WiMAX Forum® Network Architecture

(Stage 3: Detailed Protocols and Procedures)

[Annex: R6/R8 ASN Anchored Mobility Scenarios]

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Revision History

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1. R6/R8 ASN Anchored Mobility Scenarios

This section discusses handover between within the Profile C ASN. The Profile C ASN consists of one or more BSs and one or more ASN GWs. The BSs SHALL be connected to the ASN GWs with R6 interfaces. The Neighbor BSs are interconnected with R8 interfaces. The ASN GWs are interconnected with R4 interfaces. This section discusses only R6 and R8 operations. R4 operations, if executed, are identical to those described in Section 5. Figure 6-3 in Stage 2, section 6.3.2 shows the relevant network interfaces.

With respect to R6 and R8 operations the entities that participate in HO process are logically divided into the following types:

a. Serving BS that hosts Serving HO Function and serves the MS prior to HO.

b. Target BS that hosts Target HO Function. There might be one or more Target BSs. One of them is selected as the final HO Target and becomes Serving BS after HO completion.

c. Anchor ASN GW that hosts the Anchor DP Function for the MS. Serving ASN GW MAY be located on the path between Anchor ASN GW and Serving BS. Target BS GW MAY be located on the path between the Anchor ASN GW and Target BS. In this case each such Data Path has R6 segment and R4 segment. Since this section discusses only R8 messages and R6 Data Paths operations, it is assumed in the text below that the Data Path between BSs and the Anchor GW goes directly over R6.

d. Authenticator ASN GW that hosts Authenticator/Key Distributor Function for the MS.

Data integrity may be optionally applied during the HO procedure to minimize or prevent data loss as a result of the HO.

1.1 Fully Controlled HO

1.1.1 HO Preparation Phase

Upon reception of a MOB-MSHO_REQ message from a mobile station (MS), the Serving BS SHALL initiate a handover to one or more candidate Target BSs by sending an R8 *HO_Req*(s) to the Target BS(s) over the R8 interfaces.

The R8 *HO_Req* message SHALL contain an Authenticator ID TLV that points to the Authenticator/Key Distributor Function hosted in the Authenticator ASN GW. Thus upon receiving an R8 *HO Req* message, the Target BS(s) MAY retrieve AK Context and Service Authorization Info TLV from the Authenticator ASN GW. The Target BS(s) is/are not required to retrieve this information immediately upon receipt of the R8-HO Request message and MAY postpone the retrieval until the Handover Action Phase. This call flow scenario (subsequently referred to as Scenario 1) is shown in Figure 1.

After receiving the R8 *HO_Req* message, each Target BS MAY pre-establish the data path for the MS with the Anchor ASN GW, if the R8 *HO_Req* message includes the Anchor ASN GW ID TLV which points to the ASN GW that hosts the Anchor DP Function. Data Path Pre-Registration at the Handover Preparation Phase is optional and may be executed only when all entities involved support this functionality. If the Anchor ASN GW does not support Data Path Pre-Registration and the Target BS attempts to initiate Data Path Pre-Registration procedure, the transaction should be rejected (i.e. *Path_Prereg_Rsp* message with a rejection code TLV will be sent back to the Target BS).

Data Path Pre-Registration at the Handover Preparation Phase is optional and may be executed only when all entities involved support this functionality. If the Anchor ASN GW does not support Data Path Pre-Registration and the Target BS attempts to initiate Data Path Pre-Registration procedure, the transaction should be rejected (i.e. *Path_Prereg_Rsp* message with a rejection code TLV will be sent back to the Target BS).

The Target BS SHALL respond to the R8 *HO_Req* message with the R8 *HO_Rsp* message, and the Serving BS SHALL acknowledge the Handover Preparation transaction completion by sending an R8-HO Acknowledge message.

1.1.1.1 R6 Data Path Pre-Registration Procedure

The procedure is identical to the one described in the normative Profile C text (see 9.3.3.1.1.1).

1.1.1.2 R6 Authenticator Context Retrieval Procedure

The procedure is identical to the one described in the normative Profile C text (see 9.3.3.1.1.2).

