update and Connection_Info TLVs provide a shorthand method for renewing active connections used by the MSS in its previous Serving BS. The TLVs specify CID in the Target BS that shall replace active CID used in the previous Serving BS. Multiple iterations of these TLVs may occur in the REG-RSP suitable to re-creating and re-assigning all active Service Flows for the MSS from its previous Serving BS. If any of the Service Flow parameters change, then those Service Flow parameters and CS parameter encoding TLVs that have changed will be added. Only active Service Flows are transferred in this manner. These TLVs enable the Target BS to renew connections used in the previous Serving BS, but with different QoS settings.'

Remedy Action 9:

*[In **C.2.4 MSS-info-response message**, **Table C5—MSS-info-response Message**, page 46:]*

Add row with appropriate references to MSS Network Address

Remedy Action 10:

*[In **1.4.1.2.3 Drops and corrupted HO attempts**, page 12, paragraph 2, append to end of paragraph:]*

'Serving BS can also detect a drop by MSS failure to communicate exceeding MSS Sleep-Aging-Timer.'

Remedy Action 11:

*[In **1.4.1.2.4 Re-entry with the target BS**, page 12, paragraph 1, replace entire paragraph with:]*

'Network re-entry is processed using the mechanics for hand-over as detailed in **1.4.1.2.2 HO process** and as shown in Figure 0f'

Remedy Action 12:

*[Delete **1.4.1.2.4.1 Synchronize with downlink and obtain parameters** thru **1.4.1.2.4.6 Commence Normal Operation** completely; text relocated to **1.4.1.2.2 HO process]***

Remedy Action 13:

*[In **C.2.2 I-am-host-of message**, page 50, paragraph 1, replace entire paragraph with:]*

'**C.2.2 HO complete/Serving BS notification message**

This message is sent by a BS to notify other BS (or the ASA server) that a certain MSS is registered with it. The primary use is to notify previous Serving BS and/or ASA or other network services access control administrator that MSS has successfully completed network entry or hand-over and that the BS originating the HO complete/Serving BS notification message is now the Serving BS for the MSS. The message may be sent upon MSS establishment of Normal Operation, and periodically on timer interval (MSS Registration-TIMER). The message might trigger a Neighbor BS to request more information on the MSS (either directly from the Serving BS, or from an ASA server). The message contains the following information,

Table C3—HO complete/Serving BS notification message'

Remedy Action 14:

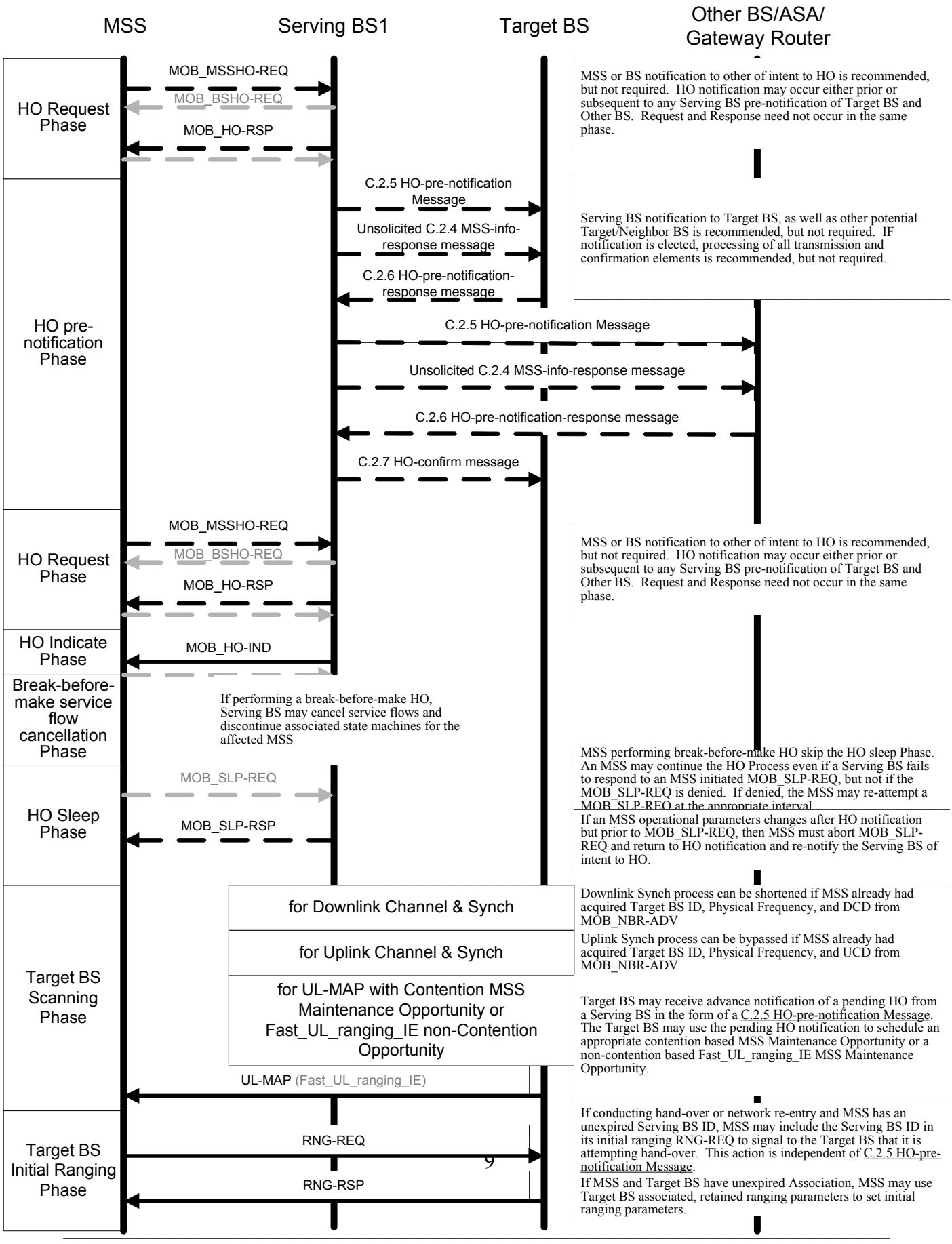
*[In **10.1 Global Values**, **Table 264a—Parameters and Constants**, pages 43&44, modify as:]*