1.1.1.3 MS Initiated HO Preparation

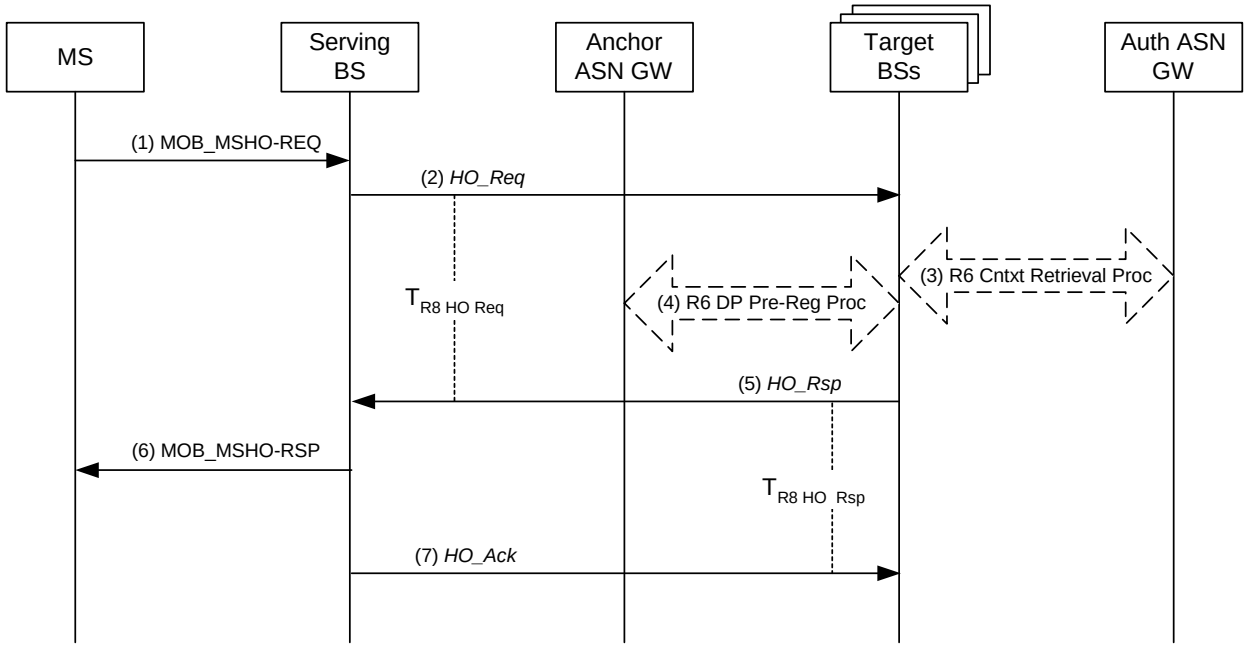

Figure 1 - Successful MS Initiated HO Preparation

STEP 1

The MS initiates a handover by sending a MOB_MSHO-REQ message to the Serving BS, which includes one or more potential target BS's.

STEP 2

The Serving BS sends an R8 *HO_Req* message destined to each potential Target BS's selected for the handover and starts timer $T_{R8\text{-}HO\ Req}$ for each message. The message includes an Authenticator GW ID TLV that points to the Authenticator/Key Distributor function at the Authenticator ASN and the Anchor ASN GW ID of the Anchor Data Path function at the Anchor ASN.

STEP 3

The Target BS(s) MAY request AK context and service authorization information for the MS by initiating a Context Retrieval procedure with the Authenticator ASN GW. Note: The Target BS(s) may optionally choose to defer this procedure to the Handover Action phase.

STEP 4

The Target BS(s) MAY initiate pre-establishment of a data path for the MS with the Anchor ASN GW. If the Anchor ASN GW does not support the Data Path Pre-Registration, the R6 *Path_Prereg_Req* message from the Target BS will be responded by the R6 *Path_Prereg_Rsp* message with an appropriate reject cause code. Note: The Target BS(s) may optionally choose to defer this procedure to the handover Action Phase.

STEP 5

The Target BS(s) sends an R8 *HO_Rsp* message to the Serving BS to acknowledge the handover request and starts timer $T_{R8\text{-}HO\ Rsp}$. Upon receipt of the R8 *HO_Rsp* message, the Serving BS stops timer $T_{R8\text{-}HO\ Req}$.

STEP 6

The Serving BS sends a MOB_BSHO-RSP message to the MS containing one or more potential target BS's selected by the network for the MS to handover to.

STEP 7

The Serving BS sends an R8 *HO_Ack* message to the Target BS(s) controlling the potential target BS(s) selected for the MS. Upon receipt of the R8 *HO_Ack* message, the Target BS(s) stops timer $T_{R8\text{-}HO\ Rsp}$.

1.1.1.4 Network Initiated HO Preparation

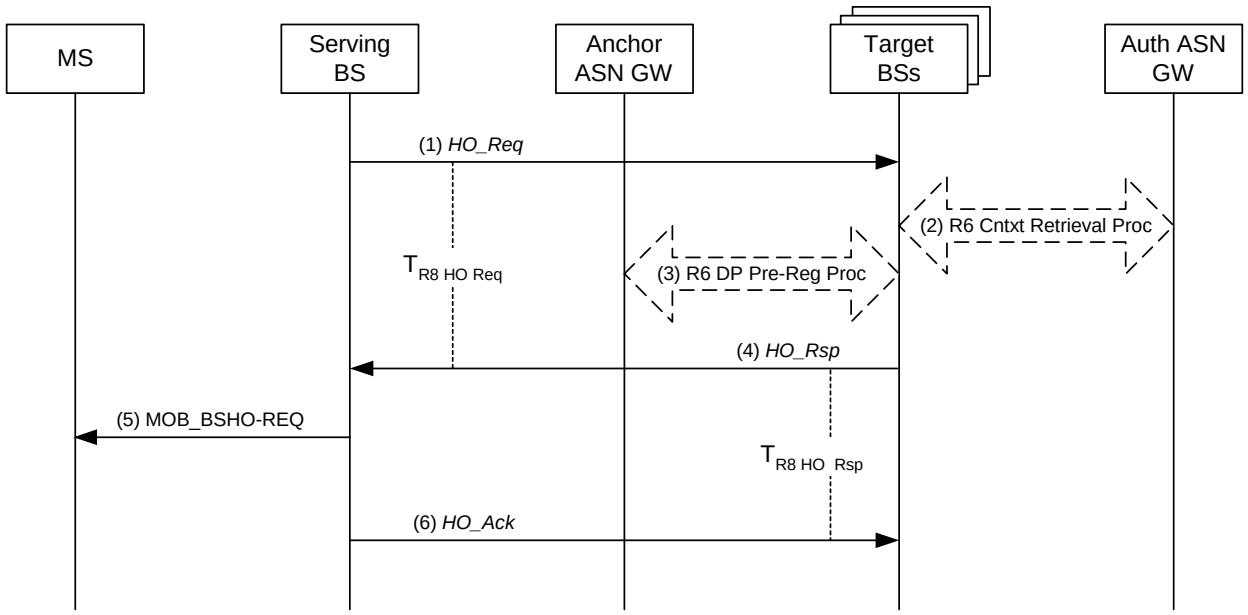

Figure 2 - Successful Network Initiated HO Preparation Phase

STEP 1

The Serving BS initiates a handover by sending an R8 *HO_Req* message destined to each Target BS's selected for the handover and starts timer $T_{R8\text{-}HO\ Request}$ for each message. The message includes an Authenticator GW ID TLV that points to the Authenticator/Key Distributor function at the Authenticator ASN and the Anchor ASN GW ID of the Anchor Data Path function at the Anchor ASN.

STEP 2

The Target BS(s) requests AK context and service authorization information for the MS by initiating a Context Retrieval procedure with the Authenticator ASN GW. Note: The Target BS(s) may optionally choose to defer this procedure to the Handover Action phase.

STEP 3

The Target BS(s) MAY initiate pre-establishment of a data path for the MS with the Anchor ASN GW. If the Anchor ASN does not support the Data Path Pre-Registration, the R6 *Path_Prereg_Req* message from the Target BS will be responded by the R6 *Path_Prereg_Rsp* message with an appropriate reject cause code. Note: The Target BS(s) may optionally choose to defer this procedure to the handover action phase.

STEP 4

The Target BS(s) sends an R8 *HO_Rsp* message to the Serving BS to acknowledge the handover request and starts timer $T_{R8\text{-}HO\ Rsp}$. Upon receipt of the R8 *HO_Rsp* message, the Serving BS stops timer $T_{R8\text{-}HO\ Req}$.

STEP 5

The Serving BS sends a MOB_BSHO-REQ message to the MS containing one or more potential target BS's selected by the network for the MS to handover to.

STEP 6

The Serving BS sends an R8 *HO_Ack* message to the Target BS(s) controlling the potential target BS(s) selected for the MS. Upon receipt of the R8 *HO_Ack* message, the Target BS(s) stops timer $T_{R8\text{-}HO\ Rsp}$.

1.1.1.5 HO Preparation Stage Timers and Timing Considerations

This section identifies the timer entities participating in the HO Preparation Phase. The following timers are defined over R8:

- $T_{R8\text{-}HO\ Req}$: is started by a Serving BS upon sending the R8-HO Request message for an MS to a Target BS and is stopped upon receiving a corresponding R8-HO Response message from the Target BS.
- $T_{R8\text{-}HO\ Rsp}$: is started by a Target BS upon sending the R8-HO Response message for an MS to a Serving BS and is stopped upon receiving a corresponding R8-HO Acknowledge message from the Serving BS.

R6 Timers are identical to those defined in the normative Profile C text (see 7.3.3.1.1.5).

Table 1 shows the default value of timers and also indicates the range of the recommended duration of these timers.

Table 1 - HO Preparation Phase Timer Values R8

Timer	Default Values (msecs)	Criteria	Maximum Timer Value (msecs)
$T_{R8\text{-}HO\ Req}$	TBD		TBD
$T_{R8\text{-}HO\ Ack}$	TBD		TBD

1.1.1.6 HO Preparation Stage Error Conditions

This section describes error conditions associated with the HO Preparation Phase.

1.1.1.6.1 Timer Expiry

The following table shows details on the timer expiry causes, reset triggers and corresponding actions. Upon each timer expiry, if the maximum retries has not exceeded, the timer is restarted. Otherwise, the corresponding action(s) should be performed as indicated in Table 2.

Table 2 - Timer Max Retry Conditions

Timer	Entity where Timer Started	Action(s)
$T_{R8\text{-}HO\ Req}$	Serving BS	???
$T_{R8\text{-}HO\ Ack}$	Target BS	

1.1.1.6.2 R8-Context Response Error

Upon receipt of the R8 *Context_Req* message, if the Serving BS is unable to provide the requested information it SHALL send an R8 *Context_Rsp* message with the Reject Cause Code TLV to the sender of the R8 *Context_Req* message. Upon receipt of the R8 *Context_Rsp* message with Reject Cause Code TLV, the Target BSSHALL stop timer $T_{R6\text{-}Cntxt\_Req}$ (if running), and MAY resend the R8 *Context_Rsp* message. If the Target BS does not resend the R8 *Context_Req* message or if subsequent attempts are also unsuccessful, then the BS MAY send a R8 *HO_Rsp* message with suitable error code included in the Result Code TLV.

1.1.1.6.3 R8-HO Response Error

Upon receipt of the R8 *HO_Req* message, if the Target BS is unable to support the requested HO, then it SHALL send R8 *HO_Rsp* message with suitable error code included in the Result Code TLV. Upon receipt of the R8-*HO_Rsp* message indicating HO cannot be supported at a Target BS, the Serving BS SHALL stop $T_{R8\text{-}HO\_Req}$ (if

running), and MAY re-send the R8 *HO_Req* message to a different Target BS. If the Serving BS does not re-send the R8 *HO_Req* message, or if all subsequent Target BSs cannot support the HO, in the case of MS Initiated handover, the Serving BS SHALL send a MOB_BSHO_RSP with mode = 0b111 to the MS.

1.1.2 HO Action Phase

The HO Action Phase begins when the MS leaves the Serving BS. The MS sends a MOB_HO-IND message to the Serving BS in which it specifies which of the Target BSs has been selected for the handover. The MOB_HO-IND message is the last message the MS sends to the Serving BS. After sending MOB_HO-IND the MS may start ranging with the Target BS.

Upon receiving MOB_HO-IND, the Serving BS SHALL generate an R8 *HO_Cnf* message and send it to the Target BS. The R8 *HO_Cnf* message includes the "most recent MAC context" at the Serving BS.