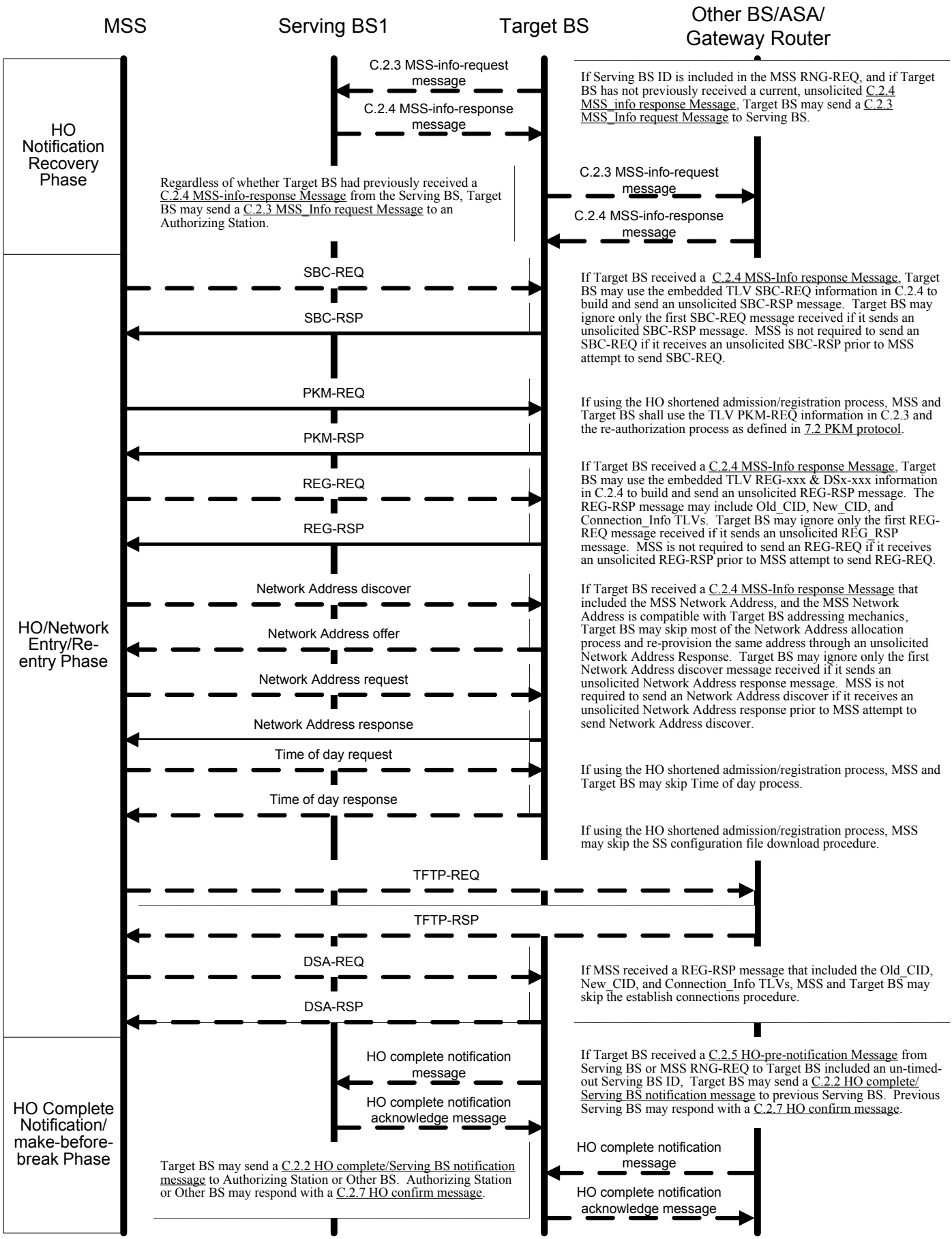
Append to end of table:

System	Name	Time Reference	Min. Value	Default Value	Max. Value
BS	MSS Registration-TIMER	Nominal time for aging of MSS registration association with Serving BS. Timer expiration may trigger re-registration, re-broadcast of MSS/Serving BS association, or other action.			86400s

Remedy Action 15:

*[In **C.2.8 Example of Backbone Network HO procedure**, pages 54-56, delete **Figure C.2—Example of HO call flow by BS** entirely and replace **Figure C.1—Example of HO call flow by MS** with:]*


MSS
Serving BS1
Target BS
Other BS/ASA/ Gateway Router
HO Request Phase
MOB_MSSHO-REQ
MOB_BSHO-REQ
MOB_HO-RSP
MSS or BS notification to other of intent to HO is recommended, but not required. HO notification may occur either prior or subsequent to any Serving BS pre-notification of Target BS and Other BS. Request and Response need not occur in the same phase.
HO pre-notification Phase
C.2.5 HO-pre-notification Message
Unsolicited C.2.4 MSS-info-response message
C.2.6 HO-pre-notification-response message
Serving BS notification to Target BS, as well as other potential Target/Neighbor BS is recommended, but not required. IF notification is elected, processing of all transmission and confirmation elements is recommended, but not required.
C.2.5 HO-pre-notification Message
Unsolicited C.2.4 MSS-info-response message
C.2.6 HO-pre-notification-response message
C.2.7 HO-confirm message
HO Request Phase
MOB_MSSHO-REQ
MOB_BSHO-REQ
MOB_HO-RSP
MSS or BS notification to other of intent to HO is recommended, but not required. HO notification may occur either prior or subsequent to any Serving BS pre-notification of Target BS and Other BS. Request and Response need not occur in the same phase.
HO Indicate Phase
MOB_HO-IND
Break-before-make service flow cancellation Phase
If performing a break-before-make HO, Serving BS may cancel service flows and discontinue associated state machines for the affected MSS
MSS performing break-before-make HO skip the HO sleep Phase. An MSS may continue the HO Process even if a Serving BS fails to respond to an MSS initiated MOB_SLP-REQ, but not if the MOB_SLP-REQ is denied. If denied, the MSS may re-attempt a MOB_SLP-REQ at the appropriate interval
HO Sleep Phase
MOB_SLP-REQ
MOB_SLP-RSP
If an MSS operational parameters changes after HO notification but prior to MOB_SLP-REQ, then MSS must abort MOB_SLP-REQ and return to HO notification and re-notify the Serving BS of intent to HO.
Target BS Scanning Phase
for Downlink Channel & Synch
Downlink Synch process can be shortened if MSS already had acquired Target BS ID, Physical Frequency, and DCD from MOB_NBR-ADV
for Uplink Channel & Synch
Uplink Synch process can be bypassed if MSS already had acquired Target BS ID, Physical Frequency, and UCD from MOB_NBR-ADV
for UL-MAP with Contention MSS Maintenance Opportunity or Fast_UL_ranging_IE non-Contention Opportunity
Target BS may receive advance notification of a pending HO from a Serving BS in the form of a C.2.5 HO-pre-notification Message. The Target BS may use the pending HO notification to schedule an appropriate contention based MSS Maintenance Opportunity or a non-contention based Fast_UL_ranging_IE MSS Maintenance Opportunity.
UL-MAP (Fast_UL_ranging_IE)
Target BS Initial Ranging Phase
RNG-REQ
RNG-RSP
If conducting hand-over or network re-entry and MSS has an unexpired Serving BS ID, MSS may include the Serving BS ID in its initial ranging RNG-REQ to signal to the Target BS that it is attempting hand-over. This action is independent of C.2.5 HO-pre-notification Message.
If MSS and Target BS have unexpired Association, MSS may use Target BS associated, retained ranging parameters to set initial ranging parameters.
Continued on next page