Upon receiving R8 *HO_Cnf* message with the HO Indication type whose value is not set to "Cancel", the Target BS SHALL retrieve the AK Context if this information was not retrieved during the Handover Preparation Phase. This call flow scenario (subsequently referred to as Scenario 1) is shown in.

If the data path between the Anchor ASN GW and the Target BS was not pre-established at the Preparation Phase, it MAY be pre-established after receiving R8 *HO_Cnf* message and before the MS starts Network Re-Entry at the Target BS.

The data paths between the Anchor ASN GW and the Target BS SHALL be established via Data Path Registration procedure after the MS either starts or completes Network Re-Entry at the Target BS[1]. If Data Path Registration procedure is invoked after the data path had been pre-registered, the procedure only confirms final establishment of the pre-registered data paths and does not convey any parameters of the data paths except MS ID. In this case, all the parameters that are related to the data paths SHALL be exchanged during the preceding Data Path Pre-Registration transaction. Furthermore, the Data Path Registration transaction is completed with a two-way handshake; DP Registration Request and Response message exchange and no *Path_Reg_Ack* message (i.e. two-way handshake).

If no Data Path Pre-Registration procedure had been completed prior to the Data Path Registration procedure, the R6 *Path_Reg_Req* and *Path_Reg_Rsp* message SHALL convey all parameters relevant for the setup of Data Paths. In this case the R6 *Path_Reg_Ack* message SHALL be sent in response to R6 *Path_Reg_Rsp* message (i.e. three-way handshake).

Upon completion of Data Path Registration procedure, the Anchor ASN GW SHALL initiate de-registration of all the pre-registered data paths to the candidate Target BSs that have not been selected for the final handover target. Also, the Anchor ASN GW SHALL initiate de-registration of the data path between the (old) Serving BS and itself.

If the Serving BS determines that the MOB_HO_IND message was not received from the MS (due to a communication loss with the mobile[2]), for example upon expiration of internal timer[3], the Serving BS MAY send the R8 *HO_Cnf* message; value for the HO Indication type should be set to an "Unconfirmed" which may include all "most recent MAC context". Such R8 *HO_Cnf* message SHALL be sent to the set of Target BSs that were indicated in the previous MOB_BSHO-REQ or MOB_BSHO-RSP message that was sent by the Serving BS to the MS. The R8 *HO_Cnf* message may also be sent to target BSs which weren't notified of a potential impending handover from the MS during the handover preparation phase and whose target BSs weren't included in the MOB_BSHO-REQ or MOB_BSHO-RSP messages (e.g candidate target BSs which were included in the MOB_MSHO-REQ message sent by the MS but weren't notified of the handover in the handover preparation phase). Upon sending the R8 *HO_Cnf* message to the candidate Target BS(s), the Serving BS SHALL stop all the downlink and uplink scheduling for the data transmission and reception from the MS respectively.

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[1] If DP registration is initiated before MS completes Network Reentry there is a probability that MS will not complete the Network Re-Entry where it has started because the RNG-RSP might be lost in the air. In this case the Data Path will have to be registered again, possibly with another Target BS.

[2] MOB_HO-IND message could be lost over the air or not sent by the MS because it didn't receive the MOB_BSHO-RSP message from the BS in the MS initiated handover case, or it didn't receive the MOB_BSHO-REQ from the BS in the network initiated handover case.

[3] For example, $T_{MOB\_HO\_IND.}$

Upon sending the R8 *HO_Cnf* message, if the Resource_Retain flag was not set, the Serving BS SHALL discard all MS's connections resource information including the MAC state machine and all outstanding buffered PDUs, else the Serving BS SHALL retain the connections, MAC state machine and PDUs associated with the MS for service continuation until the expiration of Resource Retain Timer.

The Serving BS SHALL release all MAC context and MAC PDUs associated with the MS upon reception of a R8-HO Complete message from the Target BS indicating MS committed Network Attachment at the Target BS.

If the Target BS does not receive the R8 *HO_Cnf* message before the MS starts Network Reentry, the Target BS MAY request the "most recent MAC Context" via Context Request/Report exchange with the Serving BS as it is shown in Scenario 2.

Immediately after the MS completes Network Re-entry, the Target BS (which at that moment becomes new Serving BS) SHALL send *CMAC_Key_Count_Update* message to the Authenticator ASN GW to notify the successful HO completion at the selected Target BS. The message SHALL deliver to the Authenticator the value of the CMAC_KEY_COUNT which is received from the MS. For details of *CMAC_Key_Count_Update*, refer to 4.3.4.2 Maintenance of CMAC Key Count by the Network. As soon as the MS Network Re-entry procedure at the Target BS is completed, the Target BS MAY send an R8 *HO_Complete* message to the Serving BS to expedite the resource release in the Serving BS.

1.1.2.1 Data Path Registration Procedure

The procedure is identical to the one described in the normative Profile C text (see 9.3.3.1.2.1).

1.1.2.2 Data Path De-Registration Procedure

The procedure is identical to the one described in the normative Profile C text (see 9.3.3.1.2.2).

1.1.2.3 CMAC Key Count Update Procedure

The procedure is identical to the one described in the normative Profile C text (see 9.3.3.1.2.3).

1.1.2.4 MAC Context Retrieval Procedure

MAC Context Retrieval Procedure is shown in Figure 3:

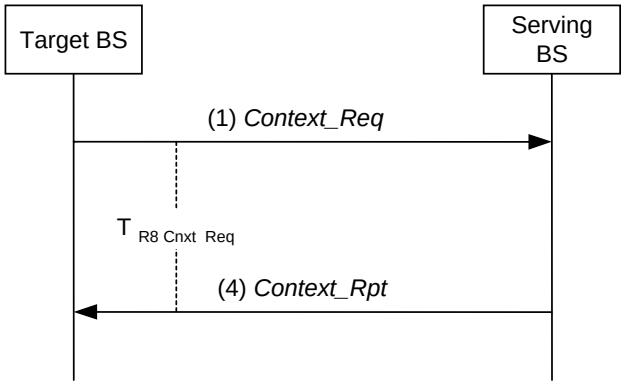

Figure 3 - MAC Context Retrieval Procedure

Target BS sends an R8 *Context_Req* message to request the context associated with a specified MS stored in the Serving BS. The Target BS starts timer $T_{R8\text{-}Cntxt\_Req}$.

Serving BS responds by sending the requested context information for the mobile in the R8 *Context_Rpt* message. Upon receipt of the R8 *Context_Rpt* message, Target BS stops timer $T_{R8\text{-}Cntxt\_Req}$.

1.1.2.5 Handover Action Scenario 1: Serving BS Sends HO Confirm After receiving MOB HO-IND

The following call flow describes a successful handover action scenario where the Serving BS receives MOB-HO-IND and sends the R8 *HO_Cnf* message to the Target BS.

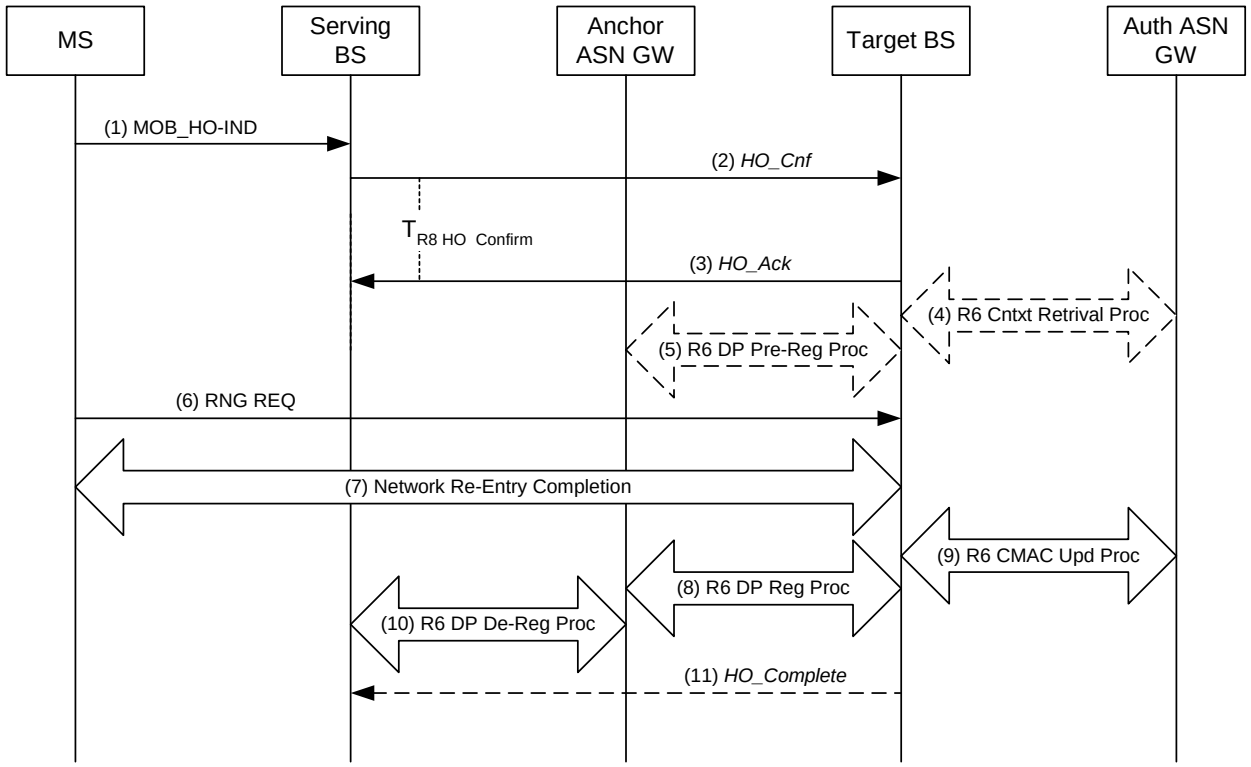

Figure 4 - Successful HO Action Phase, Scenario 1

STEP 1

The MS sends a MOB_HO-IND to the Serving BS to notify a handover to one of the target BSs selected by the Serving BS in the Handover Preparation phase.

STEP 2

Upon reception of the MOB_HO-IND the Serving BS sends an R8 *HO_Cnf* message and starts timer $T_{R8\text{-}HO\ Confirm}$.

STEP 3

The Target BS sends an R8 *HO_Ack* message. Upon receipt of the R8 *HO_Ack* message, the Serving BS stops timer $T_{R8\text{-}HO\ Confirm}$.

STEP 4

If AK context and service authorization information for the MS was not requested during the Handover Preparation phase, the Target BS requests AK context and service authorization information for the MS by initiating a Context Retrieval procedure with the Authenticator ASN. Otherwise, this step SHALL be skipped.

STEP 5

If the Data Path Pre-Registration procedure did not occur during the Preparation Phase, the Data Path Pre-Registration procedure may take place at this moment.

STEP 6

The MS initiates network re-entry with the Target BS by sending RNG-REQ.

STEP 7

The Target BS responds with RNG-RSP and the MS and the Target BS complete Network Reentry.

STEP 8

Target BS initiates Data Path Registration procedure with the Anchor ASN GW. This procedure MAY take place immediately after step 6.