MSS
Serving BS1
Target BS
Other BS/ASA/ Gateway Router
HO Notification Recovery Phase
HO/Network Entry/Re-entry Phase
HO Complete Notification/ make-before-break Phase
C.2.3 MSS-info-request message
C.2.4 MSS-info-response message
If Serving BS ID is included in the MSS RNG-REQ, and if Target BS has not previously received a current, unsolicited C.2.4 MSS_info response Message, Target BS may send a C.2.3 MSS_Info request Message to Serving BS.
Regardless of whether Target BS had previously received a C.2.4 MSS-info-response Message from the Serving BS, Target BS may send a C.2.3 MSS_Info request Message to an Authorizing Station.
C.2.3 MSS-info-request message
C.2.4 MSS-info-response message
SBC-REQ
SBC-RSP
If Target BS received a C.2.4 MSS-Info response Message, Target BS may use the embedded TLV SBC-REQ information in C.2.4 to build and send an unsolicited SBC-RSP message. Target BS may ignore only the first SBC-REQ message received if it sends an unsolicited SBC-RSP message. MSS is not required to send an SBC-REQ if it receives an unsolicited SBC-RSP prior to MSS attempt to send SBC-REQ.
PKM-REQ
PKM-RSP
If using the HO shortened admission/registration process, MSS and Target BS shall use the TLV PKM-REQ information in C.2.3 and the re-authorization process as defined in 7.2 PKM protocol.
REG-REQ
REG-RSP
If Target BS received a C.2.4 MSS-Info response Message, Target BS may use the embedded TLV REG-xxx & DSx-xxx information in C.2.4 to build and send an unsolicited REG-RSP message. The REG-RSP message may include Old_CID, New_CID, and Connection_Info TLVs. Target BS may ignore only the first REG-REQ message received if it sends an unsolicited REG_RSP message. MSS is not required to send an REG-REQ if it receives an unsolicited REG-RSP prior to MSS attempt to send REG-REQ.
Network Address discover
Network Address offer
Network Address request
Network Address response
If Target BS received a C.2.4 MSS-Info response Message that included the MSS Network Address, and the MSS Network Address is compatible with Target BS addressing mechanics, Target BS may skip most of the Network Address allocation process and re-provision the same address through an unsolicited Network Address Response. Target BS may ignore only the first Network Address discover message received if it sends an unsolicited Network Address response message. MSS is not required to send an Network Address discover if it receives an unsolicited Network Address response prior to MSS attempt to send Network Address discover.
Time of day request
Time of day response
If using the HO shortened admission/registration process, MSS and Target BS may skip Time of day process.
If using the HO shortened admission/registration process, MSS may skip the SS configuration file download procedure.
TFTP-REQ
TFTP-RSP
DSA-REQ
DSA-RSP
If MSS received a REG-RSP message that included the Old_CID, New_CID, and Connection_Info TLVs, MSS and Target BS may skip the establish connections procedure.
HO complete notification message
HO complete notification acknowledge message
If Target BS received a C.2.5 HO-pre-notification Message from Serving BS or MSS RNG-REQ to Target BS included an un-timed-out Serving BS ID, Target BS may send a C.2.2 HO complete/ Serving BS notification message to previous Serving BS. Previous Serving BS may respond with a C.2.7 HO confirm message.
Target BS may send a C.2.2 HO complete/Serving BS notification message to Authorizing Station or Other BS. Authorizing Station or Other BS may respond with a C.2.7 HO confirm message.
HO complete notification message
HO complete notification acknowledge message

Note: still need to rework all of sections D.1 through D.5 Figures and Diagrams.