STEP 9

Immediately after completing Network Reentry, Target BS initiates CMAC Key Count Update procedure and updates the Authenticator ASN GW with the latest CMAC Key Count value received from MS.

STEP 10

Upon completing the Data Path Registration procedure with the Target BS, the Anchor ASN GW initiates Data Path De-Registration procedure with the old Serving BS. Also, the Anchor ASN GW SHALL de-register all the pre-registered data paths with the other unselected Target BSs. See discussion in the normative section 9.3.3.1.2.8 for more details.

STEP 11

Upon completion of network re-entry, the Target BS may send an R8 *HO_Complete* message to notify the completion of the handover. Upon receipt of the R8 *HO_Complete* message, the Serving BS releases the MS context.

1.1.2.6 Handover Action Scenario 2: Serving BS Proactively Sends HO Confirm

The following call flow describes a successful handover action scenario where the Serving BS doesn't receive HO-IND because the latter is lost in the air and sends the R8 *HO_Cnf* messages to the entire set of the Target BSs. See also section 5.7.2.1.6 HO Action Scenario 3.

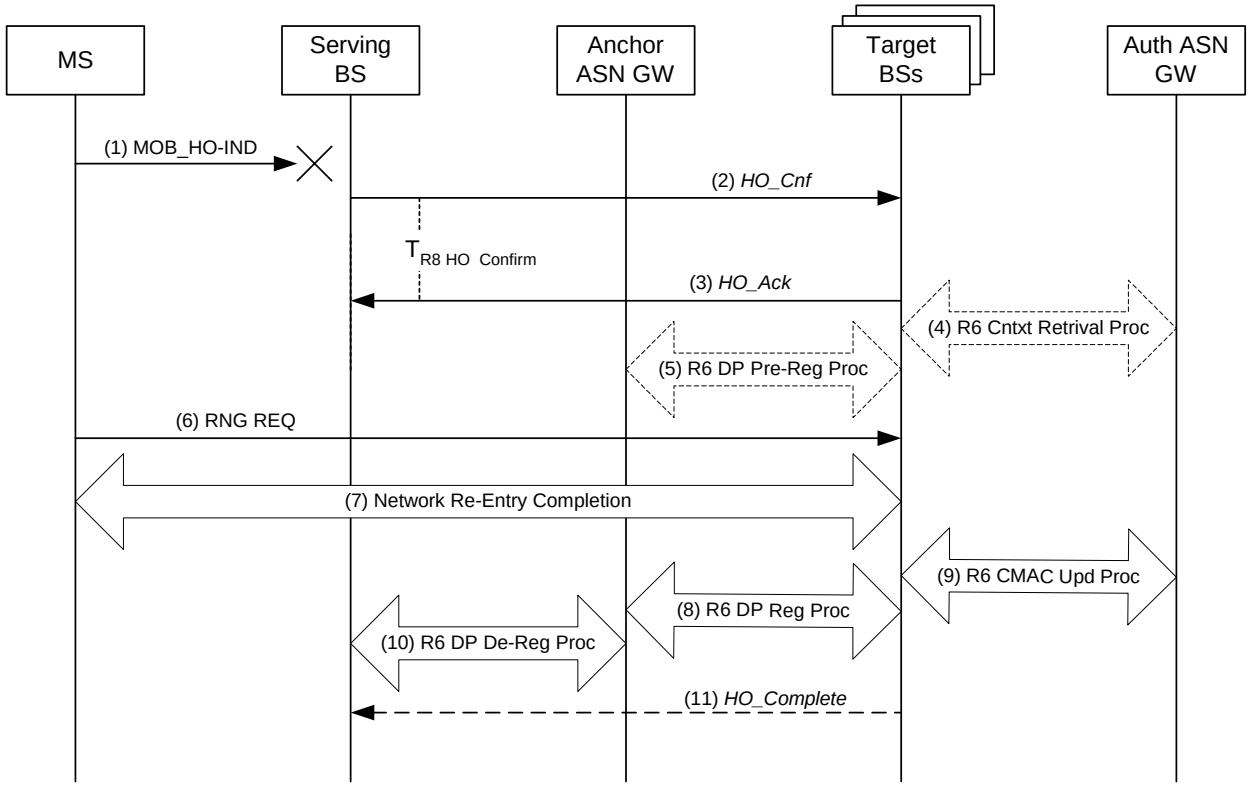

Figure 5 - Successful HO Action Phase, Scenario 2

The step description is the same as in Scenario 1 described in 1.1.2.5 with one difference – in this case in step 1, the serving BS sends multiple R8 *HO_Cnf* messages. The R8 *HO_Cnf* message may also be sent to candidate targets BSs the MS may chose to handover to which weren't previously notified of a potential handover from the MS

during handover preparation. The R8 *HO_Cnf* message includes the HO_Indication Type set to "Unconfirmed", and may include the most recent MAC content for the MS.

1.1.2.7 Handover Action Scenario 3: Serving BS Doesn't Send R8-HO Confirm

The following call flow describes a successful Handover Action scenario where the MOB_HO-IND sent by the MS to the Serving BS was lost over the air and not received by the Serving BS, and/or the R8 *HO_Cnf* message sent by the Serving BS to the Target BS was either delayed or not received. The MS completes network re-entry at one of the Target BSs selected by the Serving BS during the Handover Preparation phase.

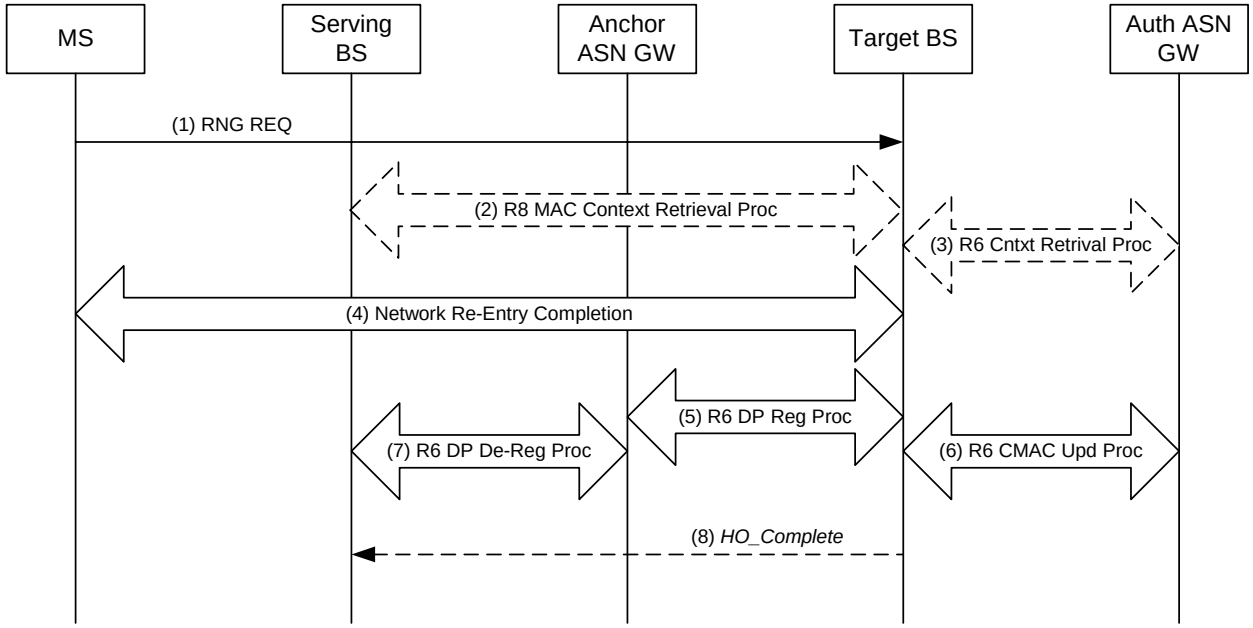

Figure 6 - Successful HO Action Phase, Scenario 3

STEP 1

The MS initiates network re-entry with the Target BS by sending RNG-REQ.

STEP 2

If the Target BS needs to synchronize the dynamic MAC context it initiates a Context Request procedure with the Serving BS to retrieve the latest MAC context for the MS.

STEP 3

If AK context and service authorization information was not obtained during the Handover Preparation phase, the Target BS requests AK context and service authorization information for the MS by initiating a Context Request procedure with the Authenticator ASN.

STEP 4

The Target BS responds with RNG-RSP and the MS and the Target BS complete Network Reentry.

STEP 5

Target BS initiates Data Path Registration procedure with the Anchor ASN GW. This procedure MAY take place immediately after step 3.

STEP 6

Immediately after completing Network Reentry, Target BS initiates CMAC Key Count Update procedure and updates the Authenticator ASN GW with the latest CMAC Key Count value received from MS.

STEP 7

Upon completing the Data Path Registration procedure with the Target BS, the Anchor ASN GW initiates Data Path De-Registration procedure with the old Serving BS. Also, the Anchor ASN GW SHALL de-register all the pre-registered data paths with the unselected Target BSs. See discussion in the normative section 7.3.3.1.2.8 for more details.

STEP 8

Upon completion of network re-entry, the Target BS may send an R8 *HO_Complete* message to notify the completion of the handover. Upon receipt of the R8 *HO_Complete* message, the Serving BS releases the MS context.

1.1.2.8 HO Action Phase Timers and Timing Considerations

This section identifies the timer entities participating in the HO Action Phase. The following timers are defined over R8:

- $T_{R8\text{-}HO\ Confirm}$: is started by the Serving BS when sending a R8-HO Confirm message to a Target BS, and is stopped upon receiving a R8-HO Acknowledge message from the corresponding Target BS.

R6 Timers are identical to those defined in the normative Profile C text (see 7.3.3.1.2.8).

Table 3 shows the default value of timers and also indicates the range of the recommended duration of these timers.

Table 3 - HO Action Phase Timer Values for R6

Timer	Default Values (msecs)	Criteria	Maximum Timer Value (msecs)
$T_{R8\text{-}HO\ Confirm}$	TBD		TBD

1.1.2.9 HO Action Phase Error Conditions

This section describes error conditions associated with the HO Action Phase.

1.1.2.9.1 Timer Expiry

The following table shows details on the timer expiry causes, reset triggers and corresponding actions. Upon each timer expiry, if the maximum retries has not exceeded, the related message is retransmitted and the timer is restarted. Otherwise, the corresponding action(s) should be performed as indicated in Table 4.

Table 4 - Timer Max retry Conditions

Timer	Entity where Timer Started	Action(s)
$T_{R8\text{-}HO\ Confirm}$	(old) Serving BS	TBD

1.1.3 Uncontrolled HO

An Uncontrolled (Unpredictive) handover occurs when an MS starts ranging at a Target BS that wasn't previously notified of an impending handover from an MS and didn't participate in the Handover Preparation Phase. This may occur due to suboptimal radio planning conditions or MS implementation (handover notification of the Serving BS by MS is optional).

If an MS starts ranging with a BS that doesn't have MS Context information including Authenticator GW and Anchor ASN GW identifiers, the RNG-REQ message from the MS cannot be authenticated. In a worst case scenario a full Network Re-Entry will be required which results in a large delay, because some authentication methods may take seconds to complete, especially if the Home AAA Server is located far away and the communication is slow.

However if the MS includes the Serving BS ID TLV in the RNG-REQ message, the handover can still be completed in a reasonable delay and the period of traffic unavailability can be greatly reduced. When an MS re-enters at a Target BS and supplies its Serving BS ID in the RNG-REQ message, the Target BS may retrieve the relevant MS

Context from the Serving BS including the Authenticator GW ID and Anchor ASN GW ID. Thus it becomes possible for the Target BS to authenticate the RNG-REQ and perform data path registration with the Anchor ASN GW. This call flow scenario is described in Figure 4-29.

Network Re-Entry might be completed immediately after receiving the MS Context or after data path establishment (the latter case is shown in the call flows). The former method requires a lower Ranging Response Timeout in the MS, however it also requires holding the uplink traffic until the data path is established. The latter method doesn't require traffic holding but relies on larger Ranging Response Timeout in the MS. The moment of Network Re-Entry completion does not affect interoperability and is left as a vendor implementation option.

The following call flow provides an example of a successful uncontrolled handover scenario. A MS begins ranging at Target BS that wasn't contacted by the Serving BS to participate in the Handover Preparation phase. Therefore the Target BS was unaware of an impending arrival of the MS. The Target BS retrieves the MS context and authenticator information and successfully completes the handover.

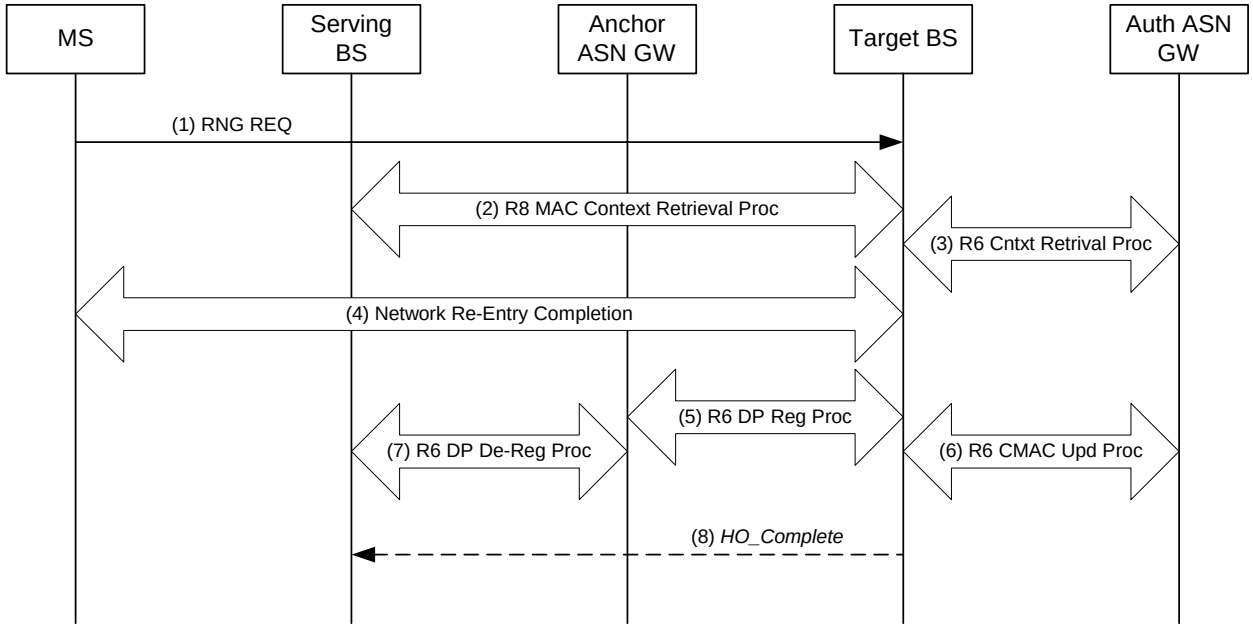

Figure 7 - Uncontrolled (Unpredictive) HO

STEP 1

An MS performs an uncontrolled handover by sending an RNG-REQ message to perform contention based ranging at a Target BS that didn't receive prior notification of an impending handover from the MS and therefore didn't participate in the Handover Preparation phase. The MS includes the Serving BSID TLV in the RNG-REQ message.

STEP 2

The Target BS initiates a MAC context retrieval procedure with the Serving BS to retrieve context information for the MS. The Serving BS responds by sending the context information that includes the Authenticator ASN GW ID and Anchor ASN GW ID.

STEP 3

The Target BS requests AK context and service authorization info for the MS by initiating a Context Retrieval procedure with the Authenticator ASN GW.

STEP 4

Target BS uses the Authenticator context to authenticate the MS message. The Target BS sends a RNG-RSP message to the MS acknowledging the HMAC/CMAC tuple (expedited security authentication) and containing the HO Process Optimization TLV.

STEP 5

The Target BS initiates data path registration for the MS with the Anchor Data Path ASN. Note: This step may occur any time after step 3.

STEP 6

The Target BS initiates a CMAC Key Count Update procedure with the Authenticator ASN to update it with the latest CMAC Key Count.

STEP 7

The Anchor ASN GW initiates an R6-Data Path De-Registration procedure with the Serving BS.

STEP 8

Upon completion of network re-entry, the Target BS may send an R8 *HO_Complete* message to notify the completion of the handover. Upon receipt of the R8 *HO_Complete* message, the Serving BS releases the MS context.

1.2 Message Definitions

The composition of the R6 and R8 messages is identical to the composition of the corresponding R4 messages described in the Stage 3 specification.